TRANSPORTATION-EFFICIENT LAND USE PLANNING

DESIGNING FOR TRANSPORTATION-EFFICIENT LAND USE PATTERNS

With the advent of the recent legislation in the State Code on Urban Development Areas, the question of how to define an efficient and effective transportation and land use interface for Virginia communities takes on increasing importance. Although the legislation is currently under review and a revised form of the legislation is anticipated in the near future, it will likely continue similar principles and a basic intent of improving the efficiency of how our land use and development patterns are served by our transportation networks – and, in turn, how those land use patterns can best promote an efficient and cost-effective transportation network.

As discussed above, previous patterns of growth and development of communities along the US 29 corridor have put enormous strain on both the local and regional transportation network along portions of the corridor. Improving the transportation performance of these heavily developed areas is a challenging and long-term problem. However, there is an opportunity to at least put in place today better policies and practices that will mitigate future congestion by a more integrated approach to land use and transportation planning in future growth areas along the corridor.

AN EFFICIENT TRANSPORTATION SYSTEM FOR URBAN DEVELOPMENT AREAS

Thinking about a better transportation and land use interface often involves a "chicken or egg" discussion about which should come first – the transportation system or the land use system. The approach proposed below works interactively between the two systems, but starts by defining a basic prototype of an efficient transportation system to serve a particular land use context and density. The land use context and density are based on the current requirements for Urban Development Areas (Section 15.2-2223.1), according to the existing legislation, below:

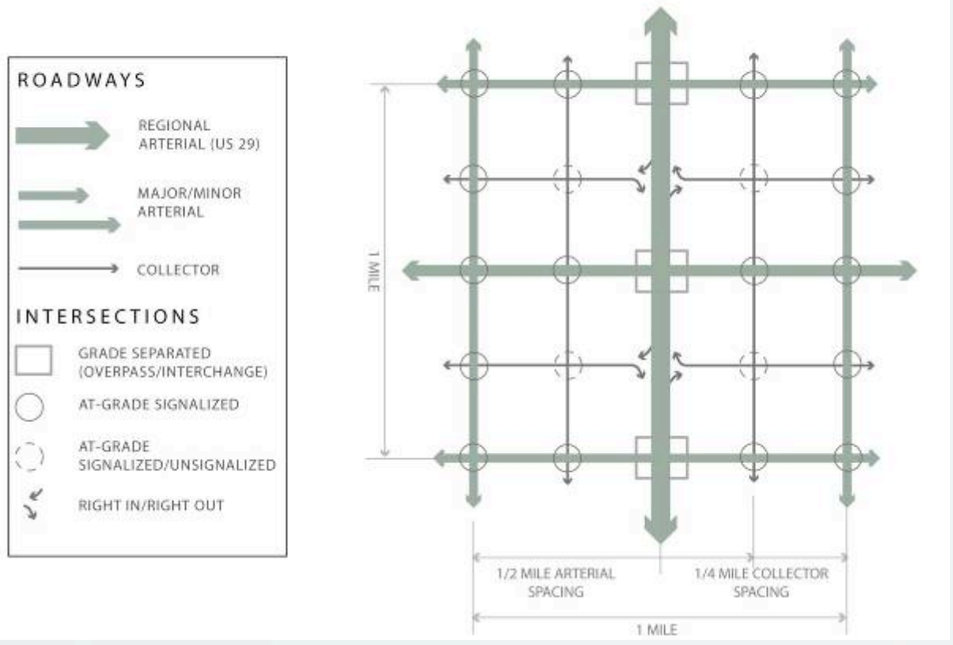
Current Urban Development Area Legislation Requirements:

Minimum Density/Intensity	Projected Growth Horizon	Other Requirements (partial list)
Residential – 4.0 units/acre (Gross Density)	Min. 10 years – Max. 20 years	Comp Plan shall incorporate principles of new urbanism and traditional neighborhood development, as defined in the legislation, anywhere within the jurisdiction Require that the local comprehensive plan include financial and other incentives for development in the UDA.
Commercial – 0.4 FAR (Gross Intensity)		

Based on these density and intensity requirements, the Urban Development Areas would essentially be a suburban development context if developed at the low end of the requirements. This is consistent with the current conditions in most of the developed areas of the US 29 corridor. The diagrams below shows a basic transportation network designed to efficiently serve this land use context, and is based on a long history of national research on optimal roadway spacing standards for different land use contexts. The diagrams show basic standards for roadway spacing that are based on Appendix F of VDOT's Road Design Manual, although distinctions between urban vs. rural highways, speed limit, and type of entrance have been generalized for this prototype.

TRANSPORTATION - EFFICIENT LAND USE IN URBAN DEVELOPMENT AREAS

A. EFFICIENT TRANSPORTATION SYSTEM

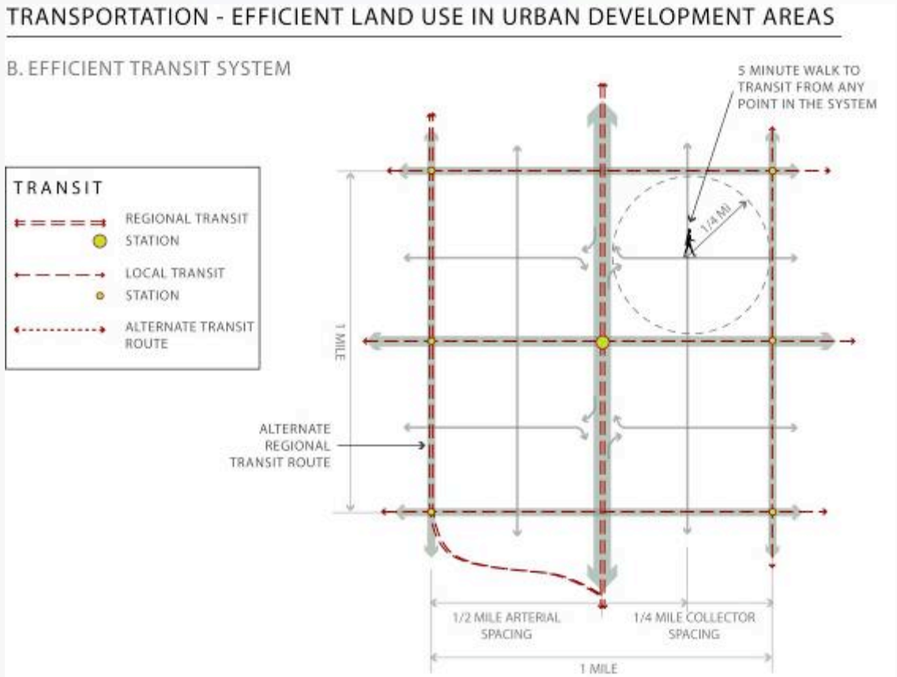


The diagram embodies a number of principles of roadway network design and access management that are fundamental to efficient transportation as described below:

- Connectivity is a fundamental principle of efficient transportation and the diagram shows a connected system of regional and local roads that is only broken at key points to maintain regional throughput.
- Spacing standards on the network are scaled according to the roadway facility type.
- A hierarchy of intersection and access types has been incorporated to balance accessibility and throughput according to the type of roadway.
- The Regional Arterial (i.e. US 29) is designed with a basic intersection spacing of ½ mile – however, in order to preserve throughput, it is intended that these should evolve into grade-separated interchanges as traffic volumes increase over time.
- The other arterials intersecting or parallel to the Regional Arterial are also spaced at ½ mile increments with signalized intersections.

- The local collectors that serve the neighborhoods located between the arterials are spaced at ¼ mile increments.
- The local collectors have full access intersections with the arterials, but have only right-in-right-out connections on the Regional Arterial as an access management feature to protect regional travel on that corridor.

The minimum require densities and intensities in the Urban Development Areas also create the opportunity to incorporate transit into the transportation network. The diagram below shows the potentials for overlaying a transit network onto this basic roadway network.



Some of the principles of an efficient transit system incorporated into this diagram are summarized below:

- An interconnected and distributed system of routes built into the basic ½ mile spacing of arterials.
- The opportunity to have every area in the network no more than approximately ¼ mile walk from a transit station.

- The option of carrying regional transit either on the main Regional Arterial (for example, within the median), or off the main corridor along a parallel arterial street.

EFFICIENT LAND USE PATTERNS FOR URBAN DEVELOPMENT AREAS

Within the basic transportation system defined above, the question arises as to what should be the appropriate land use pattern to integrate into such a system? Based on the principles described in the UDA (Urban Development Areas) legislation, the land use pattern should embody various principles of New Urbanism and Traditional Neighborhood Design, such as:

Preserved Natural Elements: Retain & Preserve the site's natural landforms, drainage patterns and sensitive environmental areas.

Preserved Cultural Elements: Retain and Interpret key aspects of the community's social and cultural history, and integrate them into the daily life of the community.

Well-Defined Edges & Surrounding Area: Provide a defined edge to developed areas, bordered by lower density or rural areas, such as protected natural or agricultural areas.

Connectivity of Travel Ways: Design an integrated, safe and connected system of travel ways for multiple modes to all destinations in the community and surrounding areas; including, pedestrian, bike, auto and transit.

Pedestrian Orientation: Provide housing, employment, recreational and shopping opportunities within easy walking distance from each other around an integrated system of pedestrian-oriented streets and paths.

Mixture of Uses: Integrate a complete mixture of uses in each community to provide convenient access to all the daily needs of the population.

Housing Diversity: Provide a complete mixture of housing types to accommodate all income levels and age groups within the community.

Community Focus: Incorporate a community focal point that serves as a center of activity and symbolic heart of the community.

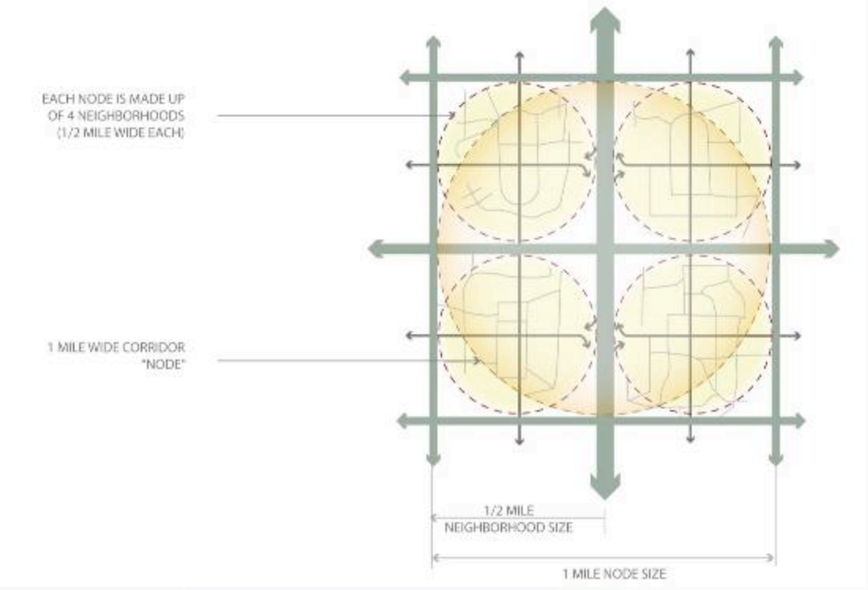
Usable Open Space: Design an integrated system of open spaces throughout the community, enriched by trees and landscaping, so that the design and placement of the open spaces encourage human interaction and recreational use.

The Neighborhood

Incorporating these kinds of principles calls for a basic planning module based on fundamental human scales, such as the "walkable neighborhood." A walkable neighborhood can be defined as a self-contained residential or mixed use community circumscribed by a 5-minute walking radius, which is traditionally measured as a circle with a radius of ¼ mile (diameter of ½ mile). Throughout history, this basic module of a roughly ½ mile wide district has been a recurring measure found in some of our best loved communities, from Forest Hills, New York, to Williamsburg, Virginia. Furthermore, this principle continues to be used - successful modern communities such as Reston Town Center, in Fairfax County, Virginia; New Town in James City County, Virginia and Old Trail Village in Albemarle County, Virginia have all used the basic ¼ mile walk as a fundamental metric of community design.

TRANSPORTATION - EFFICIENT LAND USE IN URBAN DEVELOPMENT AREAS

C. TRANSPORTATION - EFFICIENT LAND USE SYSTEM



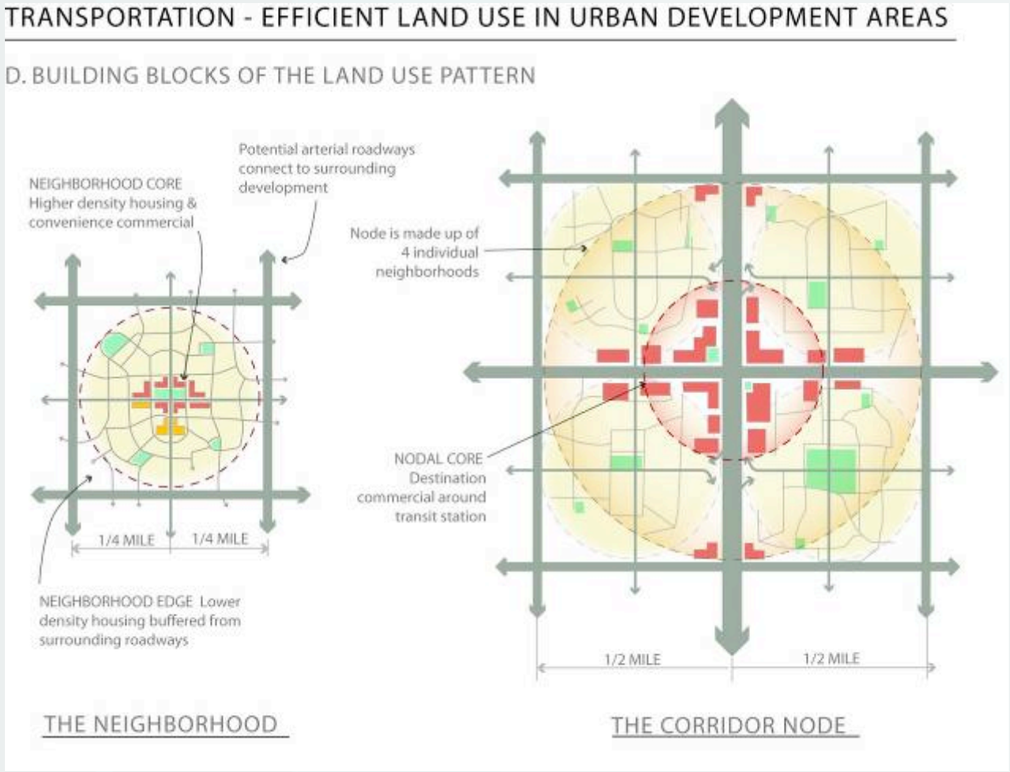
The diagram above shows how these basic ½ mile wide neighborhoods fit into the ½ mile arterial spacing and are centered around the intersection of two lower speed collector roadways. This arrangement of neighborhoods optimizes their accessibility without placing them at the intersection of the more traveled arterials at their periphery. This is appropriate for neighborhoods that are primarily residential in focus and don't depend on visibility from highly traveled roadways as in a primarily commercial neighborhood. As noted above, though, the highest accessibility – and quite often the highest increment of land value – occurs principally at the intersections of highly traveled roadways, which in this case is exactly between the four neighborhoods. When four neighborhoods come together at a primary interchange or intersection, they together define a new place type – that of a Corridor Node.

The Corridor Node

A Corridor Node, as shown on the above diagram, is basically a 1-mile wide community at the intersection of a Regional Arterial with another primary arterial roadway. It is made up of 4 interconnected neighborhoods in the four quadrants of the intersection. Because of the higher speeds and traffic of the arterial roadways, the neighborhoods avoid these roads and are centered around lower speed collectors. The Corridor Node, however, has a different function and is placed at the center of these higher speed intersections to take advantage of the higher land values deriving from the greater accessibility of its location. However, an important principle of these basic place types is that they are not separate, but overlaying – that is, a Corridor Node is overlaid on top of four Neighborhoods and transforms the edges of

each neighborhood, as well as the center intersection where the neighborhood edges touch each other. The following section describes in more detail how the Neighborhood and Corridor Node are defined by their location and context.

BUILDING BLOCKS OF THE LAND USE PATTERN



The diagram below illustrates in some more detail the characteristics of each of these place types. Together, they make up the fundamental building blocks of an efficient land use pattern that integrates effectively into an efficient transportation system for the generally suburban minimum densities called for in the UDA legislation:

Characteristics of Neighborhoods

As described above, the basic building block of an efficient land use pattern for Urban Development Areas is the ½ mile wide Neighborhood. Basic characteristics of a neighborhood embody many of the principles of New Urbanism and Traditional Neighborhood Design, as called for in the UDA legislation. These include:

- An interconnected system of neighborhood streets that are conducive to pedestrian and bicycle circulation, while also providing for efficient auto travel
- A Neighborhood Core area that is the focus for higher density housing, convenience retail and service uses and community parks and civic uses
- A diversity of housing types for a variety of markets, disposed around a general gradient of density that decreases toward the edges of the neighborhood and is highest within the Neighborhood Core
- A system of neighborhood open spaces that includes buffers at the edges, a neighborhood-wide public park at the center and smaller pocket parks within each quadrant of the neighborhood

Characteristics of Nodes

As described above, when 4 neighborhoods come together at a major intersection, they form a Corridor Node. This place type is far larger and more intense than a neighborhood. Nevertheless, it also follows the principles of New Urbanism, although adapted to the more intense character and context:

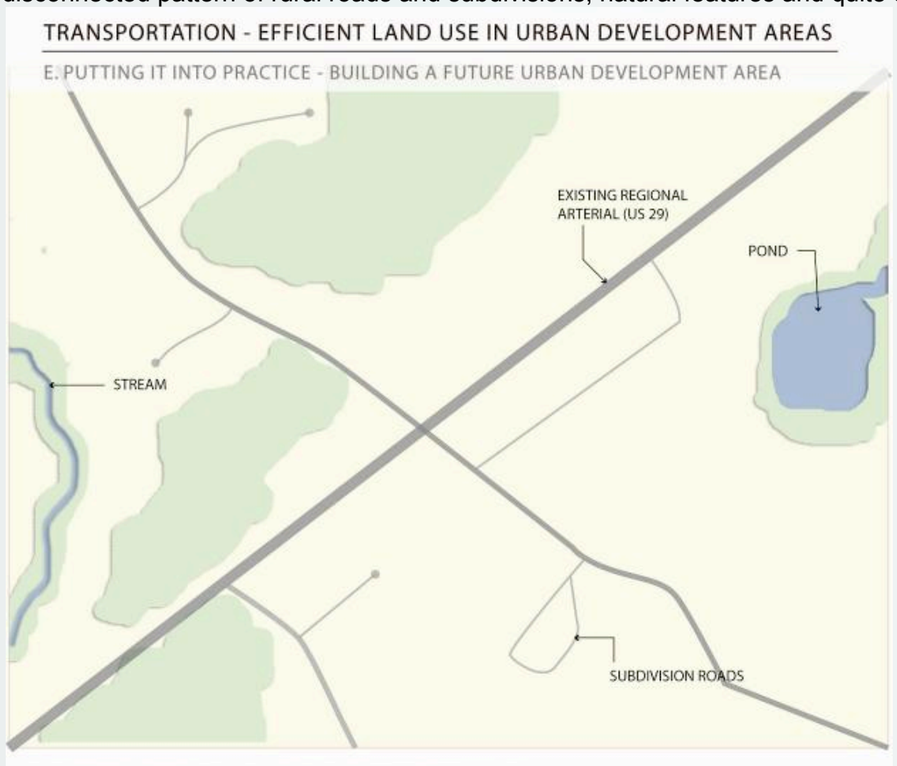
- An interconnected system of roadways and transit routes that serves both local and regional travel demands in an efficient and accessible network
- The separation of local and through traffic by the use of access management techniques, parallel roadways and a hierarchy of facilities in the node
- A land use and circulation pattern that minimizes conflicts between auto, pedestrian and bicycle modes by providing for conveniently accessible centers and destinations within each neighborhood and parallel networks for safer non-auto travel
- A mixing of land uses appropriate to the scale of the place type – i.e. mixed residential with convenience commercial within a Neighborhood, and mixed destination commercial at the center of a Corridor Node.
- A recognition of the basic market forces that shape land values and markets for more intense destination uses at the intersection of major transportation routes
- A land use and density pattern that is supportive of transit service – both regional transit to serve Corridor Nodes and local transit to serve Neighborhoods

PUTTING IT INTO PRACTICE – PLANNING FOR AN URBAN DEVELOPMENT AREA

The above sections described a series of prototypes for efficient land use and transportation within Urban Development Areas. An obvious question to ask, however, would be – how does this translate into everyday planning practice? The series of illustrations and steps below describe how this system of land use and transportation planning could be translated into actual practice through a hypothetical land use plan for a future growth area along the US 29 corridor.

The Existing Context

The illustration below shows a typical rural section of the US 29 corridor. While not a specific place, it illustrates typical existing conditions along the corridor in locations such as Campbell County, Fauquier County, Greene County and many of the rural counties that are currently or will in the future be undergoing changes and growth along the 29 corridor. Characteristics of these rural contexts include a generally disconnected pattern of rural roads and subdivisions, natural features and quite often a crossroads with a regional route around which future growth typically centers.



1. EXISTING CONTEXT - A TYPICAL RURAL CROSSROADS

Laying Out the Spacing Grid

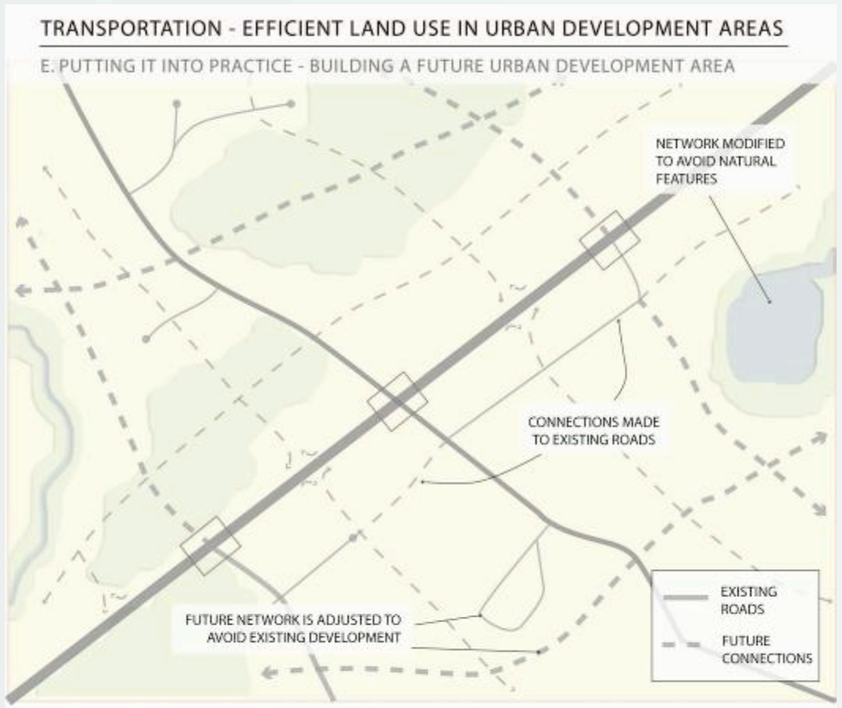
The first step in planning for future growth in this context is to identify and lay out the basic “spacing grid” of a transportation network that can serve the future densities and intensities of an Urban Development Area in this location. This step is critical in both recognizing, and planning for, the eventual future conversion of this area into a fully built out community – even if that potential build out is to occur over an unknown and very long-term timeframe.

The spacing grid should be based on the Efficient Transportation diagram above, and should be oriented primarily so that the center of the grid is along the US 29 axis and secondarily along any other major throughway that intersects US 29. The use of GIS and other computer imaging software will be helpful in visualizing how this theoretical grid overlays on to the existing context in map form.

Designing the Future Transportation Network

The next diagram, below, shows the next step in the process, which is to begin to connect the existing pattern of rural roadways to create a hypothetical future transportation network to serve the future UDA. This step will require considerable judiciousness in how these roads are connected to avoid sensitive natural, historic or other important areas and to minimize disruption of the existing pattern of land ownership. While this is an important process, it is also important to recognize that the intent of this process overall is as an element of a local comprehensive plan or area plan. These plans, by State Code are defined as only a "guide" to development and do not constitute a final alignment of roadways or in any way change the underlying property rights of landowners. Thus, this step in the planning process should be done carefully and with regard for existing conditions, but should still be considered only a general framework for future transportation in the area.

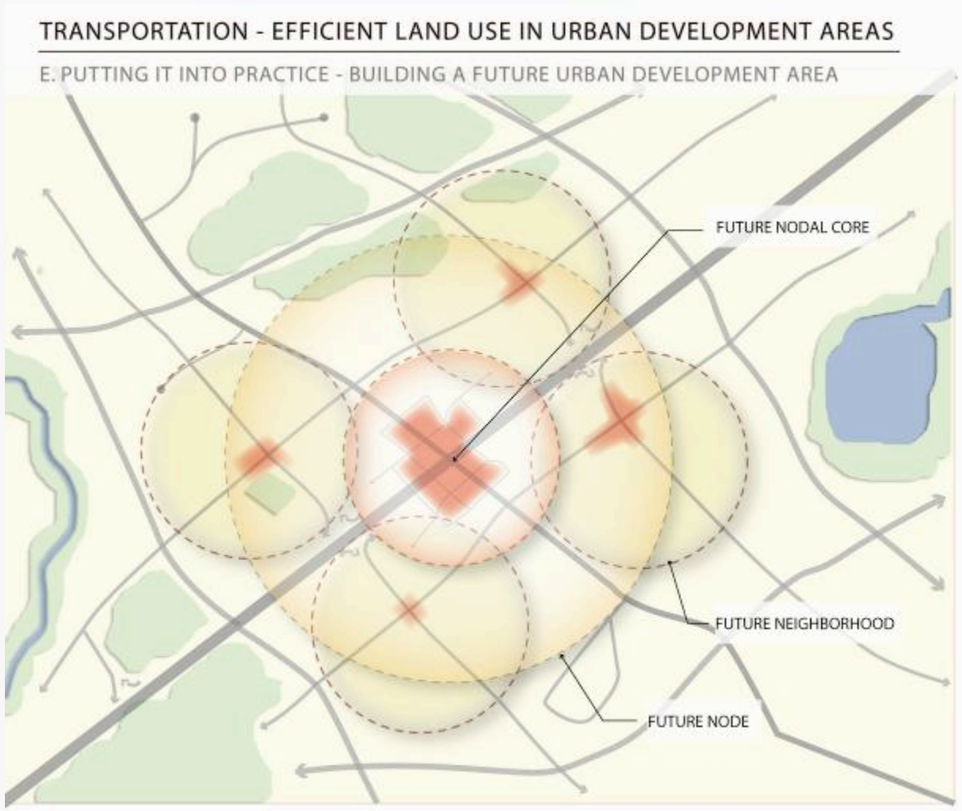
The diagram below shows how these connections can be made in a diagrammatic way. In particular, some existing roads have been connected to be future arterials or collectors, while other connections have been avoided or moved to avoid natural areas or existing communities or residents.



3. CONNECTING EXISTING ROADS TO COMPLETE THE FUTURE TRANSPORTATION NETWORK

Laying Out a Future Land Use Framework

As seen in the above diagram, the original Spacing Grid has been considerably adjusted to accommodate local conditions. However, the Transportation network as shown still follows the principles of efficient transportation planning and provides a useful context for efficient land use planning. The diagram below shows the final stage in the planning process – that of laying in the basic system of Neighborhoods and Node as described earlier.



The final Urban Development Area has all the characteristics of a safe, cost effective and efficient transportation and land use system. Even at full build out, the community design as shown can be expected to function well in terms of safety, mobility, accessibility and quality of life. Moreover, the way that land uses and circulation are laid out in an integrated fashion in this approach is intended to facilitate a number of larger goals of the planning process, as follows.

The planning approach as embodied in this system:

- Works within the typical market forces of corridor development, by placing the highest intensity uses at the nexus of highest accessibility and mobility
- Is sensitive to local conditions and context and modifies the transportation network around key existing features to preserve them
- Is designed for a specific build out density and intensity, with a transportation system appropriately scaled to serve it even at full build out
- Maximizes accessibility for all modes and all areas of the community, without creating choke points for cut through traffic so that community mobility can be an asset for all, rather than a liability for some
- Enhances quality of life by providing a choice of travel mode and lifestyle – whether auto- or pedestrian-oriented, without favoring one mode over another

CONSIDERATIONS FOR IMPLEMENTATION

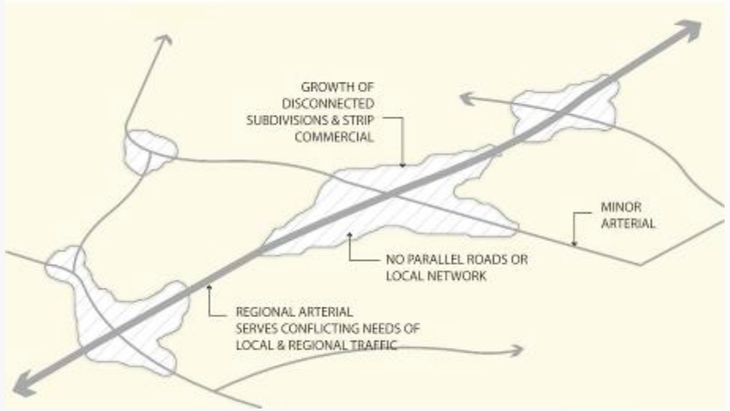
The above approach for integrated land use and transportation planning is intended specifically for communities along the corridor that will be incorporating the recent Urban Development legislation and standards into their comprehensive plan updates. It is most appropriate for the smaller scale and finer grain of issues that are encountered in a detailed Area Plan, but could work at the scale of a countywide comprehensive plan as well.

It contrasts with the typical land use planning process that has been practiced sometimes in the past, where land use “blobs” are laid out for future growth with little consideration for the future transportation system that will be required to service such a land use pattern. In this case, future transportation decisions were often made at the time of property development by landowners that were not necessarily looking at the transportation system for the whole area in the future. This resulted in a frequently disconnected system of roads that experienced congestion and safety problems as land uses intensified over time.

Using the above approach calls for more up front planning time and effort, and especially for more coordination with the landowners and residents of a future development area. However, the up front investment can be almost negligible in comparison to the future planning, acquisition and transportation investment efforts that may be needed to fix a poorly planned development area.

The basic approach of showing a more detailed – but still conceptual - future transportation and land use framework in a comprehensive plan can also help in a locality’s ability to fund transportation improvements in the future. By showing clearly the expectations for future improvements, there is a better opportunity to fund improvements through proffers for rezonings, as well as a greater level of predictability for private developers in understanding what improvements may be required to develop in a particular area. In general, the somewhat greater level of effort in up front planning required by this approach can be more than offset by the expectation of a smoother, more predictable and more systematic development process resulting from a clearer plan for the future.

SPRAWL PATTERN OF GROWTH



NODAL PATTERN OF GROWTH