

Gross Vs. Net Density

Density of residential development is without a doubt the most discussed factor the Commission faces in decisions it makes on residential zoning and concept plan applications. Density translates directly into impacts on traffic, drainage, and schools, the three most discussed issues at our public hearings. Neighborhood groups also use existing density to argue the maintenance of neighborhood character. Developers often tout market demands reflected by high land costs and changing lifestyles that favor smaller, less maintenance dependent yards to argue their cases. Both arguments can be supported.

The prevailing historic development pattern in Knox County outside the City of Knoxville has been 1 to 5 acre parcels, sprinkled with larger working farms, developed for single family residences along the historic roads of the county that connected the rural area and small communities to Knoxville. Before the extension of wastewater sewer lines into the rural part of the county, these larger residential lots were required to support septic systems used to treat human waste. As a result almost all of the non-urban part of the county has a large-lot, spacious, sprawling look and feel to it.

Types of Density Regulation

Our zoning codes regulate density in two general ways:

1. In the planned residential districts (RP in the City and PR in the County) density is expressed as the maximum dwelling units allowed per acre. This is a measure of **gross density** because it uses the total (or gross) area of the parcel in question in the density math; for example, 100 gross acres in the parcel times a density of 3 units per acre equals a total of 300 units (or lots) allowed. The maximum number of allowed units is easily calculated. There are no minimum lot areas established under many circumstances, thus density is allowed to be transferred from an undevelopable part of the parcel to a developable area; say, from the floodway or a sink hole to an unconstrained area. This style of zone districts allows a variety of lot sizes and a diversity of housing types.
2. In the other residential districts, density is regulated by establishing a minimum lot size such as 7,500 square feet for a single-family detached lot in the city's R-1 district and 10,000 square feet for single-family detached lots in the county's RA district. It is much harder to determine the maximum number of lots a parcel may yield (its actual density) in this case because of the great number of variables and natural characteristics involved in land development (perimeter roads, type of street pattern (gridded, curvy or cul de sacs), slope protection, sink holes, streams and wetlands all influence the yield of a development). A parcel zoned R-1 could yield anywhere from 2 to 4 lots per acre – depending on

its characteristics. On easily developed land (there is not much of this left anymore) this style of zone district tends to create developments that are homogenous in character – it is likely that the lots sizes will be about the same and the houses built will be about the same size and type.

Pros and Cons of Zoning Types

Zoning districts expressed in terms of gross density are preferred by many planners. From a broad perspective, gross density is a better predictor of impacts on community infrastructure and serves as a better tool to guide the development of future roads, schools and utilities (especially wastewater services). It is a relative simple task to add up the sum total of all gross density zone districts to determine the maximum size facilities such as arterial roads, wastewater treatment plans, and public safety facilities that are needed to serve the projected future population.

Gross density is a good way of describing the way a parcel or development will act in relation to the community. 100 units on 50 acres connected to the road system at one point will have the same impact on traffic, schools and utilities whether the lot sizes within the development are 4,000 square feet or 16,000 square feet. Gross density style of zoning also provides flexibility in land planning to allow the preservation and setting aside of natural attributes of the land such as heavily forested slopes and ridgelines, greenways and stream buffers and add design features such as parks, common areas and entry ways while maintaining the development rights of the land. As less and less flat, easily drained, easily developed land is available for development this type of flexibility becomes extremely valuable.

Density controlled by minimum lot size is a good way to predict the look and feel of development, although the market place is changing in this regard. It produces developments that have the same size lot widths, the same spacing between houses, the same depth of front yards and they look and feel the same as we drive down the street. They also look and feel about the same as other developments with the same zoning. But they are much less predictable with regard to their potential impacts on community infrastructure over the long term. In terms of planning future community infrastructure this style of zoning is less predictable.

In the past, when the easily developed land was first to be developed, this style of zoning worked fairly well. There were large enough parcels to accommodate significant developments of like-sized and like-looking product. This sameness is perceived to be directly related to value and in a society where houses are thought of more as a financial asset than as a dwelling, the resale value of the home is predominant. In an article about monochromatic paint colors in developments titled "The Beige Standard" that appeared in the *Minneapolis Star-Tribune* (May 17, 2005) author Leatrice Eiseman says "Human beings have a deeply ingrained desire to blend in with their tribe. Inside our homes we're using color as a way to express our individuality, but outside still has

to say, 'I'm one of you.' " I think this goes a long way toward explaining why neighborhoods want new development to look and feel just like their own – "you are one of us."

Density Trends

The market place of the 1950s and 1960s was also much more homogeneous than it is today. There was an incredible demand for homes for new and growing families. This is no longer the case as the portion of the housing market occupied by traditional two parent families has been shrinking over time, being replaced by households with single occupants, single parents and couples without children. Housing for traditional families is still an important piece of the housing market place but it no longer has the dominance it once had.

It is also true today that lot costs are a greater and greater portion of housing costs. Because new development tends to be farther and farther from existing infrastructure, the increasing cost of extending roads, utilities and services to new development and other related costs of development are captured in the lot costs. As a result, a household with a fixed housing budget (and most of us have a top end to our housing budget) is able to put fewer dollars into the actual house cost because lot costs eat a greater portion of the housing budget. So a 1960s development of 10,000 square foot lots with 2,000 square foot houses can not be duplicated even in today's dollars because of the changing dynamics of lot and house costs over time. To develop housing today comparable to historic housing requires smaller lots.

As a result of these housing trends, developing housing today that looks and feels like the housing developed in the past is not only nearly impossible but it is also not practical.

Gross translated to Net Density

To understand how development will act compared to how it will look and feel, gross density must be translated into net density.

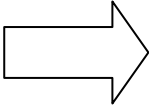
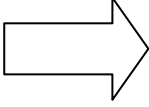

Just as gross revenues are different from net profits in the business world, gross density is different from net density. Gross density is the total number of units just as gross revenue is the total number of dollars taken in by a business. Net density leaves the total number of units allowed but divides by a number that represents the developable land rather than the total land, just as net revenue takes away the expenses required to attract the total dollars and you are left with net dollars, so \$100 dollars gross suddenly looks and feels like 20 dollars net.

The following chart tries to demonstrate the difference between gross density and net density on a hypothetical 100 acre tract with land features that are undevelopable.

Density Overview Gross Vs. Net

Hypothetical 100 Acre Parcel

Total Gross Area	100 Acres
Undevelopable Area	40 Acres
Highway ROW	10 Acres
Floodway	5 Acres
Slope Protection	25 Acres
Net Developable Area	60 Acres

Gross Density Acts Like		Net Density Looks Like:
1 DUA (gross) [100 acres x 1 unit per acre yields 100 units]		1.67 DUA (net) [100 units on 60 acres, or approximately 18,000 SF Lots]
2 DUA (gross) [100 acres x 2 unit per acre yields 200 units]		3.33 DUA (net) [200 units on 60 acres, or approximately 9,000 SF Lots]
3 DUA (gross) [100 acres x 3 unit per acre yields 300 units]		5.00 DUA (net) [300 units on 60 acres, or approximately 6,000 SF Lots]