

**Population Model
to Forecast Population Growth
of Lehigh Acres Over Time
to Build-out**

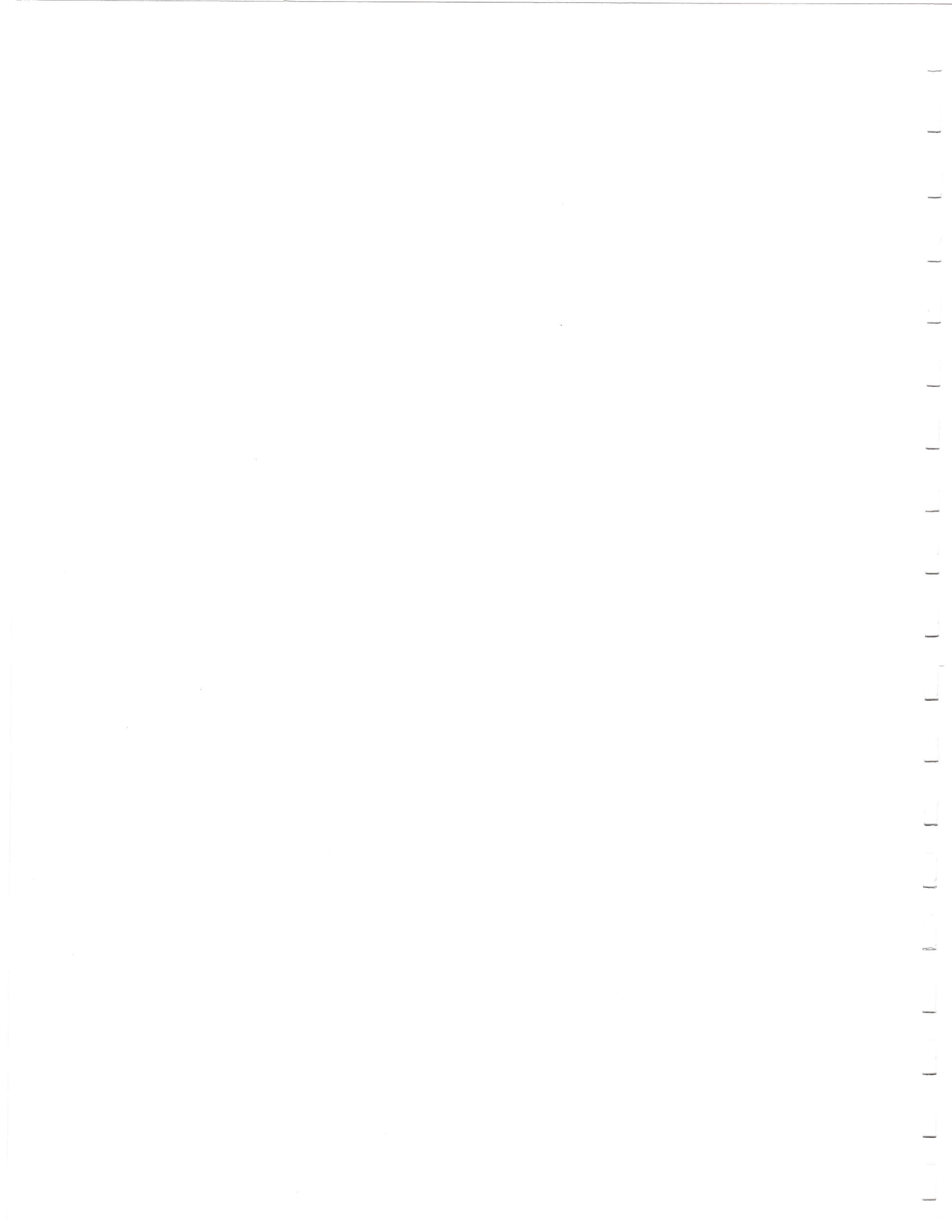
Prepared for:

**Wayne E. Daltry, FAICP
Smart Growth Director
Office of the Lee County Manager**

By:

Van Buskirk, Ryffel and Associates, Inc.

April 2004



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April 2004

Lee County Project Number 2620

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Acknowledgments

It is the standard practice of Van Buskirk, Ryffel and Associates, Inc. to encourage the active participation of government staff members on projects involving population projections and Interactive Growth Models. It has been our experience that such a strategy produces highly accurate and timely end products, saves on consultant fees and broadens staff knowledge of state-of-the-art planning. Accordingly, we wish to thank the following persons or entities, whose participation made this study possible.

Lee County Smart Growth Director Wayne Daltry, FAICP, commissioned this study, assembled County staff participants, provided direction and reviewed drafts.

We owe a special debt of gratitude to Amy Hoyt, GIS Coordinator in the Lee County Department of Public Works, who produced original maps and information depicted in graphic form that did not exist previously. She was able to do this quickly, accurately and in superb detail. We have never encountered a GIS practitioner of such in-depth knowledge in this field and Lee County is most fortunate to have her.

Valuable information concerning the build out population of Lehigh Acres was provided after many hours of work by Rick Burris, Principal Planner and Planner, Peter Blackwell of the Department of Community development. Karen Forsythe of the Division of County Lands, provided information about tax certificates in Lehigh Acres and their possible role in a land aggregation strategy.

Richard Foster, Senior Project Manager of the Florida Governmental Utility Authority provided the most up to date information about water and sewer line locations in Lehigh Acres and treatment facilities.

Tom Cookingham, Community Development Director of Charlotte County, provided valuable information about Port Charlotte, a pre-platted community, and Charlotte County's efforts to address land aggregation issues. Similarly, Rick Sosnowski, Senior Planner for the City of Cape Coral, provided information about that jurisdictions' efforts to address aggregation and other land use issues common in pre-platted communities.

To all of these professionals, we extend our most grateful appreciation.

Purpose of The Study

Lehigh Acres is a sleeping giant in Lee County that is awakening, and will grow rapidly in the months and years to come. The purpose of this study was to determine its total population, by five-year increments, to its build-out. The variety of information and data in this study, i.e., to accurately forecast population build-out in Lehigh Acres, has never been combined until now.

The results contained herein are therefore highly accurate and defensible. **The scope of this report was to forecast permanent population, over time, to build-out in Lehigh Acres.** This total population forecast figure would be a critical building block to develop an interactive growth model in the future that would distribute that population. A Lehigh Acres growth model would be invaluable to plan for growth, the reapportionment of land, timing of utilities, roads, other public services such a fire house timing and location, open space, schools and commercial uses. It is also provides for decision makers to view alternative growth scenarios and provide a mechanism to determine the efficiencies/inefficiencies of growth.

Report Objectives

The objective of this report is to research, determine and apply the methodology to accurately forecast future population growth for Lehigh Acres in Lee County.

CHAPTER 1

Lehigh Acres History, Challenges and Opportunities

Lehigh Acres, an unincorporated portion of eastern Lee County, is a pre-platted community developed during the 1950's. Its' area comprises approximately 96 square miles of land, compared to Cape Coral, another pre-platted community of 114 square miles. Unlike Lehigh Acres, Cape Coral incorporated as a city in 1970. Both Lehigh Acres and Cape Coral are two of the largest pre-platted communities in the nation. (See Map 1)

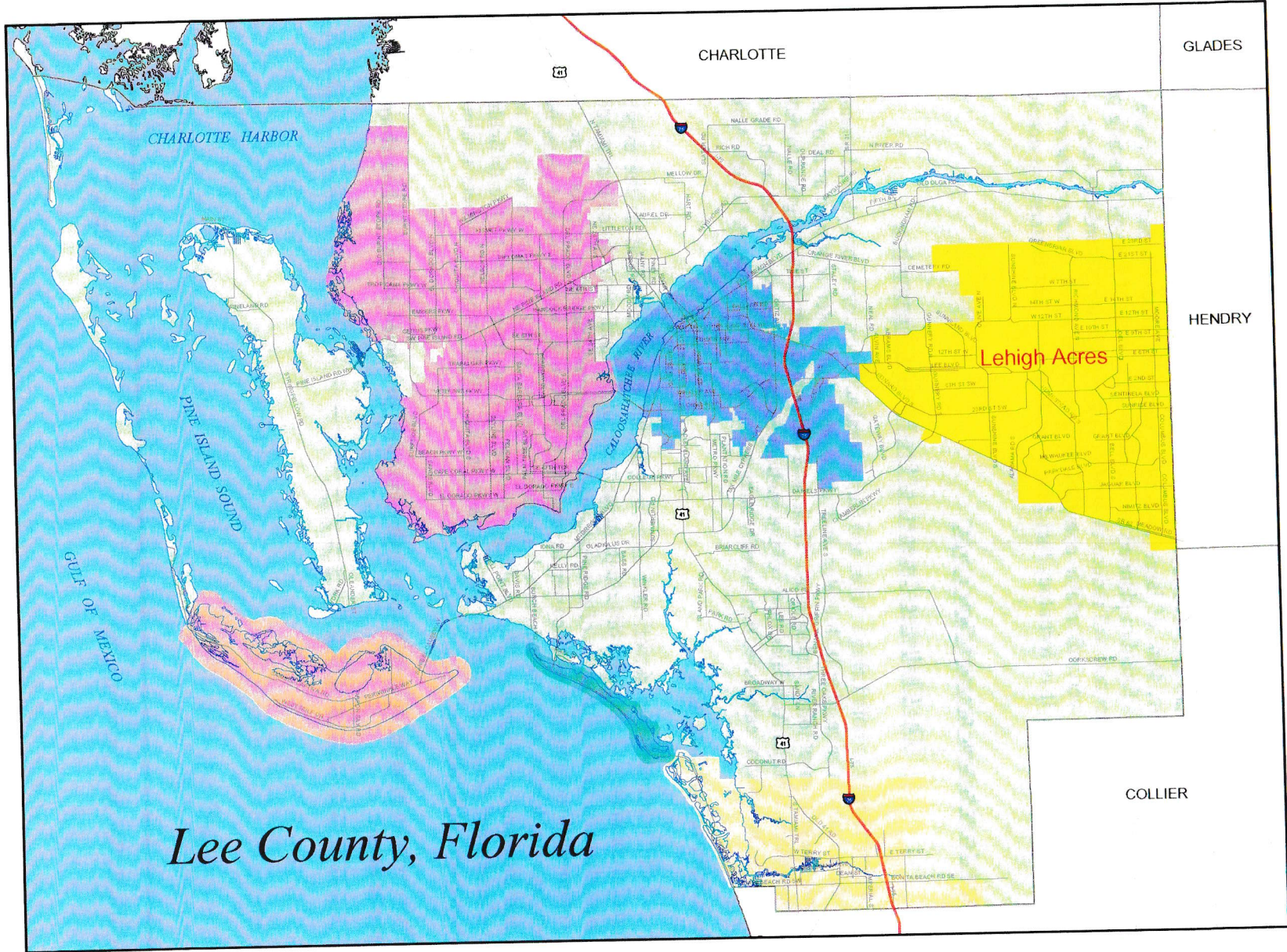
Lehigh Acres was born during the era of the Florida land sales, when customers from all over the world could buy their "piece of Florida paradise" for a minimal investment down, with the balance due after a long-term payout at modest monthly payments. The idea of low lot prices during the younger years of investors with the notion of having it paid off by their retirement years was irresistible to many. It would not be for many years that the true monetary and life-style costs would be realized.

Lehigh Acres and Cape Coral are, in many ways, tandem communities, and can help us to understand the likely evolution of Lehigh Acres. Where today Lehigh Acres has a population of about 40,000, Cape Coral has a population of over 125,000. Cape Coral has grown faster than Lehigh Acres because of its:

- Location near the Gulf of Mexico
- 400 miles of fresh and saltwater canals that provide access to the Caloosahatchee River and Gulf of Mexico
- Proximity to major shopping opportunities outside the city
- Public services provided by city government
- Relatively rapid evolution from primarily retired owners to young families
- Planning done to correct the deficiencies of the original developer
- Public services meeting current demand

The cost of lots in Cape Coral is now astounding, as the media has accurately reported nearly weekly in the past year. In fact, the Bureau of the Census has found Cape Coral to be the 9th fastest growing city of cities with population of 100,000 or greater in the nation between July 1, 2001 and July 1, 2002.

Similarly, lot prices in Lehigh Acres have made impressive advances in the last two years, even though it does not possess all of the attributes of Cape Coral. It is however, still relatively affordable to a broad cross section of the market. But as time goes by and the demand for building lots increases, the rate of growth is certain to accelerate dramatically. Even now the value of lots in Lehigh Acres are dramatically up as evidenced by an article in the February 29, 2004 issue of the News-Press that reported:



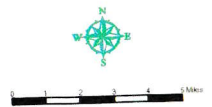
Lehigh Acres Forecasting Model

Lehigh Acres Location Map

Legend

- Lehigh Acres
- City of Bonita Springs
- City of Cape Coral
- City of Fort Myers
- City of Sanibel
- Town of Fort Myers Beach
- Unincorporated Lee County

Lehigh Acres = approx. 95 Sq Miles or 61,114 Acres



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“For decades people who’ve wanted affordable housing built homes in Lehigh Acres because there was no shortage of lots priced at less than \$5,000. Today there is not one lot listed on the local Multiple Listing Service (MLS) that is near that price in Lehigh”

The article goes on to say in part:

“But a survey of current active listings shows that only 1.3 percent are less than \$10,000.”¹

In general, large developable tracts of land are, for the most part, gone in Lee County when compared to what was available just ten years ago. However, there are some large tracts available in eastern Lee County near Lehigh Acres. Generally, lack of large tracts of developable land means that there will be fewer affordable residential lots to be found in planned communities using state of the art planning principles. As a result, their prices will be higher and will reduce the number of buyers in the affordable range. At the moment, lot prices in Lehigh Acres are very affordable compared to other areas in the county. Therefore, accelerating growth should be anticipated. It is fortuitous that Lehigh Acres is now just entering its accelerating growth period.

Could Lehigh Acres become the next Cape Coral?

The Challenges/Impacts of Pre-Platted Communities

The developer’s strategy in both Lehigh Acres and Cape Coral and most other pre-platted communities during the 1950’s was to maximize residential lot sales, and to provide minimal services such as roads and minimal drainage (that does not meet today’s standards). There was little or no consideration given to other basic needs. Unfortunately, Lehigh Acres has many of the challenges and impacts associated with the characteristics described below. Two major categories that broadly summarize the obstacles facing Lehigh Acres include:

- **Improper mix of land uses**

The Urban Land Institute has a set of land use mix standards that are based on the existing and future population of a community. In the case of Lehigh Acres, most of the land was divided into residential lots with little-no consideration given to parcels of adequate size to accommodate other support uses. These include schools, commercial/shopping, open space, environmental preservation, and sewer and water facilities. Since uses other than residential were not addressed, residents need to travel to more urbanized areas for many services and shopping opportunities. The challenge now and in the future will be the difficulty to assemble land of sufficient and contiguous land to address these needs. With property owners scattered around the world this is a very difficult task.

- **There was no phasing of development, which in turn, promoted sprawl and patchwork development**

¹. “Numbers for Lehigh Impressive”, Frank D’Alessandro, The News-Press, December 7, 2003, page G1.

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Since there is no central sewer and water outside of the core area of Lehigh Acres at this time, many properties are built using wells and septic tanks. With ¼ acre lots in the thousands, concentration of this type of water and sewer solution provides a great potential for pollution of the water table. If the problem becomes serious in the future, moratoriums could result. Since lot development is scattered, the cost of widespread extensions is not economically feasible.

Lehigh Acres Opportunities

1. The extension of Colonial Boulevard and Daniels Parkway to Lehigh Acres makes access to I-75, jobs, shopping opportunities and the Southwest Florida Regional Airport much more convenient for residents.
2. The result of this present study provides an accurate/highly defensible population forecast of Lehigh Acres by 5-year increments to build-out.
3. “*The Lehigh Acres Commercial Land Use Study*” completed in 1996 is most helpful to address Lehigh’s commercial needs.
4. The relatively low cost of land in Lehigh Acres and surrounding areas, when compared to other growth areas, will continue to create growth and demand for public services. Major developers are now acquiring land near Lehigh Acres due to a lack of large tracts elsewhere in the County.
5. There are development strategies that can help balance a proper land use mix at this critical time. Some of those approaches are currently in use in other pre-platted communities and could be applied to Lehigh Acres.

Other Pre-platted Communities – Similar Problems – Different Potential Solutions

Port Charlotte

Port Charlotte is an unincorporated area located within Charlotte County. It consists of approximately 88 square miles of platted lots that are predominantly residential, with a similar paucity of support land uses as demonstrated in other pre-platted communities. The Port Charlotte area is characterized by an overabundance of antiquated subdivisions whose conditions place enormous pressure on local government. These conditions include: 1) site improvements and subdivision infrastructure that are physically and functionally deteriorating or obsolete; 2) faulty past subdivision layout in relation to size, adequacy or usefulness; 3) inadequate and outdated building density patterns; 4) flat or stagnating assessed property values; and 5) a diversity of ownership of thousands of vacant lots that contain rigid deed restrictions which impair the innovative development of these areas that otherwise meet today's real estate development market.

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To meet this challenge Charlotte County is taking an aggressive, multi-pronged approach toward addressing the "sins of the past" in terms of the provision of an appropriate mix of land uses and upgrading inadequate infra-structure.

A few examples of this community's approach to "retro-planning" include: 1) Transfer of Development Rights (TDR) to encourage the aggregation of land in areas served by adequate infrastructure; 2) issuance of density credits to preserve land sensitive resources (historical, cultural and environmental); 3) direct acquisition, with local and state partners, of land with environmental resources and/or hazards, and 4) use of eminent domain to acquire targeted land for resale and development by overcoming impediments such as multiple ownerships, title issues and suppression of outdated use restrictions.

An example of how these tools are being applied by Charlotte County is "Murdock Village." Murdock Village is a 1,300+ acre tract of pre-platted land located in the urban center of the County. This tract of land demonstrates all the problem characteristics attributed to the speculation communities created in the 1950's Florida land boom - grid-iron plat, small lots, minimal infrastructure, scattered development (80 lots out of 3,000+ lots), multiple ownership, and zoning through self perpetuating deed restrictions. Despite excellent access to transportation and proximity to regional shopping, schools and employment there has been negligible development in the area over the last 50 years, and property values have remained flat.

Recognizing the importance of this tract of land to the continued economic viability of the County, the Board of Commissioners decided to take a proactive role in determining the future development of the tract. Subsequently the Board retained the Urban Land Institute and Wilson-Miller to develop a conceptual redevelopment plan for the 1,300+ acres, to identify a redevelopment process, and to determine the role County government should play in the tracts redevelopment. Through the ensuing public charettes the concept of a pedestrian friendly, mixed-use development with a town center and extensive green- and blue-ways was developed, and a proactive land acquisition and project management role for County was identified.

To implement the "Murdock Village" concept the County has taken the following actions: 1) formed a community redevelopment area (CRA) encompassing the 1,300+ acres and established a CRA Board; 2) began preparation of a development plan for the CRA; 3) committed \$35 million towards land acquisition and initiated eminent domain proceedings; and, 4) issued a request for proposals (RFP) and draft redevelopment agreement.

The County anticipates responses to the RFP and draft redevelopment agreement by mid-May 2004 with the selection of a preferred developer by July 2004. Given the complexities of the project it is expected that the first phase of "Murdock Village" will be started in the latter part of 2005 or early 2006. At the end of the projected ten-year development horizon, the County anticipates a modern, amenity rich mixed-use development of approximately 3,900 housing units and 750,000 square feet of professional office and retail space.

Cape Coral

Cape Coral was incorporated in 1970, and consists of 114 square miles of land area. It has the distinction of being Florida's second largest city in geographic area. Cape Coral like most pre-platted communities shares many the challenges and opportunities of other communities of this type. One of these challenges is the aggregation of land for uses to support its resident base. The city has comprehensive plan policies that encourage aggregation of land such as density increases, TDR's, a CRA (Community Redevelopment Agency).

Today, the city issues 400-500 residential permits per month, and growing. As one of the major approaches to address the problem of platted communities, was the development of an Interactive Growth Model. Initially, the city retained one of the authors of this report to determine a highly accurate total population forecast of the community to build-out in five-year increments, similar to what this study is accomplishing for Lehigh Acres. In 2002, the Mayor and City Council adopted that projection. Later, the Mayor and City Council retained the same consultant to develop an Interactive Growth Model, tailored to that specific community. The Interactive Growth Model forecasts the spatial distribution of the population by location and year and its impacts, and can be used to test different scenarios of growth as well. Other applications of the Interactive Growth Model includes the timing, location and size of commercial centers to accommodate the growing population's demands, comprehensive planning and updates, utilities planning, fire station planning, police, parks and open space, TAZ (Traffic Analysis Zone) update and tailored information to the general public.

CHAPTER 2

Population Forecasting Methods

Lee County and its communities are experiencing extraordinary growth. The County has grown from a population of 105,216 in 1970 to 440,888 in the year 2000. This is a four-fold increase over a thirty-year period. Likewise, the population for Lehigh Acres has grown from a population of 4,394 in 1970 to 33,430 in the year 2000. This is an eight-fold increase over a thirty-year period.

There is a need for the County to accurately forecast population over time for the short and long-term planning horizon. Current methods may underestimate population growth for both short and long term planning and has the potential for infrastructure to fall behind the demands of population. This infrastructure can be road network, utilities, schools, recreational facilities and public services. The cost to “catch up” far exceeds the cost to more accurately meet the demands as they occur. For example, to invest public capital to replace infrastructure before the term of its useful life (i.e. 20 years) due to over utilization can result in negative returns on public investment. Likewise, over-estimating population could result in large-scale capital investments that are underutilized with little returns.

There are more accurate applications to forecast growth than the typical linear extrapolation. For large-scale communities in Florida, such as Lehigh Acres, other methodologies may have a more accurate application. Furthermore, the application of a growth model to specifically distribute the forecasted growth over time provides for direct application of traffic models to forecast the need and location for current and future improvements. The timing of utilities and a host of demands (i.e. commercial, recreational facilities) can also be more accurately assessed as to size and location.

Forecasting Methods

The following methods were reviewed to determine that which is most applicable to forecasting the Lehigh Acres population for the short and long term. These methodologies are:

- Cohort Component Model
- Simple Curve fitting or Extrapolation Model
- Exponential Model
- Gompertz (Sigmoid or Logistic) Model.¹

Cohort Component Model

This method “ages” the various age groups or cohorts in the population into the future and applies the appropriate birth and death rates. It also requires an estimate of the level of in-and-out migration. This method can be quite accurate when forecasting population up to ten or twenty years into the future where in-migration is not the major growth factor.

¹ Community Analysis and Planning Techniques, by Richard E. Klosterman, Rowman & Littlefield Publishers, 1990.

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For example, the State of Florida Population Projection Model is an expanded version of the Cohort-Component Model. In the cohort component population projections: births, deaths and migration are projected separately by applying cohort specific rates of population divided into age and sex cohorts. This model in 1985 forecasted the population of Florida for the year 2000 at a low of 13,292,200 and at a high of 16,041,500. The recent 2000 census recorded the population at 15,982,378, which was almost outside of the high forecast. However, when high levels of in-migration are expected over long periods of time, this model becomes less relevant because it focuses on the aging of the current population, while providing little assistance in forecasting the critical rate of in-migration. This model is sophisticated and expensive and will not accurately forecast long-term growth for Lehigh Acres.

Simple Curve fitting on Extrapolation Model:

This method plots past population levels over time in a time series and then extends the line or curve by regression analysis into the future to forecast future population levels. In the early stages of growth of communities in South Florida, growth curves are often linear. Merely extended that linear curve into the future greatly underestimates future growth. Likewise communities in South Florida in their mid-stage of growth the extrapolation of the growth curve into the future greatly overestimate future growth. Another shortcoming of this method is that long-term limits to growth (build out) are not factored in. Therefore, this model is not the most appropriate one for Lehigh Acres.

Exponential Model:

An exponential trend is one where the trend is increasing at a constant rate of change each year. This compounding effect of a constant rate of growth can result in astronomical increases in forecasted population in the long term. While this type of trend in growth may exist for a period of ten years or even twenty years, it cannot sustain itself for longer terms. This model would be misleading for forecasting long-term growth for Lehigh Acres.

Sigmoid Model:

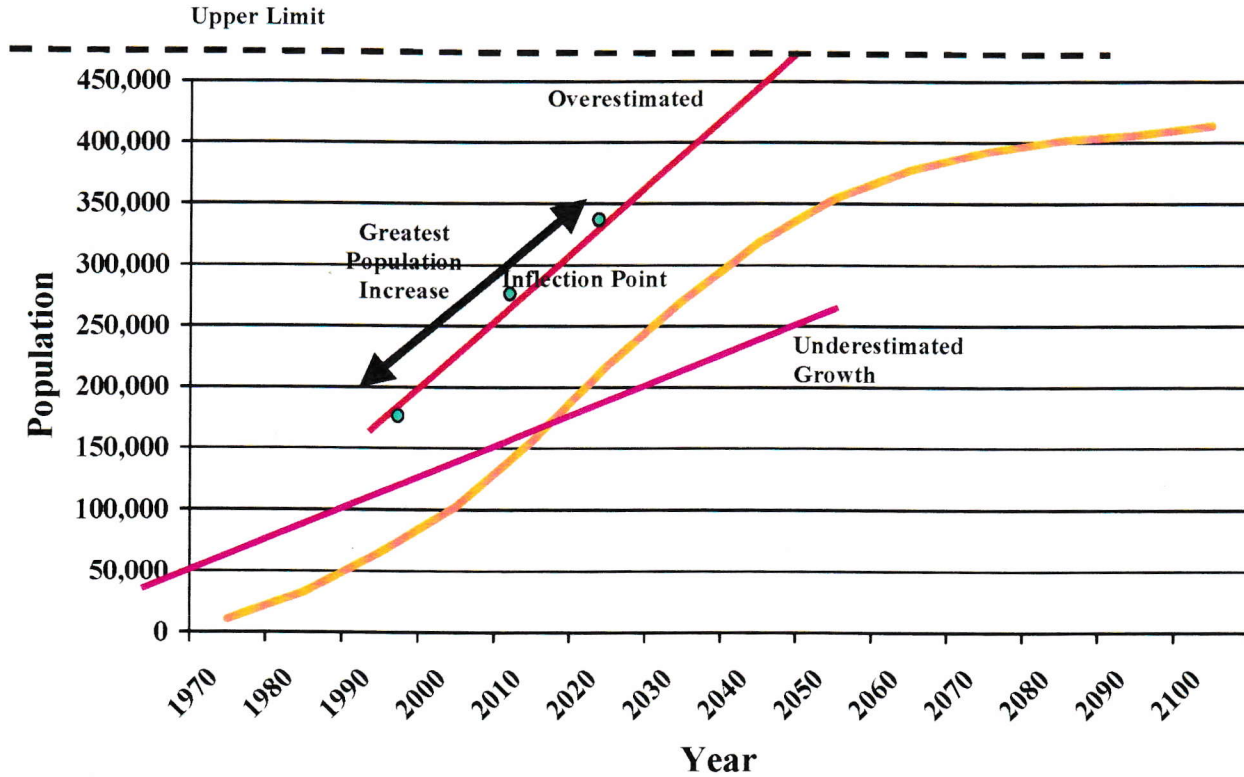
Many biological populations (including cities) tend to grow at a rate over time that simulates a logistic or Sigmoid Curve. Population growth increases at an increasing rate over time until it reaches an inflection point, then the increase in population growth is at a decreasing rate until it reaches upper growth limit. One of the key variables in this growth equation is its upper growth limit (build-out). The upper limit for large-scale pre-platted communities such as Lehigh Acres can be precisely defined by calculating the total number of housing units that can be built on platted lots, and unplatted lands. The housing units can be translated to population. Previous studies of Lehigh Acres estimated build-out population (upper limit) at 342,000 people. The Sigmoid Model is a more scientifically sophisticated variation of an extrapolation model and should be more accurate than other methods for forecasting short and long term growth for Lehigh Acres given the larger role of in-migration and estimated "build-out" population.

Population Model to Forecast Population Growth of Lehigh Acres Over Time to Build-out

The Sigmoid Model as illustrated in Figure 2-1, shows the upper limit, inflection point and the rate of growth. For example, the population increases at an increasing rate up to the inflection point, then the population increases at a decreasing rate to build-out. It should also be noticed that the greatest increase in population takes place prior to and after the inflection point.

Figure 2-1
Lehigh Acres

Typical Sigmoid Curve



CHAPTER 3

Historical Background of Population Forecasting

Historically, the official population forecasting for fast growing areas of Florida have consistently underestimated growth. For example, the Bureau of Economic and Business Research (BEBR), the official population forecast for the State using their medium, forecasted in 1982 that the population for Lee County in the year 1990 would be 295,000 people. The actual count in 1990 was 335,113 people. Their forecast had underestimated growth in Lee County by 14%. Another example is that BEBR medium forecasted in 1982 that the population for Charlotte County in 1990 would be 87,800 people. The actual count was 110,975; an underestimation of 26%. In both cases, BEBR high forecast was lower than the actual 1990 count. BEBR 1982 medium forecast for Lee County for 2000 was 379,100 and the actual count was 440,888¹. BEBR uses the Cohort Component method of forecasting population for the State and then apportions the state growth among the counties.

These forecasts are in many cases the key variable to plan and fund large-scale infrastructure improvements such as road networks, acquisition of school sites, water and sewer facilities as well as many public services to meet future population demands.

As previously stated, underestimating population growth has the potential for infrastructure to fall behind the demands of population. Again, this results in over utilization of long-term facilities and rapid depreciation and higher cost, as facilities need to be replaced before their useful life expires. This cost to "catch up" on the needs for infrastructure to meet population demands far exceeds the cost to more accurately meet the demands as they occur.

Many counties that have experienced BEBR forecasts that have underestimated growth have developed their own traditional extrapolation population models. While their forecasting results are higher than BEBR forecasts, they are still lower than the actual counts. For large-scale growing communities in Florida there is a more accurate application.

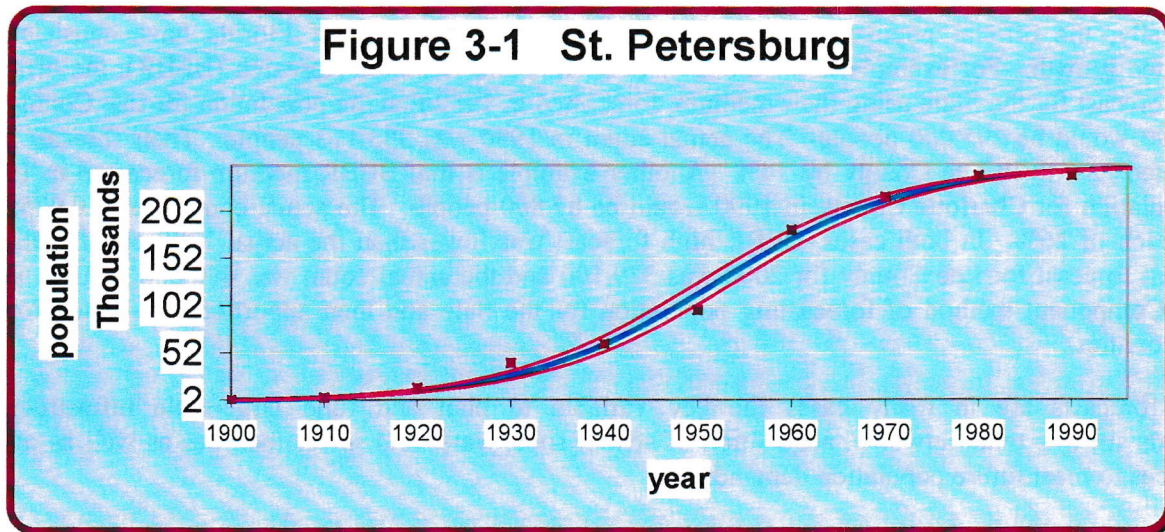
**Historical Analysis of Growth in South Florida
for Forecasting Future Populations**

Historic research was applied to construct the actual growth curves of three cities in Central and South Florida in metropolitan areas with similar build-out populations to determine if the Sigmoid Model is relevant and which growth curve would best simulate that which is to be constructed for Lehigh Acres.

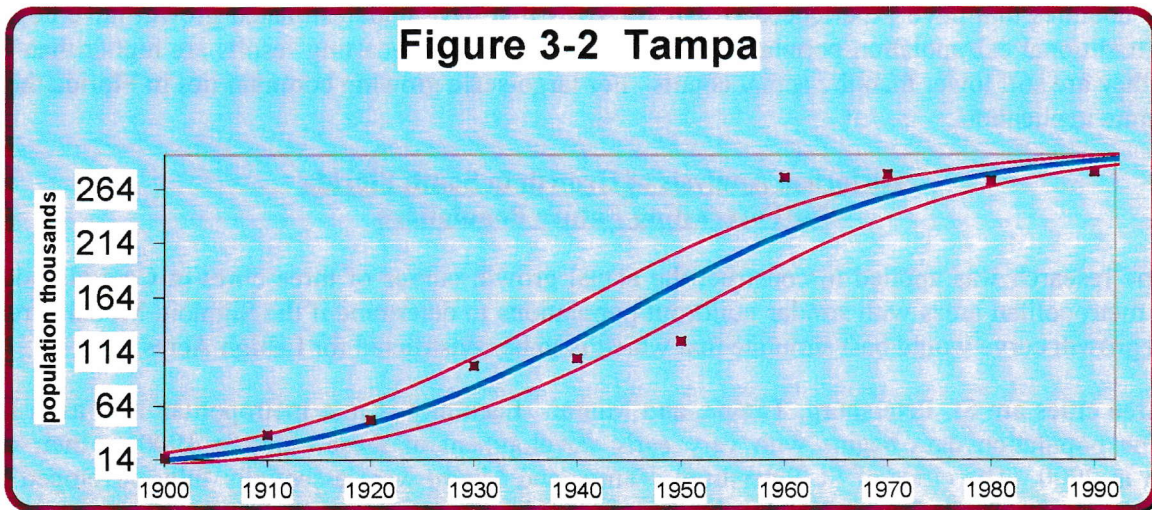
The three cities are St. Petersburg, Tampa, and Miami. Each city is in a metropolitan area as is Lehigh Acres. The population data begins with very early development of these cities in 1900 to their current population in 2000. The cities of St. Petersburg, Tampa and Miami were essentially fully developed by the year 2000. Their timeframe from initial development to build-out was one hundred years.

¹ 1982 Florida Statistical Abstract

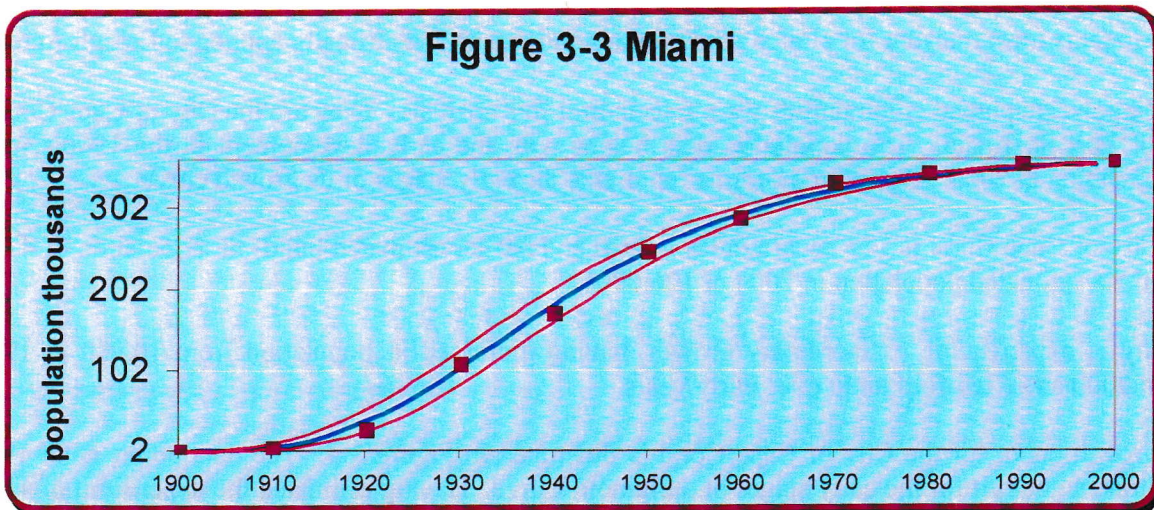
Figure 3-1 shows graphically the actual growth curve for the City of St. Petersburg with a build-out population of 250,000. The growth of St. Petersburg has followed the classic Sigmoid Curve.



The actual growth curve for the City of Tampa is illustrated in Figure 3-2. The curve is disjointed from 1950 to 1960. This may be due to a large annexation during this period. Otherwise it demonstrates a rather fragmented Sigmoid Growth Curve.



The City of Miami growth curve illustrated graphically in Figure 3-3 is an excellent example of a Sigmoid Growth Curve with a build-out population of 362,470. It is a good example of growth characteristics of population over time in South Florida.



The genesis of many South Florida cities is that in the early stages of development the majority of the population are retirees with small household size. Then a service population moved in to provide for retail, financial and medical services. The population begins to become more diverse in age and incomes and household sizes begin to increase. More service population moves in and the construction industry grows as well as demand for education services. The demand for public services continues to increase and the household size increases. Eventually, the community hits a critical mass at which the population becomes more diverse in age and incomes and begins to represent more traditional demographics. The Sigmoid Growth Curve for South Florida incorporates these growth characteristics over time. The growth curve incorporates the changes in variables over time such as demographics (i.e. household size).

Forecasting Pre-Platted Communities

The Sigmoid Model has proven to be accurate in forecasting population for large-scale platted communities in South Florida. This researcher developed a Sigmoid Growth Model to forecast future population of the City of Palm Bay in 1982 using 1980 data¹. The City of Palm Bay is a large-scale platted community on the East Coast. The model forecasted in 1980 that the population in 2000 would be 82,331. The U.S. Census for 2000 determined the population to be 79,413. This results in a 3.5% deviation over a twenty-year period. Another Sigmoid Growth Model was developed for Lehigh Acres¹ using 1990 data. The model forecasted a population in 2000 of 33,098. The U.S. Census for 2000 recorded a population of 33,430 forecasting pre-platted communities.

In 1994, Lee County had 237,818 vacant platted lots, the highest of all counties in the State of Florida. As a result, Lee County contains two of the largest lot-sales communities in the nation (Lehigh Acres and the City of Cape Coral).

¹ Port Malabar Area Growth Model, January 20, 1982, Paul G. Van Buskirk and Associates

² Lehigh Acres Commercial Land Use Study, May, 1996, Spikowski Planning Associates

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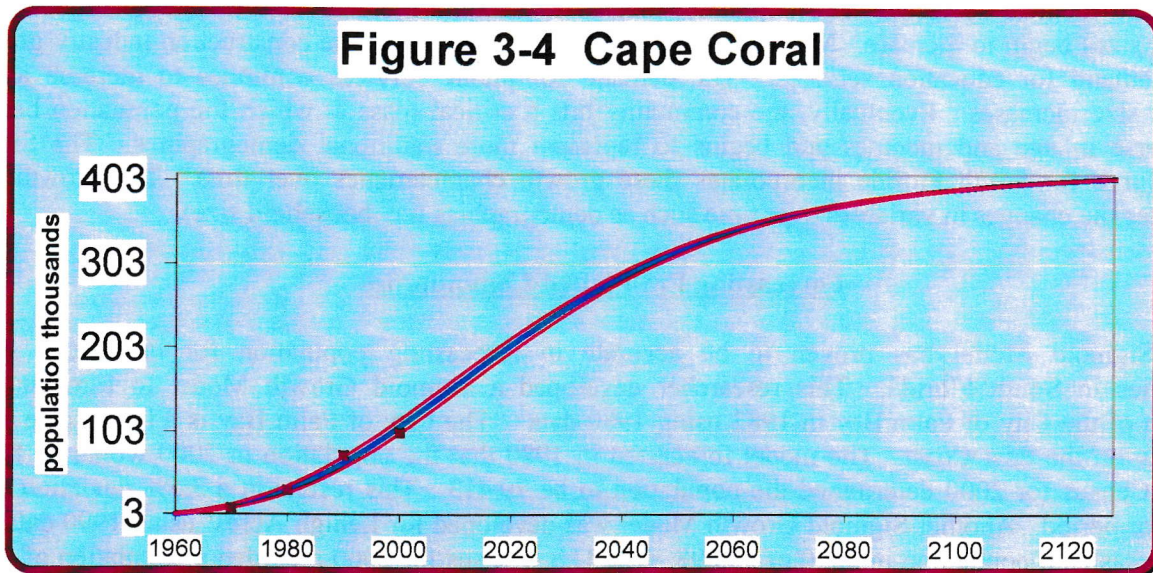
Historic research was also applied to platted communities in South Florida for analysis to determine if the Sigmoid Model is most relevant for platted communities and can be scientifically applied to Lehigh Acres.

Two large-scale platted communities were selected for this analysis. They are the City of Cape Coral and the City of Port St. Lucie. The population data begins with the early development in the 1960's to their current population in 2000. This period of time represents the early stages of its growth curve.

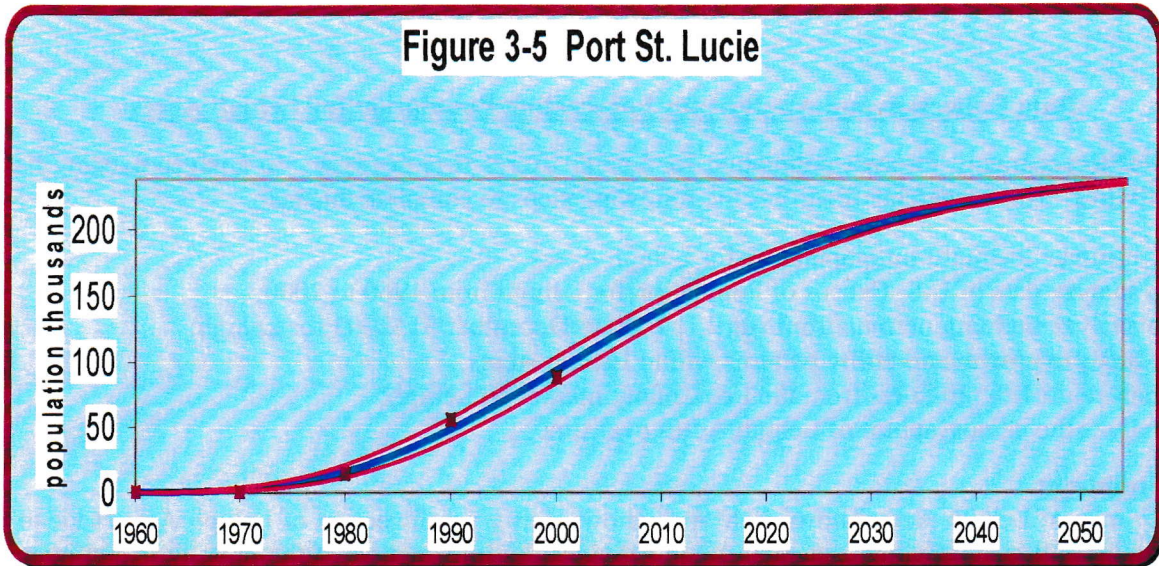
The City of Cape Coral is 114 square miles in area and has an estimated build-out population of 413,000 people with an estimated population in 2004 of 126,000.

The City is experiencing extraordinary growth, having increased in population from 10,930 in 1970 to 102,286 in 2000 and a ten-fold jump over thirty years.

The growth curve for the City of Cape Coral is illustrated in Figure 3-4. The data points from 1960 to 2000 illustrate a good fit for the early stages of a Sigmoid Curve. Having estimated the upper limit of 413,000 people and taking the historic data for population, a mathematical formula for the Sigmoid Curve can be applied to forecast the population to build-out. The results demonstrate that the application of the Sigmoid Curve is most appropriate for accurate forecasting.



The City of Port St. Lucie is another large-scale platted community undergoing extraordinary growth. Its population has increased from 330 people in 1970 to 88,769 people in 2000. When historical population data is plotted from 1960 to 2000 on a graph it depicts a very strong Sigmoid Curve in the early stages of development as shown in Figure 3-5. The build-out population is estimated at 250,000 people. A Sigmoid Curve can be scientifically constructed to forecast population to build-out.



Findings

It can be concluded from the historic analysis of population growth for cities in South Florida such as St. Petersburg, Tampa, and Miami that the Sigmoid Curve best represents population growth over time. Likewise, the analysis of platted communities in South Florida such as Cape Coral and Port St. Luce demonstrate that an analysis of their historic population data strongly indicated the formation of the early stages of the Sigmoid Curve. Given the upper limit of population (build-out), the scientific application of a Sigmoid Model can accurately forecast over the short and long term its future population. The Sigmoid Model would be the most appropriate application to forecast Lehigh Acres population to build-out.

CHAPTER 4

Data Collection and Analysis for Forecasting Population for Lehigh Acres

In order to accurately forecast population for Lehigh Acres it is necessary to analyze existing data and related activities. This researcher identifies the following steps to complete this task.

1. To estimate the build-out population for Lehigh Acres;
2. To analyze data of U.S. Census of Population for Lehigh from 1960 to 2000;
3. To analyze building permits from April 1, 2000 to December 31, 2003 for Lehigh;
4. To analyze growth and utility patterns within Lehigh Acres;
5. Analyze growth pressures from the Lee County market on Lehigh;
6. Analyze the demographics of Lehigh Acres over time.

STEP 1 Build-out

The zoning map of Lehigh Acres shown in Map 2, shows only a small section of Lehigh Acres (due to report size limitations-full size provided separately) and provides the information of the area, type and intensity of allowable development in which we can estimate the total number of dwelling units.

However, the County Staff provided a more accurate method in which to determine the total number of housing units that could be constructed at build-out. They determined the number of parcels on which single family units could be built and the number and intensity of multi-family units. We can then forecast the average household size and vacancy rate at build-out. The results are:

$$\begin{matrix} \text{Total estimated housing units} \\ \text{times average household size} \\ \text{times occupancy rate} \end{matrix} = \text{TOTAL ESTIMATED POPULATION}$$

$$131,935 \times 2.50 \times 0.92 = \begin{matrix} \text{TOTAL ESTIMATED POPULATION} \\ 303,451 \end{matrix}$$

STEP 2 U.S. Census Data

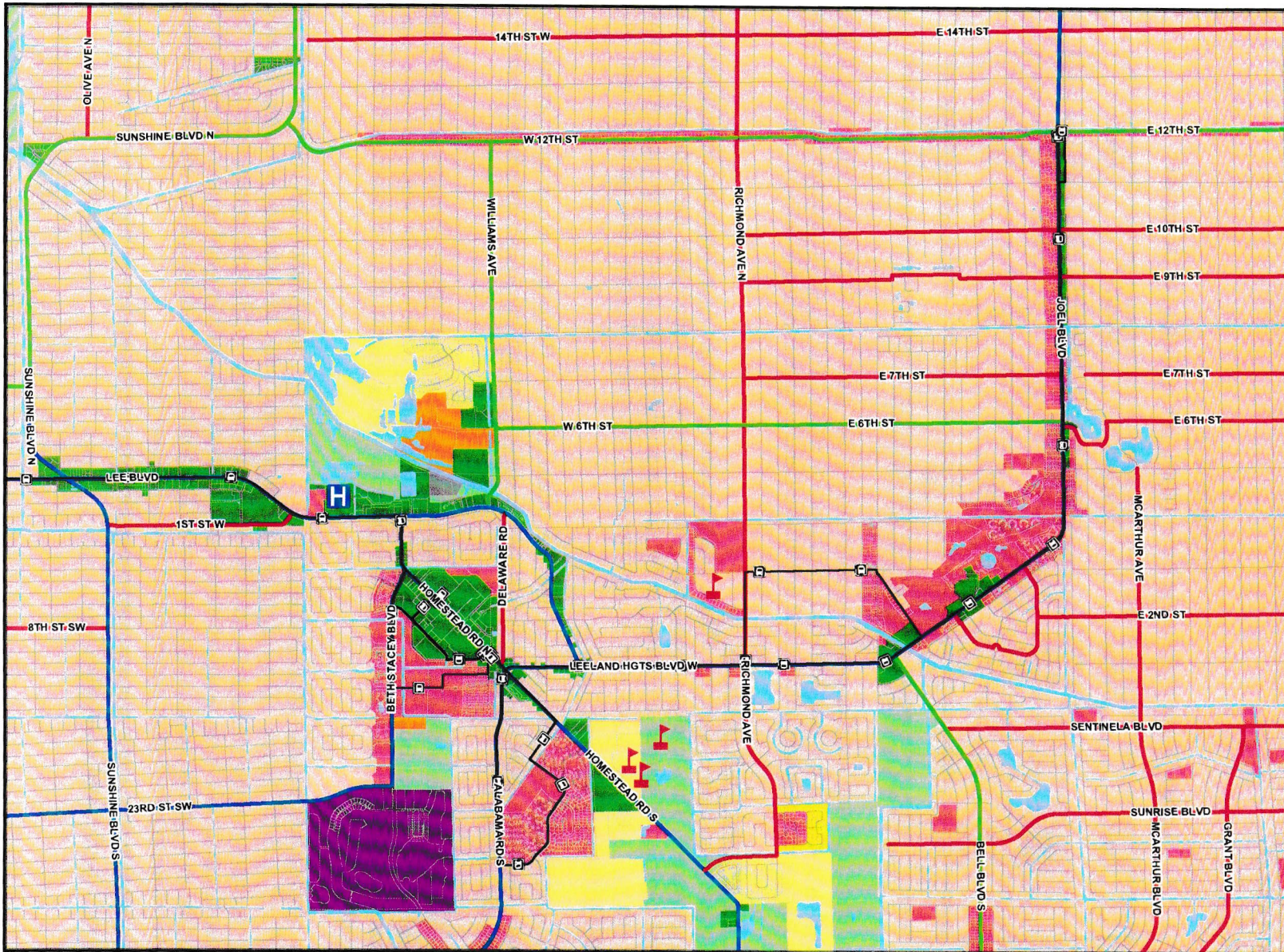
Census population data provides us with the historical data needed to scientifically construct a Sigmoid Curve. The following is the historic population data for Lehigh Acres:

Table 4-1
Lehigh Acres Population
(1960 – 2000)

<i>Year</i>	<i>1960</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>
<i>Population</i>	<i>N/A</i>	<i>4,394</i>	<i>11,371</i>	<i>22,203</i>	<i>33,430</i>

Source: U.S. Census of Population: 1960, 1970, 1980, 1990, 2000

Lehigh Acres Forecasting Model Zoning



Legend

- Agriculture
- Commercial
- Industrial
- Residential - Single Family
- Residential - Multiple Family
- Residential - Mobile Home
- Residential PD
- Two Family Conservation
- Planned Unit Development
- Recreational Vehicle Park
- Environmentally Critical
- Community Facilities PD
- Airport Operations PD
- Arterial
- Major Collector
- Minor Collector
- Road Centerline
- Surface Water
- School
- Hospital
- Bus Route

December 2003 Parcel Line

Zoning Source: Lee County
Zoning Department, December 2003



Prepared for: Van Buskirk, Ryfel and Associates, Inc.
Contract Number: 2620

STEP 3 Permits

It is necessary to update the Census to the most current calendar year of 2003. This will provide us with data points for a more accurate forecast and also to determine if there are any changes in growth trends. This data is collected from the certificates of occupancy issued in Lehigh Acres for the years 2000 through 2003 as shown on Table 4-2.

Table 4-2
Lehigh Acres by Housing Units Based on Certificates of Occupancy

<i>Year</i>	<i>Single Family</i>	<i>Duplex</i>	<i>Multi-Family</i>	<i>Total</i>
<i>2000</i>	<i>174</i>	<i>18</i>	<i>0</i>	<i>192</i>
<i>2001</i>	<i>430</i>	<i>56</i>	<i>0</i>	<i>486</i>
<i>2002</i>	<i>624</i>	<i>68</i>	<i>0</i>	<i>692</i>
<i>2003</i>	<i>736</i>	<i>264</i>	<i>20</i>	<i>1,020</i>
TOTAL	1,964	406	20	2,390

Source: Lee County, Department of Community Development

Total units receiving certificates of occupancy was 2,390 units from 2000-2003. According to the U.S. Census, Lehigh Acres in the year 2000 had an occupancy rate of 87.7% and the average household size was 2.63. The increase in population from 2000 to 2003 for Lehigh Acres is estimated at 5,513 people.

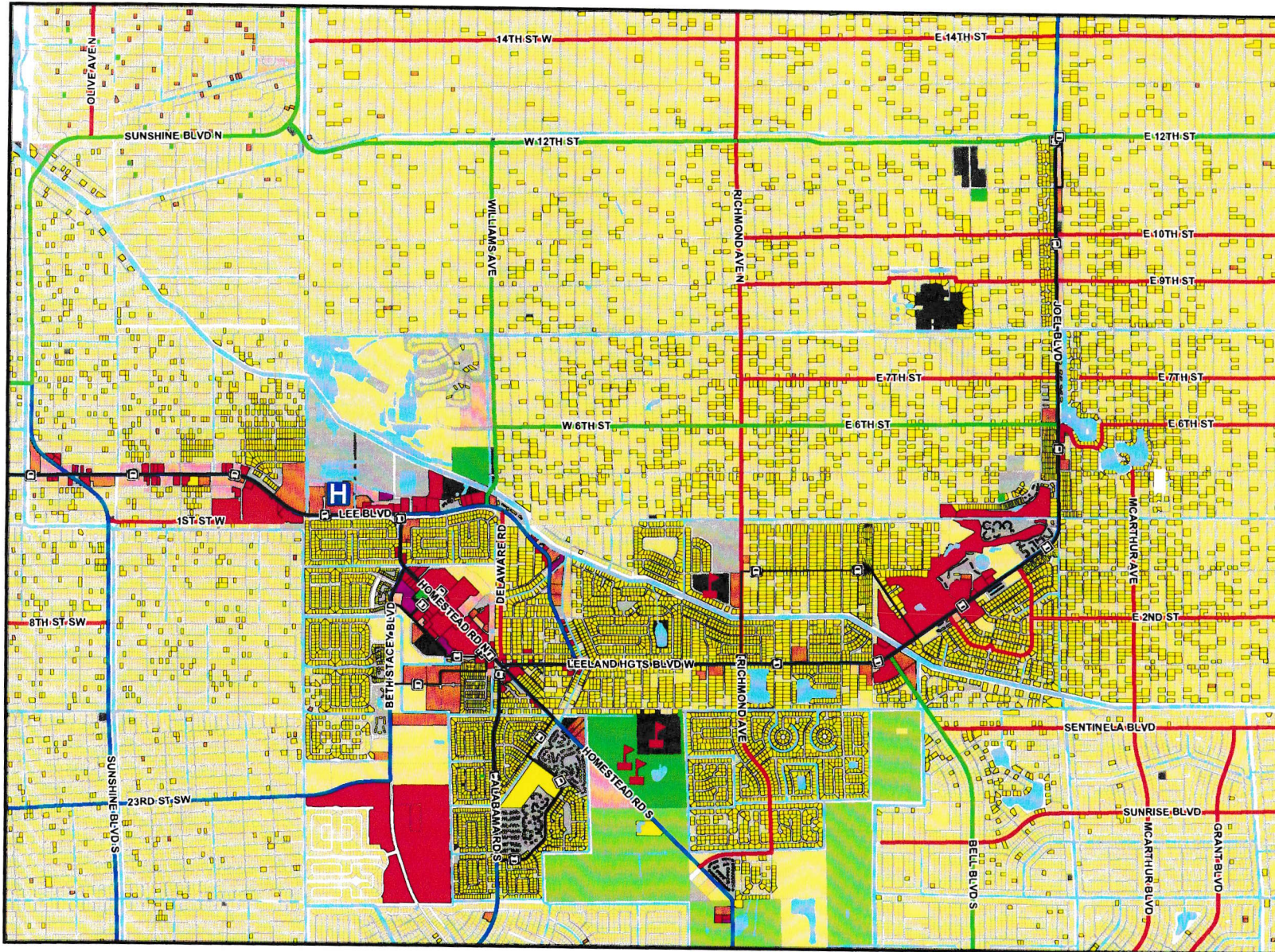
STEP 4 Growth and Utility Patterns

Map 3 Current Land Uses is a graphic illustration of a section of Lehigh Acres depicting development patterns for Lehigh Acres. The developed residential lots are shown in yellow and the undeveloped in white. Developed commercial parcels are shown in red and undeveloped lots are shown in pink. Also shown are existing schools, water treatment and wastewater treatment plants, hospital and parks as well as other developed land uses.

Core development has occurred around the intersection of Homestead Road and Leeland Heights Boulevard. There are 4 schools, a commercial center, water treatment and wastewater treatment plants and a hospital in this core area.

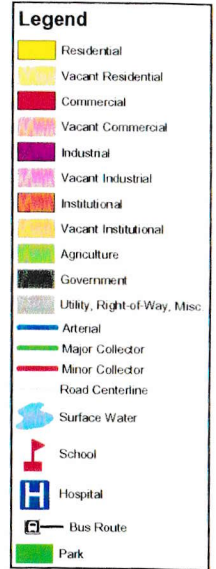
Development radiates along the major corridors from the core area. These corridors are Lee Boulevard, Homestead Road and Joel Boulevard. These corridors also serve as runways for water and sewer mains as depicted in Map 4, and are correlated with growth patterns. This is typical of development patterns for new or platted communities.

New development patterns are emanating from Joel Boulevard, along minor road collectors such as East 2nd, 6th, 7th, 9th, and 10th Streets. These development patterns encourage the extension of utilities by providing economic incentives and environmental need that will result in faster in fill development in this area. Similar development patterns are being generated along Lee Boulevard. The northern and southern portions of Lehigh Acres for the most part represent scatter patterns of development. The development and utility patterns for Lehigh Acres are similar to other platted communities in South Florida.



Lehigh Acres Forecasting Model

Current Land Use



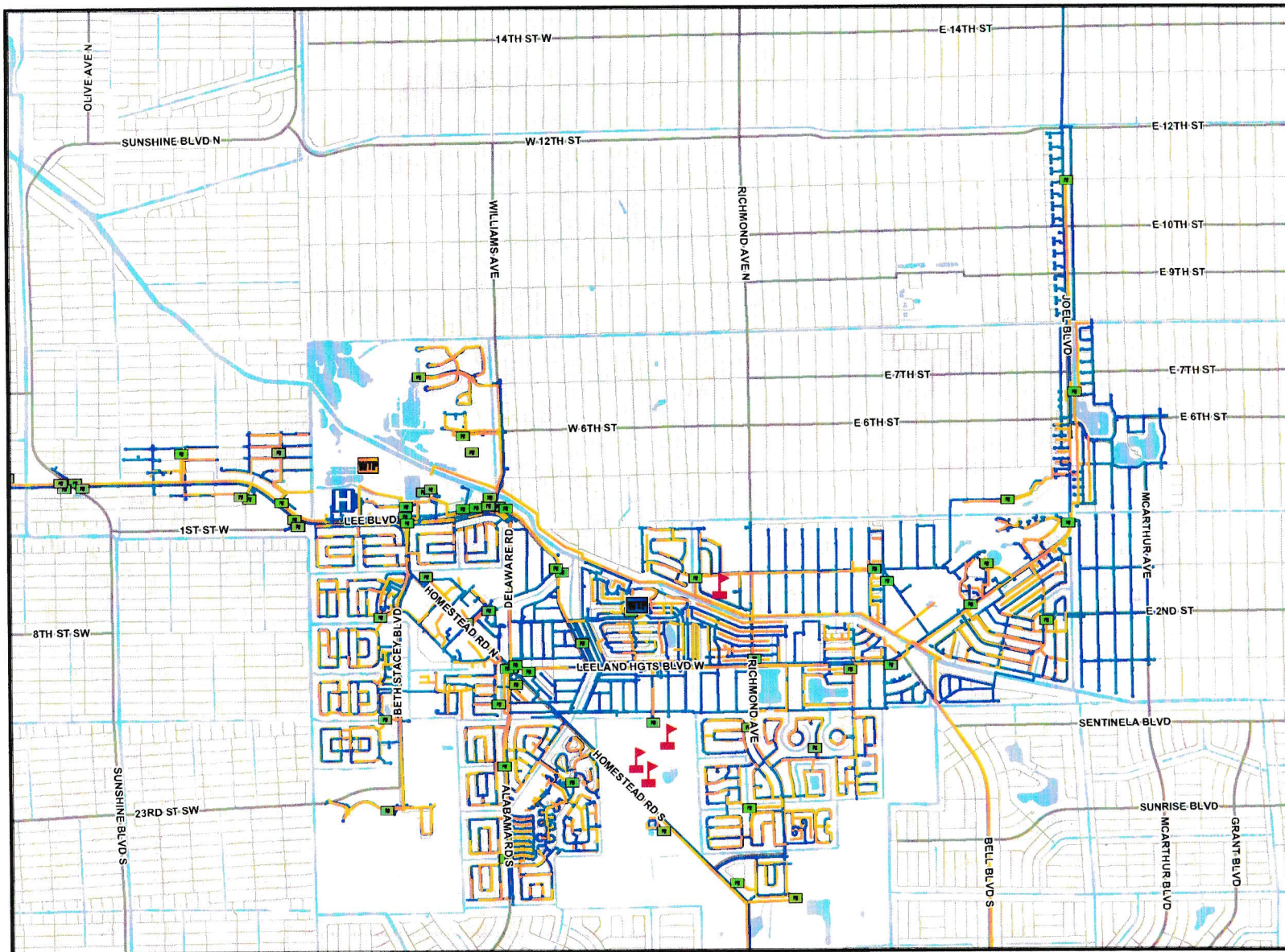
Current Land Use Source: Lee County
Property Appraiser, December 2003,
Department of Revenue (DOR) Codes



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Lehigh Acres Forecasting Model

Utilities



Legend

- Water Line
- Sewer Line
- Water Treatment Plant
- Wastewater Treatment Plant
- Lift Station
- School
- Hospital
- Surface Water
- December 2003 Parcel Line
- Major Road
- Road Centerline

Utility Source: Lehigh Utilities, Government Utility Authority, December 2003



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Population Model to Forecast Population Growth of Lehigh Acres Over Time to Build-out

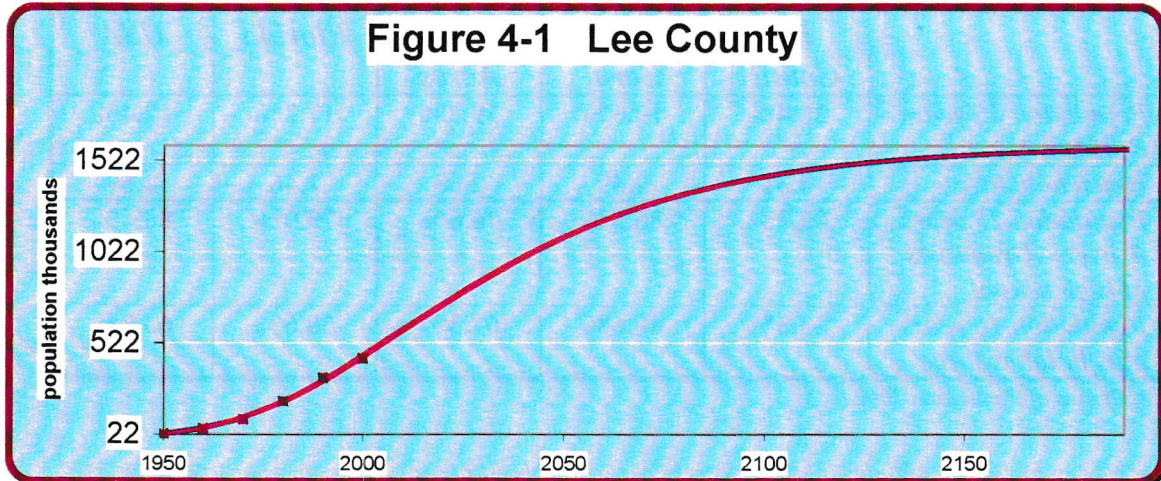
The population for Lehigh Acres is estimated at 38,943 people in 2003. Traditionally when platted communities in South Florida reach a critical mass of 30,000 people, they begin to experience more rapid growth. At the threshold of 30,000 people a community can support a community commercial center, several neighborhood shopping centers, a high school, middle school and several elementary schools as well as a hospital. This critical mass becomes an attractor for new development at an accelerated rate of growth. Then the development patterns support the continuous extension of utilities that reinforces this phenomenon.

STEP 5 Development Pressures

The development pressures within Lee County have a cause and effect on the future growth rate for Lehigh Acres. This can be easily documented for as development pressure in Lee County increases the price for parcels in Lehigh Acres has increased. The prices for parcels in Lehigh Acres have increased substantially in recent years.

The population of Lee County has increased by 105,775 people from 1990 to 2000. This is a 31.6% increase over its 1990 population of 335,113 people. As the population increases, the supply of developable land decreases resulting in development pressure on platted communities such as Lehigh Acres and Cape Coral.

The construction of a Sigmoid Curve to forecast population for Lee County as a whole is shown in Figure 4-1. From historic population data, and an estimated build-out, future populations are forecasted. The upper limit was estimated at 1,604,759 people according to the Lee County Comprehensive Plan, 1994 evaluation and appraisal report.



An analysis of this curve reveals that Lee County is in its stage of development in which it is the steepest part of the curve and it will experience its greatest rate of growth. This is also true of Cape Coral. Lehigh Acres is approaching the steepest part of its curve. One might conclude this is a perfect storm for development pressures in which all three communities will be at the steeper part of their growth curve simultaneously.

Population Model to Forecast Population Growth of Lehigh Acres Over Time to Build-out

STEP 6 Demographics

The population of Lehigh Acres, of those persons over 65 years of age in 1980, was 38.8% of the total population. This compares to 27.6% in 1990 and 19.7% in 2000. The over 65-age group for Lee County in 2000 was 25.4% and Cape Coral was 19.6%. This reflects a rather rapid transition from retiree households in the initial decades of development in Lehigh Acres toward younger and larger families moving into Lehigh Acres since 1980. This is further reinforced by the fact that household size in Lehigh has increased from 2.44 persons per household in 1990 to 2.63 in 2000. For Lee County as a whole, it was 2.31 in 2000 and for Cape Coral it was 2.49.

The percent of the population in Lehigh Acres that was 25 years or older that graduated from high school or higher is 76.6% in 2000, compared to 82.3% for Lee County and 85.5% for Cape Coral. The percent of the population that was 16 years and older in the labor force for Lehigh Acres, was 67.3% in 2000 compared to 53.3% for Lee County and 60.6% for Cape Coral.

It is clear that Lehigh Acres has and is undergoing a rapid transition from an initial retirement population to a community that attracts younger and larger working families. This transition is compressing the traditional growth curve in its early stages of development. This will advance development along its growth curve.

Table 4-3 shows comparisons of key demographic data for Lee County, Cape Coral, Lehigh Acres, State of Florida and the nation for the year 2000.

Table 4-3
Comparison of Key Demographics Data for Year 2000.

	<i>Lee County</i>	<i>Cape Coral</i>	<i>Lehigh Acres</i>	<i>Florida</i>	<i>USA</i>
<i>Population 65 years & older</i>	25.4%	19.6%	19.7%	17.2%	12.4%
<i>Household Size</i>	2.31	2.49	2.63	2.46	2.59
<i>Population 25 years & over – Graduates of high school</i>	82.3%	85.5%	76.6%	79.9%	80.4%
<i>Population 16 years plus in labor force</i>	53.3%	60.6%	67.3%	58.6%	63.9%

Source: U.S. Census of Population 2000

CHAPTER 5

Selection of Forecast Method and Results of Forecast for Lehigh Acres

The Sigmoid Model has demonstrated its accuracy in forecasting population over time for communities in South Florida including platted communities. The data collection and analysis section of this study provides us with the information in support of the selection and application of the Sigmoid Model to accurately forecast future populations for Lehigh Acres. That information is:

1. The estimated build out permanent population of 303,451 people as the upper limit of growth independent of other data.
2. The historic population data from the U.S. Census.
3. The increase in population from the most recent census in 2000 to the year 2003. This is an increase of 5,513 persons.
4. The traditional growth and utility patterns that are common is the support of future growth.
5. The acceleration of growth due to the imbalances of the supply of developable land and the demand for developable land. The phenomenon that Lee County, Cape Coral and Lehigh Acres will be in the steepest part of its growth curve simultaneously in the near future.

Forecasting Results

The Sigmoid Model that illustrates the forecast results of the population forecast over time for Lehigh Acres, applies the data outlined above, and is shown in Figure 5-1 and the five year increments forecast of population is tabulated in Table 5-1.

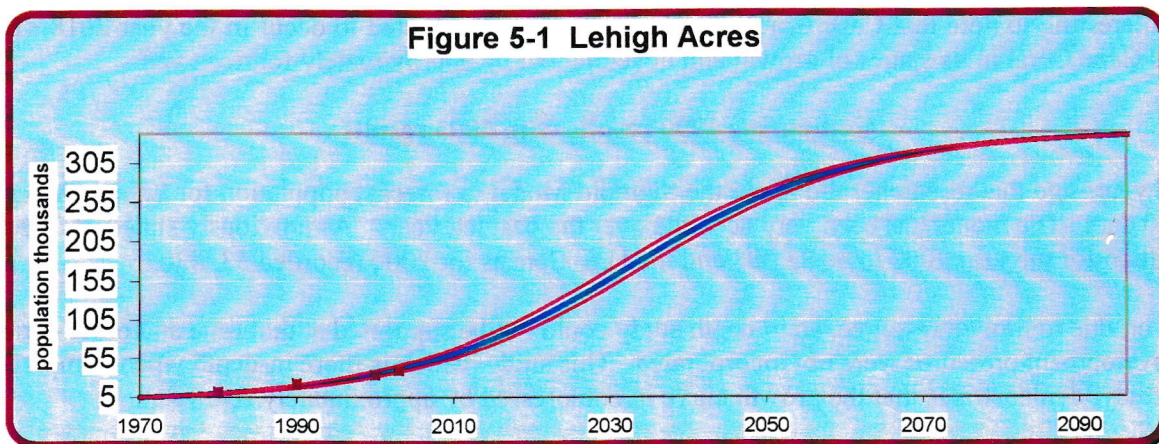


Table 5-1
Lehigh Acres Population Forecast

<i>Year</i>	<i>Population</i>
2005	46,010
2010	61,339
2015	80,388
2020	103,178
2025	129,238
2030	157,540
2035	186,606
2040	214,791
2045	240,644
2050	263,174
2055	281,949
2060	297,021
<i>B.O.</i>	303,451

The population is forecasted to increase from a population of 38,943 in 2003 to a population of 80,388 in the year 2015. This is a two-fold increase over a twelve-year period. In the year 2025 the population is forecasted to reach 129,238. This again is nearly a two-fold increase over ten years. This growth will continue until Lehigh Acres reaches its inflection point in the year 2032. Then the population will increase at a decreasing rate to build-out.

It is interesting to note that Cape Coral's inflection point is forecasted to occur in the year 2018. Lehigh Acres lags Cape Coral in its stages of growth and development by approximately fourteen years.

Comparing 1990 results with 2003 results

Several years ago this researcher did apply the Sigmoid Model to forecast population for Lehigh Acres using 1990 data. The model has been very accurate over the past ten years. As previously stated, it forecasted the population for the year 2000 to be 33,098 and the U.S. Census for 2000 recorded 33, 430.

However, due to limited resource, an in depth study could not be supported at that time and other variables such as development pressures were not incorporated. This study, which is more in-depth when compared to the 1990 study, demonstrates that the growth curve in compressed by approximately five years.

Table 5-2
1990 Sigmoid Model Forecast vs. 2004 Sigmoid Model Forecast

<i>Year</i>	<i>1990 Model</i>	<i>2004 Model</i>
<i>2000</i>	<i>33,098</i>	<i>33,430</i>
<i>2005</i>	<i>42,461</i>	<i>46,010</i>
<i>2010</i>	<i>55,964</i>	<i>61,339</i>
<i>2015</i>	<i>72,256</i>	<i>80,388</i>
<i>2020</i>	<i>91,733</i>	<i>103,178</i>
<i>2025</i>	<i>113,149</i>	<i>129,238</i>
<i>2030</i>	<i>136,788</i>	<i>157,540</i>
<i>2035</i>	<i>161,014</i>	<i>186,606</i>
<i>2040</i>	<i>186,208</i>	<i>214,791</i>
<i>2045</i>	<i>210,137</i>	<i>240,644</i>

CHAPTER 6

Impacts of Lehigh Acres as a Pre-Platted Community

The largest impact that was created from the original planning of Lehigh Acres, as a pre-platted community, was the disproportionment of designated support land uses and viable solutions to correct the problem. The disproportionment of land uses means that sufficient lands such as commercial, industrial, parks, school sites and environmental preservation were not provided in sufficient amounts to meet the needs of future populations. The result of this means that residents of Lehigh Acres, for the most part, will need to travel outside their community for goods, services and employment opportunities. This increase in vehicle trips and trip lengths puts added loading on the county's transportation network that results in added cost of road improvements and traffic congestion and is an added burden on county finances.

Another major impact is that a lack of needed support land uses such as commercial, industrial, parks, and a myriad of other uses found in what is generally considered a sound, well-balanced, quality community. The lack of this land use results in a less attractive community that will lead to lower cost type of development. This in turn, will result in a lower tax base that will generate fewer revenues to support their cost of services. Under this scenario the taxpayers throughout the county will pay an increasing amount for Lehigh Acres' cost of services.

Table 6-1 demonstrates the large discrepancies of some of the necessary support land uses needed to provide for future forecasted populations in Lehigh Acres. This situation compounded with the fact that Lehigh Acres is almost 100% pre-platted, presents new challenges to address this difficult problem.

Table 6-1
Allocated Land Uses vs. Needed Land Uses for Lehigh Acres

<i>Land Use</i>	<i>Allocated (Acres)</i>	<i>Need (Acres)</i>	<i>Deficient (Acres)</i>
<i>Commercial</i>	1,599	2,895	(1,296)
<i>Industrial</i>	370	690	(320)
<i>Parks</i>	7	2,629	(2,622)
<i>Schools</i>	251	975	(724)

Source: Lee County, Van Buskirk, Ryffel, and Associates

In summary, the disproportionment of designated land uses in Lehigh Acres results in a deficiency of sufficient lands designated for economic viability such as commercial lands for retail trade, services and industrial development as well as insufficient lands designed for recreation and parks, schools sites, institutions, (i.e. churches, libraries), environmental preservation, protection of water supply and sufficient road corridors and the necessary width of such corridors. This disproportionment of necessary designated land uses, results in lower values of developed land, resident's quality of life and higher cost of services.

Potential Initiatives

There is a need to address the problem of a fast-growing, pre-platted community such as Lehigh Acres with its disproportionment of designated land uses and its long-term impact on fiscal structures and quality of life.

One of Charlotte County's approaches was to identify a 1300-acre site that is predominately residential and to transform it into a mixed land use area-through acquisition and condemnation to make up for some of its land use mixes deficiencies.

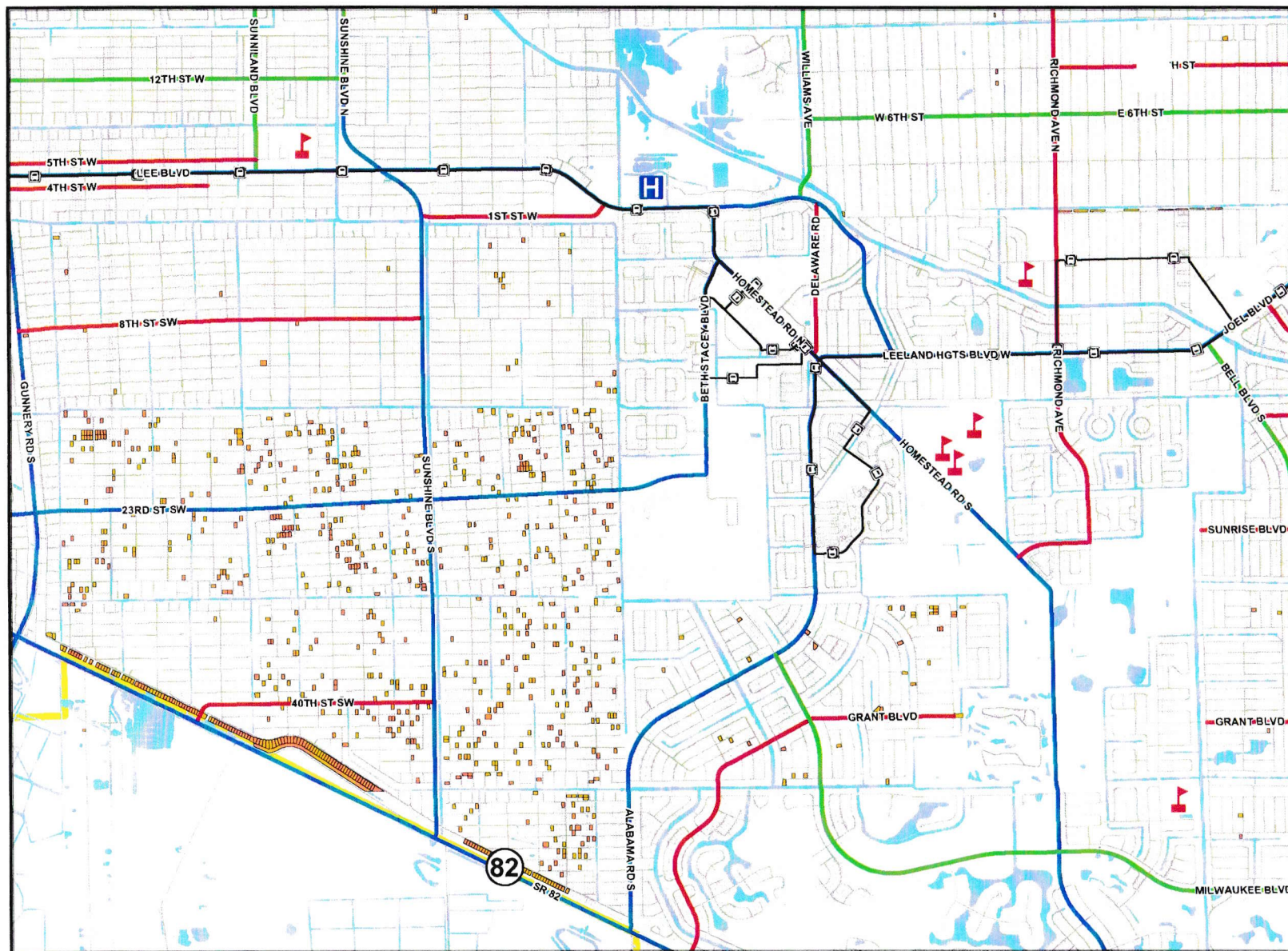
The City of Cape Coral is implementing a more comprehensive approach by determining the amount of land and its spatial distribution for commercial land to meet the need of future population. Then enacting development regulations to provide for commercial districts and their location. Cape Coral applied its Interactive Growth Model broadly to address this issue.

A major initiative for Lehigh Acres would be to apply the Cape Coral approach and determine the amount of various land use deficiencies (i.e. commercial, industrial, parks, school, etc.) and determine the size and location for the appropriate distribution of these lands consistent with forecasted population growth over time. Acquisition of land through condemnation or perhaps public-private partnerships is two mechanisms that could be used to address this problem and provide for an economically and environmentally viable community. Map 5 shows a portion of Lehigh Acres, as an example for discussion purposes, of where lots are encumbered by county-held tax certificates. This situation may present an opportunity to aggregate land by some form of lot swapping or condemnation.

As a prelude to this program, a simulation study or Interactive Growth Model may be appropriate for Lehigh Acres. The fiscal effects and value of developed land under the scenarios of Lehigh Acres continuing to develop under current conditions, policies and land use designations versus Lehigh Acres developing with appropriate land use designations to support its population, would appear to be a logical, cost-effective and a worthwhile undertaking.

Lehigh Acres Forecasting Model

County Held Open Tax Certificates
3/19/2004



Legend

- County Held Open Tax Certificates
- Arterial
- Major Collector
- Minor Collector
- Road Centerline
- Surface Water
- School
- Hospital
- Bus Route
- December 2003 Parcel Line
- Lehigh Acres

Tax Certificate Source: Lee County Tax Collector, March 19, 2004



LEE COUNTY
SOUTHWEST FLORIDA

Prepared for: Van Buskirk, Ryhal and Associates, Inc.
Contract Number: 2620

