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GUIDE FOR PREPARING A MULTIMODAL SYSTEM PLAN



MULTIMODAL SYSTEM DESIGN GUIDELINES

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GUIDE FOR PREPARING A MULTIMODAL SYSTEM PLAN

INTRODUCTION:

This document is a companion to the **Multimodal System Design Guidelines** (herein called “the Guidelines”) developed by the **Virginia Department of Rail and Public Transportation**. Its purpose is to serve as a step-by-step guide for the preparation of a **Multimodal System Plan** according to these Guidelines. A more detailed explanation of all of the concepts discussed in this document is available in the Guidelines and all the illustrations and tables in this Guide are derived directly from the Guidelines.

WHAT IS A MULTIMODAL SYSTEM PLAN?

A Multimodal System Plan is an integrated land use and multimodal transportation plan that shows the key Multimodal Districts, Multimodal Centers, and Multimodal Corridors in a region and ensures that there is a connected circulation network for all travel modes. A Multimodal System Plan can either be done “from scratch” (without using any prior modal or land use plans), or more often by assembling all of the existing land use and transportation plans into a unified whole. In this latter case, the Multimodal System Plan does not establish any new policy or change any existing policies – it merely assembles existing land use and transportation policies into a single unified plan.

Typically, developing a Multimodal System Plan is a mapping and analysis exercise and consists primarily of assembling the GIS layers from existing modal plans and land use plans so they are all integrated. However, as regions and localities in Virginia may use slightly different terminology and approaches to their land use and transportation planning, the Multimodal System Plan is also a way to assemble their existing plans into a standardized technical and graphic language for ease of communication with each other or with state agencies. In addition, the exercise of developing a Multimodal System Plan will quite often highlight any disconnects in a multimodal circulation network, such as potential gaps in a trail network or a need to connect the regional transit plan to the bike or pedestrian plan.

The Multimodal System Plan is also an opportunity for the regional or local entity to address these disconnects by adding policies and actions to fix them in the future. Ideally, the Multimodal System Plan will show that all the multimodal networks in a region are part of a continuous and connected system of circulation that offers a diversity of travel choices. Figure 1 shows the overlays that make up a Multimodal System Plan, and the methodology for developing it is described later in this Guide.

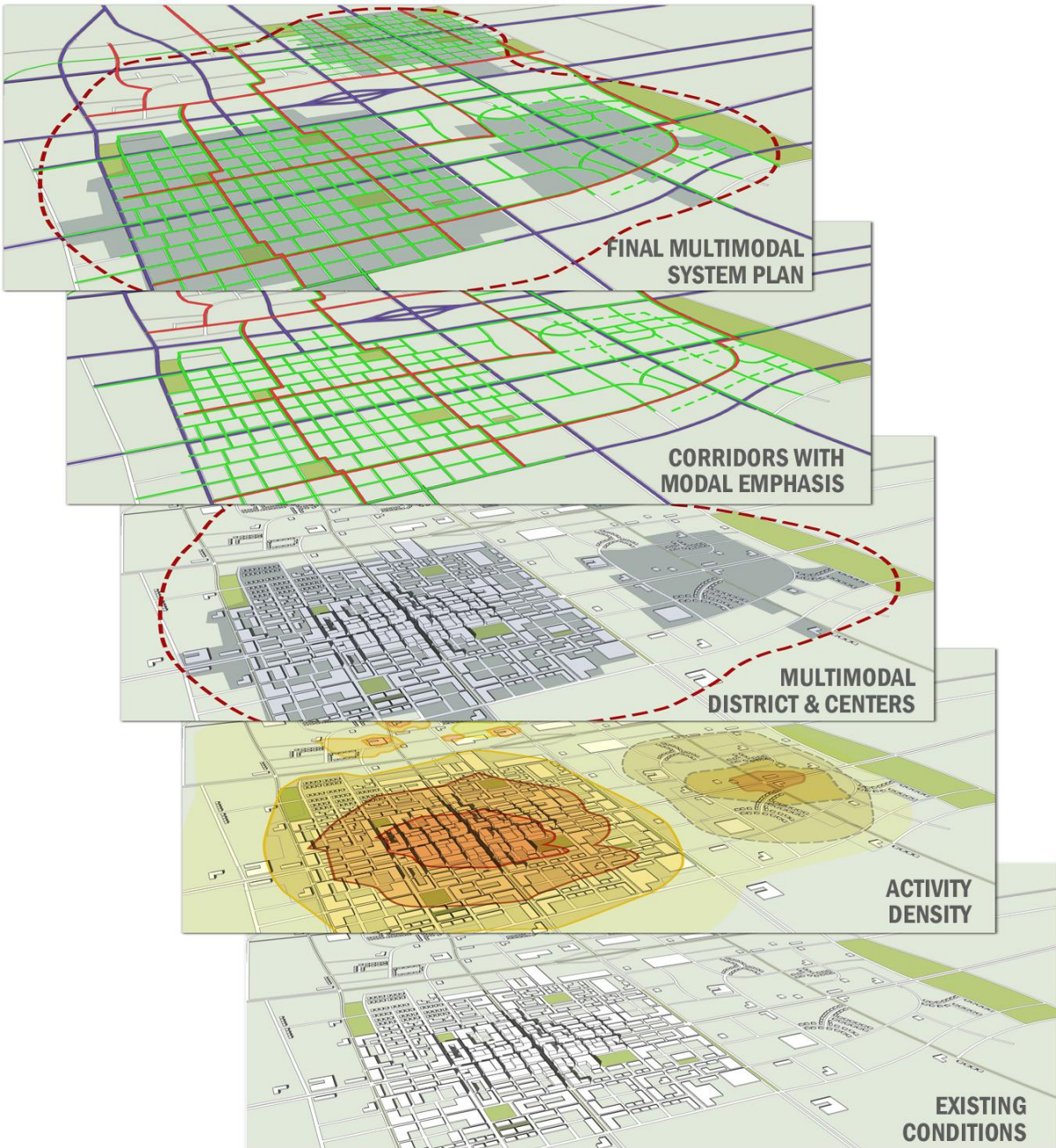


Figure I - Multimodal System Plan.

Diagram showing the overlays of land use and transportation networks by mode that make up a Multimodal System Plan

BASIC REQUIREMENTS:

The application for approval of a Multimodal System Plan needs the following three basic sets of maps to ensure a proper review:

- A. Map of Land Use Density/Intensity**
- B. Map of Multimodal Districts and Centers**
- C. Map of Multimodal Corridors with Modal Emphasis**

Each of the three basic map products is described below with suggested techniques for each map, and needed components and data for each map to be properly reviewed.

MAPPING CONSIDERATIONS:

The easiest way to develop the maps required for a Multimodal System Plan is through the use of **Geographic Information Systems (GIS)**. The use of GIS allows each of the individual map “layers” of the Multimodal System Plan to be integrated and referenced together in one file. GIS also allows automated mapping processes to be done by the software, such as producing a map of Activity Density (described in the following section). In addition, GIS allows the use of existing plans, such as a transit or bicycle and pedestrian network plan – if they have also been produced using GIS - to be pulled into the Multimodal System Plan with minimal effort.

If GIS is not available, all of the required maps for a Multimodal System Plan may still be developed using manual mapping or other mapping software, and can be made to match the same results as would be obtainable using GIS.

DETAILED REQUIREMENTS:

The following describes the detailed steps for preparing a Multimodal System Plan.

A. MAPPING LAND USE DENSITY/INTENSITY

- I. Develop a map of existing and future population and employment density in terms of **Activity Density**. Activity Density is a measure of population and employment density and is expressed in terms of jobs plus population per acre.

- I.1. Note that this map should show future Activity Density, including both the existing jobs and population and the anticipated additional growth in jobs and population in the future. Projections for future population and employment are usually available from a locality’s comprehensive plan or future land use plan. This will require some calculation to convert the future land use densities and intensities to Activity Density. There is no set way that these conversions need to be done, as long as the methodology is clearly shown for review.

Alternatively, future population and employment projections can also be developed from standard sources of projections, such as the Virginia Employment Commission projections. Finally, the regional Travel Demand Model will have future socioeconomic data (future population and employment projections) embedded in each Traffic Analysis Zone for the region. Any of these methods can be the basis for developing the future Activity Density mapping.

- I.2. The reason for using future Activity Density rather than just current Activity Density in the preparation of a Multimodal System Plan is because transportation planning typically has a long time horizon for implementation and it is important to know what population and employment levels are being planned for over the long term.
- I.3. There is no set time horizon for the future projections of employment and population, but it should be similar to the time horizon of local comprehensive plans (if a locality) or the Long Range Transportation Plan (if an MPO), usually between 20 and 30 years.
- I.4. The map of Activity Density should be expressed in the form of a “heat map” that shows a range of colors for various levels of density, as described in the following section (A.2).

2. Designate the **Transect Zones** on the Activity Density map.

- 2.1. The Transect is a relatively common way of describing density and intensity of development in the urban planning profession. Transect Zones are bands of uniform density/intensity, classified into Zones from T-1 (lowest) to T-6 (highest). A standard table of T-Zones using Activity Densities is used to define the Activity Unit density in a Multimodal System Plan, see Table 1.

Table 1- Transect Zone Intensities

TRANSECT ZONE INTENSITY	
Transect Zone	Activity Density (Jobs + people/acre)
T1	1 or less
T2	1 to 10
T3	10 to 25
T4	25 to 60
T5	60 to 100
T6	100 or more

- 2.2. A “heat map” of Activity Density according to Transect Zones is a fundamental starting point for setting up a Multimodal System Plan and gives a snapshot of regional density in a standardized way. A sample heat map of Activity Density is shown in Figure 2.

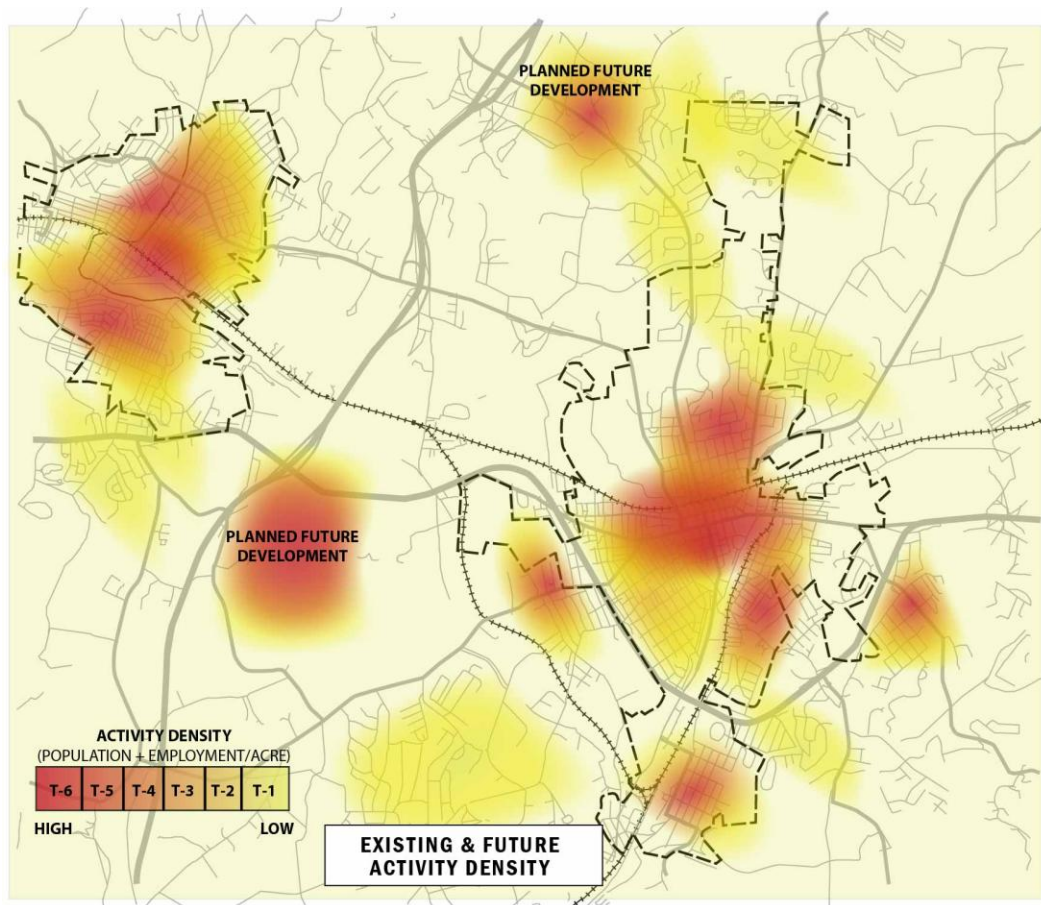


Figure 2 - Existing and Future Activity Density.

This map shows a simple "heat map" of the relative density of jobs and population in a region. Note that Activity Density is expressed in terms of Transect Zones according to the Guidelines. Note also that future Activity Density should be represented according to available population and employment projections.

B. MAPPING MULTIMODAL DISTRICTS AND CENTERS

3. Develop a map of the potential **Multimodal Districts** that are planned for the region.

- 3.1. Multimodal Districts are defined by the locality or MPO that is preparing the Multimodal System Plan. They are not used as the basis for defining Multimodal Corridors or Modal Emphasis – they are merely a useful starting point for locating and defining Multimodal Centers.
- 3.2. Multimodal Districts can be of any size, and are typically broad swaths of land area that have (or will have in the future) good multimodal connectivity. Multimodal connectivity in this context means the relative ease of making trips without needing access to a car.

Areas with good multimodal connectivity typically have:

- Moderate to high density development, quite often with mixed uses
- Good connectivity of roads and a compact, connected system of blocks
- Roads that have good transit, bike and pedestrian networks or where such networks are planned

These characteristics vary depending on the scale and context of a region. The densities in the Multimodal Districts of some regions will be much lower than in others; however, those areas that have higher densities relative to their surroundings, as well as good multimodal connectivity, would likely be good candidates for Multimodal Districts.

Multimodal Districts may overlap with areas defined by local policy documents as urban growth boundaries, service districts, mixed use neighborhoods and other types of areas that a locality may have envisioned as walkable vibrant places, either currently or in the future.

- 3.3. Multimodal Districts may be designated based on the map of Activity Density as districts that correspond to the three criteria described above. The map in Figure 3, below shows an example of Multimodal Districts that was based on the Activity Density map in Figure 2:

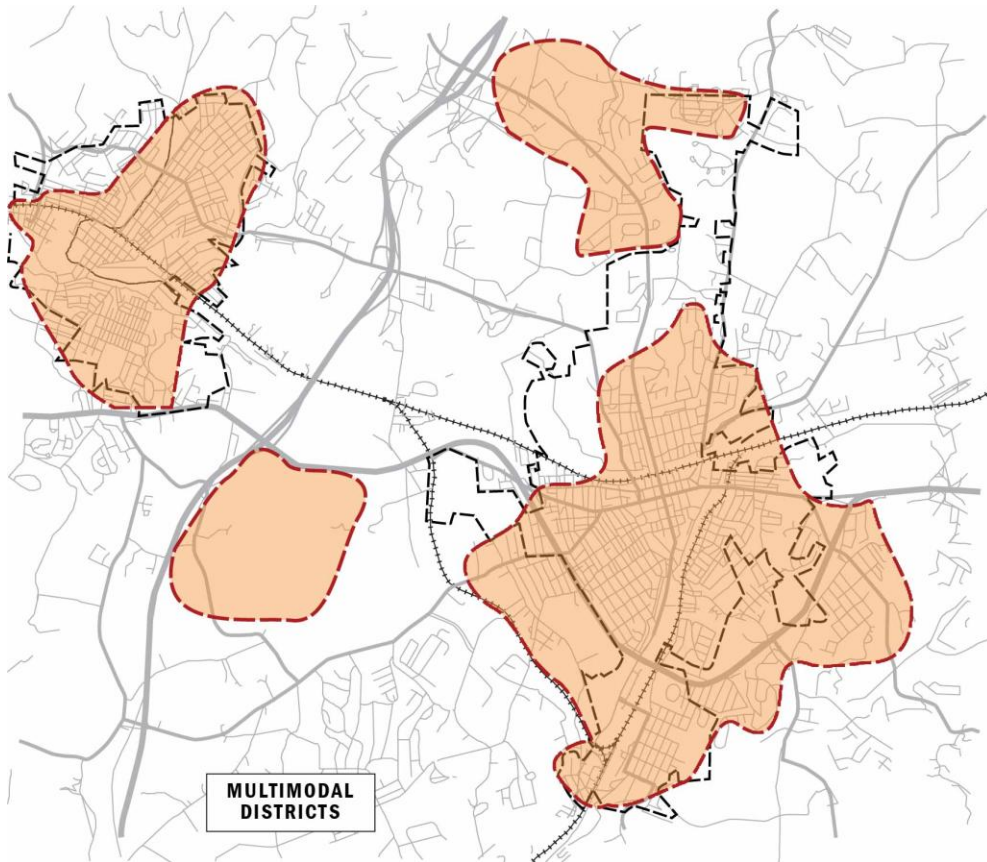


Figure 3 - Potential Multimodal Districts

Map showing areas that are identified as future Multimodal Districts based on their high activity density and good potential multimodal connectivity. Note: The future road network of the Multimodal District near the interchange is not shown. This is a planned development area and its future road network, while intended to be a connected grid-like pattern with small block lengths, has not yet been finalized,

4. Develop a map of the potential **Multimodal Centers** that are planned for the region.

4.1. A Multimodal Center, for the purpose of these Guidelines, is a smaller area within a Multimodal District with even higher multimodal connectivity and more intense activity than the surrounding area. Multimodal Centers are generally based on a 10-minute walk-shed, which can be approximated by a one-mile diameter circle that forms the nucleus for activities and destinations within easy walking distance. It is this close proximity of destinations and lack of barriers (such as rivers or high speed highways) that makes walking a viable form of transportation for all trips. A Multimodal Center serves as a primary focus for providing more multimodal connections and higher density development.

4.2. As defined in these Guidelines, Multimodal Centers have the following characteristics:

- Based on a comfortable walk-shed, generally defined as a one-mile diameter circle (modified as needed for barriers and natural or man-made features)
- Consist of localized centers of activity and density, whether population, employment or activities (retail, civic or other activity generating uses)
- Served by existing or future transit (although in low intensity centers this may not be possible)
- Have a well-connected (current or planned) network of walkable and bikable streets with low vehicular speeds and accommodations for bicycles, pedestrians, and buses.

4.3. The location of potential Multimodal Centers should be identified by placing one-mile diameter circles within the Multimodal Districts to approximate the 10-minute walk-sheds surrounding key transit stations or other hubs of activity, as illustrated in Figure 4.

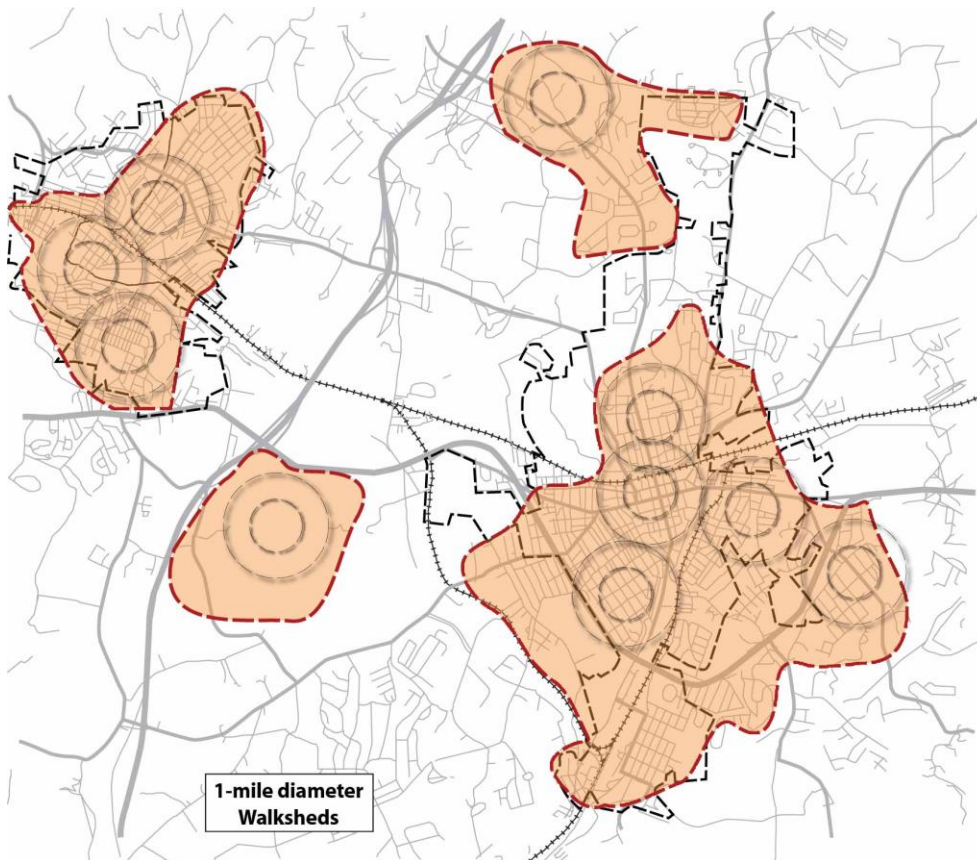


Figure 4 - Potential 10-Minute Walk-Sheds within Each Multimodal District

Map showing one-mile diameter circles that are used to approximate the potential locations of Multimodal Centers within the Multimodal Districts.

4.4. The one-mile circles should then be modified to avoid natural or man-made barriers while still retaining the general scale of the 10-minute walk-shed. Interstate highways, rivers, railroads, and other barriers to pedestrians and bicyclists should frame the edges, rather than penetrate

the middle of a Multimodal Center. Two Multimodal Centers on either side of the barrier may be more appropriate. Figure 5 shows the potential one-mile circles modified to fit to the surrounding land use and avoid barriers.

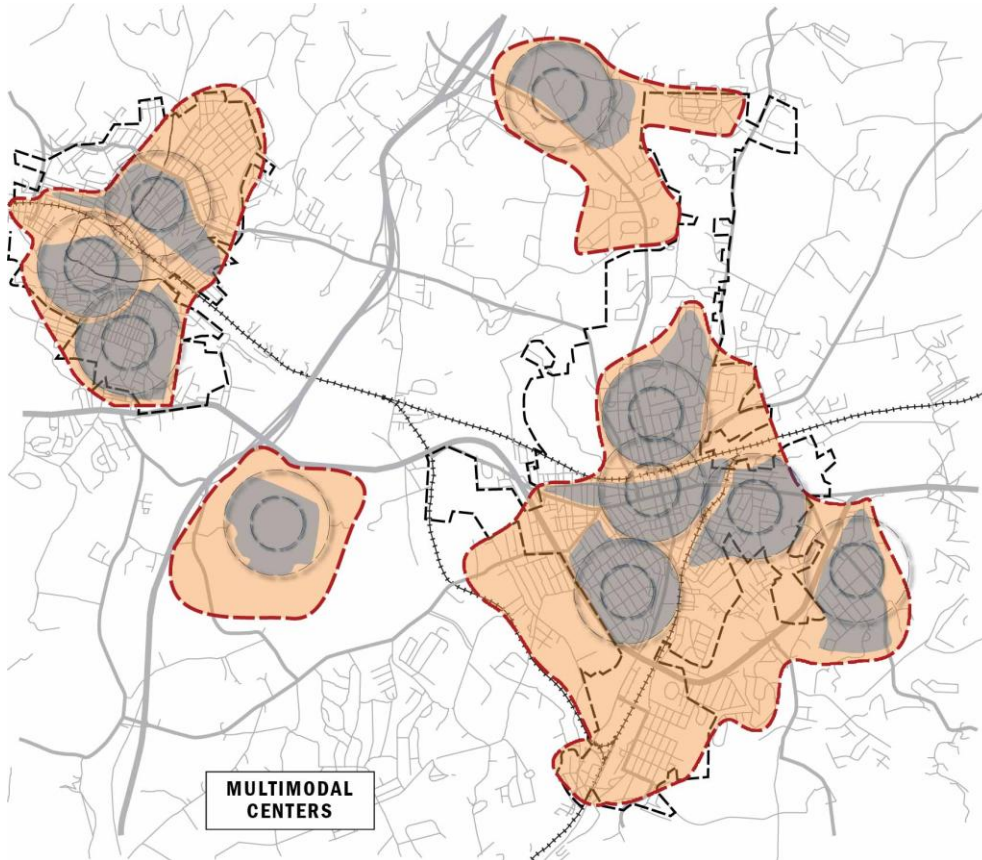


Figure 5 - Multimodal Centers within each Multimodal District.

Multimodal Centers are areas of highest multimodal connectivity and have a mix of uses and close proximity of destinations such that many trips can be made by walking. Multimodal Centers are generally based on one-mile diameter circles, but modified to fit actual conditions and barriers to connectivity such as rivers or high speed highways.

5. Designate the Multimodal Center Types on the map of the potential Multimodal Centers.

5.1. Multimodal Centers, for the purpose of these Guidelines, are categorized into six basic types, ranging from P-6 (Urban Core) to P-1 (Rural or Village Center), along with a seventh type, SP (Special Purpose Center). Figure 6 shows these Multimodal Center types as a spectrum of place types from dense urban places to low density rural places. Table 2 defines the range of Activity Densities for each Multimodal Center type.

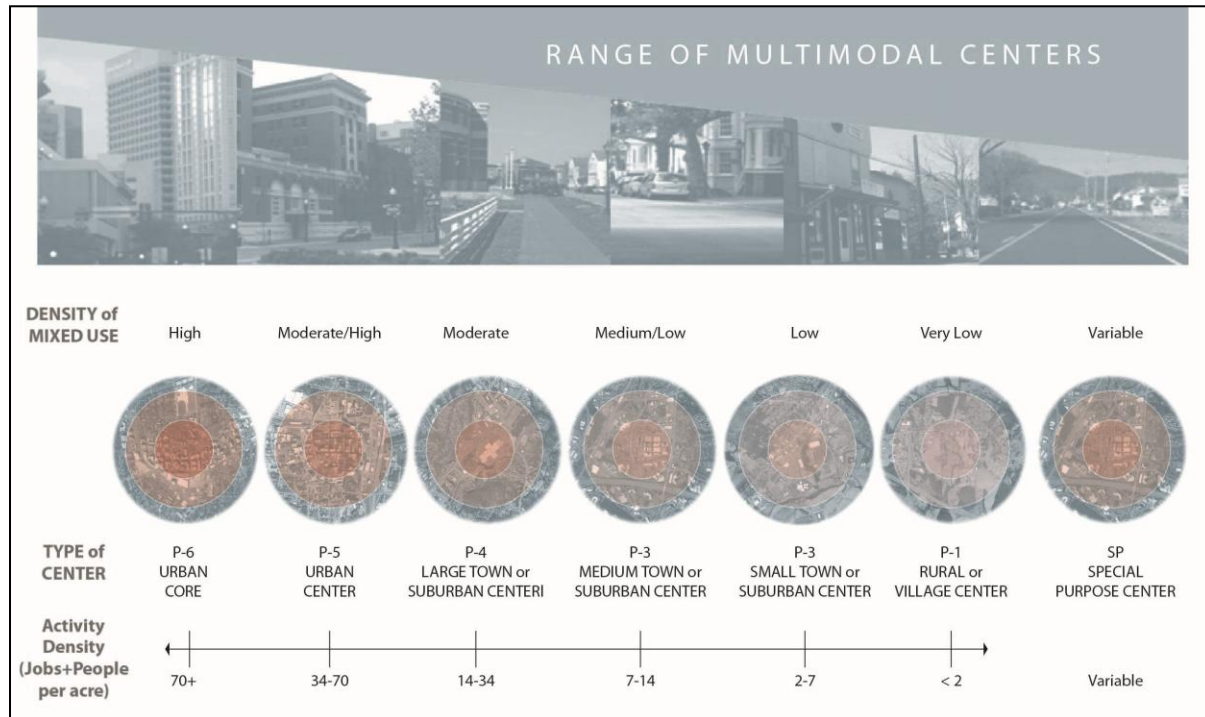


Figure 6 - Range of Multimodal Center Types.

Urban to rural Multimodal Center types defined by Activity Density (number of jobs + people per acre) in each Multimodal Center.

Table 2 - Multimodal Center Intensity.

MULTIMODAL CENTER INTENSITY	
Center Type	Activity Density (Jobs + people/acre)
P6 Urban Core	70.0 or more
P5 Urban Center	33.75 to 70.0
P4 Large Town or Suburban Center	13.75 to 33.75
P3 Medium Town or Suburban Center	6.63 to 13.75
P2 Small Town or Suburban Center	2.13 to 6.63
P1 Rural or Village Center	2.13 or less

- 5.2. Based on the range of Activity Densities for the Multimodal Center types in Table 2, each of the Multimodal Centers should be designated into one of the seven Multimodal Center types, ranging from P-1 to P-6 (and/or SP).
- 5.3. The designation of Multimodal Center types should be based on the average future Activity Density within the boundary that defines each Multimodal Center. This computation can be done using GIS to calculate the precise number of activities (jobs + people) and divide this by the number of acres within the one mile circle boundary. This will yield the average future Activity Density for the Multimodal Center and allow it to be classified according to Table 2. The calculation of Activity Density should be made by applying it to a one-mile circle centered over the most intense area for purposes of consistency in measurement. However, as noted above, the actual boundaries of the Multimodal Center may not conform to a perfect circle as they are adjusted for conditions on the ground.
- 5.4. Figure 7 shows an example of how Multimodal Centers could be designated based on underlying Activity Density in the Richmond Region. It is important, however as noted above, to calculate the average Activity Density based on the ultimate planned or future densities –as established in the local comprehensive plan or other land use policy document for the area.

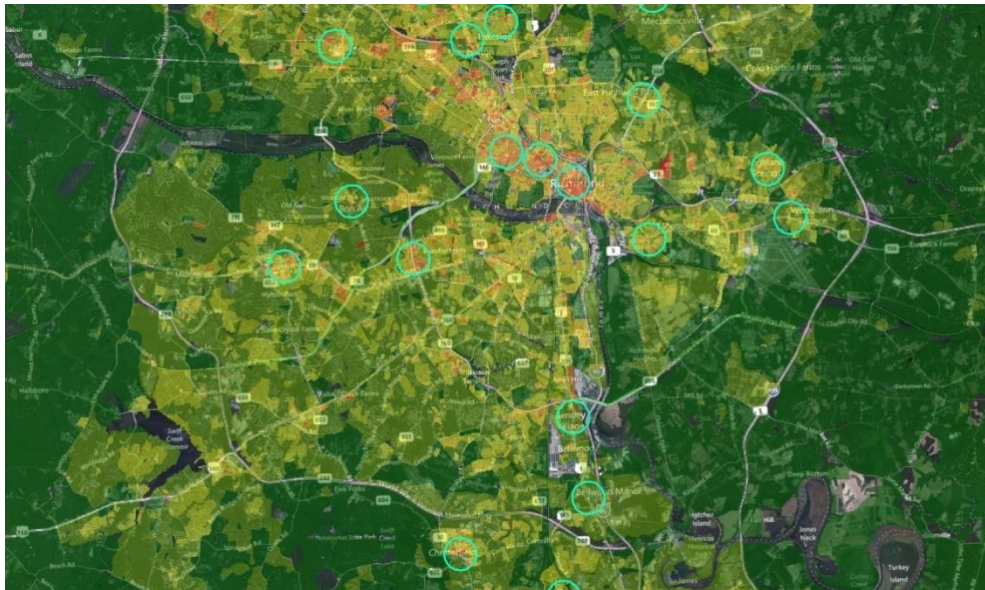


Figure 7 - Map of Activity Density in the Richmond Region

The underlying red-to-green layer shows Activity Density by census block. One-mile diameter circles show potential Multimodal Centers in the Richmond Region. Note that the locality or region will determine the Multimodal Center locations and classifications based on planned or future activity density.

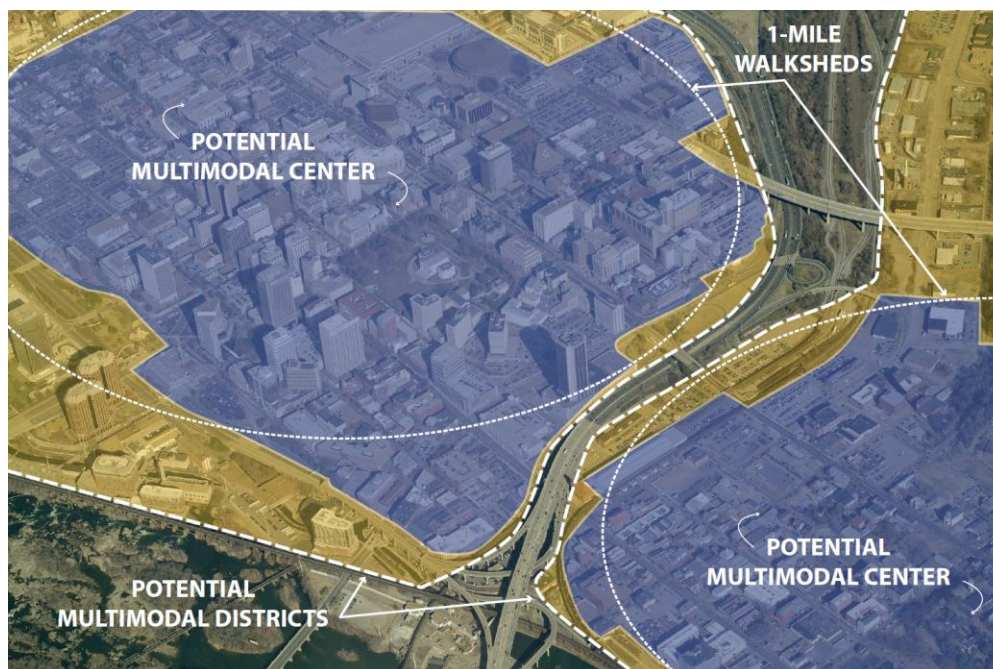


Figure 8 – Potential Multimodal Districts and Centers in downtown Richmond

The photo above shows one potential configuration for Multimodal Districts and Multimodal Centers as modified for actual conditions in downtown Richmond.

C. MAPPING MULTIMODAL CORRIDORS WITH MODAL EMPHASIS

6. Develop a map of the potential **Multimodal Corridors** that are planned for the region.

- 6.1. Multimodal Corridors are defined by the locality or MPO that is preparing the Multimodal System Plan. Multimodal Corridors should connect the areas within and between Multimodal Centers and Multimodal Districts in the region.
- 6.2. A Multimodal Corridor, as used in the Guidelines, is generally a roadway that accommodates multiple modes, (or in special cases a trail or rail right of way) and includes all the area within the public right of way, as well as the adjacent building context zone.
- 6.3. There are six basic types of Multimodal Corridors used in the Guidelines, divided into two broad categories of corridors – Through Corridors and Placemaking Corridors, as shown in Figure 8:

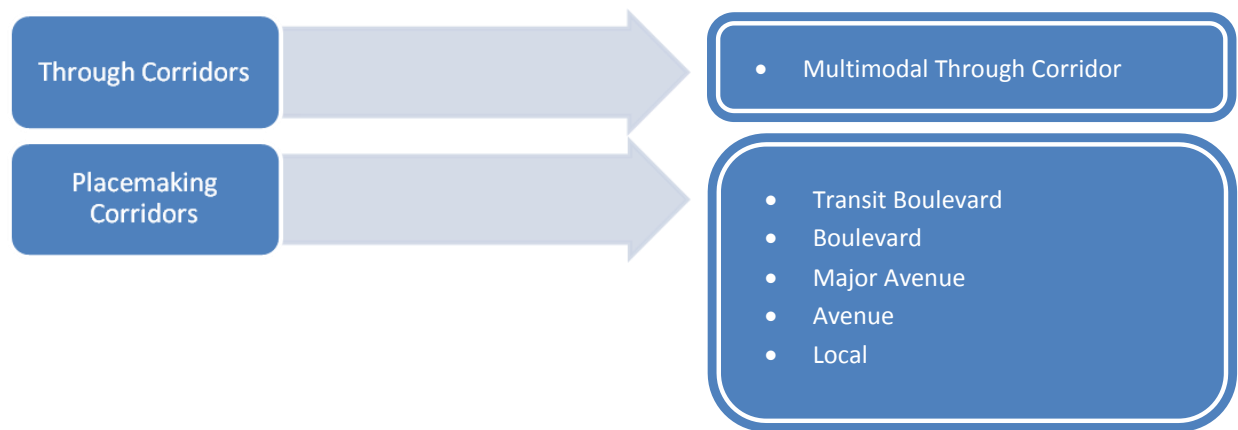


Figure 9 – Multimodal Corridor Types

- 6.4. Note the two broad types of Multimodal Corridors addressed in the Guidelines. Multimodal Through Corridors should generally be the corridors that go between Multimodal Centers, and Placemaking Corridors should generally be the ones within each Multimodal Center.
- 6.5. Each of the Multimodal Corridors on the Multimodal System Plan should be designated as one of the six Multimodal Corridor types listed above, according to the general criteria contained in Chapter 5 of the Guidelines.

7. Show the **Transect Zones** for each Multimodal Corridor on the Multimodal System Plan.

- 7.1. Based on the map of Activity Density, the Transect Zone designation for each corridor should be shown on the map. This can be done simply in GIS by assigning the Transect Zone designation for each portion of a corridor that passes through that Transect Zone on the map. An illustration of this is shown in the sample Multimodal System Plan detail in Figure 11.

8. Show the proposed **Modal Emphasis** for each Multimodal Corridors on the Multimodal System Plan.

- 8.1. The Modal Emphasis for the Multimodal Corridors should be defined by the locality or MPO that is preparing the Multimodal System Plan. Each Multimodal Corridor should have one or more Modal Emphases based on the regional plans for different modal transportation networks.
- 8.2. The Modal Emphasis should designate the primary transportation networks for the region by mode, including transit, bicycle and pedestrian (auto mode is assumed on all networks in this case). Figure 9 shows the Modal Emphases used in these Guidelines:

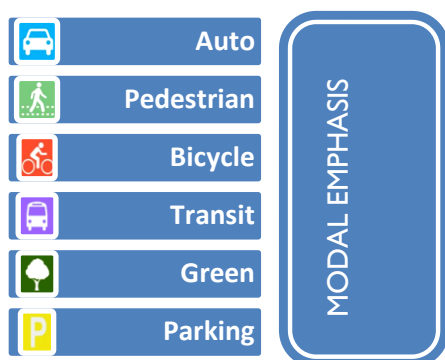


Figure 10 – Modal Emphases Used in the Guidelines

- 8.3. It should be noted that two of the Modal Emphases – Green and Parking – are not travel modes per se. However, they are included in the consideration of Modal Emphasis because they have a significant impact on roadway cross section design. For example, a Green Modal Emphasis roadway may need extra right of way width to allow for tree planting in the median or along sidewalks and a roadway with Parking Modal Emphasis will need to accommodate on street parking. It is not necessary to designate Green and Parking Modal Emphasis at the Multimodal System Plan scale. These Modal Emphases would typically be designated at a closer scale, either through a small area plan for a Multimodal District or Multimodal Center, or incorporated in the corridor design phase.

It should also be noted that Auto Modal Emphasis is assumed on all corridors unless specifically excluded in rare case such as a pedestrian-only street.

- 8.4. It should be noted that assigning Modal Emphasis to Multimodal Corridors should typically be simply an exercise in overlaying the pre-existing plans in a region for transit, pedestrian or transit networks. In this sense, the Multimodal System Plan does not establish new transportation policies, but merely reflects current policies from existing modal plans.
- 8.5. Figure 10 shows a sample Multimodal System Plan that has the Modal Emphases defined for each Multimodal Corridor:

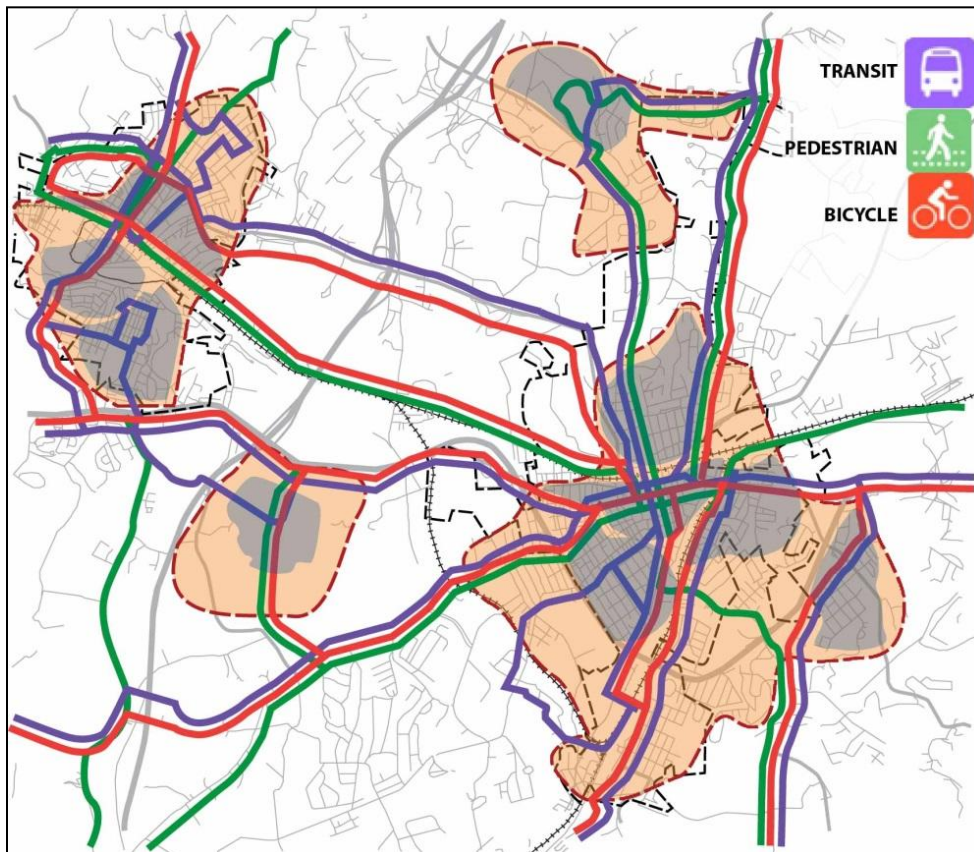


Figure 11 – Multimodal Corridors with Modal Emphasis

The multimodal networks have been assembled onto one map and define the Modal Emphasis for each Multimodal Corridor.

9. Show all of the above data on a single Multimodal System Plan.

- 9.1. The Multimodal System Plan for a region will typically contain a lot of data as it summarizes the following classifications and categories of data:

- Multimodal Districts
- Multimodal Centers and their classifications
- Multimodal Corridors and their classifications
- Modal Emphasis for each Multimodal Corridor

9.2. Figure 11 shows a detail of a potential Multimodal System Plan at a scale of a single Multimodal Center, to show how each corridor is designated by its Corridor type, its Transect Zone, and its Modal Emphasis.

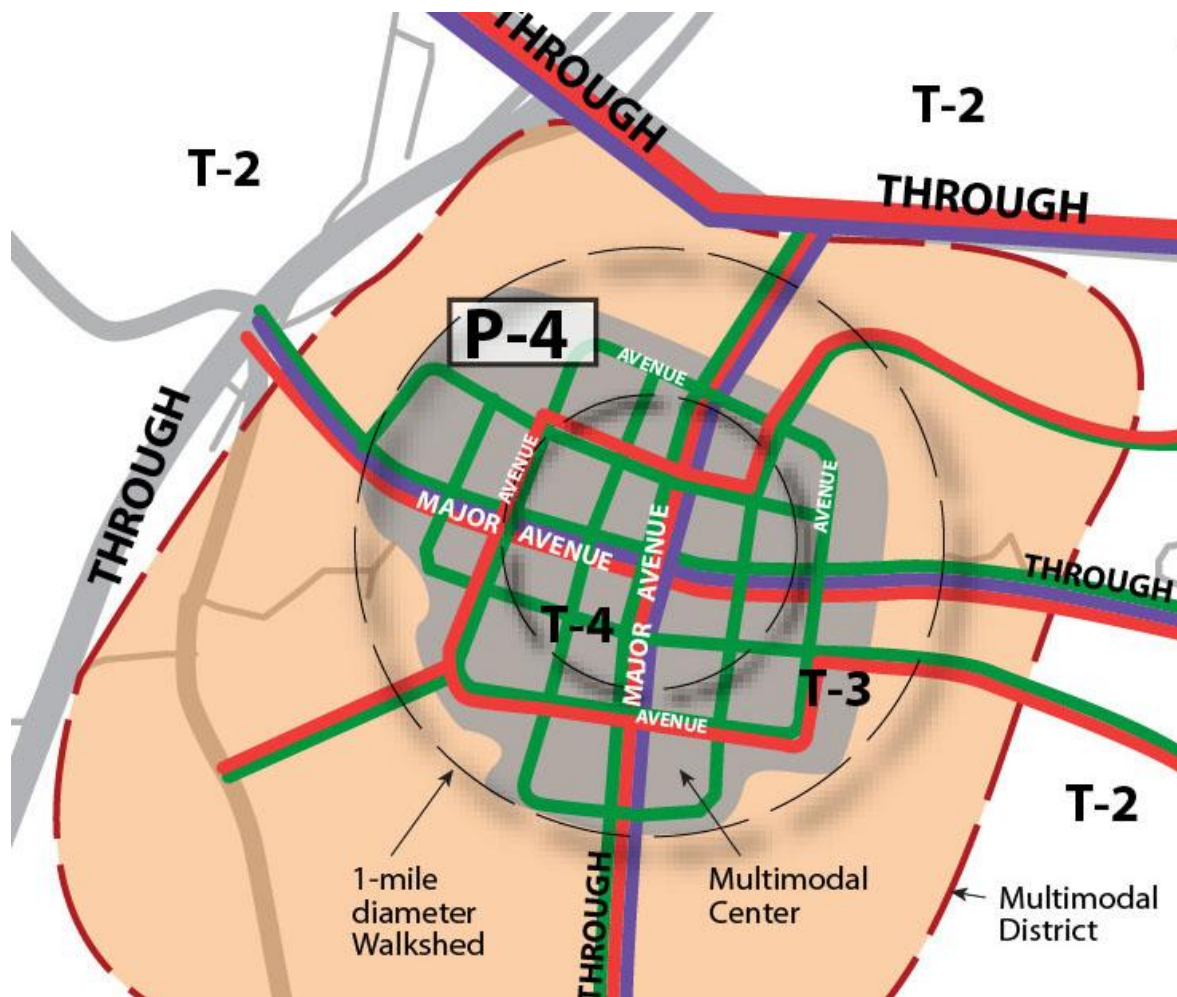


Figure 12 – Detail of a Final Multimodal System Plan

This map detail of a potential Multimodal System Plan shows how the Multimodal Center and Multimodal Corridors are designated according to the Multimodal Center types and Multimodal Corridor types described in the Guidelines.

- 9.3. Figure 12 provides an example of how the concepts of Multimodal Districts, Multimodal Centers, and Multimodal Corridors could be applied in a real place – in this case using downtown Roanoke as an example.



Figure 13 – Example of a Multimodal Districts, Multimodal Centers, and Multimodal Corridors

This example shows how Multimodal Districts, Multimodal Centers, and Multimodal Corridors could be applied in the downtown Roanoke area. The Multimodal District for the downtown area covers the entire area within the photograph west of the interstate. Another Multimodal District begins just east of the interstate, and is more residential in character. The downtown P-5 Urban Center and industrial SP Special Purpose Center are Multimodal Centers shown in blue. A blue Multimodal Through Corridor forms the boundary between these two Multimodal Centers. Some Multimodal Through Corridors transition into Placemaking Corridors when they enter into a Multimodal Center.

NEXT STEPS

The next steps in this process after the completion of the Multimodal System Plan are to develop typical cross-sections for as many corridors as are needed at a time. The steps for designing typical cross-sections based on their designations in the Multimodal System Plan are detailed in Chapter 5 of the Guidelines.

There are two basic approaches to the development of typical cross-sections once the Multimodal System Plan has been completed. Each approach is equally valid and depends on the needs of the locality or regional agency:

1. Develop typical cross-sections for all corridors comprehensively at one time.

This approach is feasible if a locality has relatively few Multimodal Corridors or if there is adequate time and resources to develop a comprehensive database of typical cross-sections for all Multimodal Corridors. This can be done in coordination with other major plan updates such as a comprehensive plan or Long Range Transportation Plan.

Advantages of this Approach:

- It allows the locality's transportation plans and detailed designs for each corridor to be adopted ahead of time and gives consistency and predictability to developers and applicants in the future as to the final design of corridors and road improvements.
- It ensures a level of "pre-approval" by VDOT of the ultimate design of each Multimodal Corridor and closely correlates the expectations of the locality with those of VDOT.
- It ensures transparency and predictability for property owners and developers in that the locality's and the state's standards for each corridor will be consistent.

2. Develop typical cross-sections for individual corridors as needed over time.

This approach is more suitable when resources are more limited, and only those corridors that are relevant to a particular improvement project can be designed at that time.

Advantages of this Approach:

- It allows a relatively easy development of a typical cross-section for an individual corridor (once the Multimodal System Plan is in place) by using the look-up tables in the Guidelines to design a cross section according to the corridor type and Modal Emphasis designated in the Multimodal System Plan for that corridor.
- It ensures that similar corridor types will be designed consistently in different locations, by using the same methodology and look-up tables in the Guidelines.
- It can allow for a smoother approval process through VDOT of the cross-section design, as the corridor type designation has already been approved (through the approval of the Multimodal System Plan) and the same design methodology from the Guidelines would be used by the locality and by VDOT.

CONCLUSION

The above set of steps shows how a Multimodal System Plan can be developed according to the basic principles of the Multimodal System Design Guidelines. When properly applied, the Guidelines can facilitate the gradual transformation of primarily auto-oriented districts and communities into pedestrian-, bicycle-, and transit-friendly places with connected networks for all travel modes. It is important to note that these kinds of transformations are typically gradual and require efforts on the part of both the public and private sectors in a community over many years or even decades. However, one of the primary intents behind the Guidelines is to allow communities to establish a blueprint for this transformation over time through a clear and consistent design approach and methodology.