

Land Capacity Analysis Project in the City of Maple Valley

Introduction

Washington State and the Puget Sound Region have experienced rapid growth in the past 30 years. As a result, in 1993, the state passed a smart growth program called the Growth Management Act (GMA). The purpose of the GMA is to concentrate population growth within designated “urban growth boundaries” due to urban sprawl consuming Washington’s natural countryside (WA State Community Trade and Development, 2000). The resulting effects from the GMA can be seen throughout the Puget Sound Region with the most current development being concentrated within growth boundaries. Multi-family residential zoning has increased population density in many municipalities along with higher densities of other residential zoning. Oregon, Maryland and many other states are beginning to implement growth laws due to the sprawling nature of urban growth (Maryland Department of Planning, 2005). The GMA has created a built environment that can sustain growth over the next twenty to thirty years and still maintain environmental integrity.

The City of Maple Valley was incorporated in 1997. Its present population is around 18,000 within the city limits and its main school district is the Tahoma School District. It covers 5.6 square miles of land and has two lakes and many natural areas in its boundaries. The GMA mandates the development of a comprehensive plan for every city under its governing wing, including Maple Valley. The original plan was in place until 2003 when it was updated and revised (City of Maple Valley, 2003). Comprehensive plans are usually in place for the duration of the twenty year planning period. Land use, housing, transportation, utilities, environmental quality, parks and historical preservation are few items

the plans cover in depth. A comprehensive plan provides city planners and development investors with key information for the development of land within the city limits. This information is available to the public through the city website. One of the many challenges associated with the Growth Management Act is being able to measure its success, statewide as well as citywide.

A land capacity analysis is a way for municipalities, such as Maple Valley, to measure the results from their development plans. This analysis takes into account the total amount of land available within each zoning district and tracks how much of that land is being developed and at what densities. This allows a city to track its development patterns and use the information for growth and population estimates (CTED, 2000). This amendment was passed in 1997 by the Washington State legislature and just happens to be the year that local municipalities did their initial capacity analyses. Doing a capacity analysis every five years is a reasonable amount of time to be able to track subtle changes to the landscape in such a small city. The last capacity analysis done for the city of Maple Valley was done in 1997, 2002 and 2007. Now I am being asked to begin the next capacity analysis for 2012.

Planning Process

During Fall Quarter I began an internship with the City of Maple Valley, working with their GIS analyst. I knew that I was going to be doing an in depth project that should take a few months to complete. I mentioned this to my supervisor that I wanted to do an analysis project for the city. He asked around within the different departments to find an analysis project. The community development director suggested doing an updated land capacity analysis for the city. There was no direction given and no other information. Starting from scratch on an analysis I had never heard of sounded like an interesting challenge.

To begin my project I had to learn how to conduct the analysis. There are several ways to complete the analysis and I chose to utilize GIS as a main part of my analysis. The first part of my project

was a Google search on “land capacity analysis.” The search brought up information on how they work, what they are used for and different ways of implementing them. After using Google, I used UWT’s library to search out other articles that would provide me background knowledge about land use in general. When doing research, I came across an article that mentioned the Community, Trade and Economic Development Department of Washington State. I went to their website to do some searching and found guidelines for all land capacity analyses conducted within the state and methods on how to implement them.

Based on the information that I had found during the literature review phase I began constructing a basic flow chart of processes that would need to be done in order to complete the project. I laid out a workflow for the analysis and tried to visualize all of the necessary steps needed. This proved to be much harder than I anticipated. I knew that the end results should look a certain way and I knew, generally, the processes needed to get there. The problem was that I had information overload and was not quite sure where to start.

I received a file geodatabase, from the City of Maple Valley, that contained all of the newest geographic information published by King County. When I first received this I began sifting through the information available within the database. There were tables, roads, parcels, critical areas, census tracts, voting districts and city borders to mention a few. I began by writing down the layers and tables that would be applicable to my project. Next I began to layout how these layers and tables would interact with each other to get to my end result.

Methods

There are many different methods to complete a land capacity analysis. GIS is just one, but it is also the easiest one. Other ways this analysis could be conducted are, comparing tables and doing math calculations, doing a drive around the city to note underutilized and redevelopable land and the use of

the permit tracking system to understand development patterns to name a few. Using GIS adds a spatial element to the analysis, not to mention that it saves gas and driving time around the city. This gives the user an opportunity to display findings in a map format that can be saved and later used to evaluate zoning laws or identify large tracts of land that are able to be redeveloped.

The original goal of my project was to design a tool in an ArcCatalog toolbox to complete a land capacity analysis and to identify underutilized land. This tool would be beneficial to many different municipalities because many of them have to do these analyses, just like Maple Valley. I thought the use of Model Builder would be all that was needed to complete the project. Once I started trying to run through the processes that were needed in order to get results, I realized that Model Builder was not capable of doing the calculations that were required. To be able to do these analyses I needed a model that could produce intermediate variables, use those variables for math operations and then discard them. This would require the use of a programming language such as Python. I wanted to learn the Python scripting language this quarter, and I did try for a few weeks, but there was not enough time for me to learn the language with everything else going on. I decided, with some consultation from the GIS professor, that this project would be fine without building a model, although a model would be ideal for this type of project.

Once I realized a model would no longer be a viable option I began working through the analysis, taking notes on the steps I used in order to build a model sometime in the future. I began by clipping the King County data to the extent of the City of Maple Valley. To do this I selected Maple Valley from the city administration area layer and exported it to its own layer which was just the boarder around Maple Valley. Then I clipped the county tax parcel layer, roads layer, city right of way layer and the hydrology layers to the extent of Maple Valley. The data that I received from Maple Valley was a

current zoning layer and a list of permits the city has issued in the last five years. With this information I could conduct my analysis.

To determine the development patterns of the previous five years I had to create my own table of the plat developments that had been permitted to build within the last five years. To make sure that my table would join to the parcel information I first had to create my primary key. This required me to dissolve the plat/development field within the parcel data to get the plat development names for entire neighborhoods. Once this was done I located the permit record on the list and made sure that the name I wrote in my created table matched the name that was within the plat/development field. The table I created contained two pieces of information, the name of the development and the year that it was permitted to build. Once this table was done I joined it to the city plat development layer in order to visualize the scope of recent development. I could then use simple select by locations to determine the density of development and the population increase due to this development. The commercial development presented a little more of a challenge because square footage of buildings were required in order to calculate the number of jobs increased. All of this information is probably best displayed in a table format, but I will probably visualize the locations of development on a map because I think it is interesting to see development and growth patterns visually.

To determine underutilized land was a little more challenging than doing the previous five year development patterns. To begin this process I dissolved the city zoning layer so that it contained the zoning "zones." For example this would include all of the R-6 zoning in one polygon, instead of multiple polygons. I would then select by location all of the tax parcels within each zone and determine the number of parcels and the number of acres used. While the parcels are selected within each zone I would search the selected attributes and determine underutilized land based on the zoning zone that the parcel is in and its current land use designation. To get its current land use designation I had to

download new data from the King County Assessor’s website and joined it to my parcel data. I selected out of parcels underutilized land for each zone and used that information to determine the percent of underutilization for each zone. This process was repeated until I had covered all of the zoning in Maple Valley. Once I had compiled the information needed for my analysis I made two maps, one of underutilized land and the other of development during the previous five years.

Results

My analysis of the parcel level data from King County showed the estimated growth potential of vacant and underutilized land in Maple Valley. There could be 1,985 domestic units added and enough space for 4,129 jobs to be created. The potential population increase from the residential capacity, based on 2.5 people per house, would be around 4,961 people. This table below, though does not fit well into Microsoft Word, has the results of my analysis.

Zoning	Gross Acres	Critical Areas Acres	Net Uncons trained Acres	Future ROW Pct	Future Public Purpose Pct	Net Buildable Acres	Market Factor Pct	Net Available Buildable Acres	D us Per Net Acre	Floor Area Ratio	Sq. Ft. Per Empl oye	Empl oye Per Acre	Hou sing Cap acity	Empl oye ment Cap acity
Vacant Land														
Business Park	1.72	0	1.72	2%	2%	1.65	10%	1.49		0.16	850	0.020		12
Business Park/Conditions	27.87	0	27.87	2%	2%	26.76	10%	24.08		0.16	850	0.020		197
Community Business	26.5	0	26.5	2%	2%	25.44	10%	22.90		0.23	500	0.011		459
Neighborhood Business	0.14	0	0.14	2%	2%	0.13	10%	0.12		0.23	500	0.011		2
Office	3.04	0	3.04	2%	2%	2.92	10%	2.63		0.05	350	0.008		163
R-12(12 Domestic Units per Acre)	24.03	0	24.03	5%	10%	20.43	0%	20.43	12				245	

Gross Capacity on Redevelopable Land													816	2205
Minus existing DU's and Jobs (estimated)													150	200
Net Capacity on Redevelopable Land													666	2005
Plus Development Capacity in Pipeline													500	125
Total Development Capacity													1985	4129

Critical Analysis

A land capacity analysis is a straight forward use of GIS. It is used to calculate areas on large tracts of land and analyze growth potential. A closer look at a buildable land analysis shows some holes in the techniques used to find the information. The Washington Research Council (2005) studied the land capacity analysis and found that it misses many different variables in its analysis. There are a number of assumptions that are used to determine development capacity and underutilized land, some of which are, market percent factors, right of way factors and floor area ratios. The analysis that is conducted does not take into account the economic factors surrounding land that is currently being used for a purpose and the cost of that redevelopment. Another factor not taken into account is infrastructure costs associated with creating greater urban densities (WA Research Council, 2005).

A model that is made to identify underutilized land may be problematic if the user is not fully aware of the proper variable inputs. Running a model that spits out some numbers may be useful for keeping consistency in the records, but it would also be useful to ground truth the models observations. For the purposes of my project underutilized land was determined by the user (me) and there may have

been land that was not recognized as being deficient, or there may have been land that was assumed redevelopable, but cannot be for certain reasons. These variables can prove to be problematic and should warrant a closer look.

Geographic information can be powerful and any analysis done using a GIS has a bias because the user always has a bias (Pickles, 1995). There is no way to stop the bias, the user can only acknowledge the bias and try to mitigate their effects. Since the land capacity analysis can be done in many different ways, but all of the results need to be comparable with each other, there can be problems with the way each municipality does their analysis. The state needs to set stricter standards for collecting this information to be able to lose some of the bias that comes from each municipality. In the end GIS is a powerful tool that needs to be handled carefully from beginning to end.