A Community Build-Out Analysis of Dickinson Township, Cumberland County, Pennsylvania

Prepared for

South Mountain Conservation Landscape Initiative

Jointly Prepared by

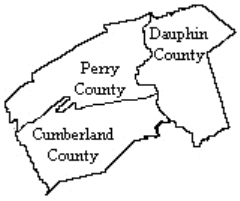
The Center for Land Use at Shippensburg University

Central Pennsylvania Conservancy

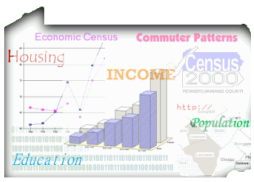
In cooperation with

Cumberland County Planning Commission

Cumberland County GIS Department



Tri-County Planning Commission



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EXECUTIVE SUMMARY

What is a "community build-out analysis?" What is the value of this?

Community build-out analysis is a tool for examining the effectiveness of a community's zoning and other land use regulations. In most cases, **a build-out is used to present a scenario of what development will likely occur and where it will occur over the long term, given the current zoning.** The scenarios typically presented are 10 or 20 years into the future and are based on current growth trends, as well as current development patterns. Build-out results typically include numeric tables and tabulations of the projected development along with the projected fiscal and environmental impacts. The scenarios are most powerfully presented through use of maps and other graphics that underscore and provide a simple, yet effective, evaluation of the community's current zoning and land use planning. A detailed technical discussion of how build-outs are performed may be found in the Appendix.

The build-out analysis provides the community a chance to soundly evaluate the effectiveness of its land use planning efforts and provide insight into how such efforts may be improved. With particular respect to South Central Pennsylvania, a municipality will be better able to assess whether its zoning regulations, together with other land use regulations, are stringent enough to preserve its rural character and protect its natural and other environmental assets. The analysis can even speak to the fiscal implications of the projected development scenarios.

Why Dickinson Township?

Like the rest of the region, the township is situated at the "growth edge" of Megalopolis (see Figure 1) and is within a region characterized by sustained and comparatively rapid growth. In fact, Adams, Cumberland, Franklin, and York counties have been and are projected to be among the state's fastest growing (Table 1). South Middleton Township, of course, is within Cumberland County.

Table 1

Selected Growth Rate Rankings of Local Counties Among All 67 Pennsylvania Counties

County	*Rank in Growth, 2000-08*	*Rank in Growth, 2007-08*	*Rank in Projected Growth, 2000-2030*
Adams	7	12	16
Cumberland	13	5	12
Franklin	6	2	25
York	5	4	15

*Sources: assorted U.S. Census Bureau and Pennsylvania State Data Center materials.

This large regional scale situation within Megalopolis, combined with more local factors such as:

- proximity to Interstate 81;
- being within the commuting range of Harrisburg and other cities;
- availability of undeveloped land; and
- appealing rural community character with nearby natural amenities

leaves the township poised for continued steady (or perhaps even more rapid) growth.

What is in this report?

Apart from the Executive Summary, this report consists of two broad components. The first is a "Where are We Now?" component that presents the descriptive land use and planning background of the township. The second component is entitled "Where we could be" and it presents a reasonable scenario of future development patterns the year 2020.

Of the several specific or particular items in this report, the one of the greatest significance is the spatial build-out map, presented here on the next page. This maps present hypothetical landscapes for the township in the year 2020.

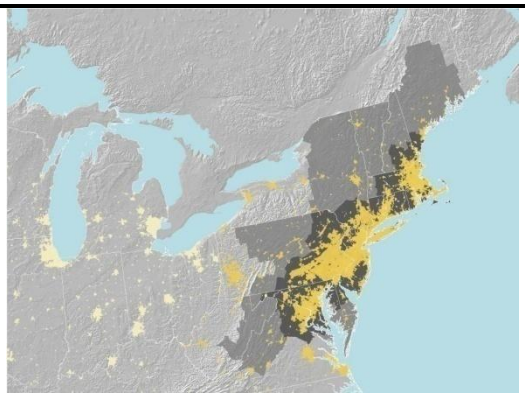
In other words, **they reasonably illustrates where future residential development will occur in each of these years** given Dickinson Township's:

- population projections for 2020;
- current pattern of land ownership;
- current pattern of development (buildings);
- current zoning

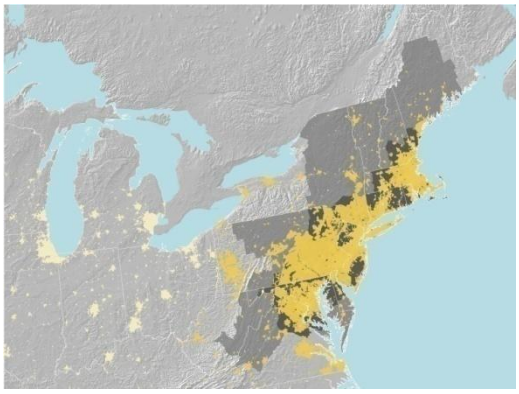
In addition to the build-out maps, a number of other items are included in narrative, tabular, and graphical fashion. These other items speak to other impacts and aspects of the 2020 scenario.

- **In the build-out maps on page six and below (Figure 2,), existing buildings of any kind are represented by yellow and gray symbols. The red point symbols represent hypothetical residential buildings.**

Land consumption in Megalopolis region as of 2000



Projected land consumption in Megalopolis in 2025



Projected land consumption in Megalopolis in 2050

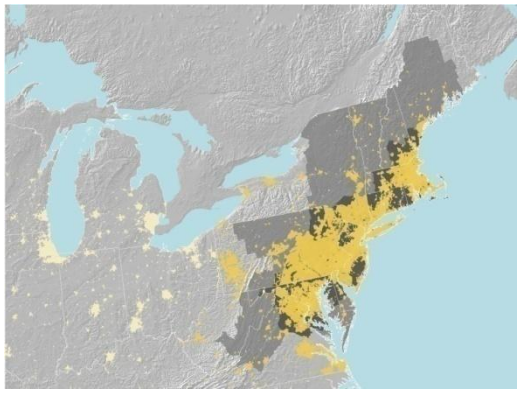


Figure 1:

Projected Land Consumption in the Megalopolis Region, 2000-2050

Source: Regional Plan Association, 2005.

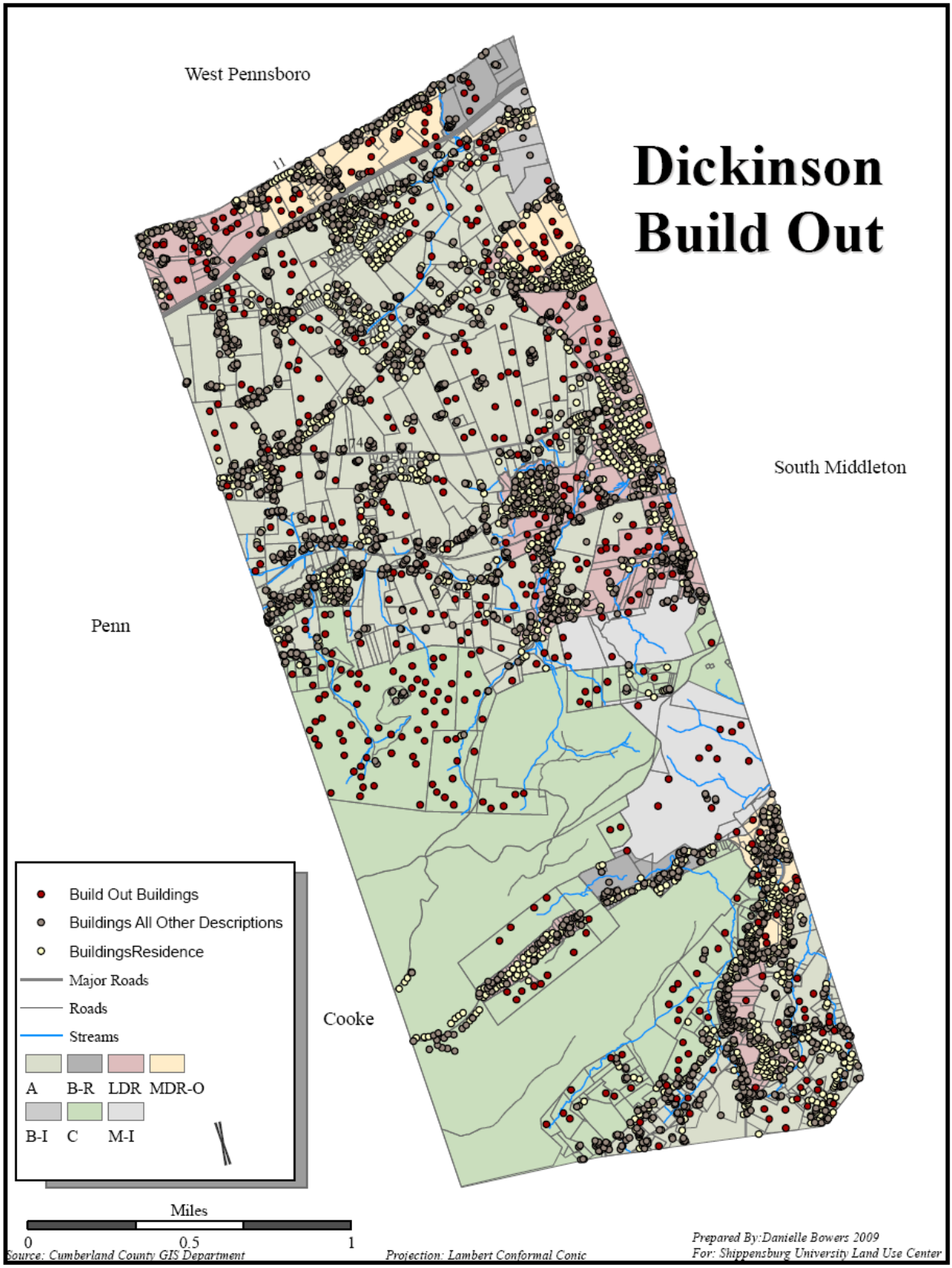


Figure 2: Build out map for Dickinson Township, 2020.

What are the major findings?

Two related caveats need to be made known prior to any assessment how effective land use regulations are. First, there is no clear, widely acceptable method of evaluating zoning. Such evaluations are qualitative and not comparable from setting to setting.

A second caveat is that any evaluation and decision on whether the zoning is "good, bad, or in between" is necessarily a political one that is dealt with by township supervisors, planning commission, residents and other stakeholder groups. Economic interests, neighborhood interests, and environmental interests all need to be taken into consideration.

Also, it is important to note, again, that the maps produced portray a reasonable hypothetic scenario and do not show where actual homes will be constructed. In some rare cases, a hypothetical residence will appear in an area not feasible for construction. The analysis nor the software can account for every factor.

That being said, there is still a role for planning expertise and an independent critique. The following findings, comments, and conclusions may be made based on this community-wide build-out analysis.

Findings

1. Given the current pattern of land parcelization, the zoning as it now exists, and population projections, it is projected that:

a) An additional 680 residential units have been or will be built between 2000 and 2020.

2. The build-out map for 2020 indicates a significant number of new housing units will be built outside of residential zoning districts. Development occurring in the Agricultural and Conservation Districts is of a particular concern.

Comments / Conclusions

1. A visual assessment of the visual build-out map (Figure 2) finds that sprawling development is predicted for the Agricultural District and the Conservation District, which is problematic for the township's intention to preserve its natural resources and agricultural base. New development in floodplains of the Conservation District is also predicted.

Further conclusions can be drawn from the build-outs. These include:

- Greater farmland fragmentation will occur, further reducing the viability of agricultural operations. The vicious cycle of decreased farming leading to decreased services and in turn to increased farming costs will accelerate. The scale economies of current agricultural operations will be further eroded.

- A greater number of land use conflicts between residential and agricultural land uses will occur, as larger numbers of suburbanites will be even more dispersed across the existing agricultural landscape.
- The open space amenity of farmlands will further deteriorate.
- Opportunities for commercially viable local grown foods may decrease as agricultural activities wane in the face of increased sprawl.
- Fiscal costs will increase as new, low density development will demand greater public service provision. The costs of these new services will outweigh increased tax revenues coming from new residential development, eventually resulting in a greater tax burden.

CONTENTS

FIGURES

TABLES

DICKINSON TOWNSHIP:
"WHERE WE ARE NOW"

This section briefly presents descriptive and analytical background of the current demographic, land use, development characteristics of the township, along with a succinct overview of the selected land use planning activities.

Dickinson Township was established in 1785 has an area of approximately 45.6 square miles. The population of the township was approximately 5,284 in 2007, which represents a 1.7 percent increase from the previous year. The majority of the township is located in the Cumberland Valley but a portion is part of the South Mountain area.

Demographics: Recent Numbers and Projected Growth

The population is expected to continue increasing in Dickinson Township, and the population composition is expected to change also**.** Project population numbers from the Tri County Planning Commission estimate a continued increase to 6,436 by 2020. It is also noteworthy that Dickinson's growth rate of 1.7 percent from 2006 to 2007 is higher than the 1 percent for Cumberland County and 0.2 percent for Pennsylvania. Table 2 provides more details on the regional context of growth Dickinson Township. Additionally the number of residential households is estimated to increase from 1,935 in 2000 to 2,514 in 2020. The number of households is estimated by dividing the projected population by the gross average number of people per household. Table 3 provides a detailed breakdown of population projections and household characteristics.

These are very reasonable projections given the factors already identified in the Executive Summary, which include:

- being situated at the growth edge of Megalopolis even as the region is expected to grow by the year 2050 by another 18 million, up from the current 50 million.
- Local factors such as proximity to Interstate 81;
- being within the commuting range of Harrisburg and other metropolitan centers;
- availability of comparatively lower priced undeveloped land; and
- appealing rural community character with nearby natural amenities.

From these projections, a number of future dwelling units may also be projected. It is assumed that average household sizes and vacancy rates will remain the same for the future as they were for 2000. These rates are generally stable over time and between townships. Such assumptions work well for practical purposes of accomplishing this analysis.

General Land Use and Development Character

Currently Dickinson Township has predominantly agricultural land uses. Residential land uses also occupy a significant amount of the township area. Commercial and industrial uses of the land are also present.

The land in the township with low slopes of less then 10 percent is the most valuable for both agricultural and development purposes. Therefore population pressures will offer a real challenge to the continuation of agriculture. Areas with slopes between 15 and 25 percent could be used as a buffer between the developed uses and forested uses that will continue to dominate the areas with slopes over 25 percent.

Table 2: Population Characteristics and Trends of Dickinson Township in Local, County, and State Context

Year	Dickinson Township		Monroe Township		South Middleton Twp.		Cumberland County		Pennsylvania	
	Population	% Change from prev.	Population	% Change from prev.	Population	% Change from prev.	Population	% Change from prev.	Population	% Change from prev.
2007	5,284	1.7%	5,799	0.8%	14,262	1.6%	228,019	1.0%	12,432,792	0.2%
2006	5,194	1.8%	5,755	1.1%	14,042	1.8%	225,772	1.3%	12,402,817	0.3%
2005	5,104	2.3%	5,695	0.3%	13,796	0.7%	222,818	0.9%	12,367,276	0.2%
2004	4,990	1.5%	5,680	0.6%	13,697	1.4%	220,890	0.8%	12,348,618	0.2%
2003	4,915	1.6%	5,648	0.4%	13,509	1.2%	219,218	0.9%	12,327,250	0.2%
2002	4,839	1.5%	5,623	0.8%	13,354	1.3%	217,308	1.0%	12,305,751	0.1%
2001	4,768	1.4%	5,578	0.9%	13,186	1.9%	215,113	0.7%	12,287,542	0.1%
2000	4,702	21.7%	5,530	1.1%	12,939	25.1%	213,674	9.4%	12,281,054	3.4%
1990	3,865	27.3%	5,468	13.1%	10,340	15.6%	195,257	8.7%	11,881,643	0.1%
1980	3,037	25.7%	4,836	45.4%	8,941	18.9%	179,625	13.6%	11,864,720	0.5%
1970	2,416	19.3%	3,326	44.7%	7,521	38.7%	158,177	26.7%	11,800,766	4.3%
1960	2,025	4.6%	2,298	22.6%	5,424	29.0%	124,816	32.2%	11,319,366	7.8%
1950	1,936		1,875		4,204		94,448		10,498,012	

Sources: U.S. Census Bureau, Tri-County Planning Commission, and respective comprehensive plans.

Monroe and South Middleton Townships are nearby townships to Dickinson Township that are subject to concurrent build-out studies.

Table 3: Projected Populations, Average Household Size, and Projected Numbers of Residential Units

Year	Dickinson Township		Monroe Township		South Middleton Twp.		Comments on Households & Housing Units
	Projected Pop.	Projected Housing Units	Projected Pop.	Projected Housing Units	Projected Pop.	Projected Housing Units	
2030	(No projection)	- - -	8,343	3,272	18,078	7,409	*The total number of occupied households for 2000 were 1,721 (Dickinson), 2,073 (Monroe), and 5,081 (S. Middleton)*
2020	6,436	2,514	7,273	2,852	17,300	7,090	*The total number of housing units along with the "vacancy rate" for each township in 2000 was 1,834, 6.6% (Dickinson); 2,165, 4.4% (Monroe); and 5,302, 4.3% (S. Middleton)*
2000	*Avg. household size*	2.73	*Avg. household size*	2.67	*Avg. household size*	2.51	
2000	*population divided by total housing units*	2.56	*population divided by total housing units*	2.55	*population divided by total housing units*	2.44	
	Additional Number of Housing Units Compared to 2000						
2030	(not calculated)		1,107		2,107		
2020	680		685		1,788		

Note: the values from 2001 through 2007 are U.S. Census Bureau estimates; the values prior to those are decennial census counts.
Note: the projected number of residential units is a rough estimate that simply takes total projected population divided by average household size in 2000. Replacements units and vacancy rates are not accounted for.

Sources: U.S. Census Bureau, Tri-County Planning Commission, and respective comprehensive plans.

Table 4: Land Uses by Zoning Designation

	Residential Use (codes 100 to 299)		Commercial Use (codes 300 to 399)		Industrial Use (codes 400 to 499)		Institutional / Special Use / Communication (codes 600 to 720)	
ZONING DISTRICT	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*
All districts (zones)	1705.32	80.97	50.50	2.40	150.63	7.15	199.71	9.48
Conservation (C)	192.57	48.63	15.83	4.00	4.75	1.20	182.88	46.18
Agricultural (AC)	1021.62	99.46	1.75	0.17	0.00	0.00	3.83	0.37
Residential - Low Density (R-L)	277.08	97.89	2.57	0.91	0.00	0.00	3.40	1.20
Residential – Moderate Density - Office(MDR-O)	114.12	94.71	2.63	2.18	0.49	0.41	3.25	2.70
Business-Recreation (B-R)	27.80	48.63	11.01	2.40	3.47	7.15	0.03	9.48
Mining Industrial [M-I]	16.77	11.20	0.27	0.18	129.63	86.55	3.10	2.07
Business Industrial [B-I]	11.78	43.74	15.15	56.26	0.00	0.00	0.00	0.00

Table 5: Overview of Land Use and Development Status, by Zone, January 2009

ZONING DISTRICT	Total Acreage	Total Parcels	Avg. Parcel Size (acres)	No. of Structures	No. of Parcels w/o Structures	Acreage of Parcels w/o Structures
All districts (zones)	2736.10	2732	.77	2080	747	665
Conservation (C)	396	248	1.60	151	97	131.21
Agricultural (AC)	1028	1263	.81	856	407	361.62
Residential - Low Density (R-L)	283	870	.325	714	156	84.47
Residential – Moderate Density - Office(MDR-O)	120.50	331	.36	277	54	46.36
Business-Recreation [B-R)	42.32	68	.622	65	3	49899
Business Industrial [B-I]	26.93	15	1.80	7	8	7.83
Mining Industrial [M-I]	149.78	32	4.68	10	22	28.61

Environmental Character

There are portions of the township that have development constraints. These constraints are not only environmental in nature but also relate to some institutional limitations, including those relating to ownership. Soil is an important environmental consideration, because high quality soils are in demand for agricultural and urban land uses. Slope is also an important constraint because of the variable topography which includes portions of South Mountain.

Table 6: Environmental and Other Limitations to Development

ZONING DISTRICT	Total Acreage	Acerage by ownership and other constraints					
		Steep Slopes	Wetlands	Floodplain	Soil Suitability	Prime Ag. Soils	Public or Quasi-Public Ownership / Use
All districts (zones)	2736.10	740.57	47.8	110.08	0	0	192.46
Conservation (C)	980.77	290.15	10.49	24.84	0	0	181.47
Agricultural (AC)	1069.75	279.20	19.74	42..32	0	0	2.56
Residential - Low Density (LDR]	307.35	69.15	6.94	17.25	0	0	2.47
Residential – Moderate Density - Office(MDR-O)	136.86	44.30	0.09	0	0	0	2.86
Business-Recreation [B-R)	52.19	13.49	2.21	11.00	0	0	0
Business Industrial [B-I]	27.91	8.72	0	0	0	0	0
Mining Industrial [M-I]	161.29	35.56	.089	14.66	0	0	3.10

Community and Land Use Planning in Dickinson Township

Planning efforts in Dickinson Township are ongoing. The comprehensive plan and zoning ordinance are crucial planning documents.

The current zoning ordinance was adopted by the Board of Supervisors on September 6, 1994. The most important goals of the zoning ordinance are to:

- Promote, protect and facilitate the health, safety, and general welfare of the population.
- Promote preservation of the natural, scenic and historic values in the environment and preservation of forest, wetlands, aquifers and floodplains.
- Prevent one or more of the following: overcrowding of land, blight, danger and congestion in travel and transportation; loss of health, life, or property from fire, flood, panic, and other dangers.
- Prevent the loss of prime agricultural lands when considering topography, soil types and classification, and present use.
- Provide for the use of land for residential housing of various dwelling types encompassing all basic forms of housing, including single-family and two-family dwellings, and a reasonable range of multifamily dwellings in various arrangements, mobile homes and mobile home parks.
- To accommodate reasonable overall community growth, including population and employment growth, and opportunities for development of a variety of residential dwelling types and nonresidential uses.

Dickinson Township has seven different zoning districts with three special overlay districts differing in density, land uses, and purposes.

Zones:

- Conservation District (C)
- Agricultural District (A)
- Low Density Residential District (LDR)
- Medium Density Residential-Office District (MDR-O)
- Business-Recreation District (B-R)
- Business-Industrial (B-I)
- Mining-Industrial (N-I)

Special Overlay Districts:

- Floodplain Area Overlay District (FA)
- Scenic River Overlay District (SR)
- Billboard Sign Overlay District (BS)

Each of these planning tools is widely used and accepted across the state. The purpose of a comprehensive plan is to provide a road map in achieving a community's long term vision. Zoning is the regulation of land use, bulk, and density for the purposes of the community's health, safety, welfare, and morals, as well as to minimize public and private nuisances. Zoning is nearing its 100th anniversary as a widely accepted and implemented planning tool in the United States. Figure 3 represents the current zoning map for Dickinson Township.

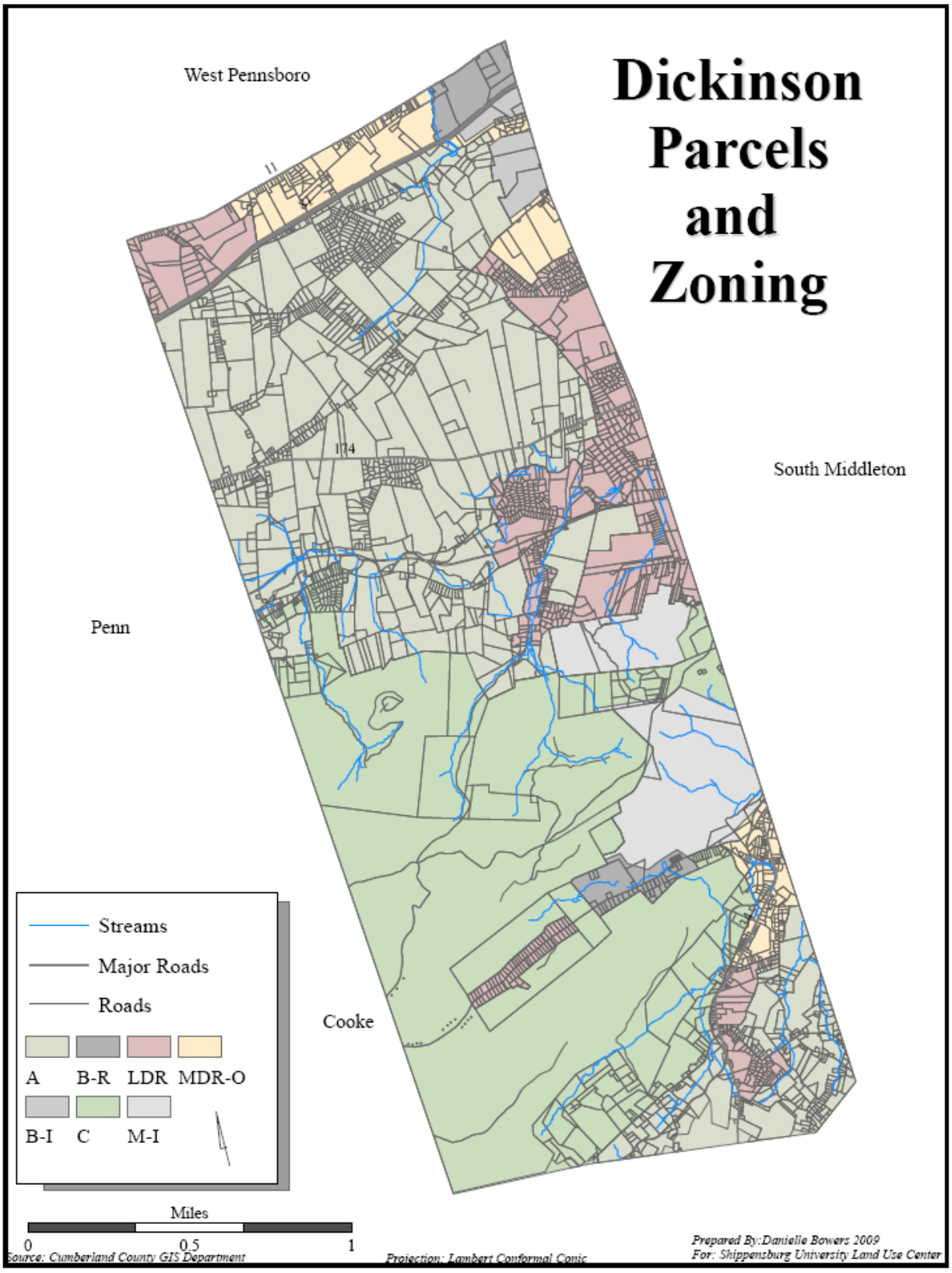


Figure 3. Zoning map and existing parcels of Dickinson Township

DICKINSON TOWNSHIP:
"WHERE WE MAY BE HEADED"

This section presents a scenario of where the township may be in terms of patterns of residential development in 2020. First, the generalized process of developing a community build-out analysis is succinctly described and explained. Then, the particulars of this build-out project for Monroe Township are presented.

Community build-out analysis is a useful tool in projecting the future consequences of long term planning in a given community. These future consequences may variously relate to community character, fiscal conditions, adequate provision of community services, impacts to school enrollment, and the community's vision of itself in the next 20 to 50 years and beyond. It also is useful in projecting the environmental consequences of poor (or good!) planning in terms of automobile emissions, energy use, water consumption, and agricultural / forest land fragmentation.

Conducting a Community Build-Out Analysis

With changes in computer technology, availability of GIS (geographic information system) software, and availability of suitable data, build-out analyses is becoming a more commonly employed tool for examining the effectiveness of planning, particularly zoning. Prior to these changes, build-out projects were even more labor intensive. The technique first appeared during the 1960s in association with Ian McHarg's planning work in the urban fringe of the Baltimore, Md. Metropolitan area (Arendt, 1994). Complementing these three changes, noted Randall Arendt helped popularize the tool in 1994 with his publication of *Rural by Design*.

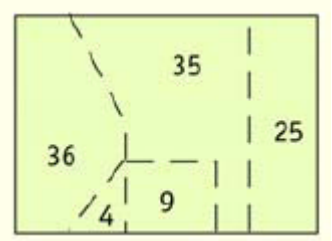
It should be noted that Arendt suggests that communities not simply use such analyses as a way of illustrating "shortcomings" of the community's prior planning efforts (1994:253). Rather, it should be thought of as a "preview of the area's future prospects under the present regulations (p. 250). Ideally such maps are complemented with maps identifying areas that should remain un-built and other areas more appropriate for construction. However, this is not done in this case study of Monroe Township.

The procedural steps of performing a community build-out analysis are outlined in Table 9. The process is simple in concept, yet as Arendt notes (p. 250) "tedious and time-consuming" – even with computers and GIS software.

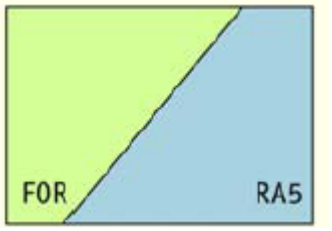
The most basic and "required ingredients" to a build-out analysis project are the parcel map, the zoning map, and a map of current development. To make such an analysis more realistic to a township, areas that are prohibitive or limited to development also need to be mapped. These include areas with environmental limitations (i.e., areas with prohibitively steep slopes of 25% or more) or areas that have institutional or ownership constraints (most notably publicly owned lands, but also private lands that cannot or will not be developed (i.e., land owned by utilities or land under agricultural easement).

While the particulars vary in case to case, at a minimum a map is produced (as an interim step) that shows all the hypothetical lots (parcels) that can be created and build upon. To add to the realism, a hypothetical structure is illustrated on the new potential lot. Matters may be made even more realistic when three dimensional images (termed "visual build-outs") of such potential future development is produced. All the maps in this project are two-dimensional or "spatial" build-outs.

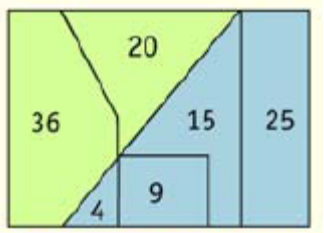
1. Five hypothetical parcels with the acreage of each noted.



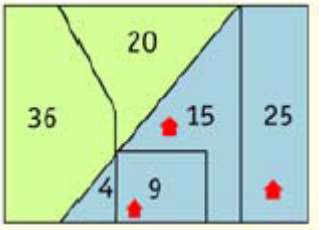
2. Zoning districts across the same landscape. One zone ("FOR)" is a forest zone with a 25 acre minimum lot size requirement. The other zone is a rural zone with a five acre minimum lot size.



3. Laying the zoning over the parcel map one begins to see what areas are potentially subject to greater development.



4. Current existing dwelling units are portrayed on the landscape.



5. Given a grossly calculated potential parcelization, a number of new, hypothetical dwelling units allocated and placed on to the landscape.

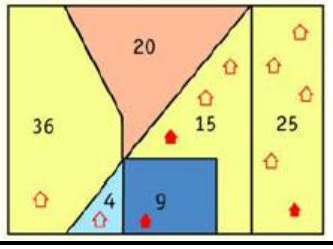


Figure 4: Basic Conceptual Steps of the Build-Out Process Simply Illustrated

Graphics taken from Center for Rural Vermont *Community Build-Out Analysis Manual*.

In this analysis, ESRI ArcGIS 9.3 software was used in conjunction with CommunityViz software (version 3.2) to process the spatial data. ESRI ArcGIS 9.3 software is the most widely used mapping and geographic information system software. CommunityViz 3.2 is the latest version of an "add on" software that is specifically designed for land use, environmental, and community planning applications, as well as community visioning. CommunityViz is a project of the Orton Family Foundation and Placeways, LLC. According to The Orton Family Foundation's website

(http://www.orton.org), the organization's mission is to "We are committed to helping towns steer and embrace growth and change while enhancing the cultural, social, environmental and economic qualities that are the essence of what makes a place a valued home to its citizens." Placeways software was developed in close association with the Orton Family Foundation mission and its outreach activities, though today it is a separate corporate entity. A special training session with the software was held in March 2009, with Placeways instructor Amy Anderson facilitating the session.

Additional Findings and Conclusions of the Community Build-Out Analysis

The findings and conclusions contained here are largely supplemental and complementary to those already noted in the Executive Summary.

Most powerfully presenting the results of this project is the build-out maps. Figures 2 reproduced here as Figures 5, best captures the future implications of the current planning regulations. From examining these maps it is clear that the rural character of the township is jeopardized. What makes these maps even more surprising is that they do not even show the entire number of projected housing units for 2020. This is because the CommunityViz software could not allocate each of the hypothetical units to a particular hypothetical location.

In addition to the impacts noted in the Executive Summary, there are further impacts of that can be estimated through extrapolation. These local impacts, which are primarily environmental, are substantial. All estimated impacts are summarized in Table 7 below.

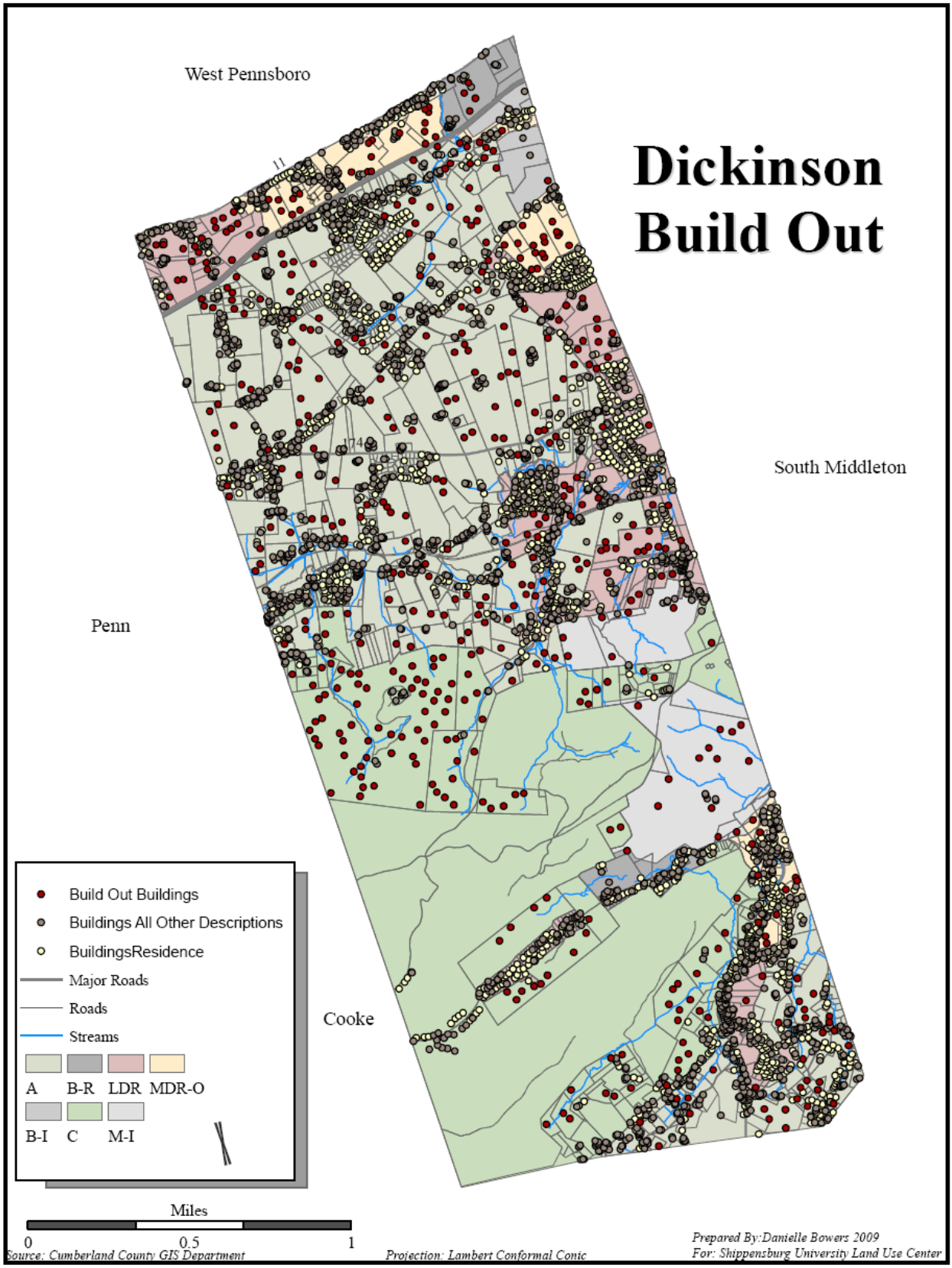


Figure 5. Build-out map for Dickinson Township

Table 7: Generalized Process / Outline in Completing Community Build-Out Analysis

Stage	*Action / Operation*	*Data Used, Conceptually Described*
1. General Operations for all Build-Outs (Numeric, Spatial, & Visual)	A. Combine parcel and zoning data to produce a 'hypothetical' maximum number of parcels, or polygons.	• Parcels • Zoning • Existing buildings
	B. Consider areas with special zoning designations (i.e., overlay districts)	• i.e., floodplain overlay zone
	Sequentially eliminate lands from consideration that have ownership, institutional or other related restrictions to development	• Federally owned lands • State owned lands • Township owned lands • Agricultural easements • Land trust properties • Other public land uses (school districts, cemeteries) • utilities
	C. Sequentially consider lands with prohibitive environmental constraints (may eliminate areas not already addressed by overlay zones)	• steep slopes • areas in the 100 year floodplain • stream buffers (of 75' from selected streams) • wetlands
	D. Transferring Density – may be allowed to correct for or ignore certain dimensional constraints	
	E. Considerations for different types of land uses: • Residential – these are represented as points or even building footprints • Commercial – may assume use of building footprints and consideration of Floor Area Ratio (FAR) • mixed use – this is allowed / provided for	
	F. Considerations of "efficiency" are also an option. This is where land lost for roads may be accounted for.	
	G. Accounting for the existing buildings	• existing buildings
2. Numeric Build-Out Specifics	A. This provides a summary of the estimated numeric building capacity, based the area, planned density, and limitations, for the polygons.	
3. Spatial Build-Out Specifics	A. This provides a spatial, two-dimensional representation of where buildings, represented by points, could be placed. This takes into account parcel (polygon) geometry and, thus setback rules, road frontage requirements, minimum separation distances, and other considerations are taken into account. These factors are:	
	• setback distances • minimum separation distances between buildings	• Building footprints • Floor area ratios

	B. With respect to the new parcel polygons, hypothetical buildings may be placed either randomly, in grid fashion, or along roads. These hypothetical building placements may differ by zone. These new hypothetical buildings are in a layer which may be edited. For example, individual building may be moved or deleted.
4. Visual Build-Out Specifics	A. Visual build-out provides a three dimensional scene of the hypothetical landscape. This hypothetical landscape features various building types, depending on how the settings are configured and assumptions made by the user. 3-D models of buildings are placed at the points of both actual and hypothetical buildings. This hypothetical layer may be draped on to actual areal photos of the existing landscape. This may use user supplied imagery or Google Earth imagery.
5. Time Scope Application *(optional)*	A. This may be used to visualize how the projected or forecasted development in a given scenario may occur over time.

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Zoning Practice — April 2006

Ask the Author

Here are reader questions answered by David R. Godschalk, FAICP, author of the March 2006 *Zoning Practice* article "Buildout Analysis: A Valuable Planning and Hazard Mitigation Tool."

Question from Mark Zeigler, AICP, Associate Planner, City of Wilmington, North Carolina:

Our city is 90 percent built out with 10 percent vacant land left. Analysis of our recent future land-use plan from 2004 shows that the development trend has been to build at a much lower density than the code allows. Our city has vast amounts of low-density development with a large amount of residential land and not enough commercial and industrial.

1. As we rapidly approach buildout, can you think of development and redevelopment incentives or methods that we could offer commercial land owners to build at a greater density? (Note: We have a mixed-use zoning district available to developers. In my opinion, even a recent mixed-use development has been built at a too low a density.)

2. If we were to undertake further buildout analysis, do you know of trends and impacts from other cities that we would want to consider?

Answer from author David Godschalk:

In order to encourage higher-density commercial development and redevelopment, a city can consider three related approaches:

1. carry out a buildout analysis to document the impacts of continued low-density development, as well as the benefits of higher-density, mixed-use development;
2. build consensus on areas of change to higher density that are adopted in the future land-use plan;
3. adopt zoning regulations that include both incentives and regulations to implement the desired type of development.

One of the most difficult challenges to achieving higher densities in a largely built-up city is the opposition to change from existing low-density property owners. Understandably, these existing owners desire to preserve land-use stability in their neighborhoods and feel threatened by the potential of development at higher density than currently exists. This is the problem that arose when Seattle attempted to implement its 1994 *Sustainable Seattle Plan*, which called for nodes of higher density to be achieved through redevelopment and infill in new urban villages. Opposition was fierce and well organized. The city then went through a number of years of neighborhood planning in order to respond to the concerns of existing residents and to generate agreements on adjustments to the proposed densities. Ultimately, they were able to work out a new higher-density land use pattern through a strong citizen participation program that empowered the neighborhoods.

This opposition is also a problem for developers, who realize that it is much less difficult to build at the same densities as existing properties. The delays caused by opposition and the conflicts generated by lawsuits tend to discourage developers from proposing new higher-density infill or redevelopment projects. It may be much easier, and possibly more profitable, for them to accept the existing low densities, even if the zoning allows higher densities.

If the city desires to use its dwindling supply of land for higher-density development, then it must look for ways to assure the existing property owners that their interests will be protected and to assure potential developers that they will find a positive reception to higher-density proposals. A buildout analysis can help to frame the problem by pointing out the impacts of continued low-density residential development on the small supply of available land. Such impacts could include lost opportunities to create mixed-use areas, less than optimal development in special areas (such as waterfronts), difficulty in encouraging affordable housing, failure to grow the city's tax base (and thus to be able to provide desired public facilities and amenities), and possibly increased sprawl outside the city boundaries.

Once the buildout analysis has documented the benefits and costs of continuing the existing development pattern versus changing in some areas to higher density, mixed use, then stakeholders need to work together to build consensus on areas where the status quo is to be preserved and areas where change is to be encouraged. For example, the development management strategy of *Blueprint Denver* is to designate and map Areas of Stability, where maintaining the existing character is most important, and Areas of Change, where investment in new building and alternative transportation can be integrated. Areas of change include major corridors and close-in neighborhoods where change is both logical and acceptable.

Neighborhood workshops and charrettes are useful tools to build agreement on areas of change through the preparation of small area plans. (See the Small Area Plans chapter in the 2006 fifth edition of *Urban Land Use Planning.*) In these small area settings, designers can translate two-dimensional land-use and zoning maps into three-dimensional building forms, streetscapes, and public open spaces. New Urbanist professionals are especially skilled at creating these images of desired built environments. For example, see the Stapleton Airport redevelopment plan in Denver. Once consensus has been achieved, the new plans can be formally adopted as part of the city's comprehensive plan.

To implement the new small area plans, it will be necessary to rethink those portions of the zoning ordinance that permit the continuation of low-density development in locations where change is desired. Several options can be considered. Incentives can be provided in the form of increased density (with increases limited to the agreed-upon plan densities) and reduced processing time (if the proposed project conforms to the adopted plan). Regulations can be written to ensure that projects meet minimum densities, minimum setbacks, and other design parameters. For example, the zoning code could include both minimum-density "floors" as well as maximum density "ceilings." A helpful reference is APA's Planning Advisory Report 526: *Codifying New Urbanism.*

There is no single panacea that will work to change a long-standing trend toward low-density residential dominance. However, a combination of tools and planning efforts can make a difference.

Question from Russell L. Lambert, AICP, Yuma County (Arizona) Department of Development Services:

As a planner tasked with updating county area plans (last update five years ago), I'm interested in the analysis tools you might recommend or ascribe to for updating the area plans. Pending new industrial development may occur with probable extension of electrical power lines and gasoline pipelines supporting a proposed refinery.

The county is largely a low-density rural/agricultural area in the low desert area, with the county seat having approximately 90,000 people, two other communities ranging from 10,000 to 20,000 (full time), with higher winter-time guest residents two to three times those numbers. The largest rural community where work is being initiated has a population of approximately 3,500. There are two or three other "satellite" communities of small size supporting the rural, agrarian lifestyle.

This proposed major new development (industrial and support-related activities) along an interstate corridor is located about five miles from the nearest incorporated community (of 3,500 noted earlier) and approximately 15 miles distant from the metropolitan area. The rural density pattern for the area has generally been large lots for farming activities with occasional farm residences. A current development pattern seems to be two- to five-acre parcels for rural home site development, but various proposals are being discussed to support "master planned developments." Significant areas of federal and state land holdings exist, but some of these may be transferred to private ownership for support development to the proposed industrial development center while protecting higher-quality agricultural lands.

Any assistance or guidance would be appreciated.

Answer from author David Godschalk:

Your situation has many of the same issues as other rural/agricultural areas facing major industrial growth, along with scattered rural home site development and the prospect of large-scale master planned development projects. How do you maintain the desired quality of life in the face of these land-use and development pattern changes? What are the likely impacts on farming, winter tourism, public services, and agrarian lifestyles? Are existing government policies and procedures adequate to manage the consequences of new types and scales of growth? These are difficult questions, particularly under growth pressure demands.

A buildout analysis can help to make decision makers aware of the potential consequences of alternative county development patterns, and can provide the basis for a creating a new desired vision, to be implemented through revised county area plans and related growth management tools. The process of conducting a buildout analysis also can highlight the impacts of industrial growth on an agrarian county and illustrate potential mitigation strategies. A rural county is particularly vulnerable during periods of discontinuous change because many of its traditional ways of making decisions and dealing with growth are no longer adequate, and the necessary new policies and procedures have not yet been adopted.

A buildout analysis has the benefit of being an objective analytical tool, rather than a prescriptive regulatory tool. Even conservative elected officials should be able to support an analytical process that objectively seeks to understand the effects of land-use changes. The buildout analysis process can also involve stakeholders from the various interest groups — agriculture, tourism, industry, development, and federal and state government agencies. A side benefit may be to heighten the countywide level of

understanding of different policy and planning choices while improving communications and relationships among the various parties.

You will need maps of existing land use and of future land use allowed under your existing county area plans. If your county tax office has a GIS database, that will be a good starting point for a buildout analysis. The Mass GIS website illustrates the methodology for mapping and analyzing current land use and buildout land use. (See Mass GIS "Scope of Services for Buildout Analysis.")

Your buildout analysis might question the future impacts of existing development trends and what the county could be like under two basic scenarios:

Continuing Existing Trends

What are the consequences of continuing to develop two- to five-acre parcels for residences, in terms of land consumption, sprawl, conflicts with agriculture, water resources, and the like? What will the future land-use pattern of the county look like with such low density spread between the existing city and towns? Where will the future population be located? Will it be possible to provide adequate public services under this scenario?

What are the direct economic, environmental, and social consequences of building the new industrial center? What are its indirect consequences, in terms of potential induced development along its fringe (e.g., the Disney World effect)? What will be its impacts on traffic, air quality, demand for public services, housing, and the like? Where will the future work force be located?

Alternative Development Patterns

Are there locations where it might be advantageous to encourage higher-density, mixed-use, master-planned developments, in terms of feasibility of providing public services, lessened environmental impacts, and the like? If so, what would be the pros and cons of a buildout pattern that directed a percentage of the future county growth into such planned communities? How would they affect the existing urban areas, the agricultural areas, and the sensitive environmental areas?

Could industrial development be handled in some alternative fashion? Are there ways to locate or design the industrial center so as to reduce its potential negative impacts? Could it be linked to master-planned development so as to decrease worker commuting?

If you are successful in completing a buildout analysis, then you can use its findings and conclusions in updating your county area plans. For some examples of contemporary land-use and small area plans and plan-making approaches, see the 2006 fifth edition of *Urban Land Use Planning.*

Question from Kris Mago:

How did you address the "Compensatory Storage" issue in the build out analysis involving the flood zone(s)?

Answer from author David Godschalk:

According to the Mecklenburg County Floodplain Mapping Summary Report (October 1999), the following process was used to develop the new floodplain maps:

1. The floodplain boundaries were updated to correct the FEMA floodplain maps from the 1970s. Flood elevations and floodplain boundaries were developed through computer modeling to simulate the effect of rainfall and runoff in a watershed. The models were calibrated using data from actual storms. Property owners along streams were interviewed to ensure accuracy of the models.

2. To create the new FEMA floodplain maps, current land use was loaded into the computer models and the analysis was performed using various flood frequencies to establish regulatory flood elevations and areas (e.g., the 100-year flood). Then an encroachment analysis removed storage areas from each side of the floodplain until the original water surface elevation increased by a surcharge value of 0.5 feet. That determined the boundaries of the FEMA floodway, where any fill will require a variance by the local government and approval by FEMA.

3. In order to take future land-use conditions into account, Mecklenburg County developed local Floodplain Land use Maps (FLUMs) that are more restrictive than the FEMA maps and will be used to regulate new development. They used existing land use and a 0.1-foot surcharge to establish the boundaries of the FLUM floodway. This set aside additional areas as floodway, increasing the carrying capacity of the floodplain, and reducing the amount of floodplain that can be filled and built upon. This information is used in regulating land development to limit the amount of fill placed in the floodplain. Fill in the FLUM floodway requires a variance by the local government, but not FEMA approval.

4. In addition to increasing the size of the floodway, minimum finished floor elevations (FFEs) of new structures will be based on future, ultimate development in the watershed in order to protect new development from flooding. Future land use, defined as ultimate buildout in locally adopted district plans, is loaded into the hydrologic/hydraulic computer models. New flood elevations and floodplain areas are computed and used for all new building permits. New development must be constructed a minimum of one foot above the base flood elevation.

Question from Nimfa Simpson, AICP, City Planner, Xenia, Ohio:

What should be considered in a build out analysis? Can you provide us with a general outline?

Answer from author David Godschalk:

A buildout analysis should consider the impact of the future, ultimate development allowed in the planning area on the public health, safety, and welfare. This future growth scenario of full development projects the location and amount of growth allowed under existing community development plans and regulations. Thus, the buildout analysis should be designed to compare existing and projected future development, and then to consider the impacts of the change from present to future.

A general outline of a buildout analysis report typically would include the following sections, which also follow the typical steps in conducting a buildout analysis:

1. **Purpose**: states the objective of the analysis. For example, a community might be concerned about protecting the public from natural hazards, such as floods, as was the case in Charlotte Mecklenburg. Or it might be concerned about the adequacy of its public facilities, such as schools, water supply, waste disposal, etc., to support projected growth. Or it might be concerned about sustainability and livability in the future, such as the Massachusetts Statewide Buildout Analysis Whatever the case, the purpose of the analysis should drive the analytical process and methodology.

2. **Existing Development**: describes the current status of development in the planning area. This would include verbal, tabular, and mapped information about existing land use, population, zoning, environmentally sensitive areas, natural hazard areas, and the like. It could identify areas of potential development, such as vacant or underdeveloped lands or possible redevelopment or infill areas.

3. **Projected Development**: describes the full amount of future development possible under existing regulations, policies, and plans. This would include verbal, tabular, and mapped information about the location, amount, and type of future land use and population. It could be stated as a single future buildout condition, as a time sequence of development leading to buildout, or as a set of alternative scenarios based on potential changes in plans or regulations (such as buildout under an Existing Policy scenario versus buildout under a Smart Growth scenario).

4. **Buildout Impacts**: discusses the projected impacts of buildout relative to the purpose of the analysis. This would include the sources of data employed, the mapping procedure, the calculation of yield, the use of multipliers, and the like. This is the Abottom line@ of the buildout analysis. Findings should be carefully framed to meet the needs of residents and decision makers, who must understand not only the analysis conclusions, but also the assumptions that underlie them.

5. **Methodology**: lays out the procedures and technical information used to create and analyze the buildout scenario. It is important to document the buildout analysis formulas, multipliers, and other quantitative techniques, so that the study can be readily updated and revised as conditions change. Collected data should be provided