



# DESIGN GUIDELINES





## **DESIGN GUIDELINES**

These design guidelines were adopted by:  
Tennessee Technology Corridor Development Authority on August 8, 2011  
Knoxville Knox County Metropolitan Planning Commission on August 11, 2011  
Knoxville City Council on September 20, 2011  
Knox County Commission on September 26, 2011





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# *Overview*

## Concept

The Tennessee Technology Corridor is a geographic area with a unique environment specifically managed with the principal aim of attracting, expanding, and supporting technology-based economic development. Established in 1983 by Private Act (Chapter 148) by the Tennessee State Senate, the Technology Corridor, under the authority of the Tennessee Technology Corridor Development Authority, lends itself to the attraction of high technology development, as a result of a number of conditions already in place. These include: good arterial highway access, infrastructure availability, undeveloped pastoral lands, developed business parks, and the physical attractiveness of the varied natural conditions which contribute to development in a natural setting. Map 1 shows the boundary of the Technology Corridor, as well as the boundary of the overall City and County Technology Overlay.

In addition to the corridor being an area suited to technology-based development, the area is well-positioned for the development of a variety of uses that can complement research and development operations and corporate offices. Individual commercial and office uses, banks, and institutional uses, and mixed-use office and residential districts can be sited in a manner, and with proper design controls, to create a vibrant and unified development corridor. Map 2 shows the Comprehensive Development Plan for the Technology Corridor.

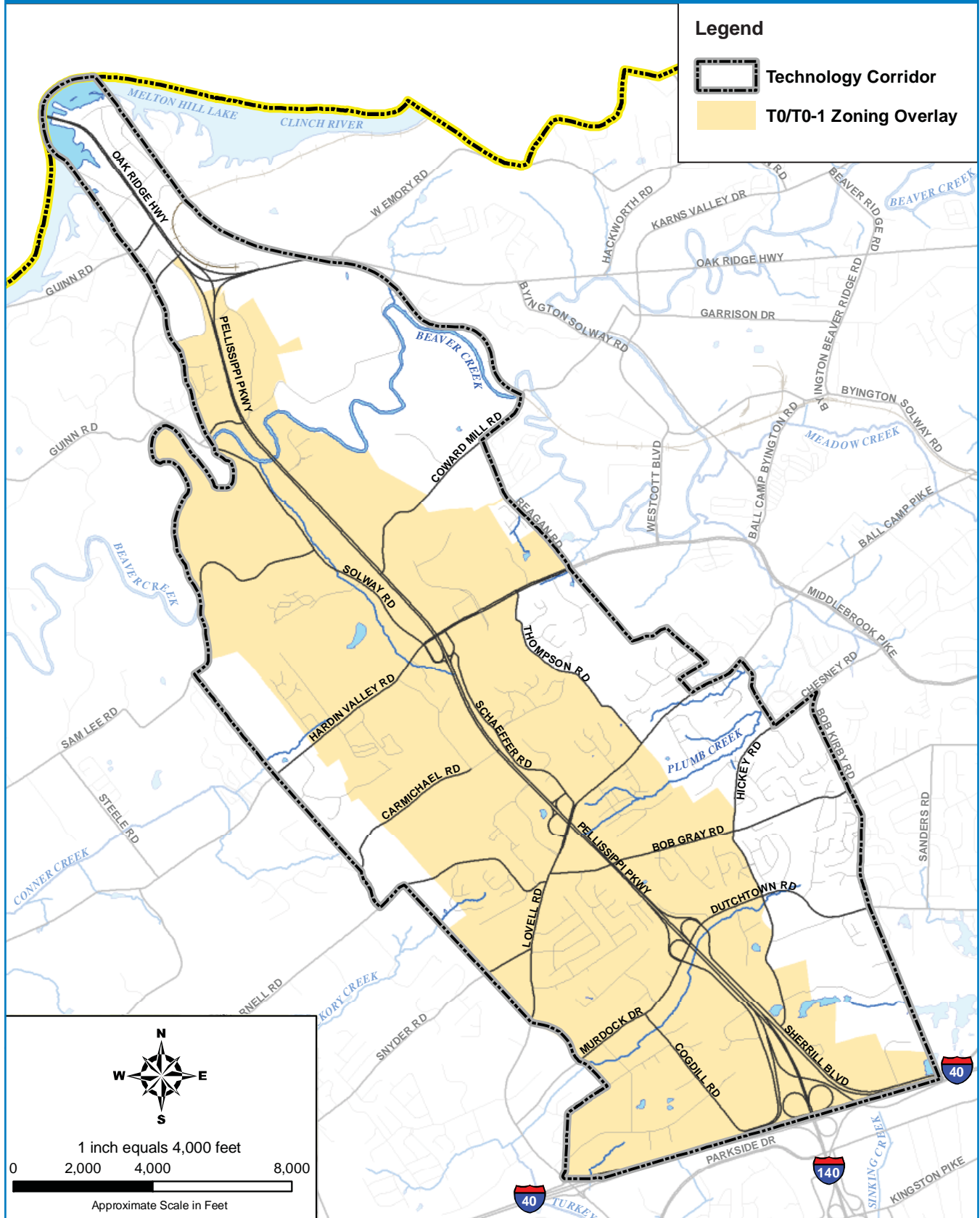
## Policies

The Tennessee Technology Corridor concept is based upon the ability to achieve aesthetic quality and environmental conservation during site development within the Technology Overlay zones of the city and the county. This requires the recognition of key policies which guide the development process. These policies are intended to serve as general design criteria during the site planning review process.

### TTCDA POLICIES

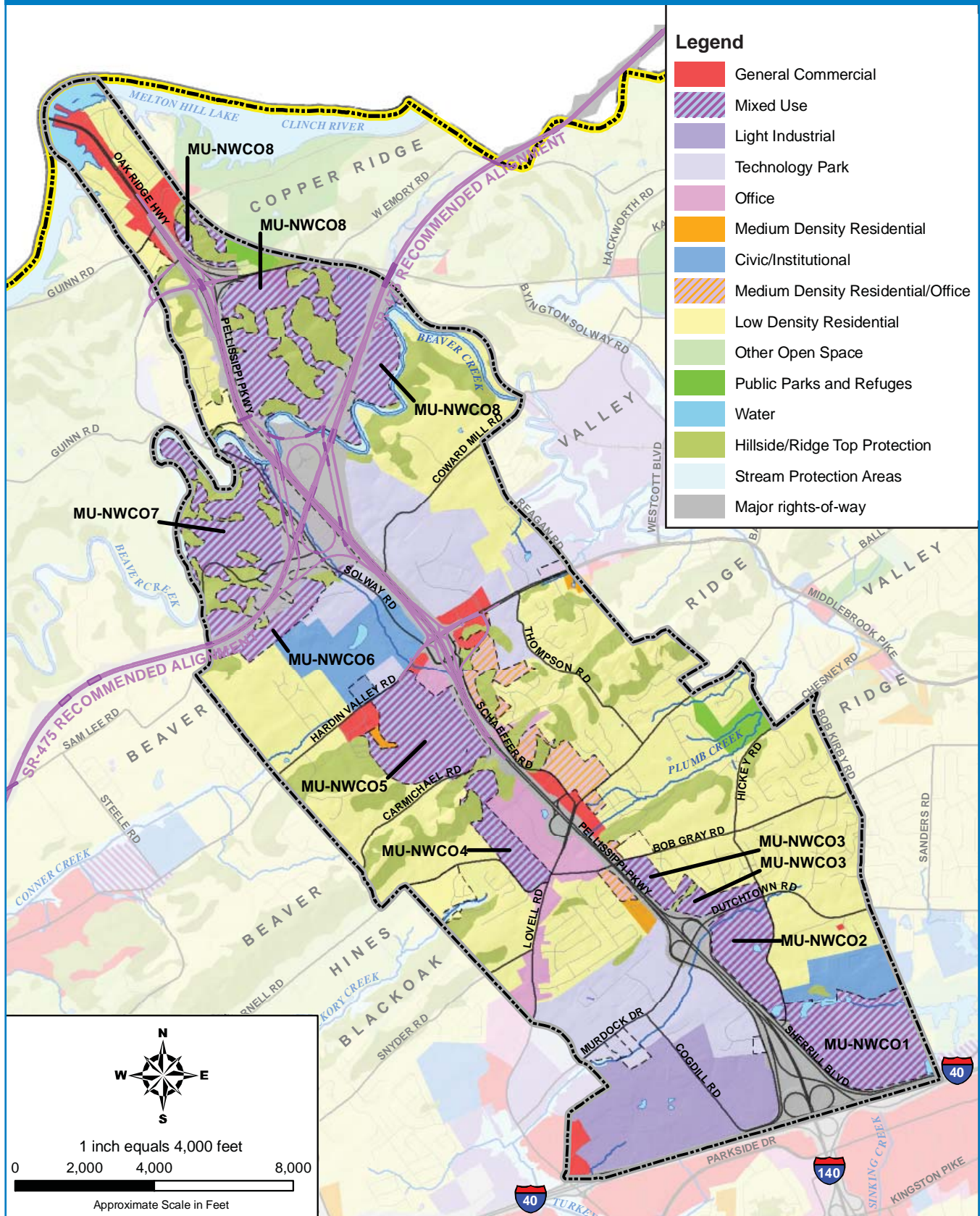
- **Create a sense of place and identity as a development corridor.**
- **Maintain overall visual quality and continuity within the corridor.**
- **Maintain a high-quality man-made and natural environment.**
- **Ensure a high-quality setting conducive to the needs of technology-based users, as well as other users, that can result in an overall, unified development pattern.**
- **Provide a variety of sites consistent with the needs of a range of users, including technology-based, office and commercial uses.**
- **Minimize the adverse environmental effects of development.**
- **Respond to, utilize, and enhance the natural systems within the technology corridor to promote an open space system.**
- **Build on the existing circulation system to develop a comprehensive network capable of serving all users.**
- **Complement and improve on the infrastructure available within the Technology Corridor.**

Map 1: Tennessee Technology Corridor with Zoning Overlay





Map 2: Tennessee Technology Corridor Land Use Plan





## Purpose of Design Guidelines

The purpose of these design guidelines is to shape future development and to ensure quality in the development process. By building on existing assets, the guidelines attempt to achieve functional, aesthetic, and visual unity, while maintaining individual user expression. A balanced approach which achieves both unity and flexibility in the design/development process is basic to the implementation of the design guidelines.

It is intended that these guidelines be uniformly applied to all types of new or altered development, with the following exceptions:

- Agricultural and residential uses are excluded from review. If adopted, proposed revisions to the state enabling legislation would allow review of medium and high density residential development.
- The Tennessee Technology Corridor Development Authority may grant waivers when strict application would be infeasible and the objectives of the Authority and the general public health, safety, and welfare would not be adversely affected. The criteria for the issuance of waivers may be such factors as unique site configurations and features, building construction considerations, and parcels of one acre or less which were created prior to the enactment of the design guidelines. Financial hardship, as a single criterion, is not considered a just reason for the issuance of waivers.



*One of the earliest Technology Corridor projects, Center Pointe Business Park is an example of a well-designed complex of offices and technology-based businesses.*



*Another early Technology Corridor development, Pellissippi Office Center, provides a good corporate image to motorists passing by on the Pellissippi Parkway.*

## Alternative Compliance

The purpose of alternative compliance is to foster innovative, high quality, environmentally-sustainable development that meets the intent of pedestrian-oriented projects and mixed-use districts that would not otherwise be allowed by a strict interpretation of the zoning district regulations and the TTCDA Design Guidelines. Several considerations for alternative compliance include the standards of the Town Center and Traditional Neighborhood Zoning Districts, sustainability requirements as may be adopted, or the creation of a form-based code by the proponent of a mixed-use development area.

Alternative compliance may be permitted by approval of a site plan by the Tennessee Technology Corridor Development Authority and

subsequent use on review approval by the planning commission, if required. Pursuant to the submission of such requests for alternative compliance, the staff of the Tennessee Technology Corridor Development Authority may request that such applications be reviewed informally by the TTCDA Board prior to their formal approval and with the applicant's participation. Informal workshops of this nature would provide the opportunity to address concerns that the Board might have regarding any deviation from the Design Guidelines that alternative compliance proposes. While the Board should be open to the consideration of innovative design solutions, whatever their nature, their responsibility to ensure that the spirit and intent of these guidelines should be maintained.



# DESIGN GUIDELINES

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## Section 1.1: Phasing and Context

Sites should be developed within the context of surrounding development, subdivisions, or planned subdivisions of land.

### GUIDELINES

- 1.1.1 Piecemeal subdivision and development without an overall plan is prohibited and will not be considered.
- 1.1.2 Where a parcel is split apart or is part of a larger development, the Development Authority reserves the right to review the proposal within the context of the larger scheme or concept plan.

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## Section 1.2: Site Development

Care should be taken during the construction phase of development so as not to disturb the natural systems in the Technology Corridor.

### GUIDELINES

- 1.2.1 Grading and site preparation should be kept to a minimum during the development process.
- 1.2.2 All grading should complement natural land forms.
- 1.2.3 Except for purposes of surveying and core drilling to gather geologic and soil data, and to allow for minimum road access, property in the Technology Overlay shall not be disturbed prior to the issuance of a Certificate of Appropriateness (for grading or building) and any other permit that may be required by the city or the county regarding the disturbance and/or restoration of land. Land disturbance shall include any grading or vegetation removal. Additional guidance for land disturbance is found in Section 1.12 and reflected in any policies adopted by the city and county for hillside and ridgetop protection areas.



## 1.2.4 For new construction, the following maximum slopes for land disturbance shall apply:

Table 1: Maximum Slope for Land Disturbance	
LAND USE	SLOPE
Office <sup>1</sup>	25%
Medium Density Residential <sup>2</sup>	25%
Business Park	10%
Industrial • Manufacturing & Warehousing	10%
Mixed-Use <sup>3</sup>	10%
Retail <sup>4</sup>	10%
All Other Uses <sup>5</sup>	15%

<sup>1</sup> Includes business and professional offices; medical and dental offices and clinics; financial, real estate and insurance offices; office parks; and multi-tenant office buildings

<sup>2</sup> The TTCDA Comprehensive Development Plan (adopted January 2009) includes a category for office/medium density residential development. At some point in the future, high density residential development may also be depicted in the plan. At that point, high density residential uses will be reflected in this table and elsewhere in the Design Guidelines.

<sup>3</sup> Includes developments that are a combination of retail commercial, various forms of residential, and office; with the potential for a vertical mix of uses (for example, a restaurant at ground level and offices above)

<sup>4</sup> Includes retail establishments; restaurants; shopping centers; hotels and motels; and supermarkets

<sup>5</sup> As allowed by the Knoxville and Knox County zoning ordinances

**Section 1.3: Development Intensity**  
Development intensity is controlled by Ground Area Coverage, Floor Area Ratio, and Impervious Area Ratio restrictions. Ground Area Coverage (GAC) is determined by dividing the area of a lot covered by a building by the gross area of that lot. Floor Area Ratio (FAR) is determined by dividing the gross floor area of buildings on a lot by the gross area of that lot. Impervious Area Ratio (IAR) is determined by dividing the gross area of all impervious surfaces by the gross area of the lot. Impervious surfaces are those which do not absorb rain and generally include all buildings, roads, parking lots, sidewalks and any area paved in concrete or asphalt.

The intent of establishing maximum coverage is to ensure that building and parking spaces share ground space with the appropriate amount of open green areas. The implementation of these regulations will contribute to the achievement of a campus-like environment within the Tennessee Technology Corridor.

### GUIDELINES

- 1.3.1 Ground Area Coverage (GAC) shall not exceed 25%.
- 1.3.2 Floor Area Ratio (FAR) shall not exceed 30% except where a proposed building includes an under-building parking structure, in which case the floor area ratio may not exceed 40%.
- 1.3.3 Impervious Area Ratio (IAR) shall not exceed 70%.
- 1.3.4 Except in hillside and ridgetop protection areas, the maximum allowable height of a structure is set at ninety (90) feet, measured from the finished grade.

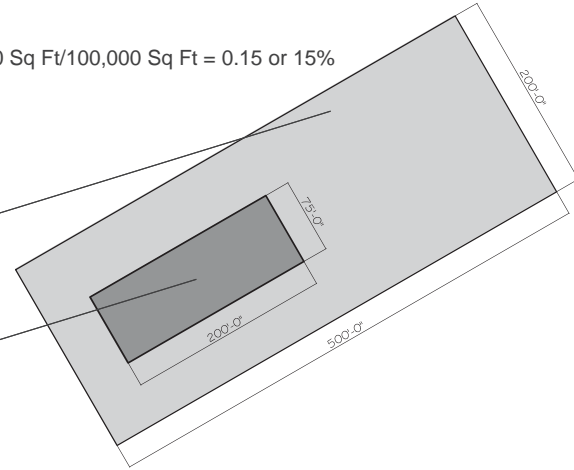
Figure 1: Calculating Development Intensity Example

## Ground Area Coverage (GAC)

$$\text{GAC} = \text{Building Footprint Area} / \text{Gross Lot Area} = 15,000 \text{ Sq Ft} / 100,000 \text{ Sq Ft} = 0.15 \text{ or } 15\%$$

Gross Lot Area = 100,000 Sq Ft

Building Footprint Area = 15,000 Sq Ft

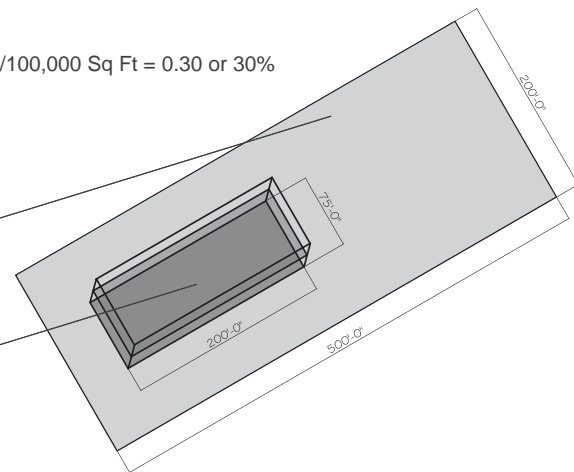


## Floor Area Ratio (FAR)

$$\text{FAR} = \text{Gross Floor Area} / \text{Gross Lot Area} = 30,000 \text{ Sq Ft} / 100,000 \text{ Sq Ft} = 0.30 \text{ or } 30\%$$

Gross Lot Area = 100,000 Sq Ft

Gross Floor Area of a Two (2) Story Building with  
a Footprint of 15,000 Sq Ft = 15,000 Sq Ft x 2  
= 30,000 Sq Ft



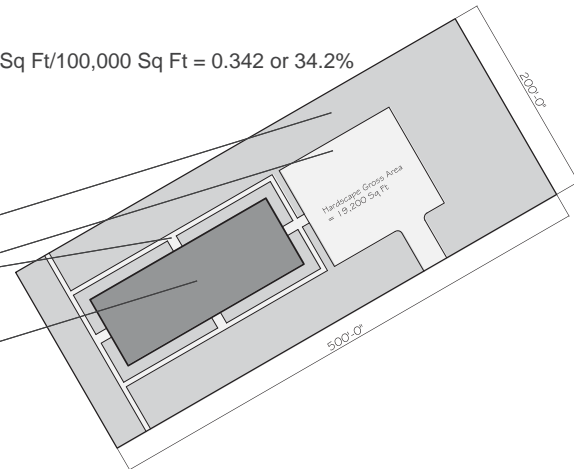
## Impervious Area Ratio (IAR)

$$\text{IAR} = \text{Gross Impervious Area} / \text{Gross Lot Area} = 34,200 \text{ Sq Ft} / 100,000 \text{ Sq Ft} = 0.342 \text{ or } 34.2\%$$

Gross Lot Area = 100,000 Sq Ft

Hardscape Gross Area = 19,200 Sq Ft

Building Gross Area = 15,000 Sq Ft



## Section 1.4: Setbacks

The open space system is complemented by the use of building setbacks and how buildings are placed on a site. The setbacks allowed by these Design Guidelines offer two approaches for site development.

### GUIDELINES

**1.4.1** For individual properties within the Technology Overlay Zone, the following building setbacks will be required, based on the number of stories of the proposed building. The consideration of waivers to these required minimum setbacks may be appropriate to promote setback continuity in the older, more established development areas of the Technology Overlay Zone. Waivers also would be appropriate on sites where there is a need to protect hillsides and ridgetops.

Table 2: Required Minimum Setbacks	
Yard Location	Minimum Setback
Front — 1-Story Building	20 Feet / 60 Feet*
Front — 2-Story Building	25 Feet / 70 Feet*
Front — 3-Story Building	30 Feet / 80 Feet*
Side	20 Feet
Rear	20 Feet
Abutting Residential Zone	100 Feet

*\*with parking in front yard*

- 1.4.2** In order to maintain continuity of an established building setback along a street, no front setback shall deviate by more than 5 feet from the established minimum building setback for the street face. Waivers to this requirement, however, may be considered in areas where existing setbacks were not approved under the TTCDA review process.
- 1.4.3** To encourage the design and construction of unified developments, with interrelated land uses, open space and vehicular and pedestrian connections, applicants may establish their own building setbacks, with the approval of the TTCDA Board, if such standards are based on a master site plan for the property. Once the setbacks have been approved, setback waivers, or variances, shall not be allowed. Setbacks for buildings higher than three stories shall be established through this process.
- 1.4.4** In unified developments, common open space shall be no less than 10% of the area of the site.

## Section 1.5: Open Space

A natural open space system is evident within the technology corridor consisting of features identified with development limitations. These features generally consist of ridges, streams, floodplains, sinkholes, and steep slopes. Development should be avoided in these locations. The intent is to retain these natural systems as conservation zones, capitalizing on their aesthetic as well as functional value.

### GUIDELINES

- 1.5.1 Construction is prohibited in floodplains and within 50 feet of sinkholes.
- 1.5.2 Natural drainage corridors should be preserved to reduce infrastructure costs and conserve the natural systems in place.
- 1.5.3 Construction which impairs scenic views or reduces the visual quality of the corridor is discouraged.
- 1.5.4 Conservation of slopes shall be maintained based on the degree and severity of the slope. For specific requirements in areas identified as hillside and ridgetop protection areas (slopes greater than 15%), see Section 1.12.
- 1.5.5 Open space areas in new developments should include the following, as appropriate, to supplement the natural systems that are maintained:
  - A. New landscaping should be used in addition to any preserved vegetation to buffer residential uses from new non-residential development. (See appendices for landscaping standards.)
  - B. Landscaping and existing vegetation should be used to provide transitions between different intensities of non-residential uses.
  - C. Open space continuity should be maintained through the use of sidewalks and pathways within and between developments.

## Section 1.6: Circulation

The flow of traffic at or near a site is related to the activity patterns of land use proposed for the site. Circulation systems, in this context, refer to vehicle and pedestrian passages within and surrounding the site. The circulation system of local streets, sidewalks and pathways should be planned to accommodate the patterns of activity within a site. The intent should be to maintain the natural edges of existing roadways and, where new internal streets are required, to work with the physiography of the land.

### GUIDELINES

- 1.6.1 The interior circulation system of a site (roads and sidewalks) should reflect the change in scale between arterial highways, collector roads and local road networks.
- 1.6.2 Internal streets should be planned to assure connectivity and to maintain smooth traffic flow.
- 1.6.3 Internal access streets shall have a minimum paved width of 22 - 24 feet measured from curb to curb, unless otherwise stipulated in these regulations or as required by the city and county engineering departments.
- 1.6.4 Sidewalks and landscaping should be used along collector and arterial streets to separate pedestrians and vehicles.
- 1.6.5 A sidewalk should be provided along all streets. On local streets a sidewalk on one side may be appropriate.
- 1.6.6 Sidewalks and pathways should have a minimum width of five feet and should connect adjacent streets, sidewalks and buildings.
- 1.6.7 Bicycle or pedestrian trails should be used to provide connections between sites and for recreational purposes.



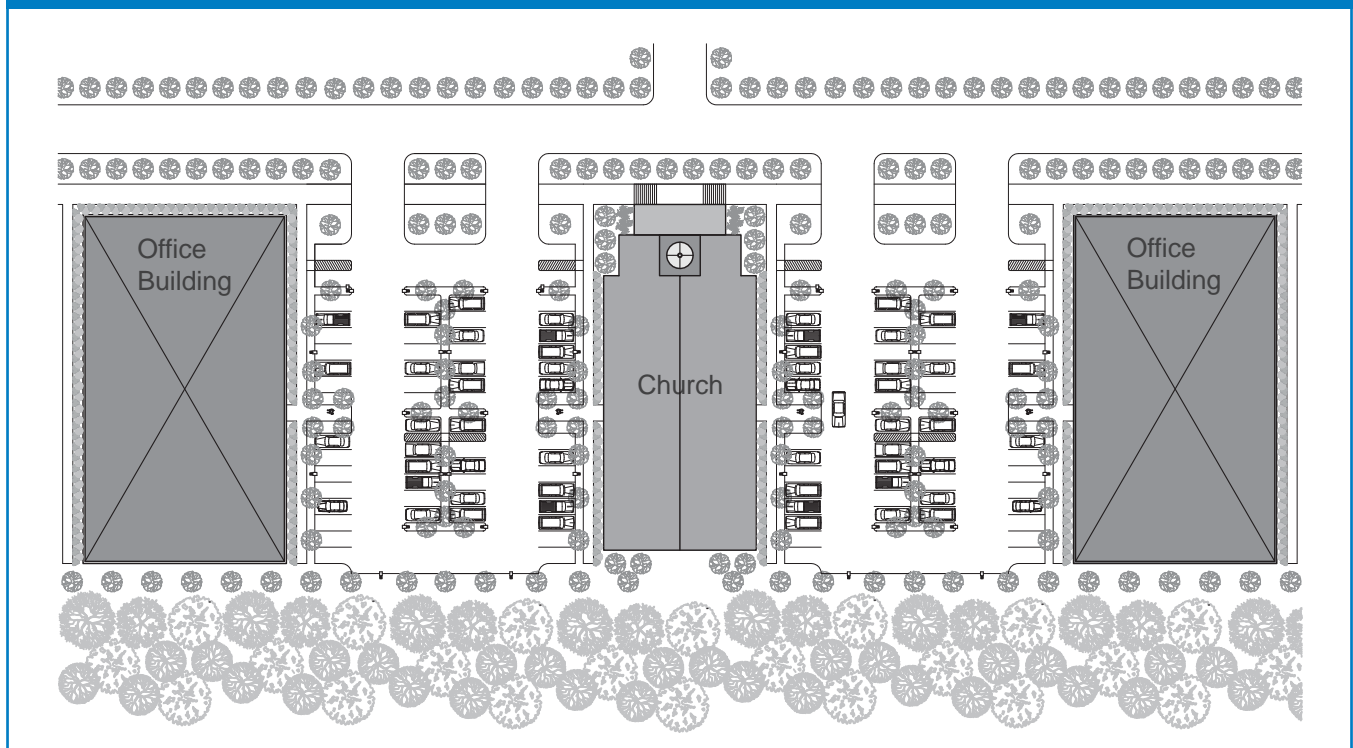
## Section 1.7: Parking

Parking lot design is an important factor in creating a quality setting within the Technology Corridor. Careful attention must be paid to site design in order to ensure that parking lots do not detract from the views of neighboring properties or the public right-of-way. Parking should be integrated with the building and landscaping plan.

### GUIDELINES

- 1.7.1 Parking must meet the standards of the Knoxville or Knox County zoning ordinances for their respective zones, unless the requirements of these Design Guidelines are more restrictive.
- 1.7.2 The configuration of the parking lot should respond to site conditions and topography.
- 1.7.3 Shared parking arrangements are encouraged and may be requested by an applicant, or required by the Board, to reduce the need for off-street surface parking. Developments with mixed-uses are typical examples of situations where shared parking provisions can be approved. One such example would be a church next to an office where parking spaces could be shared because of different hours of operation. (See Figure 2: Shared Surface Parking Example below.)
- 1.7.4 Shared parking and on-street parallel parking bays should be used where possible to minimize land and soil disturbance, reduce impervious surface coverage, and achieve excellence of design and aesthetic sensitivity.

Figure 2: Shared Surface Parking Example



## 1.7.5 Minimum and maximum parking space requirements for all properties in the Technology Overlay Zone are as follows:

Table 3: Off-Street Parking Space Requirements\*

Land Use	Minimum Number of Spaces Required	Maximum Number of Spaces Allowed
Restaurant	7.5 per 1000 sq. ft. of Gross Floor Area	15 per 1000 sq. ft. of Gross Floor Area
Office	3 per 1000 sq. ft. of Gross Floor Area	4.5 per 1000 sq. ft. of Gross Floor Area
Retail Establishments	3 per 1000 sq. ft. of Gross Floor Area	4.5 per 1000 sq. ft. of Gross Floor Area
Office Park, Multi-tenant Office Building	2 per 1000 sq. ft. of Gross Floor Area	3.5 per 1000 sq. ft. of Gross Floor Area
Shopping Center	2 per 1000 sq. ft. of Gross Floor Area	3.5 per 1000 sq. ft. of Gross Floor Area
Research & Development Facility, Laboratory	2 per 1000 sq. ft. of Gross Floor Area	3.5 per 1000 sq. ft. of Gross Floor Area
All Other Non-Residential Uses	2 per 1000 sq. ft. of Gross Floor Area	3.5 per 1000 sq. ft. of Gross Floor Area
Medium Density Residential	1.5 per dwelling unit for the first 20 units, plus 1.5 additional per dwelling unit for each two (or more) bedroom unit in excess of 20, plus 1 additional per dwelling unit for each one bedroom unit in excess of 20	175% of the minimum number of spaces required
Warehousing, with Office Space	1 per 1000 sq. ft. of Gross Floor Area	1.5 per 1000 sq. ft. of Gross Floor Area
Industrial and Manufacturing	1 per 1000 sq. ft. of Gross Floor Area	1.5 per 1000 sq. ft. of Gross Floor Area
Hotel, Motel	1 per Room or Suite	1.5 per Room or Suite
Church or similar place of worship	1 per 4 seats in Main Worship Area	1 per 3 seats in Main Worship Area

\* On-street parking spaces may be used to reduce either the minimum number required or the maximum number allowed for off-street parking spaces.

Table 4:  
Off-Street Parking Stall  
Minimum Size Requirements

Parking Angle	Stall Depth in Feet			Width in Feet	
	to Wall	to Curb	to Interlock	Stall	Aisle
45°	16.5	15	14.5	9	15 <sup>1</sup>
60°	18	16.5	16.5	9	18 <sup>1</sup>
75°	18.5	17.5	17.5	9	22 <sup>1</sup> / 26 <sup>2</sup>
90°	17.5	15.5	17.5	9	26 <sup>1</sup> / 26 <sup>2</sup>
Parallel	22.5	20.5	22.5	9	15 Minimum 20 Maximum <sup>1</sup> 25 Minimum 30 Maximum <sup>2</sup>

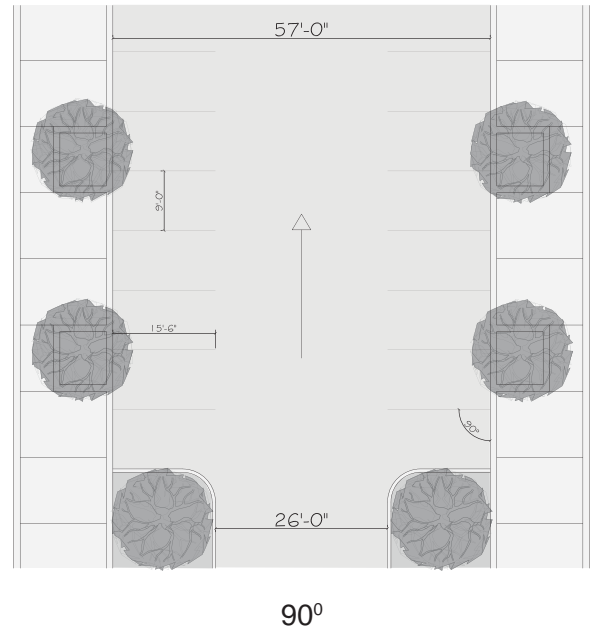
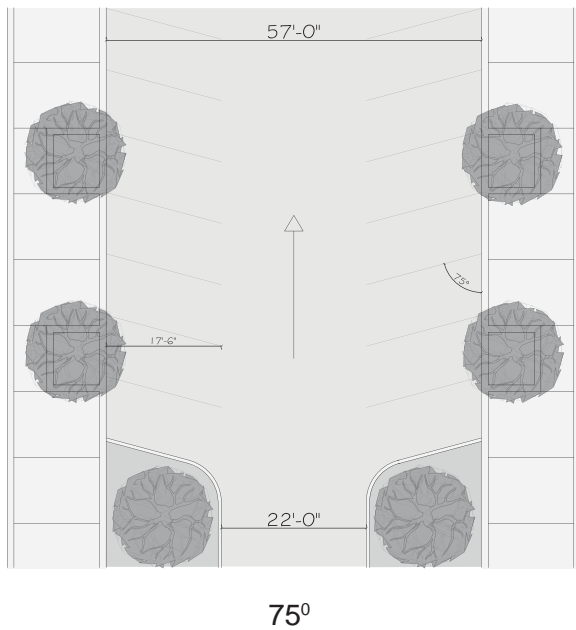
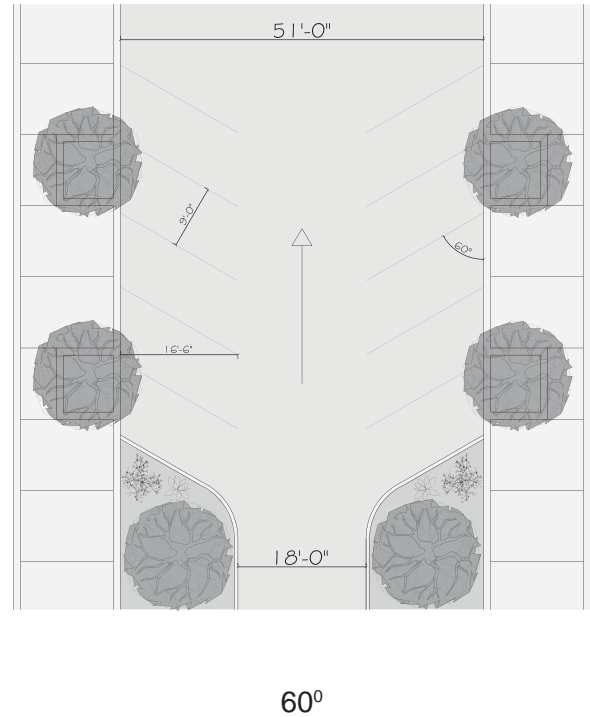
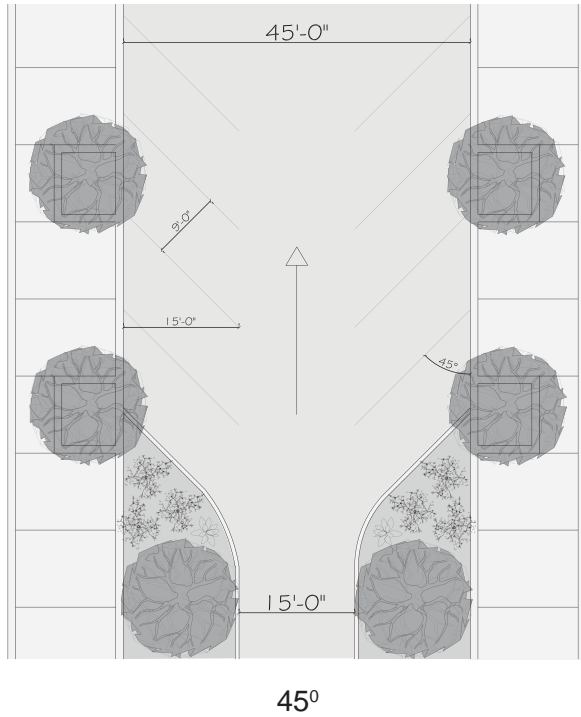
NOTE: Stall depths measured perpendicular to aisle.  
Stall depths and aisle widths for parking angles other than those indicated shall be consistent with the above values and are subject to the approval of the respective city and county engineering departments, where applicable.

<sup>1</sup> One-way traffic

<sup>2</sup> Two-way traffic

- 1.7.6 The size of required off-street parking spaces and areas shall be as follows:
- 1.7.7 Thirty percent (30%) of the parking spaces may be designated for compact cars. The minimum size of a compact car space shall be 8 ft. by 16 ft.
- 1.7.8 Parking areas shall be landscaped according to Section 3.4 requirements.
- 1.7.9 Surface parking areas should be located to the side or to the rear of buildings. If parking is requested to be located in front of a building, the parking shall be separated from the front property line by a 20 ft. landscape buffer.
- 1.7.10 Parking, above the maximum number of spaces allowed (see Table 3), may be permitted if the parking surface is pervious, or structured parking is used.

Figure 3: Parking Lot Layout Based on Angle of Parking Examples



## Section 1.8: Lighting

As the lighting function changes from roadway orientation to a parking or pedestrian orientation, the consistency in style and design should be maintained. Street lights are recommended along the internal road systems, parking lots, and building access points.



*An example of cut-off fixtures on light poles that meet the requirements of the Design Guidelines*

### GUIDELINES

- 1.8.1 Any lighting used for exterior illumination shall be directed away from adjoining properties.
- 1.8.2 Glare, whether direct or indirect, such as from flood lights, shall not be visible at any property line.
- 1.8.3 All light fixtures, including wall-mounted fixtures, are to be either full cut-off luminaires, or directionally shielded fixtures.
- 1.8.4 Exterior light sources may be high pressure sodium, metal halide, or LED. Low pressure sodium and mercury vapor lights are prohibited.
- 1.8.5 Intensity of lighting shall not exceed the following maximum requirements:
  - A. Building entrances = 5.0 foot candles
  - B. Parking lots = 2.5 foot candles
  - C. Paths and sidewalks = 1.0 foot candles
  - D. Streets & driveways within developments = 0.5 foot candles
  - E. Within 20 ft. adjacent to residential zones = 0.2 foot candles
  - F. Within 20 ft. adjacent to all other zones = 0.5 foot candles
  - G. Convenience store gas canopies = 10.0 foot candles
- 1.8.6 Light poles and wall-mounted fixtures are not to exceed a 30-ft. height limit. More specifically, the following are maximum height requirements for light poles:
  - A. Along roadways and parking lots 22 – 30 ft.
  - B. Along sidewalks 12 – 15 ft.
  - C. Within 20 feet of a residential zone 22 ft. maximum
- 1.8.7 Light poles are to be a neutral, preferably dark color.

Figure 4: Lighting Direction and Glare Examples

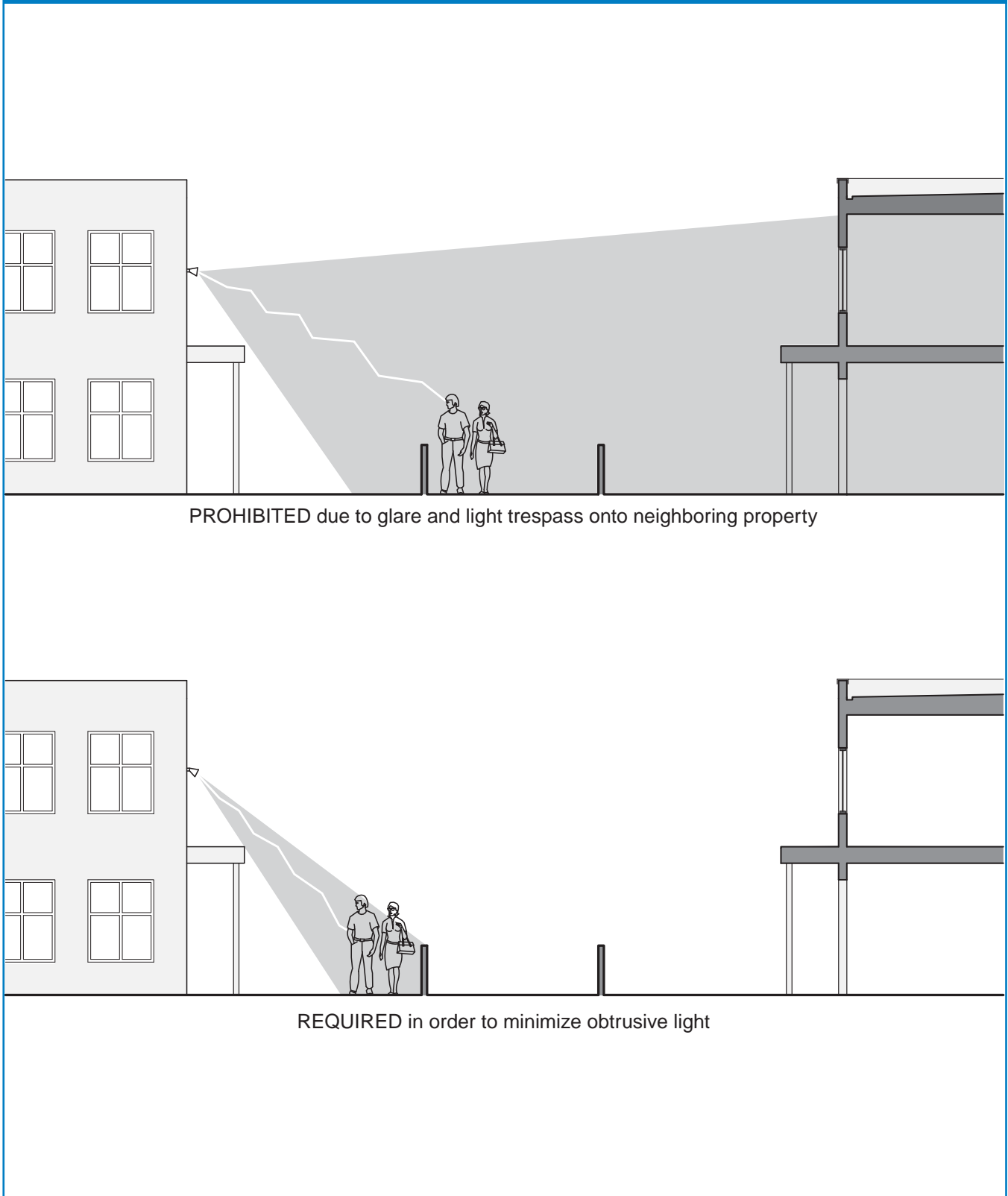
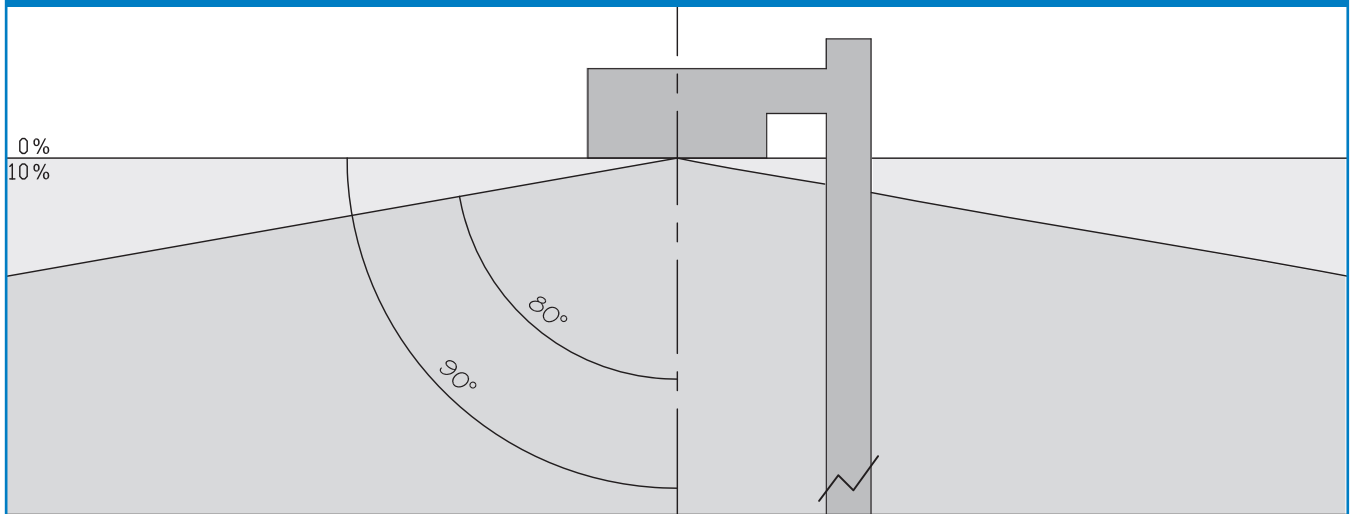
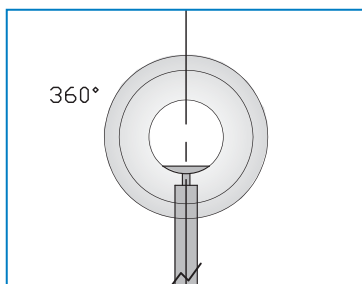


Figure 5: Full-Cutoff Lighting Fixture Example

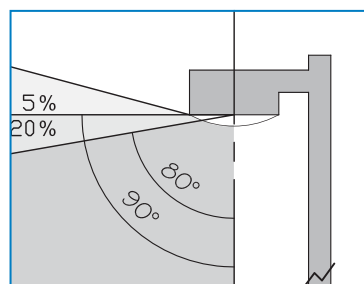


A Full-Cutoff fixture is defined by a minimum of 90% of the total lamp lumens within the 80° zone, a minimum of 10% of the total lamp lumens within the 90° zone, and no light above 90°.

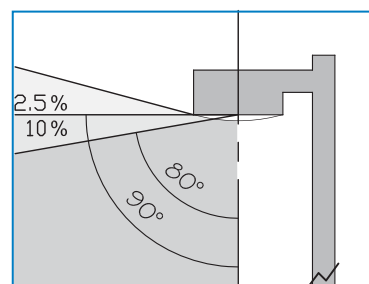
Figure 6: Prohibited Lighting Fixture Examples



Non-Cutoff



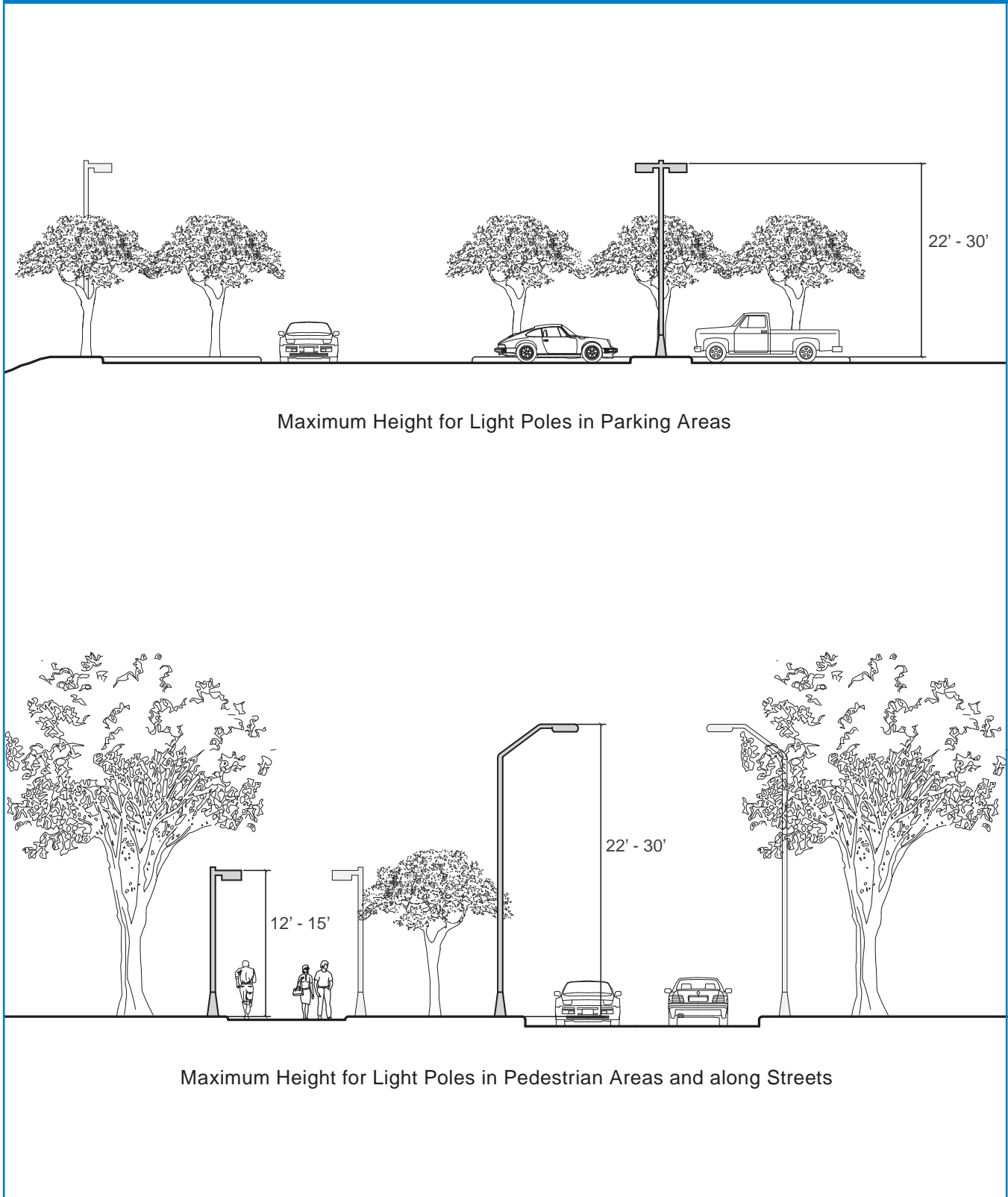
Semi-Cutoff



Cutoff



Figure 7: Maximum Height for Light Poles Examples



## Section 1.9: Utilities

The utility network of the Technology Corridor is a vital element in the marketability of the area. To ensure quality of development and the preservation of the natural character of the Corridor, the following guidelines apply:

### GUIDELINES

- 1.9.1 All electrical service and telephone lines shall be placed underground.
- 1.9.2 Any utility equipment shall be of neutral color and completely screened with landscaping and/or architectural materials that complement the nearby buildings.



*Underground utilities help to preserve the Technology Corridor's natural appearance.*



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## Section 1.10: Stormwater Management

The open space system of the Technology Corridor offers a unique opportunity to introduce a natural stormwater management component to the development. The floodplains of rivers and the conveyance zones of permanent streams serve as a continuous network serving stormwater runoff, providing a basic framework for a management system. The natural drainage systems are to be kept free of development throughout the Technology Corridor in order to avoid bottlenecks on individual sites. Any plan proposal where drainage is a key component shall be prepared in accordance with the city and county stormwater regulations, as appropriate.

### GUIDELINES

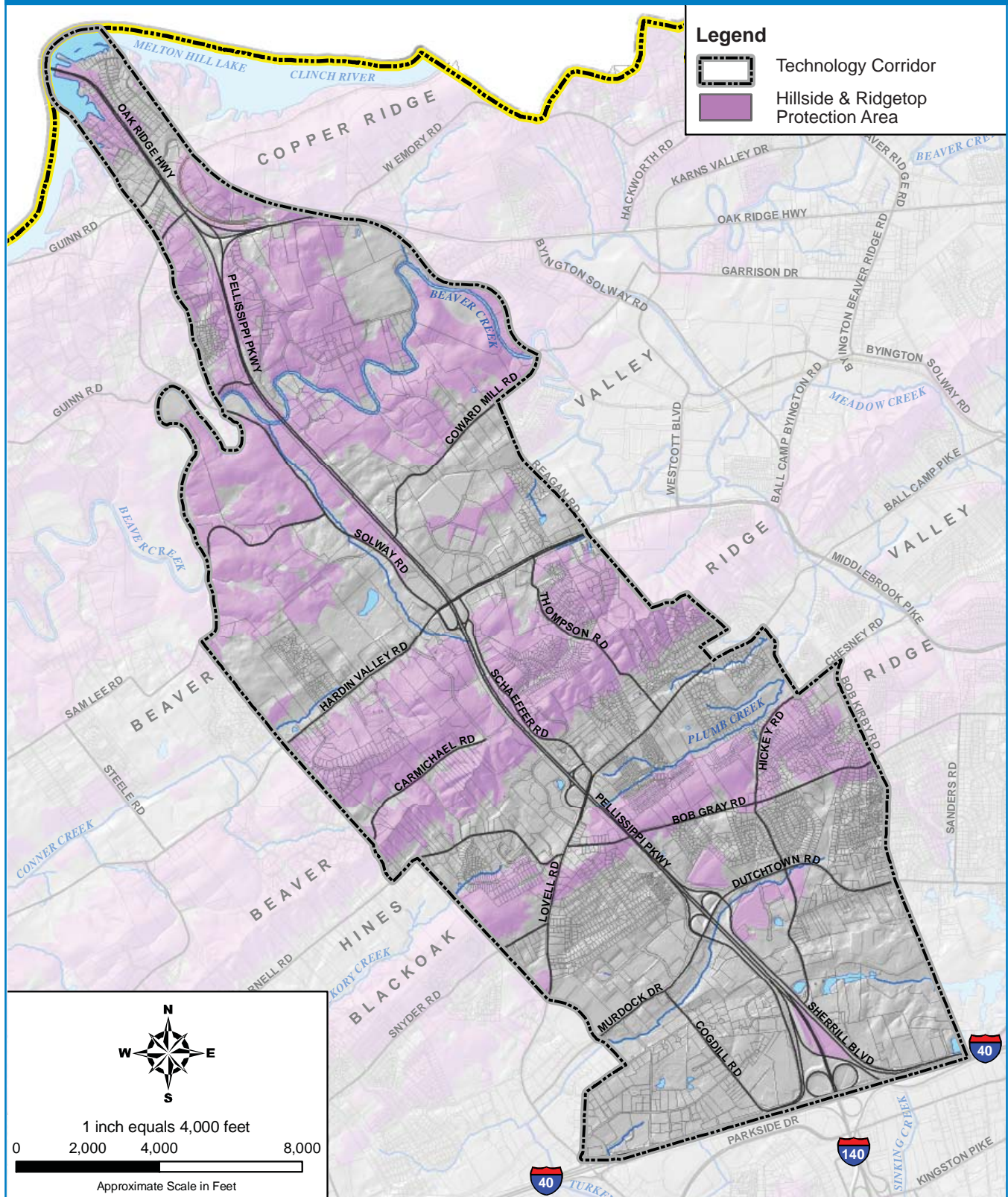
- 1.10.1 Natural drainage corridors should be preserved.
- 1.10.2 The rate of discharge must correspond to the rate in evidence prior to site development.
- 1.10.3 All plans for drainage and stormwater runoff shall comply with applicable city and county stormwater regulations.

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## Section 1.11: Road Access to State Route 162 - Pellissippi Parkway

In addition to the access controls stipulated by the Tennessee Department of Transportation, access to properties fronting on the Pellissippi Parkway shall be from an existing roadway or from a new public or private road constructed according to the officially adopted Tennessee Technology Corridor Comprehensive Development Plan. No new median cuts shall be provided to the Pellissippi Parkway.

Map 3: Tennessee Technology Corridor Hillside and Ridgetop Protection Areas



## Section 1.12: Hillside and Ridgetop Development

Portions of the Technology Corridor are characterized by moderate to steep slopes which present challenges for development in regard to public safety, environmental concerns and visual continuity. All development within or partially within hillside and ridgetop protection areas (areas with slopes in excess of 15%) shall be subject to TTCDA approval. In order to provide the proper development guidance for such areas, the following standards and requirements shall apply.

### GUIDELINES

#### 1.12.1 SITE DEVELOPMENT

- A. To reduce the amount of site disturbance, the maximum building footprint for office and medium density residential uses shall not exceed 5,000 square feet per building per two acres in hillside and ridgetop protection areas. (Example: A four-acre site would be allowed two buildings, each with a 5,000 sq. ft. footprint.)
- B. Development sites should be prepared in such a manner so that the use of retaining walls is minimized. The maximum allowable height of a retaining wall shall not exceed six (6) feet for a side yard, which may not extend into a required front yard adjacent to a street. The maximum allowable height for a retaining wall in a rear yard shall not exceed eight (8) feet. If a greater height is necessary, two (2) retaining walls at a maximum height of four (4) feet shall be terraced with a minimum horizontal width of four (4) feet and maximum horizontal width of eight (8) feet of separation. The maximum slope between the two walls shall be 2:1. An alternative

retaining wall design may be approved if it is consistent with the city or county engineering requirements and such that the amount of land disturbance shall not exceed the maximum allowed under 1.12.4.

- C. In addition to these requirements and any other requirement in the Design Guidelines regarding site preparation and grading, the policies of Knoxville and Knox County pertaining to hillside and ridgetop development shall be followed.

#### 1.12.2 DEVELOPMENT INTENSITY

- A. In hillside and ridgetop protection areas, the maximum allowable height of a structure shall not exceed 35 ft., measured from the average natural grade of the building site.
- B. Ground area coverage shall not exceed 5,000 sq. ft. per two acres.
- C. Floor area ratio shall be determined by the relationship of the building's total square footage to the size of the site and how much of the site can be disturbed (or 50% maximum).
- D. Impervious area ratio shall not exceed 50% on slopes ranging from 15% to 24.99%.

#### 1.12.3 SETBACKS

- A. Waivers to the setbacks listed under Section 1.4.1 may be required to preserve and maintain hillsides and ridgetops, as shown in Map 3.
- B. Setbacks respecting hillside and ridgetop conditions may also be approved under the provisions of Section 1.4.3 regarding unified developments.



# 1 Site Design

## 1.12.4 OPEN SPACE

- A. The criteria for the conservation of hillside and ridgetop protection areas focus on the prevention of erosion and the preservation of vegetation and scenic views. As such, new development (other than low density residential uses, as defined by the *Knoxville-Knox County General Plan*), including parking areas, artificial berms, and detention/retention ponds, should not be permitted on slopes in excess of 25%. Map 3 shows the Hillside and Ridgetop Protection Areas in the Technology Corridor.
- B. With the exception of road access, the following requirements shall apply:

Table 5: Slope Conservation

Slope	Land Conservation	Land Disturbance	New Development Permitted
25% or more	100%*	0%*	0%*
15% - 24.99%	50%	50%	50%
0 - 14.99%	Negotiable	Negotiable	Negotiable

\*Some disturbance may be allowed to accommodate road access.

## 1.12.5 CIRCULATION

- A. Roadway and driveway design should respect the site's topography.
- B. The amount of area devoted to roadways and driveways shall be determined by the amount of disturbance allowed on the site, not to exceed 50%.

## 1.12.6 PARKING

- A. Under building parking structures, or terraced parking, should be used to preserve hillside and ridgetop protection areas.
- B. Shared parking and on-street parallel parking bays should be used where possible to minimize land and soil disturbance, minimize impervious surface coverage, and achieve excellence of design and aesthetic sensitivity. Parking minimums may be reduced on a case-by-case basis in hillside and ridgetop protection areas.
- C. Grading for parking lot construction is prohibited in areas with natural slopes of 25% or greater.
- D. Maximum allowed parking for office, office park and multi-tenant office buildings shall not exceed 2 spaces per 1000 sq. ft. of gross floor area.

Figure 8: Under-Building Parking with Hillside Development Example

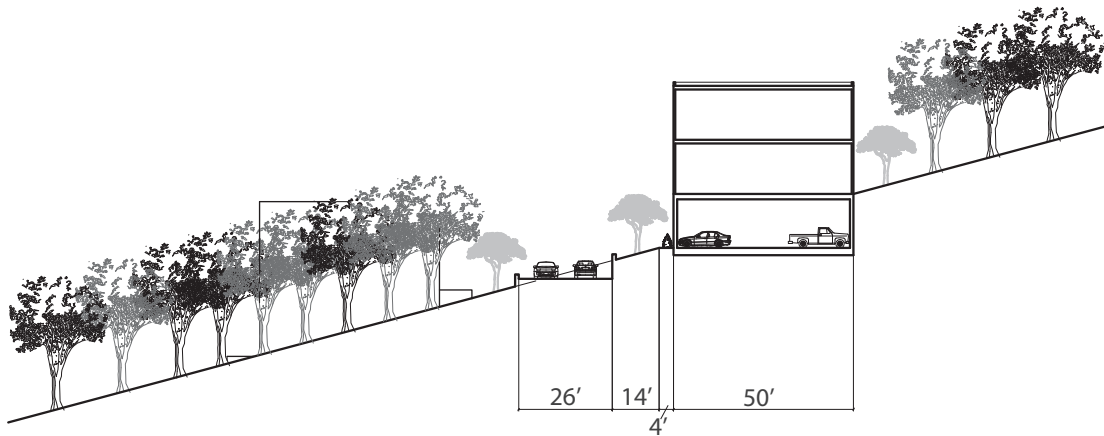
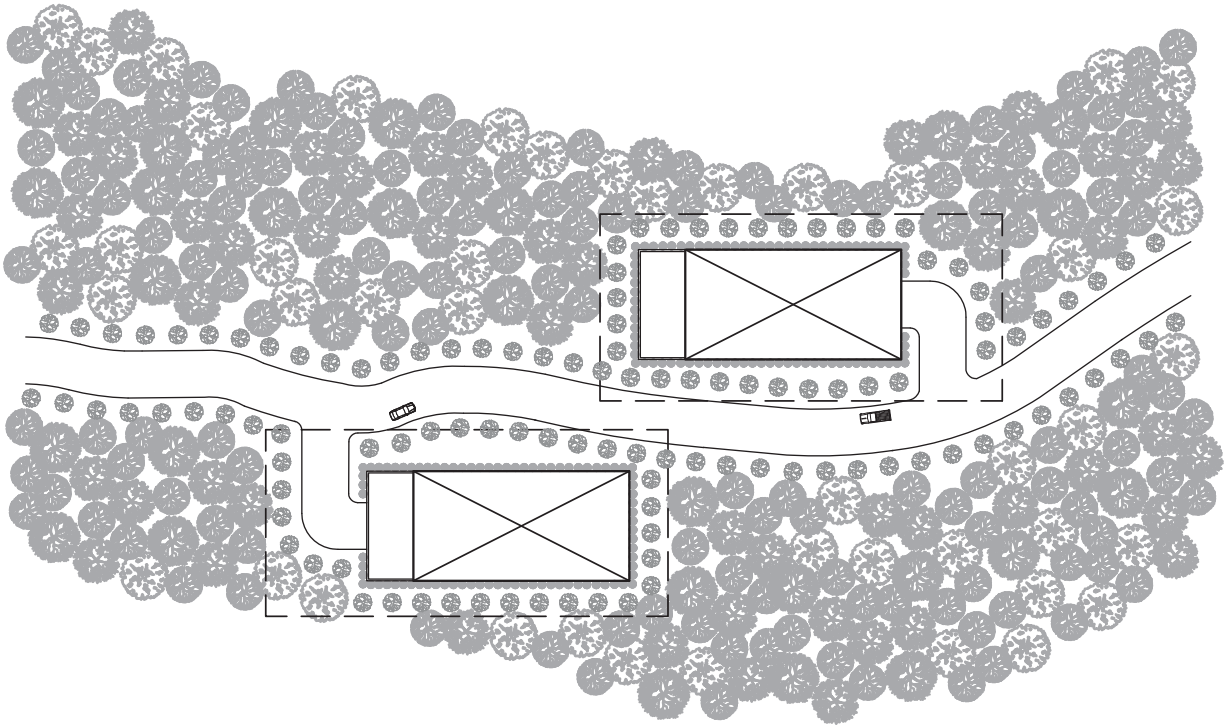


Figure 9: Side Parking with Hillside Development Example

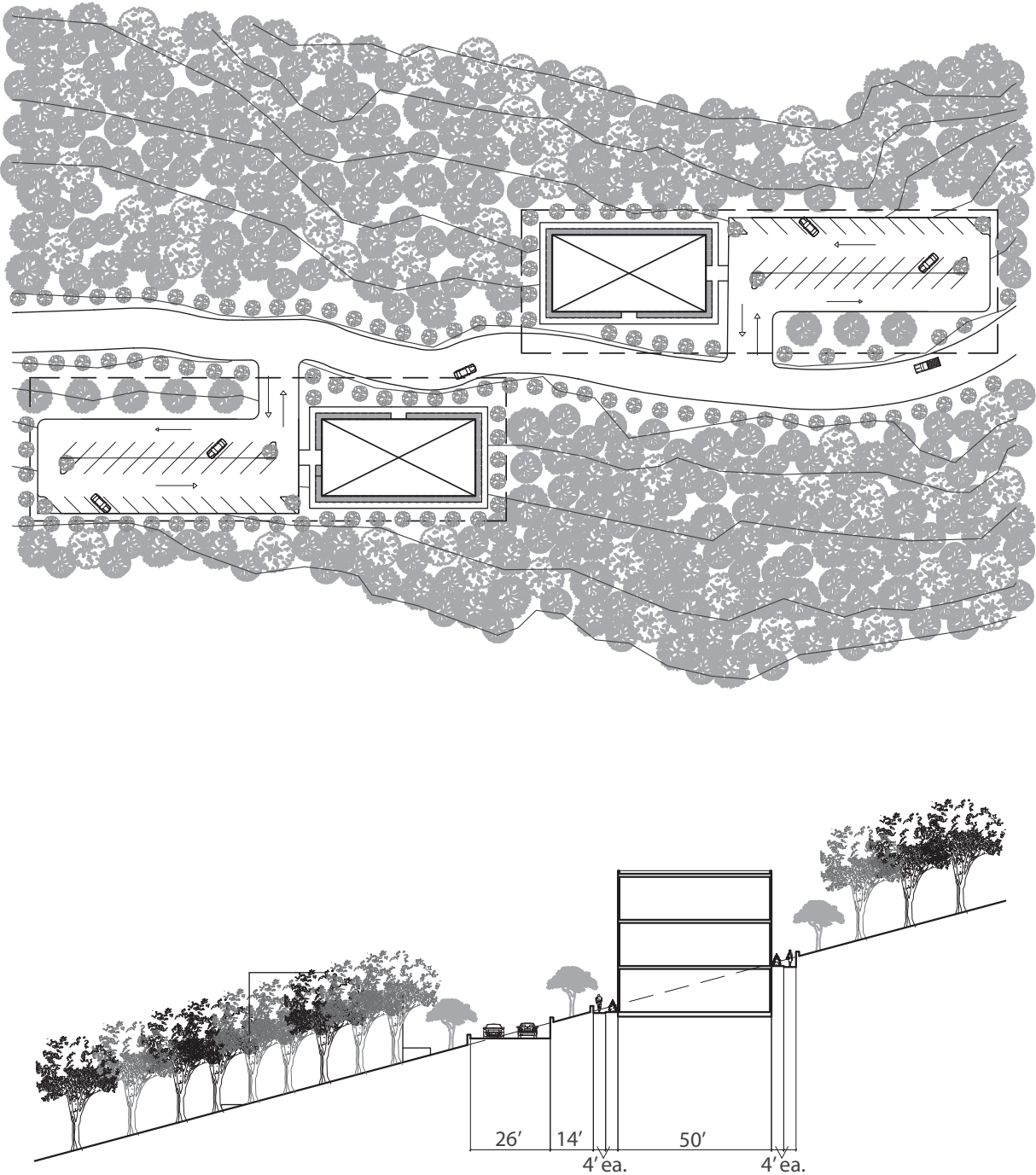


Figure 10: Shared Side Parking with Hillside Development Example

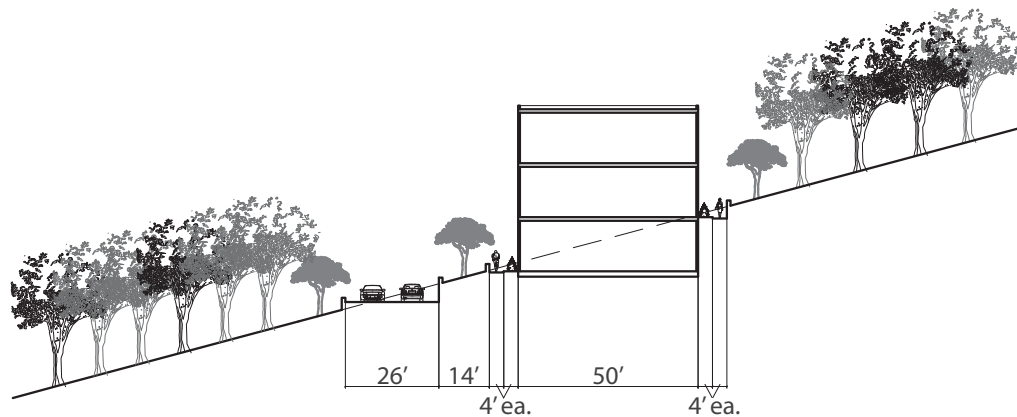
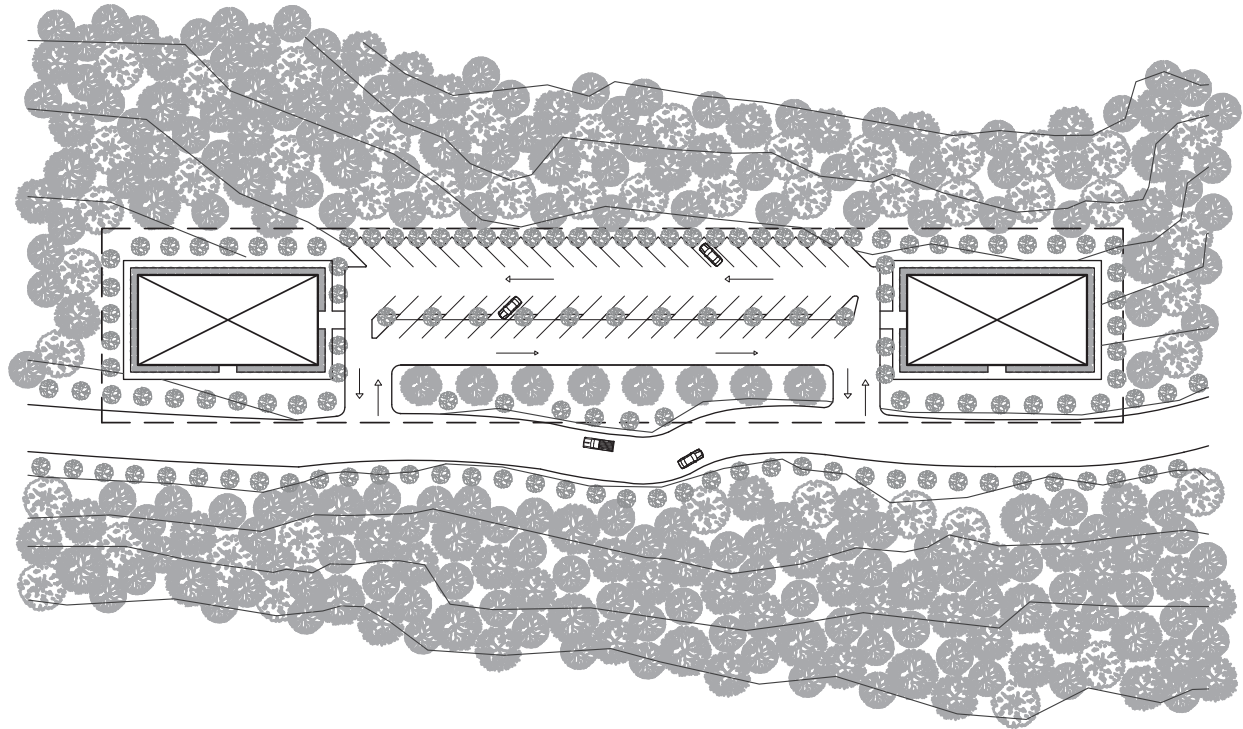


Figure 11: Shared Rear Parking with Hillside Development Example

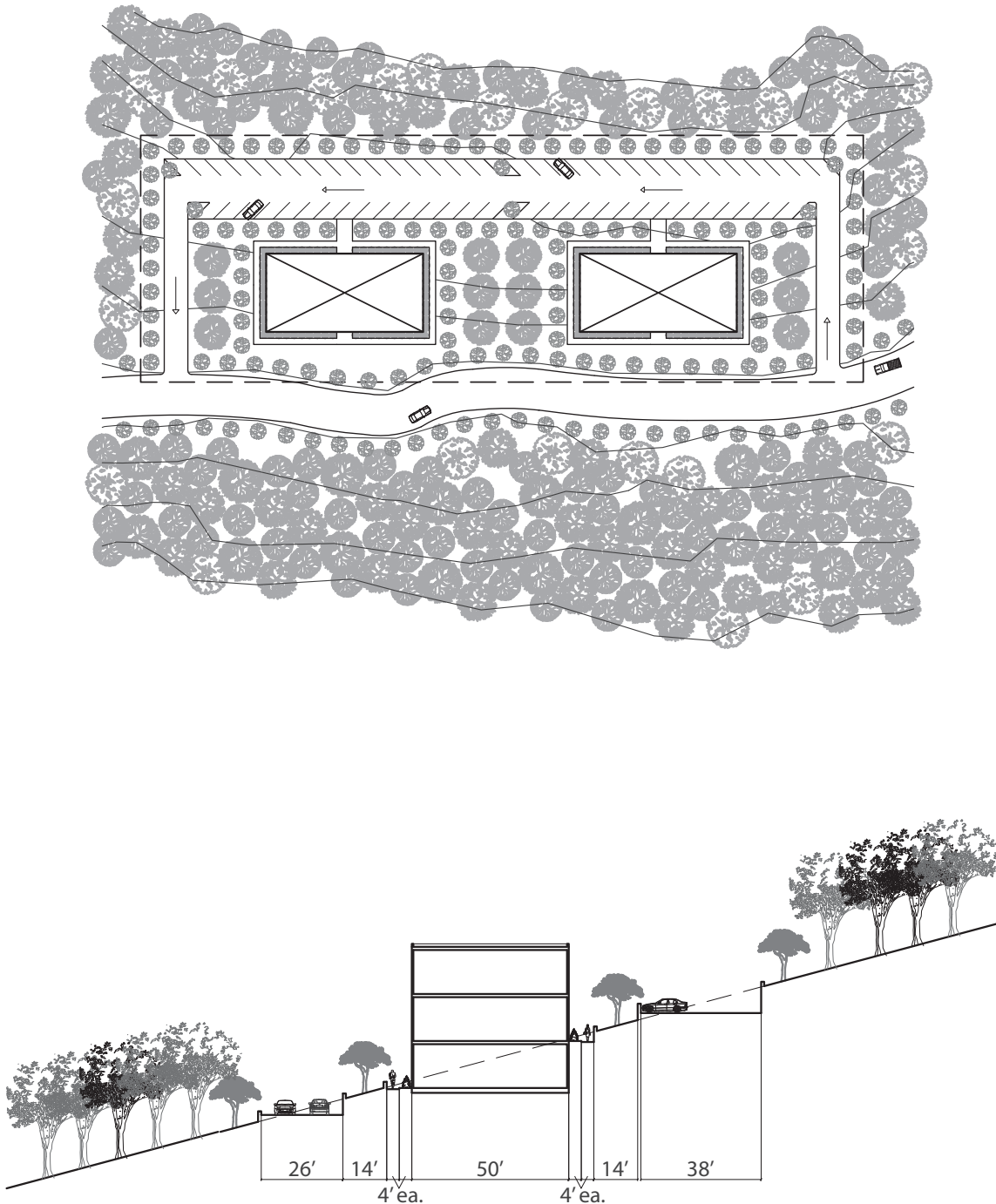
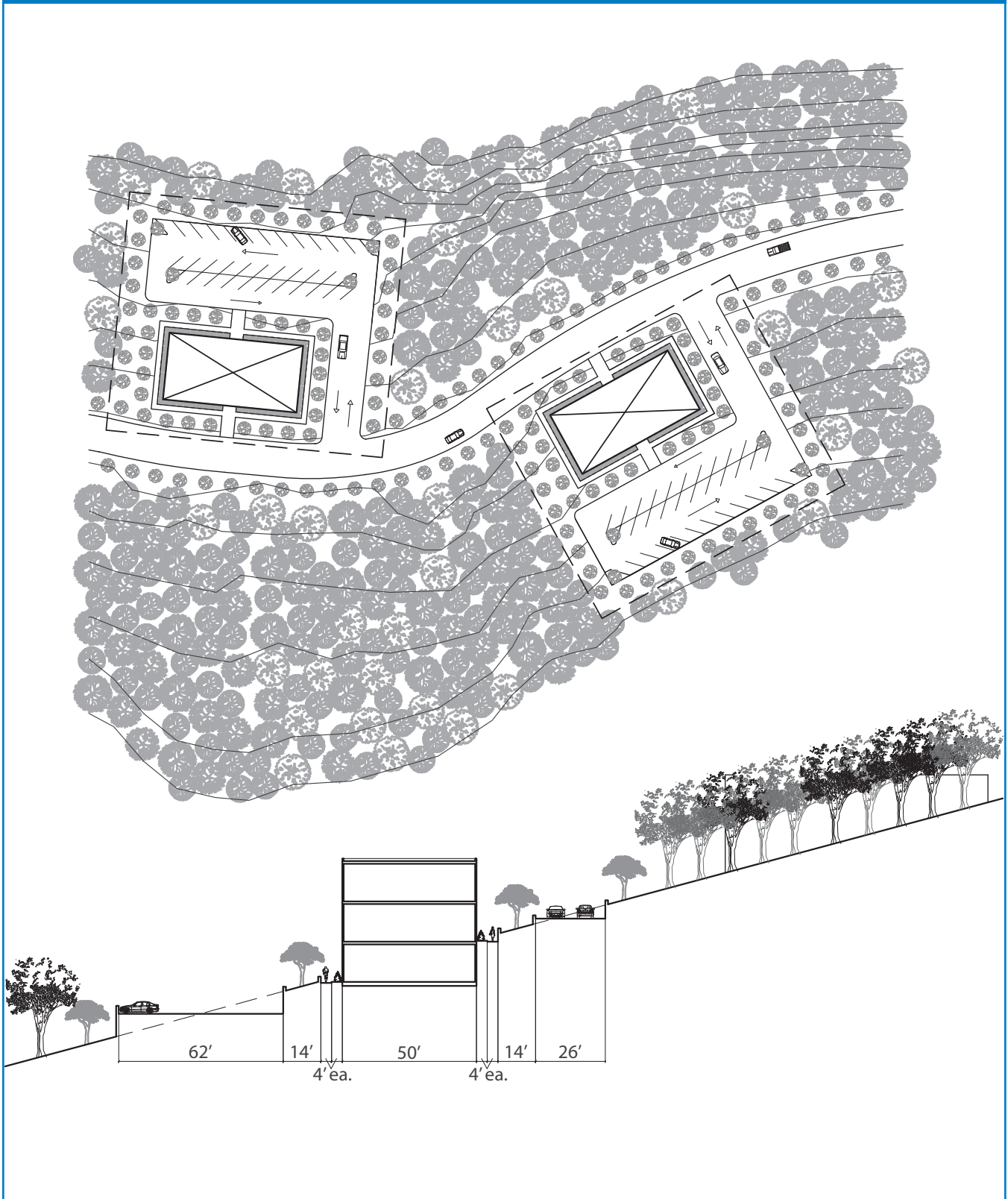




Figure 12: Rear Parking with Staggered Hillside Development Example



## Section 2.1: Architecture

Ideally, the site and building should be planned together as a cohesive whole. The design of each should be complementary to the other. A major emphasis within the Technology Corridor is to create an architecturally integrated complex where buildings respect both their neighbors and the surrounding environment. Buildings should be designed with this in mind.

### GUIDELINES

2.1.1 The building should be recognized as an object on the site that is part of an integrated whole.

- 2.1.2 Doors, windows, recesses, and other architectural elements, as well as a mix of compatible materials, colors and textures, should be used to create visual interest in a building's exterior. Long unbroken facades are discouraged.
- 2.1.3 Building roofs are to exhibit an uncluttered appearance. Where a roof top is visible from roads or nearby properties, an aesthetically-appropriate roof is required.
- 2.1.4 All rooftop, as well as ground-mounted, mechanical equipment is to be completely screened from view by a screening device, evergreen vegetation or by the design of the structure itself (For one example, see Figure 13 on page 32).
- 2.1.5 Any man-made outdoor structures such as water fountains, sculptures, statues, etc., should be compatible in scale with surrounding development.



*A combination of architectural elements creates visual interest in this building's exterior.*

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### Section 2.2: Materials

Besides the shape and design of buildings, an important factor in maintaining quality is the use of high quality building materials. The quality of building materials is to be determined by the Development Authority. The use of durable and aesthetically pleasing building materials tends to improve the value of buildings and land. The use of high quality building materials also promotes visual continuity throughout the Technology Corridor.

#### GUIDELINES

- 2.2.1 Building materials are to be of a permanent nature; temporary buildings are discouraged. If they are developed, however, they should be allowed to remain on the development site for no more than one (1) year. At such time, the structure should be removed and replaced by a more permanent structure designed and built in compliance with these design guidelines.
- 2.2.2 Brick, stone, pre-cast materials, synthetic stucco, architectural metal panels, and glass should be the exterior materials of choice. The use of non-decorative metals and masonry block, as well as cloth and membrane material, is discouraged. Such materials, however, may be used if a project applicant can demonstrate a superior design and layout through landscaping, building placement and/or other site design solution to the degree that the spirit and intent of these guidelines are maintained.
- 2.2.3 Exterior building materials are to have good weathering qualities.
- 2.2.4 Exterior building materials are to be subdued in color.
- 2.2.5. To the extent that they can enhance energy efficiency, exterior building materials and colors consistent with requirements for LEED building certification may be used. (See Section 2.6.)

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### Section 2.3: Floor Plan

A floor plan should be included with the site plan to show the various uses and layout of the building. Entrances and exits should be integrated with the flow of the overall site, parking, and building plans.

#### GUIDELINES

- 2.3.1 The floor plan of the building shall include the location and dimensions of entrances and exits.
- 2.3.2 The floor plan shall show the location of types of activity within a building (Example: manufacturing activity in relation to the office areas).

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### Section 2.4: Entrances

In order to orient the pedestrian to the building, entrances should be a prominent element of the building design. To achieve this, a mix of landscaping and facade treatments is recommended.

#### GUIDELINES

- 2.4.1 Entrances should be prominent elements of the building.
- 2.4.2 Long unbroken facades are discouraged.
- 2.4.3 Entrances should be large enough to be seen from the Pellissippi Parkway or an arterial, but should shift to a human scale as one enters the site.



# 2

# Building Design

## Section 2.5: Service Areas

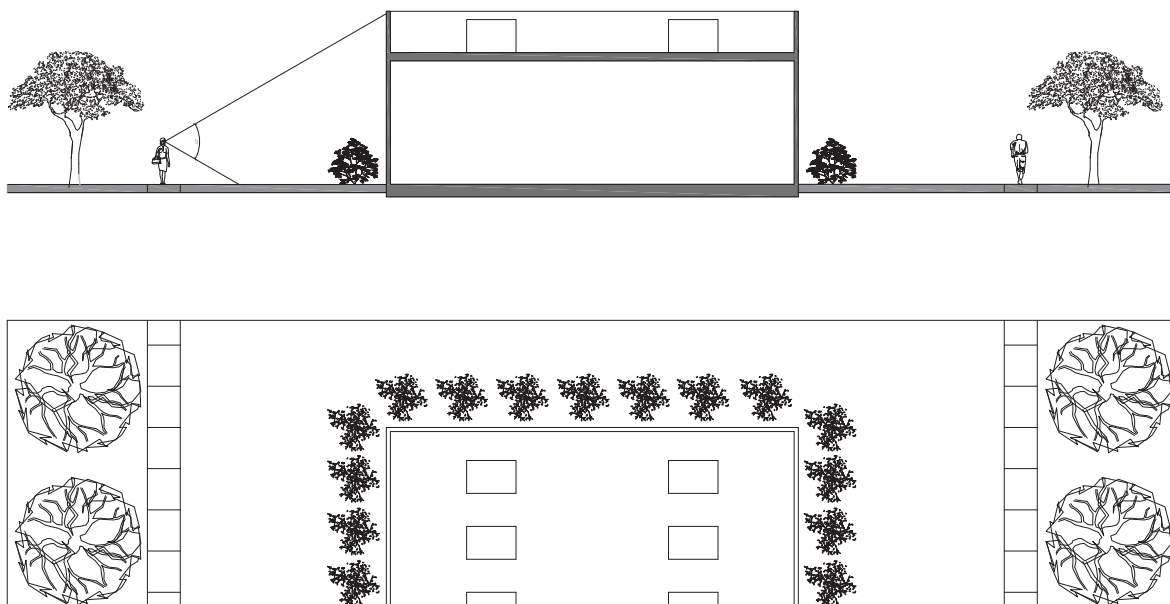
The quality of the Technology Corridor as viewed from public rights-of-way is very important to the image of the Corridor. Service and maintenance areas, because of their propensity to become nuisances, are to be screened from view.



*A combination of building materials and landscaping effectively screen a dumpster pad.*

- 2.5.1 All rooftop and ground-mounted mechanical equipment (HVAC units, ventilating fans, cooling towers, vents, etc.) is to be completely screened from view by a screening device, evergreen vegetation and/or by the design of the building structure itself.
- 2.5.2 Garbage dumpsters shall be screened from view.
- 2.5.3 Loading docks and overhead doors shall be located in the rear of buildings. If the size and shape of the lot prohibits the location on the rear of the building, front or side locations for loading docks and overhead doors may be proposed provided their visual impact can be reduced by landscaping and/or architectural feature.

Figure 13: Roof-Mounted Mechanical Equipment Screening Example



## Section 2.6: LEED Certification

Developers and property owners are encouraged to submit proposals that comply with LEED (Leadership in Energy and Environmental Design) Certification requirements, as established by the U. S. Green Building Council. In such cases, the TTCDA Board may consider waivers to the Design Guidelines, where the guidelines are in conflict with LEED requirements and standards. To be eligible for such waivers, the applicant shall submit a written justification explaining the need for the waiver and how the specific LEED requirement is in conflict with the corresponding requirement of the Design Guidelines.



*The Scripps Networks office expansion has been designed to be eligible for consideration of LEED certification.*

The landscaping guidelines are designed to maintain overall visual continuity within the Technology Corridor. The intent is to reflect the traditional character of the Corridor while providing an atmosphere which is supportive of the needs of high technology industries. The use of setbacks and the open space system of the Technology Corridor provide the buffers between properties. It is important that the existing vegetation in these areas remains largely undisturbed. Areas of landscaping emphasis are overall site, access points, parking areas, and buildings. In all areas a detailed landscaping plan should show the quantities, sizes, and types of plants to be used.

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## Section 3.1: Site

The landscaping of the site should seek to preserve the natural environment. Special attention should be given to buffering adjacent uses and sites.

### GUIDELINES

- 3.1.1 Landscape plans shall be submitted with each request for the approval of a Certificate of Appropriateness for a building permit. Such plans shall be prepared, sealed, signed and dated by a registered landscape architect, or architect, consistent with state law. (Tennessee Board of Architectural and Engineering Examiners.)
- 3.1.2 The landscaping plan for the site should be planned as a total experience, not only for the individual parcel, but also in relation to neighboring properties. There should be continuity in the plan as the pedestrian or motorist travels through the site. There should also be a natural rhythm to plantings to avoid a regimented appearance.
- 3.1.3 Existing vegetation on a site should be preserved as much as possible to complement any new landscaping. Such areas shall be shown on the required landscape plan to be maintained. Every effort should be made to conserve mature trees within thirty (30) feet of the exterior boundary of the site. The area under the drip line of each conserved tree must be marked in the field and shown on the landscape plan.
- 3.1.4 In order to provide year-round greenery, at least 25% of newly planted or conserved trees should be evergreen.
- 3.1.5 When planting trees on a development site, a roughly equal combination of large, medium and small trees (see Appendix B) should be planted, with at least 10 large maturing trees per acre of yard space. Depending on the number of existing trees that are maintained and their characteristics, as described under 3.1.3, the required total of new plantings may be reduced.
- 3.1.6 Indigenous plant materials should be used to preserve the natural quality of the area. Invasive exotic species are prohibited. Any existing invasive species on the development site should be removed (see Appendix B).
- 3.1.7 Buffer materials and berms should be used to minimize noise, to provide transitions between land uses and to screen parking areas. Evergreen species are not only appropriate as screening material, but also are suitable throughout a development (see Appendix B).
- 3.1.8 The required front yard for a 1-, 2- or 3-story building with no parking in front shall be landscaped. A minimum 20-foot landscaped yard shall be placed between the right-of-way and a parking area in front of a building.



## Section 3.2: Site Entryways

The landscaping of the entrance to the site leaves a first and last impression of the Corridor. As such, special attention should be given to points of ingress/egress.

### GUIDELINES

- 3.2.1 The arrival areas should be landscaped to make an introductory statement about each site.
- 3.2.2 Landscaping should be used to accentuate entryways to the site and the building(s) and to provide areas of shade for pedestrians and vehicles.
- 3.2.3 A transitional zone consisting of landscaping and sidewalks is recommended between the building and the parking area.

## Section 3.3: Buildings

The landscaping of areas immediately surrounding buildings is an important factor in both visual quality and energy conservation. This landscaping need not detract from the architectural style, but rather, should complement it.

### GUIDELINES

- 3.3.1 Landscaping should complement the visual quality of buildings.
- 3.3.2 Entrances into buildings should be accented by plantings.
- 3.3.3 Areas around buildings equal to 50% of the area of each front and side elevation shall be planted with ornamental trees, shrubbery and bedding plants (see Appendix B).
- 3.3.4 Minimize shading of south-facing facades in winter; maximize shading of south-facing facades in summer.
- 3.3.5 Landscaping should buffer the building from the microclimate of the parking area.
- 3.3.6 Landscaping should be used to screen mechanical equipment or other unsightly exterior building elements.



*This entrance is well-landscaped with bedding plants, shrubbery and ornamental trees*

## Section 3.4: Parking

One of the most important site elements to be landscaped is the parking area. Landscaping should be used to control the extremes of the parking lot micro-climate. Landscaping should soften the visual impact of row upon row of automobiles. Care must be taken to ensure that parking lots do not detract from the objective of blending new development into the natural setting. Where possible, it is desirable to have the parking lot screened from the view of public rights-of-way.

### GUIDELINES

- 3.4.1 Parking areas should be screened from public rights-of-way by landscaped berms, low level shrubbery or a combination of the two.
- 3.4.2 If surface parking is necessary, existing trees both upslope and downslope should be conserved for environmental and aesthetic purposes. In cases where existing vegetation cannot be saved, or does not exist, medium and large maturing canopy trees should be planted between parking areas.
- 3.4.3 Trees shall be required at the rate of one (1) medium or large maturing canopy tree for every ten parking spaces provided.
- 3.4.4 In addition to the planting of required canopy trees, planting areas for ornamental trees, shrubbery and bedding plants shall be no less than five (5) percent of the surface area devoted to parking.
- 3.4.5 Medium and large maturing canopy and ornamental trees may be chosen from the recommended species list in Appendix B.
- 3.3.6 Mature trees that are preserved within eight (8) feet of the parking area may be used to satisfy up to 50% of the required number of canopy trees, as described in (a) above. In all other respects, however, the number of trees and other plantings required for parking areas shall be in addition to those required under Section 3.1.
- 3.3.7 Required canopy trees shall be located within the parking areas as terminal islands, interior islands, interior wells, medians, traffic delineators, between rows of parking spaces, or in planting areas adjacent to buildings in a manner such that no parking space is located more than sixty (60) feet from the trunk of a large canopy tree.
- 3.3.8 Interior islands at the rate of one for every 200 feet of parking shall be installed to break up long rows of parking stalls.

## Section 4.1: Common Elements

A unified system of signage is used in the Technology Corridor. The intent is to create a cohesive image for visitors traveling within the Corridor and to satisfy the functional needs of building and entry identification. Simple yet sophisticated designs used consistently decrease the amount of clutter and visual disturbance along the roadways and present an image of quality.

### GUIDELINES

- 4.1.1 The message on the sign shall be limited to a maximum of corporate name, logo, street address, and parent company.
- 4.1.2 Sign materials should be substantial and permanent in nature.
- 4.1.3 Signs are to be constructed of materials that are compatible in character and color.
- 4.1.4 Materials and colors should be either the same as or compatible with those used on the building.
- 4.1.5 Finishes should be matte or flat, as opposed to glossy or reflective finishes.
- 4.1.6 The number of colors on each sign should be limited to three. However, the number of sign colors may exceed three where it is desirable to preserve a corporate image, or to portray a unified theme for a multi-tenant development based on a well-conceived signage plan.
- 4.1.7 Molded sheet plastic fully illuminated signs are prohibited.
- 4.1.8 Signs should be illuminated either through the use of properly screened ground-mounted lights or by using back lit letters (reversed channel type) with concealed neon tubes. Signs, however, may be directly illuminated by means of LED (light emitting diode) technology, if such illumination does not distract from the overall design and appearance of the structure or building. Signs for medium density residential buildings and developments should be illuminated only by means of ground-mounted lights, or back lit letters, creating a halo effect.
- 4.1.9 Signs for individual sites, while designed to satisfy the key objective of expressing individual corporate image, must also be of a character and size consistent with the overall signage system.



*This sign for a multi-business office park complies with the Technology Corridor Design Guidelines.*



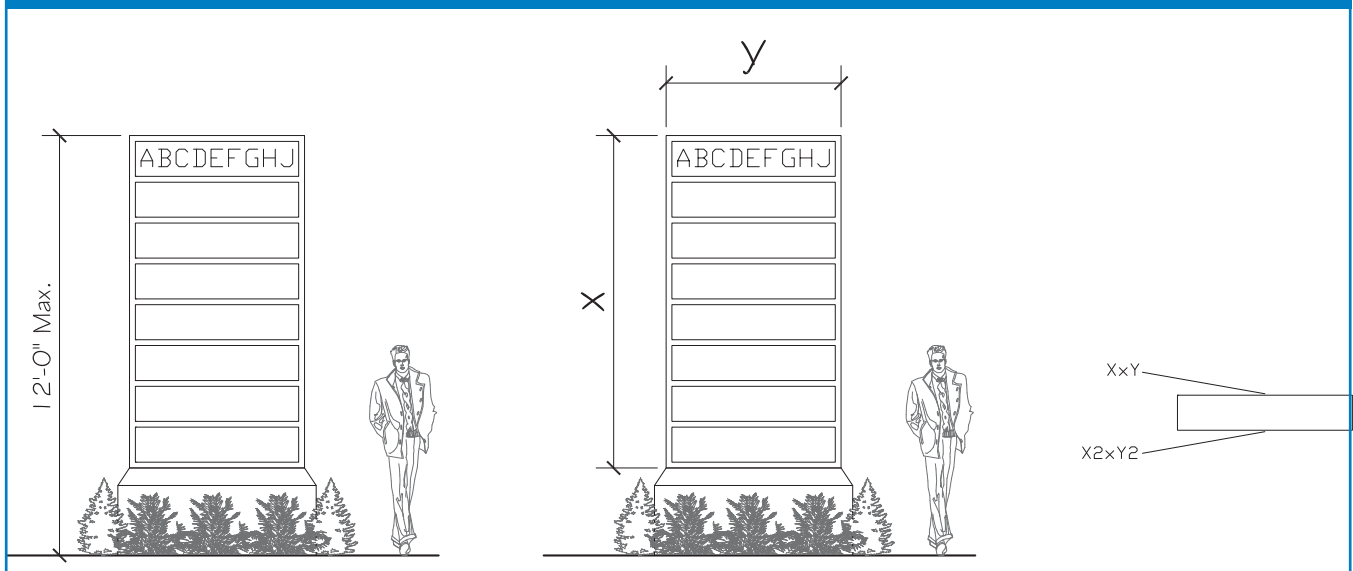
### Section 4.2: Subdivision and Planned Development Signs

Business parks and other subdivisions within the Corridor often require a unified system of signage to perform the function of orientation and building identification. The sign system within a subdivision or planned development should meet all previous signage guidelines located in this document. Subdivisions and planned developments, however, may be granted approval of a number of signs if their use can be justified in performing the function of vehicle and pedestrian orientation or building identification. Subdivision and planned development entrance signs will be allowed to exceed the size of individual yard signs by two times.

#### GUIDELINES

- 4.2.1** Sign size for a subdivision or planned development sign is limited to 1 square foot of sign for every linear foot of road frontage within the subdivision, up to a maximum of 200 square feet per sign.
- 4.2.2** Subdivision signs shall be no taller than 12 feet, measured from the finished grade, and must be ground mounted with fully enclosed bases.
- 4.2.3** Subdivision entrance signs shall be limited to no more than one (1) sign per street frontage for the development, with the number of signs not to exceed two (2). In this case, the maximum total square footage allowed for both signs shall not exceed a maximum of 300 sq. ft. The total square footage for one (1) sign shall not exceed 200 sq. ft.
- 4.2.4** Additional signs for vehicle and pedestrian orientation or building identification and for traffic circulation and control may also be approved consistent with an overall sign plan prepared for the development.
- 4.2.5.** For the purpose of calculating sign size, the area devoted to the sign's message shall be used. Any portion of the sign's structure, supporting members, or decorative features is excluded from calculating the size of the sign. All sides of the sign shall be used to calculate total sign area.

Figure 14: Subdivision/Planned Development Sign Height/Area Calculation Example



## Section 4.3: Yard Signs

The presence of signs in a yard should not detract from the natural features of the Corridor. The preceding guidelines should be followed as well as the following:

### GUIDELINES

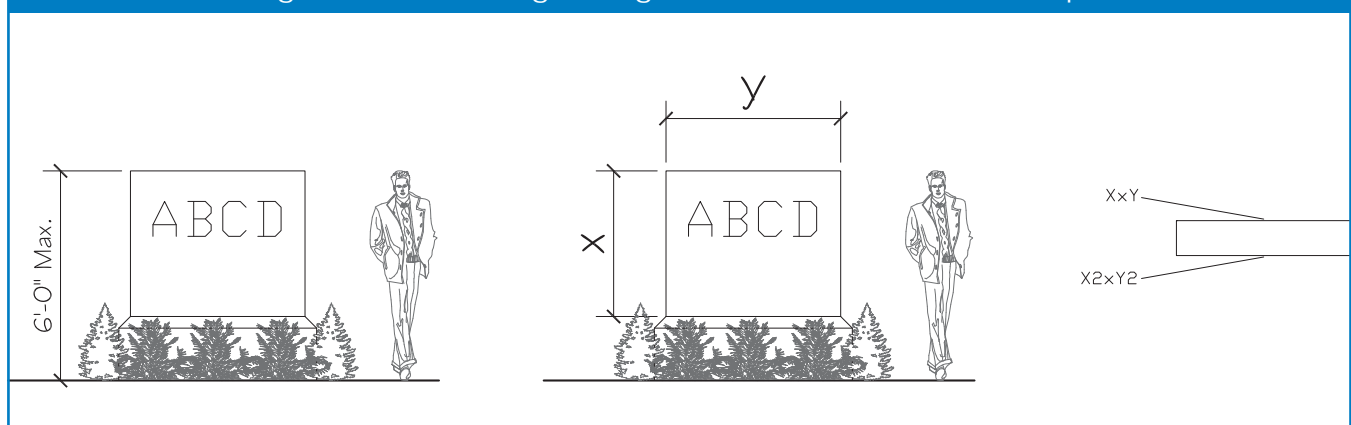
4.3.1 For non-residential developments, only one monument (or yard) sign shall be permitted per building. For residential developments comprised of only one building, only one monument (or yard) sign shall be permitted. For residential developments of more than one building, a subdivision or planned development sign may be used, consistent with the requirements of Section 4.2.



*This is an example of a well-designed and landscaped yard sign in the Technology Corridor.*

- 4.3.2 No monument (or yard) sign shall be placed closer to the public right-of-way than twenty (20) feet.
- 4.3.3 Monument (or yard) signs shall be no taller than 6 feet, measured from the finished grade.
- 4.3.4 Sign size, or message area, is limited to 1 square foot of sign for every linear foot of building frontage up to a maximum of 100 square feet. The maximum allowable square footage shall be measured using all sides of the proposed sign. (Example: A two-sided sign with 50 sq. ft. on each side would equal 100 allowable square feet.)
- 4.3.5. For the purpose of calculating sign size, the area devoted to the sign's message shall be used. Any portion of the sign's structure, supporting members, or decorative features is excluded from the calculating the size of the sign. However, the size of the supporting structure using the extreme outer limits of the structure for area calculation shall not exceed  $1\frac{1}{2}$  times the allowable square footage for the message area. Again, all sides shall be used in this calculation. (Example: A sign with a message area of 50 sq. ft. on one side could have an overall area of 75 sq. ft. for one side. For both sides, the message area would be 100 sq. ft. and the overall area would be 150 sq. ft.)

Figure 15: Yard Sign Height/Area Calculation Example



### Section 4.4: Building Signs

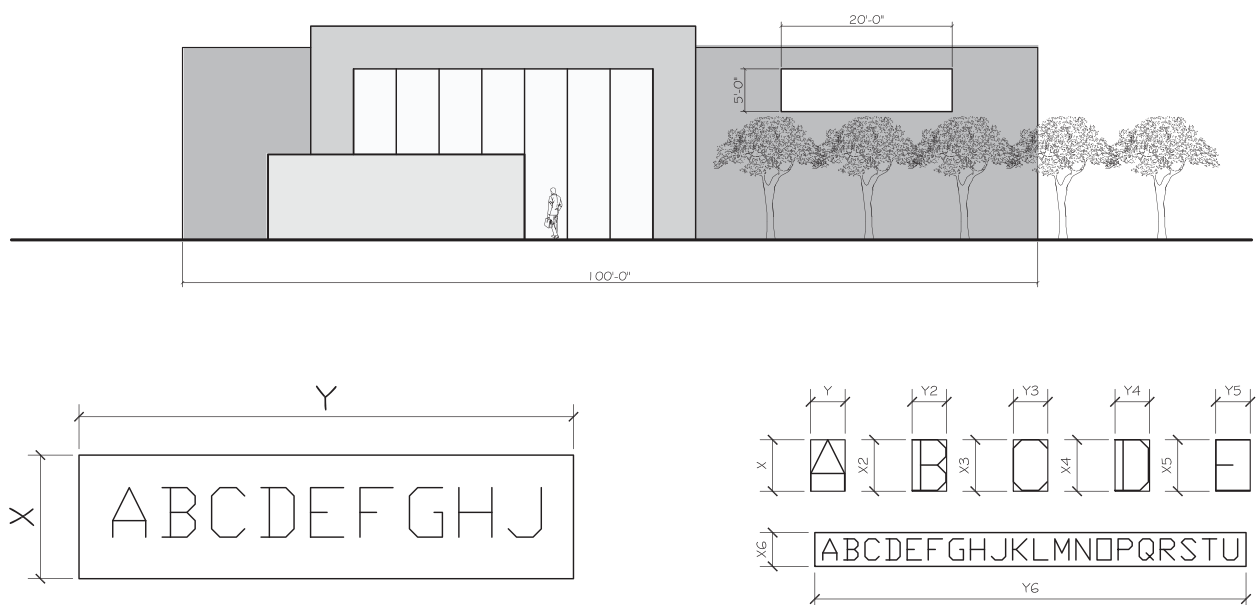
Signs on buildings should reflect the character of the building through the use of compatible colors and materials. Multi-tenant buildings may be granted approval of a number of signs if their use can be justified for orientation and business identification purposes.

#### GUIDELINES

- 4.4.1 All building (or wall) signs should be sensitive to the design of the buildings or businesses they identify and discrete using colors which accent building colors and materials.
- 4.4.2 Signs on building facades shall not protrude above the height of the building and shall consist only of letters and/or symbols. Their design should not detract from the overall design and appearance of the building.

- 4.4.3 Sign size is limited to 1 square foot of sign for every linear foot of building or business frontage up to a maximum of 100 square feet. The size of a sign shall be measured by using the outer limits of the surface of the sign upon which the copy is placed. The size of signs that are comprised exclusively of letters and/or symbols shall be measured using the outer limits of each letter and symbol.
- 4.4.4 Wall signs shall not be permitted for residential structures, except for the purpose of building identification. (Examples: Building A, Building 201, Building 4 East, etc.)

Figure 16: Building Sign Height/Area Calculation Example





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## Section 4.5: Interim Signs

While signs of a non-permanent nature are generally not permitted, interim signs of various types are important to marketing the Corridor's land base and identifying construction and development projects. Any sign that is not permanent in nature and fails to meet permanent sign requirements must be of the following type and meet the respective specifications:

### GUIDELINES

- 4.5.1 **Project Construction Signs.** Temporary signs which identify construction sites shall not exceed 64 square feet in size and may contain information as to the identity of the future facility and its occupant, the firm participating in the design and construction, and anticipated date of completion, and the responsible party for inquiries and emergency situations. Only one sign is permitted per site and shall be removed upon completion of all construction activity and before occupancy of the building.
- 4.5.2 **Real Estate Signs.** "For Sale" and "For Lease" signs, often with the name and/or logo of the listing real estate firm, shall be limited in number to one per parcel. The size shall be limited to one square foot of sign for every four feet of lot road frontage up to a maximum of 64 square feet for one face or 32 square feet per face with 2 faces maximum. Real estate signs shall have a maximum height of 6 feet, measured from ground level (natural grade).
- 4.5.3 **Special Event Signs.** These signs will comply with all guidelines adopted for permanent signs except those that relate to materials and/or permanence. Special event signs must be completely removed following the event and are permitted only on the premises and during the event but in no case longer than fifteen (15) days.

# 5 Residential Development

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## Section 5.1: Medium and High Density Residential Development in the Technology Overlay

Changes to the TTCDA state enabling legislation allowing the review of medium and high density residential developments were adopted in the spring of 2011. As such, standards for site design, building design, landscaping, and signage for medium and high density residential development are found in those respective sections of these Design Guidelines.

## **A***ppendices*

## Appendix A: Glossary of Terms

**Average Natural Grade:** The average existing grade elevation of the location of the proposed structure or building (prior to any grading or construction); calculated around the proposed perimeter of the building or structure at or directly below its outermost exterior walls (not including uncovered decks, stairs and similar structures).

**BP Zone/BP-1 District:** The “business and technology park” zoning classification as defined by the *Knox County Zoning Ordinance* (BP) and the *Knoxville Zoning Ordinance* (BP-1).

**Building Frontage:** That portion of a building facing a street.

**Certificate of Appropriateness:** Written verification that requests to seek approval of building and grading permits, sign permits, rezoning requests, and variances have been approved by the TTCCA Board.

**Construction:** Any land disturbance activity, including clearing, grading, grubbing, building and the installation of roads and utilities.

**Detention Pond:** A temporary holding pond used to control excessive storm water runoff on a site.

**Finished Grade:** The elevation of the manufactured grade of that portion of the lot covered by the structure following the completion of an approved grading operation.

**Floor Area Ratio:** The ratio of the gross floor area of the building to the area of the lot on which the building is located.

**Gross Floor Area:** The sum of the total floor area for each of the several stories under roof, measured from the exterior limits or faces of a building or structure.

**Ground Area Coverage:** The ratio of the total floor area of the ground floor of the building to the area of the lot on which it is located.

**Hotel:** Any building containing twelve (12) or more guest rooms, intended or designed to be used, or which are used, rented or hired out for sleeping purposes by guests.

**Illumination, Direct:** Illumination by an artificial light source installed on, or transmitted through, a sign surface.

**Illumination, Indirect:** Illumination by reflected light intentionally directed upon a sign surface, or silhouettes of letters or symbols placed before a background of reflected light.

**Impervious Area Ratio:** The ratio of the surfaces which do not absorb rain to the gross area of the lot.

**LEED:** Leadership in Energy and Environmental Design

**Lot:** A parcel of land which is or may be occupied by a building and its accessory buildings or uses customarily incident thereto, together with such yards or open spaces within the lot lines as may be required by the *Design Guidelines*, or the zoning ordinances.

**Lot Frontage:** That dimension of a lot or portion of a lot abutting on a street, excluding the side dimension of a corner lot.

**Microclimate:** A small area that is characterized by substantially different temperatures than other areas of the site. (Example: parking lot)

**Minimum Lot Size:** The minimum size of a lot that can exist in a given area usually defined by the zoning ordinance.

**Motel:** A building, or group of buildings, used for the temporary residence of motorists or travelers.

**Office, Business:** A place for the conduct of a business that does not include any retail sales.

**Office, Medical or Dental:** A facility, or clinic, for the examination and treatment of ill and afflicted human outpatients provided, however, those patients are not kept overnight except under emergency conditions.

**Office, Professional:** The office of a member of a recognized profession maintained for the conduct of that profession.

**Restaurant:** An establishment where food and drink are prepared, served, and consumed primarily on site.

**Retail Establishment:** An establishment engaged in selling goods or merchandise to the general public for personal or household consumption and rendering services incidental to the sale of such goods.

**Retention Pond:** A permanent storage pond, primarily for storm water runoff.

**Right-of-way:** An area used as a public way, measured from boundary line to boundary line, which may also accommodate public utilities.

**Scenic Highway:** A route in the City of Knoxville or Knox County, as designated by the State of Tennessee as part of the State Scenic Highway System.

**Setback:** A line delineating the minimum allowable distance between the property lines of the building lot and the structure, within which no building shall be placed.

**Shopping Center:** A group of commercial (retail) establishments, planned, developed and managed as a unit, with off-street parking provided on the property, and related in its location, size and type of shops to the trade area which the unit serves.

**Sign, Building:** A sign that is affixed to a building, or individual business, that identifies the building, or business. The sign may be comprised of letters and logo on a panel, or individual letters and logo directly attached to the building. Also referred to as a wall sign.

**Sign, Ground:** A sign supported by a pole, uprights, or braces on the ground. A monument sign is a type of ground sign.

**Sign, Monument:** A ground sign with a fully enclosed base that identifies a single business, residential development or building. Also referred to as a yard sign

**Sign, Subdivision (or Planned Development):** A ground-mounted sign, with a fully enclosed base, that identifies a commercial or industrial subdivision, or other planned development.

**Sign, Yard:** See monument sign.

**Story:** That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof above.

**TO Zone/TO-1 District:** The "technology overlay" classification as defined by the *Knox County Zoning Ordinance (TO)* and the *Knoxville Zoning Ordinance (TO-1)*. The *Design Guidelines* applies to properties within the area that abuts the Pellissippi Parkway (State Route 162) in Knox County, between I-40/75 on the south and Oak Ridge Highway (State Route 62) on the north.

**TTCDA:** The Tennessee Technology Corridor Development Authority. The TTCDA Board of Commissioners is the regulatory authority for reviewing and approving requests for Certificates of Appropriateness in the Technology Overlay.

**Unified Development:** A development characterized by multiple uses that, by virtue of compatible building design standards, pedestrian and vehicular connections, related landscaping treatment, or other site development features, are brought together in a unifying whole and approved as part of an overall master plan. Shopping centers, office parks and mixed use developments are examples of unified developments.

**Variance:** Permission granted by the County (or City) Board of Zoning Appeals that allows a development to vary from the requirements of the zoning ordinance and is granted in the case of hardship, such as an irregular site configuration or physical characteristic of the property.

**Waiver:** Permission granted by the TTCDA Board that waives a development requirement or standard of the *Design Guidelines*.

## Appendix B: Landscape Guidance

LARGE TREES Mature Height More than 50'	Table 1: LARGE TREE SPECIES RECOMMENDATIONS							
	Interchanges/ Grade Separations	Medians	Parking Lots or Similar 'Hardscape'	Near Sidewalks	Under Utility Lines	Visibility Concern Areas**	Yards	Hillside Reforestation ***
American Basswood (Linden)*	YES	YES	YES	YES	NO	YES	YES	YES
White Basswood (Linden)	YES	YES	YES	YES	NO	YES	YES	YES
American Beech*	YES	YES	NO <sup>B</sup>	NO <sup>B</sup>	NO	YES	YES	YES
European Beech	YES	YES	NO <sup>B</sup>	NO <sup>B</sup>	NO	YES	YES	YES
Blackgum*	YES	YES	NO	NO	NO	YES	YES	YES
Yellow Buckeye	YES	NO	NO	NO	NO	YES	YES	YES
Bald Cypress*	YES	YES	NO	NO	NO	YES	YES	NO
American Elm	YES	YES	YES <sup>C</sup>	YES <sup>C</sup>	NO	YES	YES	YES
Hackberry*	YES	YES	NO	NO	NO	YES	YES	YES
European Hornbeam	YES	YES	YES	NO	NO	NO	YES	NO
Ginkgo	YES	YES	NO <sup>D</sup>	NO	NO	YES	YES <sup>E</sup>	NO
Red Maple*	YES	YES	YES	YES	NO	YES	YES	YES
Sugar Maple*	YES	YES	YES	YES	NO	YES	YES	YES
Black Oak	YES	YES	NO	NO	NO	NO	YES	YES
Bur Oak	YES	YES	NO <sup>B</sup>	NO <sup>B</sup>	NO	YES	YES	YES
Chestnut Oak*	YES	YES	YES	YES	NO	YES	YES	YES
Chinkapin Oak*	YES	YES	NO <sup>B</sup>	NO <sup>B</sup>	NO	YES	YES	YES
English Oak	YES	YES	YES	YES	NO	YES	YES	NO
Northern Red Oak*	YES	YES	YES	YES	NO	YES	YES	YES
Post Oak	YES	YES	NO	NO	NO	NO	YES	YES
Sawtooth Oak	YES	YES	YES	YES	NO	YES	YES	NO
Scarlet Oak*	YES	YES	YES	YES	NO	YES	YES	YES
Shumard Oak*	YES	YES	YES	YES	NO	YES	YES	LIMITED
Southern Red Oak*	YES	YES	YES	YES	NO	YES	YES	LIMITED
White Oak*	YES	YES	YES	YES	NO	YES	YES	YES
Willow Oak*	YES	YES	YES	YES	NO	YES	YES	YES
Loblolly Pine*	YES	NO	NO	NO	NO	NO	YES	LIMITED
Pitch Pine	YES	YES <sup>A</sup>	NO	NO	NO	NO	YES	YES
Shortleaf Pine*	YES	YES <sup>A</sup>	NO	NO	NO	NO	YES	YES
White Pine*	YES	YES <sup>A</sup>	NO	NO	NO	NO	YES	YES
London Planetree/Sycamore* <sup>F</sup>	YES	YES	NO	NO	NO	YES	NO	NO
Tulip Poplar*	YES	YES	YES	YES	NO	YES	YES	LIMITED
Dawn Redwood	YES	YES <sup>A</sup>	NO	NO	NO	NO	YES	NO
Sweetgum*	YES	YES	NO <sup>B</sup>	NO <sup>B</sup>	NO	YES	YES	LIMITED
Black Cherry*	NO	NO	NO	NO	NO	NO	YES	YES
Virginia Pine*	NO	YES <sup>A</sup>	YES	NO	NO	NO	YES	YES
Laurel Oak	YES	YES	NO	YES	NO	NO	YES	NO
Winged Elm	YES	YES	YES	NO	NO	NO	YES	YES
Eastern Hemlock	NO	NO	NO	NO	NO	NO	YES	NO

A. If site does not obstruct visibility and median width is acceptable

B. Large nuts can cause difficulties under foot

C. If hybrid, disease-resistant variety is used

D. Because of slow-growing nature and 'stick-like' appearance

E. Male trees, only

F. Two different species; both can produce pollen, causing allergies

\* Native to south central United States

\*\*Tree placement and maintenance procedures should be respectful of sight distance

\*\*\*Yes = well suited for shallow, poor soil quality on disturbed hillsides;

No = non natives, slow growth rate or riparian-oriented species;

Limited = better suited for good soil conditions and north-facing slopes



MEDIUM TREES Mature Height 30' - 50'	Table 2: MEDIUM TREE SPECIES RECOMMENDATIONS							
	Interchanges/ Grade Separations	Medians	Parking Lots or Similar 'Hardscape'	Near Sidewalks	Under Utility Lines	Visibility Concern Areas**	Yards	Hillside Reforestation ***
Arbervitae*	YES	YES	YES	NO	NO	NO	YES	LIMITED
River Birch*	YES	YES	NO	NO	NO	YES	YES	NO
Catalpa*	YES	YES	NO	NO	NO	NO	YES	YES
Atlantic White Cedar*	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	NO
Deodar Cedar	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	NO
Eastern Red Cedar*	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	YES
Kentucky Coffeetree <sup>8</sup>	YES	YES	NO	NO	NO	YES	YES	YES
Amur Cork Tree	YES	YES	YES	YES	NO	YES	YES	NO
Cryptomeria	YES	YES	YES <sup>B</sup>	NO	NO	NO	YES	NO
Lace-bark Elm	YES	YES	YES	YES	NO	YES	YES	NO
Smooth Leaf Elm	YES	YES	YES	YES	NO	YES	YES	NO
Eastern Hemlock*	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	NO
American Holly*	YES	YES	YES <sup>B</sup>	NO	NO	NO	YES	NO
Thornless Honeylocust*	YES	YES	YES	YES	NO	YES	YES	YES
American Hornbeam*	YES	YES	YES	NO	NO	YES	YES	NO
Eastern Hophornbeam*	YES	YES	YES	NO	NO	YES	YES	NO
Little-leaf Linden	YES	YES	YES	YES	NO	YES	YES	NO
Silver Linden	YES	YES	YES	YES	NO	YES	YES	NO
Black Locust*	YES	YES	YES	NO	NO	YES	YES	YES
Southern Magnolia*	YES	YES <sup>A</sup>	NO	YES	NO	NO	YES	NO
Sweetbay Magnolia*	YES	YES	YES <sup>B</sup>	YES	NO	NO	YES	NO
Hedge Maple	YES	YES	YES	YES	NO	YES	YES	NO
Trident Maple	YES	YES	YES	YES	NO	YES	YES	NO
Austrian Pine	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	NO
Japanese Red Pine	YES	YES	YES	NO	NO	NO	YES	NO
Chinese Pistache	YES	YES	YES	YES	NO	YES	YES	NO
Sassafras*	YES	YES	NO	YES	NO	YES	YES	YES
Sourwood*	YES	YES	NO	YES	NO	YES	YES	LIMITED
Colorado Blue Spruce	YES	YES <sup>A</sup>	YES <sup>B</sup>	NO	NO	NO	YES	NO
White Spruce	YES	YES	YES <sup>B</sup>	NO	NO	NO	YES	NO
Weeping Willow <sup>C</sup>	YES	NO	NO	NO	NO	NO	YES	NO
Yellowwood*	YES	YES	YES	YES	NO	YES	YES	NO
Zelkova	YES	YES	YES	YES	NO	YES	YES	NO

A. Avoid planting where there are breaks in median for turning across travel lanes. Plant where a screen from on-coming car headlights is needed.

B. Use at edges of parking lots for border or buffering purposes. Do not use in islands or medians of parking lots.

C. Avoid near septic systems and similar problem areas.

\* Native to south central United States

\*\* Tree placement and maintenance procedures should be respectful of sight distance

\*\*\* Yes = well suited for shallow, poor soil quality on disturbed hillsides;

No = non natives, slow growth rate or riparian-oriented species;

Limited = better suited for good soil conditions and north-facing slopes

SMALL TREES Mature Height Less than 30'	Table 3: SMALL TREE SPECIES RECOMMENDATIONS							
	Interchanges/ Grade Separations	Medians	Parking Lots or Similar 'Hardscape'	Near Sidewalks	Under Utility Lines	Visibility Concern Areas**	Yards	Hillside Reforestation ***
Blackhaw*	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	LIMITED
Rusty Blackhaw*	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	LIMITED
Red Buckeye*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Carolina Buckthorn*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Oriental Cherries	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	YES
Carolina Cherrylaurel*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Flowering Crabapple <sup>C</sup>	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	LIMITED
Crepe Myrtle	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Flowering Dogwood*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Kousa Dogwood*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Pagoda Dogwood	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Autumn Flametree	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	YES
American Fringetree*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Chinese Fringetree	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Golden Raintree	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Cockspur Hawthorn	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Foster Holly	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Amur Maple	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Japanese Maple	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Pawpaw*	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	LIMITED
Eastern Redbud*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	YES
Service Berry*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Carolina Silverbell*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
European Smoketree	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
American Smoketree*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	YES
Sourwood*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	LIMITED
Mountain Stewartia	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Witch-hazel*	YES	YES	YES <sup>A</sup>	YES	YES	YES <sup>B</sup>	YES	NO
Southern Crabapple	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	YES
Hawthorns <sup>D</sup>	YES	YES	YES <sup>A</sup>	NO	YES	YES <sup>B</sup>	YES	LIMITED

A. Should not be used for more than 25% of parking lot trees. Do not use in parking lot islands. May be used in parking lot medians

B. If properly trimmed. Some species will need to be pruned in their early years to allow space for pedestrian traffic; additional trimming may be needed.

C. Note that Flowering Crabapple and Red Cedar should not be planted near each other because of potential cedar apple rust disease.

D. Examples include Washington and Wintering Hawthorns

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No = non natives, slow growth rate or riparian-oriented species;

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Table 9: PLANT RECOMMENDATIONS FOR EXPOSED WALLS

Common Name	Botanical Name	Mature Size	Light Requirement	Notes
<b>COLUMNAR EVERGREENS</b>				
Spartan Juniper	Juniperus chinensis 'Spartan'	14-16' H x 6-8' W in 10 yrs	Full sun	
Skyrocket Juniper	Juniperus scopulorum 'Skyrocket'	14-16' H x 6-8' W in 10 yrs	Full sun	
Emerald Sentinel Red Cedar	Juniperus virginiana 'Emerald Sentinel'	14-16' H x 6-8' W in 10 yrs	Full sun	
Lawson's False Cypress	Chamaecyparis lawsoniana	6-10' H	Full sun	Native; slow grower; winter interest
Arborvitae 'Emerald Green'	Botanical: Arborvitae	10-15' H x 4-5' W	Full sun or light shade	
Juniper 'Hetzi Columnar'	Juniper hetzi columnaris	10-15' H x 3-5' W	Full sun	Upright pyramidal habit with rich green foliage
Juniper 'Hollywood' aka 'Torolusa'	Juniperus chinensis 'Torolusa'	10-15' H x 6-7' W	Full sun or part shade	
<b>SCREENING EVERGREENS</b>				
Emily Bruner Holly	Ilex x meserveae 'Emily Bruner'	Around 10' H x 6-8' W	Sun	
Nellie Stevens Holly	Ilex cornuta 'Nellie R. Stevens'	Shrub to 12' H x 15' W	Sun	Heat & drought tolerant; tolerates part shade
Little Gem Southern Magnolia	Magnolia grandiflora 'Little Gem'	Up to 12' H in 15 yrs	Full sun or part shade	
Japanese Cryptomeria	Cryptomeria japonica		Full sun or part shade	Conical
Cherry Laurel	Prunus caroliniana		Full sun or part shade	see English Laurel; withstands heavy pruning
Foster Holly	Ilex x attenuata 'Fosteri'		Full sun or part shade	
Norway Spruce	Picea abies	'Conica' less than 15'	Full sun	
Burford Holly	Ilex cornuta 'Burfordii'	Can get to 12' H	Sun to part shade	
English Yews	Taxus baccata cultivars	40' but most of time much less	Sun or shade	'Aurea' has gold foliage
Japanese Yews	Taxus cuspidate cultivars	15' H	Dry & shady	Faster grower than English Yew; pollution tolerant; good for urban conditions
Hybrid Yews	Taxus x media	to 8' H & W	Sun or shade	
Burkwood Viburnum	Viburnum x burkwoodii	8' - 10' H	Sun to light shade	Semi evergreen
Weeping Canadian Hemlock	Tsuga Canadensis 'Pendula'	10 - 15' H x 8 - 10' W	Full sun; tolerates shade well	Will grow in full sun in well-drained soil

Common Name	Botanical Name	Mature Size	Light Requirement	Notes
<b>DECIDUOUS</b>				
Adirondack Crabapple	Malus 'Adirondack'	10' - 12' H x 6' W	Sun	Good screen
Lipan Crepe Myrtle	L. indica x L. fauriei 'Lipan'	13' - 20' H x 13' - 20' W	Sun	Highly mildew resistant
Sioux Crepe Myrtle	L. indica x L. fauriei 'Sioux'	15' - 20' H x 10' - 15' W	Sun	Long period of striking summer flower color
Yuma Crepe Myrtle	L. indica x L. fauriei 'Yuma'	12' - 18' H x 12' - 15' W	Sun	Slow growth; blooms June - September
Jane Magnolia	Magnolia liliiflora 'Jane'	10' - 20' H x 10' - 20' W	Full sun to part shade	Moderate growth; strong and vigorous; blooms late enough to avoid frost
Blackhaw, Plum Leaf Viburnum	Viburnum prunifolium	12' - 15' H x 8' - 12' W	Sun to part shade	Moderate growth; attracts birds
Smoke Tree	Cotinus coggygria	usually 10' - 15' H	Sun	Bushy shrub; strong orange and bronze color in fall
Variegated Yellow-Twig Dogwood	Cornus sericea	7-10' H x 10-15' W	Full sun	Dark, blood red bark

NOTE: Minimum Tree Size at Planting:

- Flowering/Ornamental = 1.5 inch caliper
- Shade/Canopy = 2 inch caliper
- Evergreen = 6 feet height

Table 10: PLANT RECOMMENDATIONS FOR FOUNDATIONS				
Common Name	Botanical Name	Mature Size	Light Requirement	Notes
EVERGREENS				
Chinese Junipers	Juniperus chinensis cultivars	2-3' to 40' H	Full sun	Can tolerate dry soil once established
Camellia	Camellia japonica	20-25' H	Full sun to part shade	
Rosebay Rhododendron	Rhododendron maxima	Usually 4-15' H	Part shade	Can tolerate dense shade
English Laurel	Prunus laurocerasus cultivars	15' - 20' H cultivars can be 3-4' H	Full sun or shade; best in shade in well drained soil	Withstands pruning
Cherry Laurel	See English Laurel			Flowers mid to late spring
Leatherleaf Mahonia	Mahonia bealei	Up to 6' H & 3-4' WW	Shade to part shade	Deep green leaf color
Leatherleaf Viburnum	Viburnum rhytidophyllum	10' - 15' H	Shade	Fast growing; alkaline soil; produces berries
Burkwood Viburnum	Viburnum x burkwoodii	8' - 10' H	Sun to part shade	Semi evergreen; flowers
Arborvitae 'Berkman's Golden'	Arborvitae	5' - 6' H x 3' - 4' W	Full sun or light shade	Golden foliage; good for corners, low screen, or as a specimen
Juniper 'Blue Point'	Juniperus chinensis	8' - 9' H x 4' - 5' W	Full Sun	Blue evergreen foliage, upright pyramidal
Juniper 'Sea Green'	Juniperus chinensis	5-6' H x 4-5' W	Full Sun	Vibrant, rich green foliage; upright mid-size; very hardy and pest resistant
'Mohave' Firethorn	Pyracantha 'Mohave'	6' - 10' H	Sun to part shade	Densely branched, red-orange fruit in fall
SMALL ORNAMENTAL TREES*				
Linden Viburnum	Viburnum dilatatum	10' H	Part shade	Deciduous
Chokeberry	Aronia arbutifolia	6-10' H x 3-5' W	Full sun to part shade	
Oakleaf Hydrangea	Hydrangea quercifolia	Usually 4-6' H	Sun to part shade	
Virginia Sweetspire	Itea virginica 'Henry's Garnet'	3-5' H	Full sun to part shade	Deciduous; summer fragrance, white flowers; leaves fall early winter
Maple-leaved Viburnum	Viburnum acerifolia	4-6' H x 4' W	Shade	
Highbush Blueberry	Vaccinium corymbosum	6-12' H and W	Full sun to part shade	
Blackhaw Viburnum	Viburnum prunifolium	12' - 15' H x 8' - 12' W	Full sun to part shade	White flowers and berries; wildlife value
Fothergilla	Fothergilla sp.	6-10' H	Full sun	Can handle part shade
Beautyberry	Callicarpa americana	3-8' H	Sun or shade	Broken shade optimal
Ninebark	Clethra acuminata	5-10' H x 6-10' W	Full sun to part shade	
Summer-sweet	Clethra alnifolia	4-8' H x 4-6' W	Full sun to part shade	
Witchhazel	Hamamelis virginiana	10-15 H	Full sun or part shade	Avoid extreme dry conditions
Bottlebrush Buckeye	Aesculus parviflora	8-12' H x 8-12' W	Full sun or part shade	
Sweetshrub	Calycanthus floridus	6' - 9' H	Full Sun	



Common Name	Botanical Name	Mature Size	Light Requirement	Notes
Silky Dogwood	Cornus amomum	6-10' H and W	Part shade best	Performs well in full sun
Winterberry Holly	Ilex verticillata	6' - 10' H x 4' - 10' W 'Nana' dwarf variety, 4'	Full sun to part shade	Tolerates wet conditions; produces red berries
Spicebush	Lindera benzoin	6' - 12' H x 6' - 12' W	Full sun to part shade	Deciduous
Fragrant Sumac	Rhus aromatica	2-6' H x 6-10' W	Shade to full sun	
Winged Sumac	Rhus copallina	Up to 20' H x 10' W	Full sun to part shade	
Coralberry	Symphoricarpos orbiculatus	6' x 6'	Full sun	Tough adaptable shrub; bright pink/red fruit; berries last long past leaf fall
Loropetalum	Loropetalum Chinese	4' - 15' H x 4' - 8' W depending on variety	Full sun preferred; will tolerate some shade	Deep purple-red with the fringe-like fuschia-pink flowers in Spring and Fall
Rose 'Knockout'	Rosa	4' - 5' H x 4' - 5' W	Full sun or afternoon shade	
Upright Yew	Podocarpus	5'+ H x 3' - 4' W	Full sun or part shade	Needlelike dark blue-green, upright, columnar growth habit
<b>SHRUBS SUITABLE FOR USE UNDER WINDOWS</b>				
Creeping Junipers	Juniperus horizontalis 'Blue Rug	4-6' H x 6-8' W	Full sun	
Shore Junipers	Juniperus conferta 'Blue Pacific'	Never more than 1' H	Full sun	
Rotunda Holly	Ilex cornuta 'Rotunda'	3-4' H x 6' W	Sun; withstands shade	Tough and durable; heat and drought tolerant
Carrisa Holly	Ilex cornuta 'Carrisa'	4' H x 5' W	Full sun or afternoon shade	Fast growing hardy, evergreen; never needs pruning; tolerates extreme cold or heat; very drought tolerant.
Dwarf Yaupon	Ilex vomitoria 'Nana', 'Schelling's Dwarf', 'Stokes Dwarf'	4' H x 5' W	Full sun preferred	Very hardy and dense mounding evergreen
Otto Luyken Laurel	Prunus laurocerasus 'Otto Luyken'	4' -5' H x 4' - 5' W	Afternoon shade preferred	Spring white flower spikes; deep green foliage
Dwarf Wax Myrtle	Myrica cerifera 'Dwarf'	3-5'	Full sun or half shade	Evergreen; many dwarf varieties
Barberry	Berberis thunbergii	4' - 5' H	Full sun	'Rose Glow': rich purple 'Red Pillar': purple red
'Crimson Pygmy'	Berberis Thunbergii var. atropurpurea 'Crimson Pygmy'	12" - 18" H	Full sun	'Atropurpurea Nana'
Globe Colorado Blue Spruce	Picea pungens 'Glauca Glabosa'	3-4' H x 4-6' W	Full sun	Very adaptable
Dwarf English Boxwood	Buxus sempervirens 'Suffruticosa'	2' - 3' H x 2' - 4' W	Part shade	Slow grower; fine texture

Common Name	Botanical Name	Mature Size	Light Requirement	Notes
Dwarf Japanese Pieris	Pieris japonica 'Compacta'	5' - 6' H x 6' W	Full sun	Set soil; long blooming
Boxwood 'Harlandi Dwarf'	Buxus	2' - 3' H x 2' - 3' W	Full sun or part shade	Can be maintained at 18" H x 18" W
Boxwood 'Wintergreen'	Buxus macrophylla	5' H x 4' - 5' W	Full sun or light shade	
Cryptomeria "Dwarf Global"	Cryptomeria japonica 'Globosa Nana'	5' H x 5' W	Full sun or part shade	
Holly 'Compacta'	Ilex crenata	4' - 5' H x 4' - 5' W	Full sun or part shade	Tolerates extreme cold or heat; very drought tolerant
Holly 'Dwarf Burfordi'	Ilex	5' - 6' H x 5' - 6' W	Full sun or part shade	Glossy dark green; rounded, mounding evergreen; red berries in Winter
Holly 'Soft Touch'	Ilex crenata	2' - 3' H x 3' - 4' W	Full sun or part shade	
Indian Hawthorne 'Eleanor Tabor'	Raphiolepis	3' - 4' H x 5' - 6' W	Full sun or part shade	Compact, evergreen; Spring; sometimes Fall bloom; pink flowers
Indian Hawthorne 'Snow'	Raphiolepis	3' H x 5' - 6' W	Full sun or part shade	Dense, mounding evergreen; drought tolerant
Spirea 'Gold Mound'	Spirea	2' - 3' H x 3' W	Full sun	Low, mounding; bright yellow foliage; summer bloom; light pink flowers; low maintenance; drought tolerant
Spirea 'Little Princess'	Spirea	2' - 3' H x 3' W	Full sun	Low, dense; mounding; blue-green foliage; low maintenance; drought tolerant
Dwarf Abelia 'Little Richard'	Abeila	2' - 3' H x 2' - 3' W	Full sun to part shade	Low mounding; drought tolerant
<b>GRASSES FOR ACCENT OR FOUNDATION</b>				
Japanese Silvergrass	Miscanthus sinensis 'Morning Light'	5' H x 5' W	Bes in full sun	perennial
Japanese Forest Grass	Hakonechloa macra 'Aureola'	12" - 18" H	Shade	
Little Bluestem	Schizachyrium scoparium	2' H	Full sun; tolerates part shade	
Muhly Grass	Muhlenbergia capillaris	3-6' H x 1-3' W	Full sun to part shade	Drought tolerant
<b>GROUND COVERS</b>				
Juniper 'Bar Harbor'	Juniperus wiltoni	4" - 6" H x 4' - 6' W	Full sun	Blue-green to blue- burgundy in winter; fast growing; ground hugging; use on embankments or groundcover
Juniper 'Blue Rug'	Juniperus horizontalis	3" - 4" H x 4' - 5' W	Full sun or part shade	Blue-green foliage
Dwarf Fragrant Sumac	Rhus aromatica 'Gro-Low'			
Mondo Grass	Ohpionopogon japonicus	2-12" H	Shade to part sun	

Table 11: Exotic Invasive Pest Plants in Tennessee

Common Name	Botanical Name	Plant Type	Rank
Tree of Heaven	<i>Ailanthus altissima</i> (Mill.) Swingle	Tree	Severe Threat
Mimosa	<i>Albizia julibrissin</i> Durazz.	Tree	Severe Threat
Sessile Joyweed	<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	Forb/Herb	Severe Threat
Cheat Grass	<i>Bromus tectorum</i> L.	Grass	Severe Threat
Asian Bittersweet	<i>Celastrus orbiculatus</i> Thunb.	Vine	Severe Threat
Chinese Yam	<i>Dioscorea oppositifolia</i> L.	Vine	Severe Threat
Autumn Olive	<i>Elaeagnus umbellata</i> var. <i>parviflora</i> (Wall. ex Royle) C.K.Schneid.	Shrub	Severe Threat
Hydrilla	<i>Hydrilla verticillata</i> (L.f.) Royle	Aquatic	Severe Threat
Goatweed	<i>Hypericum perforatum</i> L.	Shrub	Severe Threat
Cogongrass	<i>Imperata cylindrica</i> (L.) Beauv.	Grass	Severe Threat
Korean Clover	<i>Kummerowia stipulacea</i> (Maxim.) Makino	Forb/Herb	Severe Threat
Bicolor Lespedeza	<i>Lespedeza bicolor</i> Turcz.	Shrub	Severe Threat
Chinese Lespedeza	<i>Lespedeza cuneata</i> (Dum.-Cours) G. Don	Forb/Herb	Severe Threat
Chinese Privet	<i>Ligustrum sinense</i> Lour.	Shrub	Severe Threat
Common Privet	<i>Ligustrum vulgare</i> L.	Shrub	Severe Threat
Japanese Honeysuckle	<i>Lonicera japonica</i> Thunb.	Vine	Severe Threat
Purple Loosestrife	<i>Lythrum salicaria</i> L.	Forb/Herb	Severe Threat
Japanese Stiltgrass	<i>Microstegium vimineum</i> (Trin.) A. Camus	Grass	Severe Threat
Princess Tree	<i>Paulownia tomentosa</i> (Thunb.) Sieb. & Zucc. ex Steud.	Tree	Severe Threat
Japanese Knotweed	<i>Polygonum cuspidatum</i> Seib. & Zucc.	Forb/Herb	Severe Threat
Kudzu	<i>Pueraria montana</i> var. <i>lobata</i> (Willd.) Maesen & S. Almeida	Vine	Severe Threat
Multiflora Rose	<i>Rosa multiflora</i> Thunb. ex Murr.	Shrub	Severe Threat
Itchgrass	<i>Rottboellia cochinchinensis</i> (Lour.) W.D. Clayton	Grass	Severe Threat
Aquarium Water-moss	<i>Salvinia molesta</i> Mitchell	Aquatic	Severe Threat
Tropical Soda Apple	<i>Solanum viarum</i> Dunal	Shrub	Severe Threat
Johnson Grass	<i>Sorghum halepense</i> (L.) Pers.	Grass	Severe Threat
Garlic Mustard	<i>Alliaria petiolata</i> (Bieb.) Cavara & Grande	Forb/Herb	Significant Threat
Field Garlic	<i>Allium vineale</i> L.	Forb/Herb	Significant Threat
Alligatorweed	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Forb/Herb	Significant Threat
Hairy Jointgrass	<i>Arthraxon hispidus</i> (Thunb.) Makino	Grass	Significant Threat
Giant Reed	<i>Arundo donax</i> L.	Grass	Significant Threat
Japanese Barberry	<i>Berberis thunbergii</i> DC.	Shrub	Significant Threat
Paper Mulberry	<i>Broussonetia papyrifera</i> (L.) L'Her. ex Vent.	Tree	Significant Threat
Nodding Thistle	<i>Carduus nutans</i> L.	Forb/Herb	Significant Threat
Spotted Knapweed	<i>Centaurea biebersteinii</i> DC.	Forb/Herb	Significant Threat
Bull Thistle	<i>Cirsium vulgare</i> (Savi) Ten.	Forb/Herb	Significant Threat
Thorny Olive	<i>Elaeagnus pungens</i> Thunb.	Shrub	Significant Threat
Weeping Love Grass	<i>Eragrostis curvula</i> (Schrad.) Nees	Grass	Significant Threat
Gill-over-the-ground	<i>Glechoma hederacea</i> L.	Vine	Significant Threat
Yellow Flag Iris	<i>Iris pseudacorus</i> L.	Forb/Herb	Significant Threat
Tall Fescue	<i>Lolium arundinaceum</i> (Schreb.) S.J. Darbyshire	Grass	Significant Threat
Amur Bush Honeysuckle	<i>Lonicera maackii</i> (Rupr.) Herder.	Shrub	Significant Threat
Creeping Jenny	<i>Lysimachia nummularia</i> L.	Forb/Herb	Significant Threat
Osage Orange	<i>Maclura pomifera</i> (Raf.) Schneid.	Tree	Significant Threat
Chinaberry	<i>Melia azedarach</i> L.	Tree	Significant Threat
Peppermint	<i>Mentha x piperita</i> L.	Forb/Herb	Significant Threat
Chinese Silver Grass	<i>Miscanthus sinensis</i> Anderss.	Grass	Significant Threat
Asian spiderwort	<i>Murdannia keisak</i> (Hassk.) Hand.-Maz.	Forb/Herb	Significant Threat
Parrot Feather	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Aquatic	Significant Threat
Eurasian Water-milfoil	<i>Myriophyllum spicatum</i> L.	Aquatic	Significant Threat
Bristly Lady's Thumb	<i>Polygonum caespitosum</i> var. <i>longisetum</i> (deBruyn) A.N.Steward	Forb/Herb	Significant Threat
Spotted Lady's Thumb	<i>Polygonum persicaria</i> L.	Forb/Herb	Significant Threat

Common Name	Scientific Name	Plant Type	Rank
White Poplar	<i>Populus alba</i> L.	Tree	Significant Threat
Curly Pondweed	<i>Potamogeton crispus</i> L.	Aquatic	Significant Threat
Watercress	<i>Rorippa nasturtium-aquaticum</i> (L.) Hayek	Aquatic	Significant Threat
Nodding Foxtail-grass	<i>Setaria faberi</i> R.A.W. Herrm.	Grass	Significant Threat
Foxtail-millet	<i>Setaria italica</i> (L.) P. Beauv.	Grass	Significant Threat
Green Foxtail	<i>Setaria viridis</i> (L.) P. Beauv	Grass	Significant Threat
Japanese Spiraea	<i>Spiraea japonica</i> L.f.	Shrub	Significant Threat
Coltsfoot	<i>Tussilago farfara</i> L.	Forb/Herb	Significant Threat
Common Mullein	<i>Verbascum thapsus</i> L.	Forb/Herb	Significant Threat
Greater Periwinkle	<i>Vinca major</i> L.	Vine	Significant Threat
Common Periwinkle	<i>Vinca minor</i> L.	Vine	Significant Threat
Rye Brome	<i>Bromus secalinus</i> L.	Grass	Lesser Threat
Poverty Brome	<i>Bromus sterilis</i> L.	Grass	Lesser Threat
Corn Gromwell	<i>Buglossoides arvensis</i> (L.) I.M. Johnston	Forb/Herb	Lesser Threat
Hound's-ear	<i>Bupleurum rotundifolium</i> L.	Forb/Herb	Lesser Threat
Balloonvine	<i>Cardiospermum halicacabum</i> L.	Vine	Lesser Threat
Bachelor's Button	<i>Centaurea cyanus</i> L.	Forb/Herb	Lesser Threat
Chicory	<i>Cichorium intybus</i> L.	Forb/Herb	Lesser Threat
Sweet Autumn Clematis	<i>Clematis terniflora</i> DC.	Vine	Lesser Threat
Poison Hemlock	<i>Conium maculatum</i> L.	Forb/Herb	Lesser Threat
Fuller's Teasel	<i>Dipsacus fullonum</i> L.	Forb/Herb	Lesser Threat
Brazilian Elodea	<i>Egeria densa</i> Planch.	Aquatic	Lesser Threat
Burning Bush	<i>Euonymus alatus</i> (Thunb.) Sieb.	Shrub	Lesser Threat
Winter Creeper	<i>Euonymus fortunei</i> (Turcz.) Hand.-Mazz.	Vine	Lesser Threat
English Ivy	<i>Hedera helix</i> L.	Vine	Lesser Threat
Rose of Sharon	<i>Hibiscus syriacus</i> L.	Shrub	Lesser Threat
Spearmint	<i>Mentha spicata</i> L.	Forb/Herb	Lesser Threat
Grape Hyacinth	<i>Muscari neglectum</i> Guss. ex Ten.	Forb/Herb	Lesser Threat
Star of Bethlehem	<i>Ornithogalum umbellatum</i> L.	Forb/Herb	Lesser Threat
Wild Parsnip	<i>Pastinaca sativa</i> L.	Forb/Herb	Lesser Threat
St. Anthony's Turnip	<i>Ranunculus bulbosus</i> L.	Forb/Herb	Lesser Threat
Wineberry	<i>Rubus phoenicolasius</i> Maxim.	Shrub	Lesser Threat
Yellow Goat's-beard	<i>Tragopogon dubius</i> Scop.	Forb/Herb	Lesser Threat
Japanese Wisteria	<i>Wisteria floribunda</i> (Willd.) DC.	Vine	Lesser Threat
Japanese Chaff Flower	<i>Achyranthes japonica</i> var. <i>hachijoensis</i>	Forb/Herb	Alert
Russian Knapweed	<i>Acroptilon repens</i> (L.) DC.	Forb/Herb	Alert
Creeping Bentgrass	<i>Agrostis stolonifera</i> L.	Grass	Alert
Japanese Bromegrass	<i>Bromus japonicus</i> Thunb. ex Murr.	Grass	Alert
Butterfly Bush	<i>Buddleja davidii</i> Franch.	Shrub	Alert
Plumeless Thistle	<i>Carduus acanthoides</i> L.	Forb/Herb	Alert
Canada Thistle	<i>Cirsium arvense</i> (L.) Scop.	Forb/Herb	Alert
Crown Vetch	<i>Coronilla varia</i> L.	Vine	Alert
Queen Anne's Lace	<i>Daucus carota</i> L.	Forb/Herb	Alert
Air-potato	<i>Dioscorea bulbifera</i> L.	Vine	Alert
Water Hyacinth	<i>Eichhornia crassipes</i> (Mart.) Solms	Aquatic	Alert
Russian Olive	<i>Elaeagnus angustifolia</i> L.	Tree	Alert
Chinese Parasol tree	<i>Firmiana simplex</i> (L.) W. Wight	Tree	Alert
Firewheel	<i>Gaillardia pulchella</i> Foug.	Forb/Herb	Alert
Texas Blueweed	<i>Helianthus ciliaris</i> DC.	Forb/Herb	Alert
Dame's Rocket	<i>Hesperis matronalis</i> L.	Forb/Herb	Alert
Japanese Holly	<i>Ilex crenata</i> Thunb.	Shrub	Alert
Goldenrain Tree	<i>Koeleruteria paniculata</i> Laxm.	Tree	Alert
Japanese Clover	<i>Kummerowia striata</i> (Thunb.) Schindl.	Forb/Herb	Alert

Common Name	Scientific Name	Plant Type	Rank
Field Pepperweed	<i>Lepidium campestre</i> (L.) Ait. F.	Forb/Herb	Alert
Ox-eye Daisy	<i>Leucanthemum vulgare</i> Lam.	Forb/Herb	Alert
Japanese Privet	<i>Ligustrum japonicum</i> Thunb.	Shrub	Alert
Border Privet	<i>Ligustrum obtusifolium</i> Sieb. & Zucc.	Shrub	Alert
Bell's Honeysuckle	<i>Lonicera x bella</i> Zabel	Shrub	Alert
January Jasmine	<i>Lonicera fragrantissima</i> Lindl. & Paxton	Shrub	Alert
Morrow's Bush Honeysuckle	<i>Lonicera morrowii</i> Gray	Shrub	Alert
Tartarian Honeysuckle	<i>Lonicera tatarica</i> L.	Shrub	Alert
Birdfoot Trefoil	<i>Lotus corniculatus</i> L.	Forb/Herb	Alert
Uruguay Waterprimrose	<i>Ludwigia uruguayensis</i> (Camb.) Hara	Aquatic	Alert
Japanese Climbing Fern	<i>Lygodium japonicum</i> (Thunb. ex Murr.) Swartz	Forb/Herb	Alert
Leatherleaf Mahonia	<i>Mahonia bealei</i> (Fortune) Carr.	Shrub	Alert
White Sweet Clover	<i>Melilotus alba</i> Medikus	Forb/Herb	Alert
Yellow Sweet Clover	<i>Melilotus officinalis</i> (L.) Lam	Forb/Herb	Alert
True Forget-me-not	<i>Myosotis scorpioides</i> L.	Forb/Herb	Alert
Water Nymph	<i>Najas minor</i> All.	Aquatic	Alert
Sacred Bamboo	<i>Nandina domestica</i> Thunb.	Shrub	Alert
Annual Canary Grass	<i>Phalaris canariensis</i> L.	Grass	Alert
Common Reed	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Grass	Alert
Mile-a-minute Weed	<i>Polygonum perfoliatum</i> L.	Forb/Herb	Alert
Bradford Pear	<i>Pyrus calleryana</i> Dcne.	Tree	Alert
Himalayan Berry	<i>Rubus bifrons</i> Vest ex Tratt	Shrub	Alert
Prickly Russian Thistle	<i>Salsola tragus</i> L.	Forb/Herb	Alert
Sicklepod Senna	<i>Senna obtusifolia</i> (L.) H.S. Irwin & Barneby	Forb/Herb	Alert
Yellow Foxtail	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Grass	Alert
Perennial Sowthistle	<i>Sonchus arvensis</i> L.	Forb/Herb	Alert
Water Chestnut	<i>Trapa natans</i> L.	Aquatic	Alert
Chinese Tallowtree	<i>Triadica sebifera</i> (L.) Small	Tree	Alert
Puncturevine	<i>Tribulus terrestris</i> L.	Forb/Herb	Alert
Chinese Wisteria	<i>Wisteria sinensis</i> (Sims) DC.	Vine	Alert

Source: Tennessee Exotic Pest Plant Council, *Invasive Exotic Pest Plants in Tennessee, December 2009 (2nd Edition)*

#### Rank Definitions:

- Alert = possess invasive characteristics; known to be invasive in similar habitats as those found in Tennessee
- Severe Threat = possess invasive characteristics; spread easily in native plant communities and displace native vegetation
- Significant Threat = possess invasive characteristics; not presently considered to spread as easily into native plant communities as Severe Threat
- Lesser Threat = spread in or near disturbed areas; not presently considered a threat to native plant communities

The purpose of this list is to identify introduced plant species that are invasive or may become invasive and cause damage to native plant communities. Introduced species are plants not native to a region of the state and are referred to as exotics. The intent of this list is to:

- rank exotics based on their invasive characteristics;
- foster early detection of invasive exotics enabling resource managers to implement a rapid response action to prevent establishment and spread;
- educate the general public and resource managers in an effort to eliminate the use of invasive exotics in landscaping, restoration, and enhancement projects.

This list has no regulatory authority but provides useful information to help guide agencies and private landowners in making responsible decisions about plant use and management decisions. The Council acknowledges that most introduced species are harmless. However, it also realizes that many species do naturalize and have the potential to spread and become ecological disasters.



## Appendix C: Road Design Examples

Figure 17: Local Road Example 1

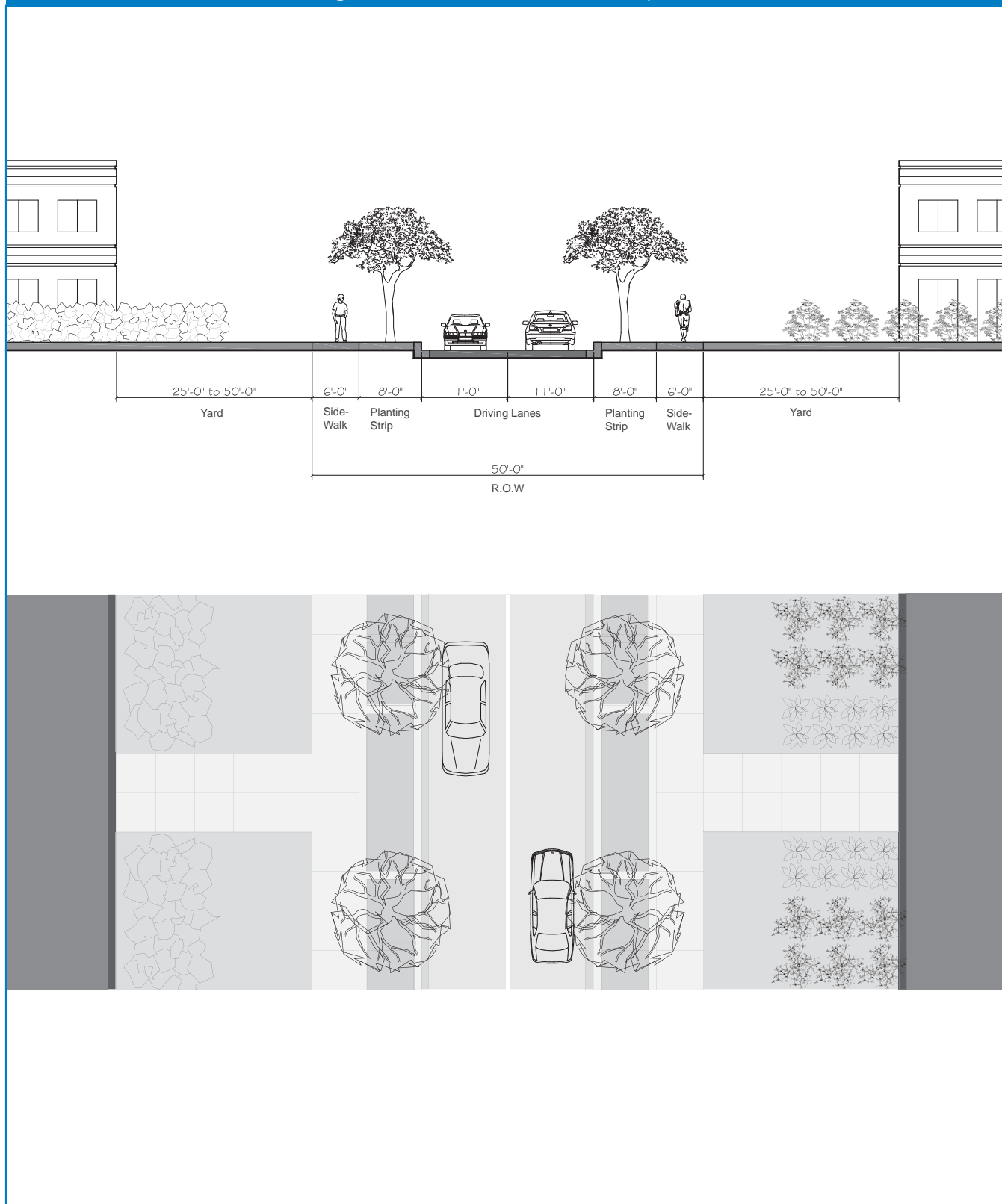


Figure 18: Local Road Example 2

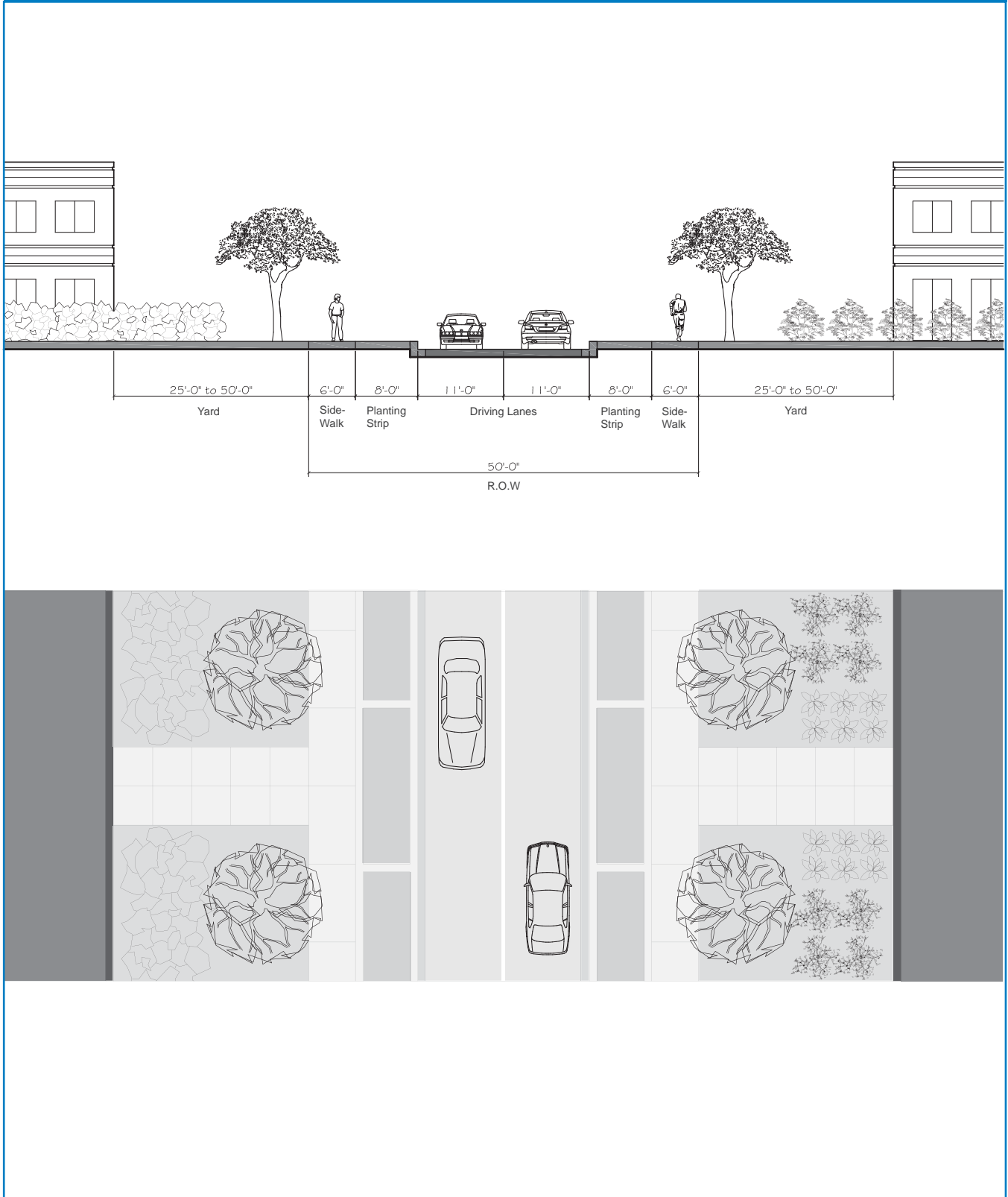


Figure 19: Local Road Example 3

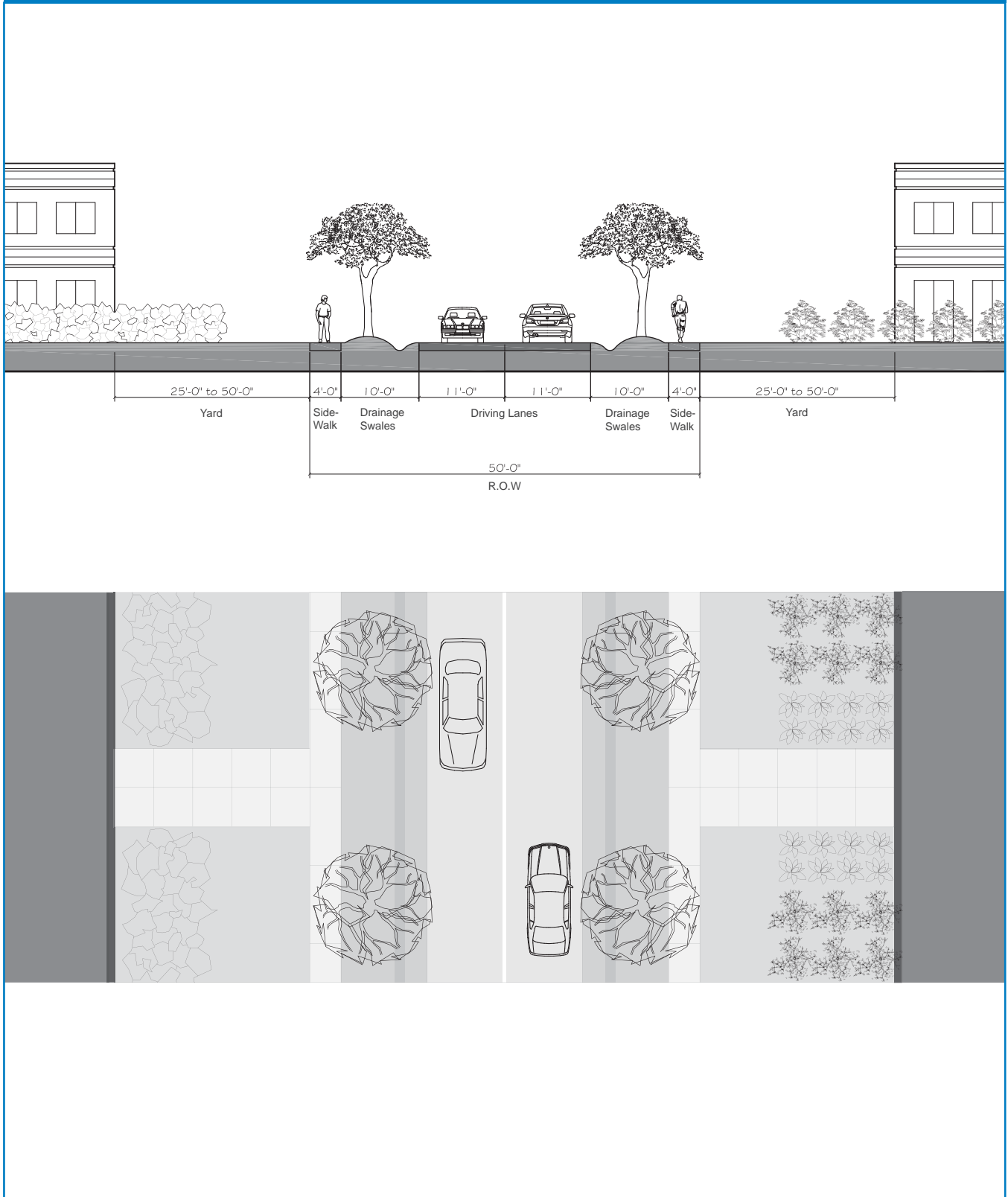


Figure 20: Local Road Example 4

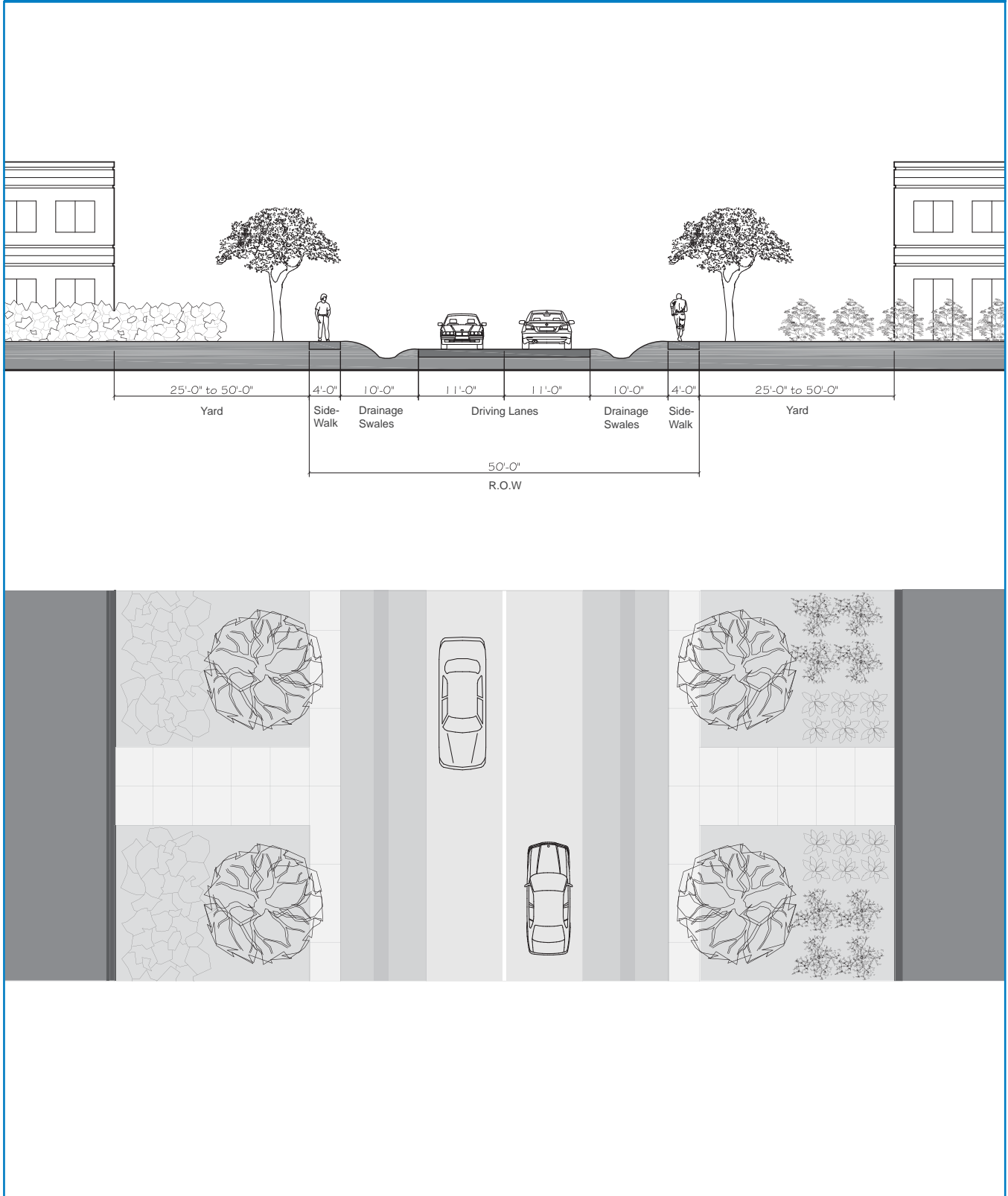


Figure 21: Collector Road Example 1

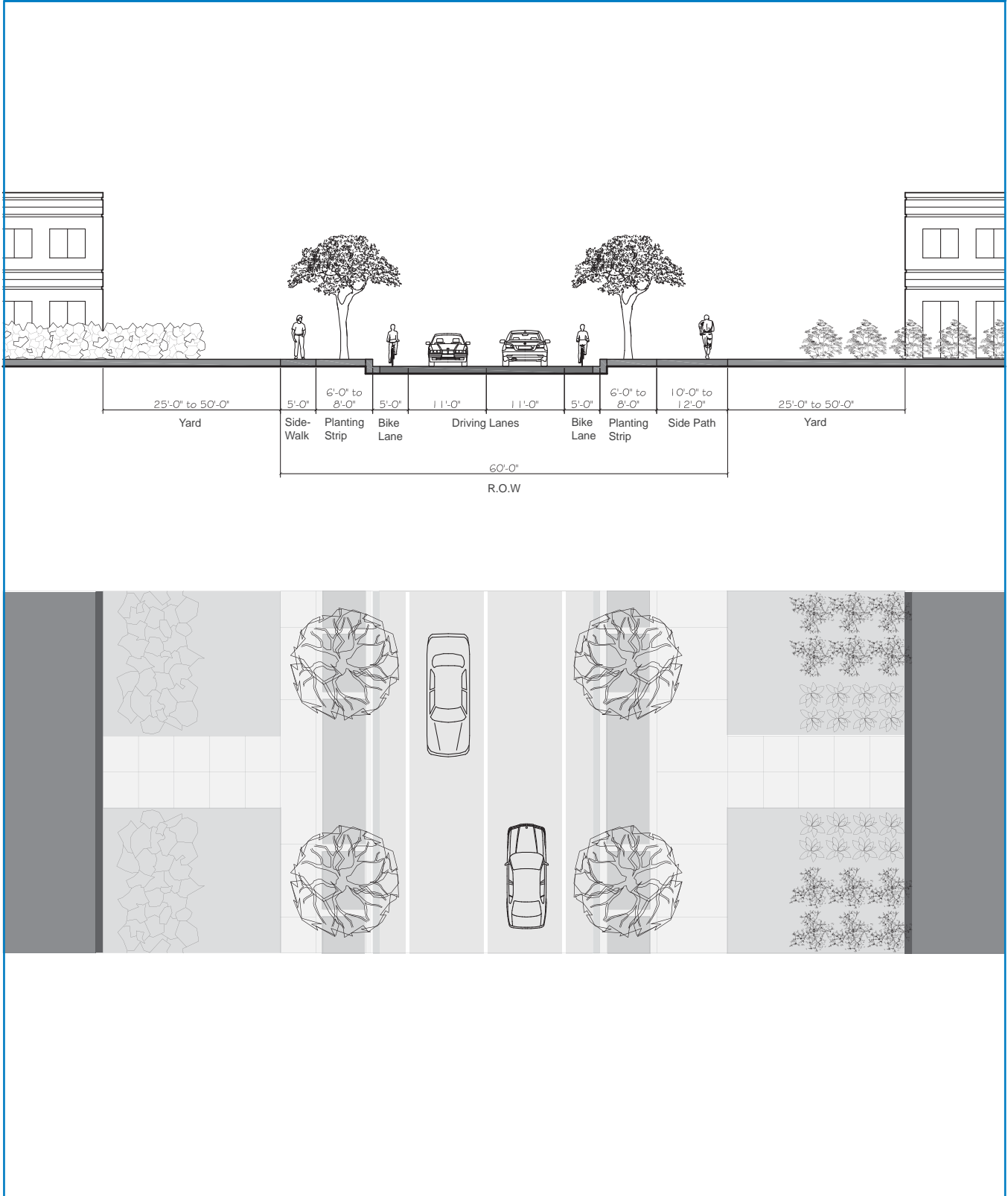




Figure 22: Collector Road Example 2

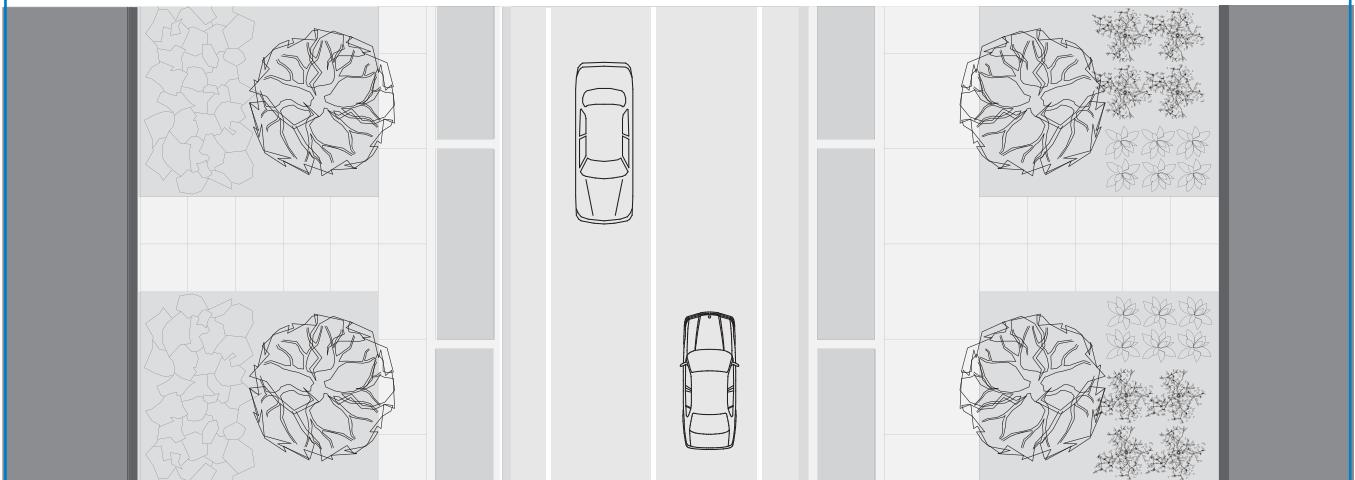
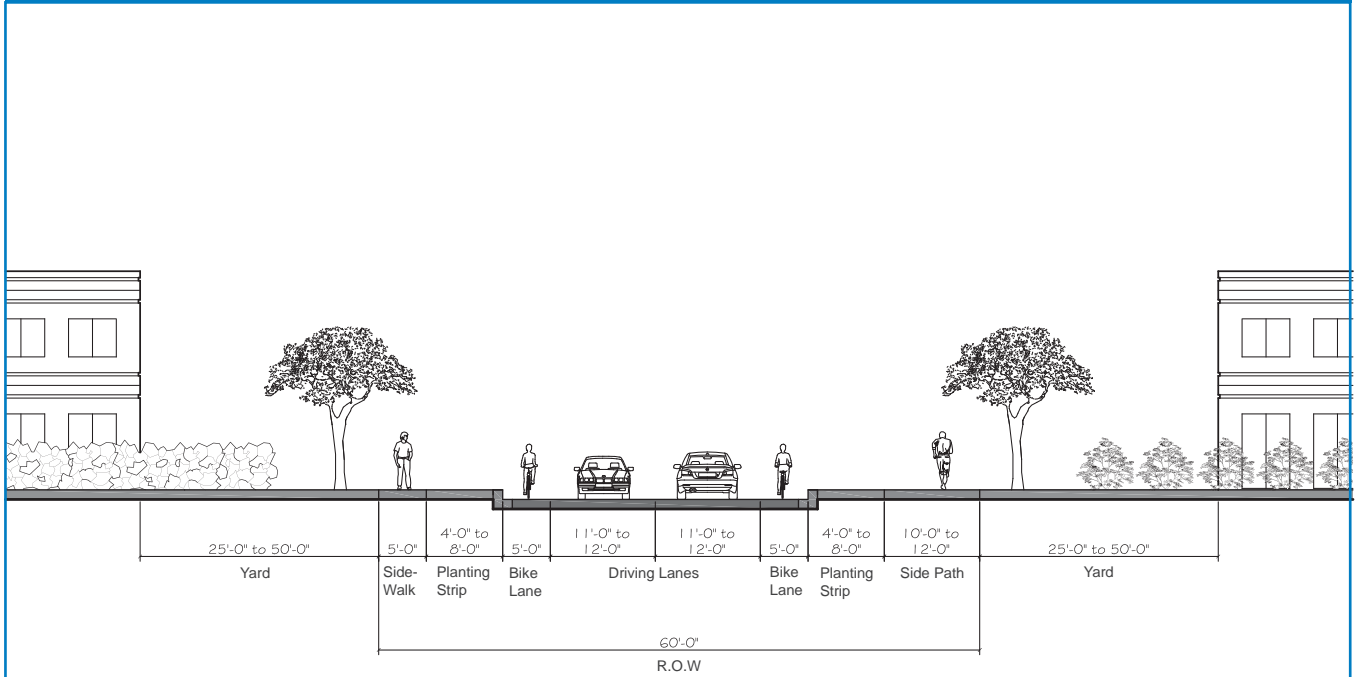


Figure 23: Collector Road Example 3

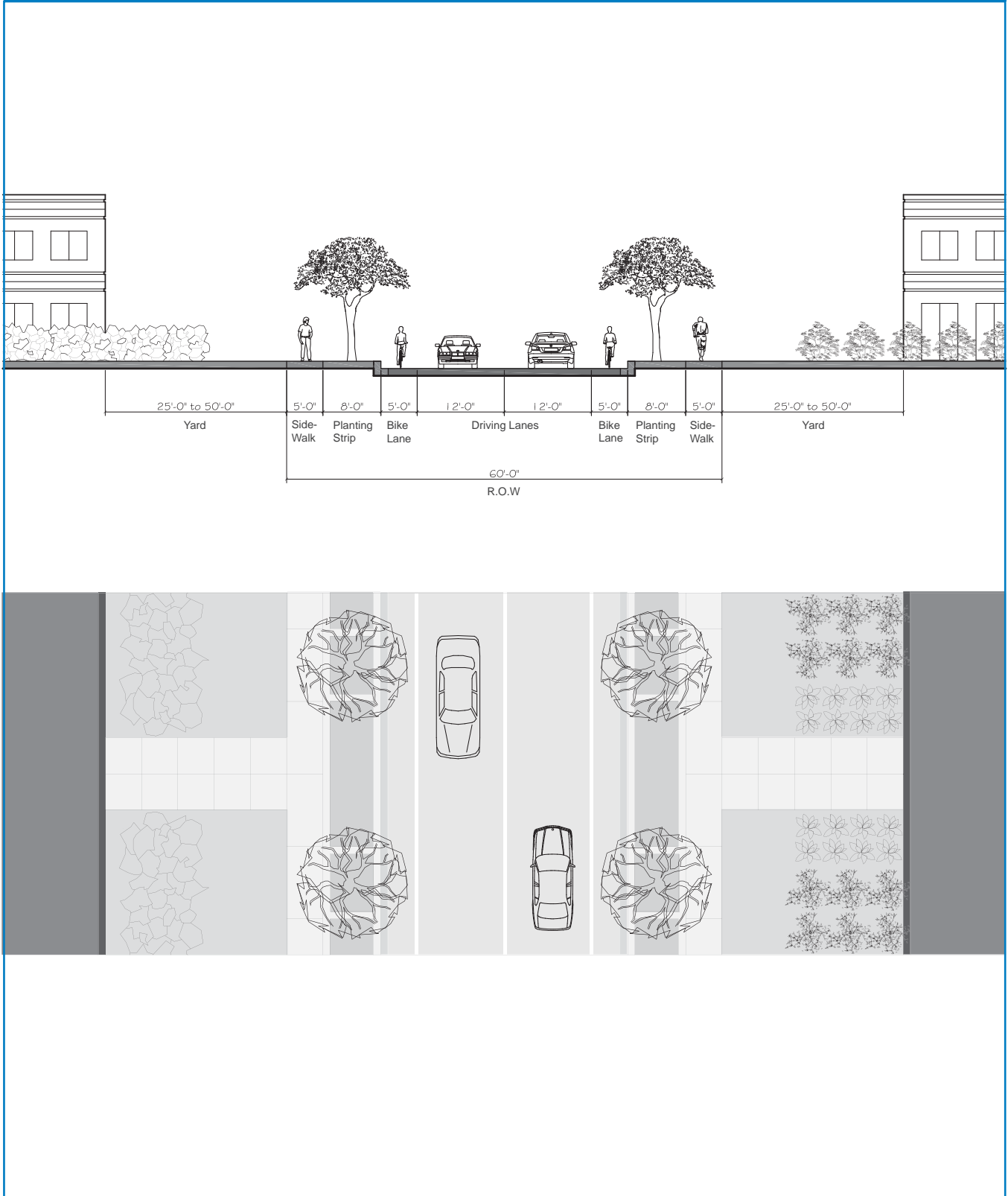


Figure 24: Collector Road Example 4

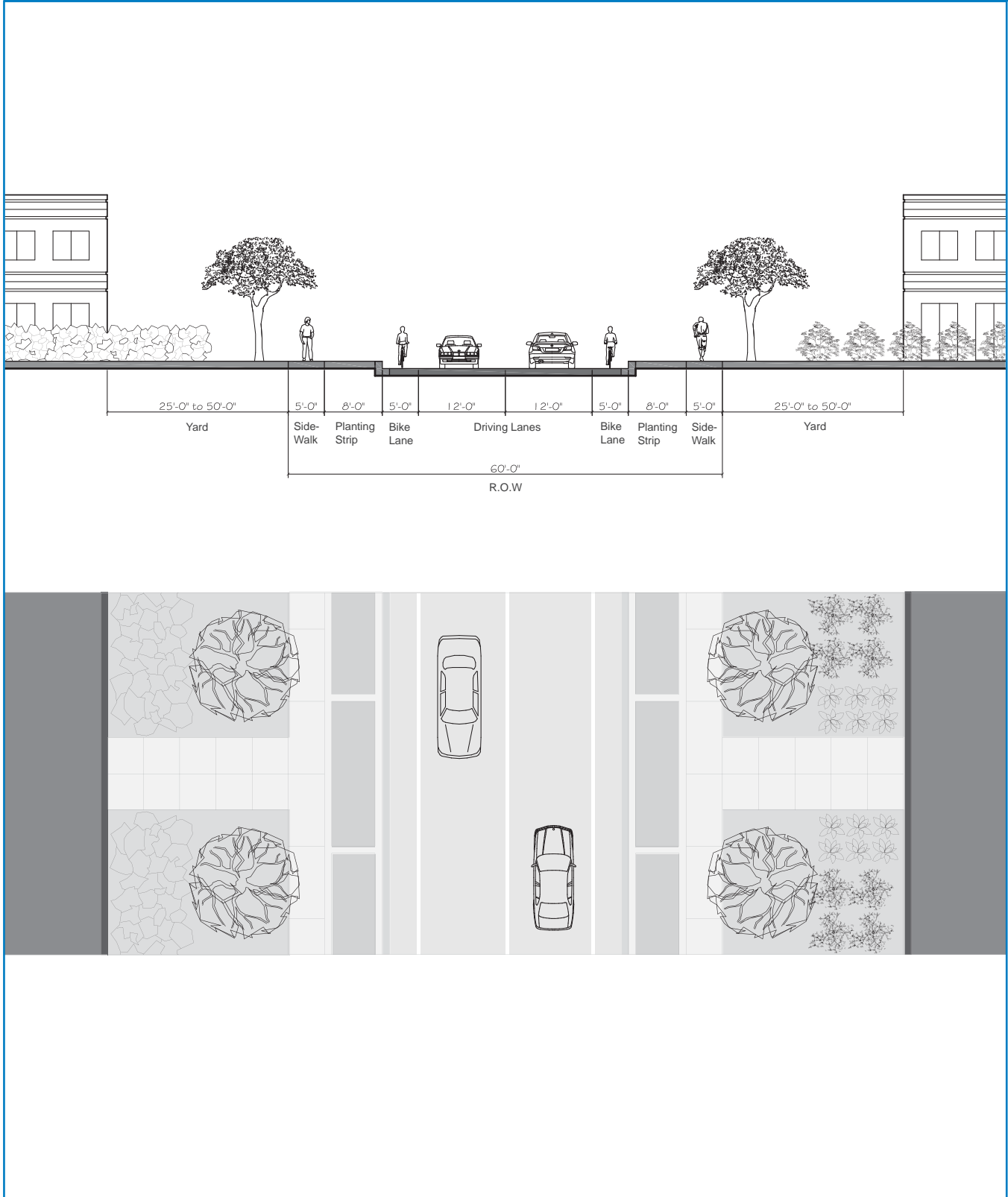


Figure 25: Arterial Road Example 1

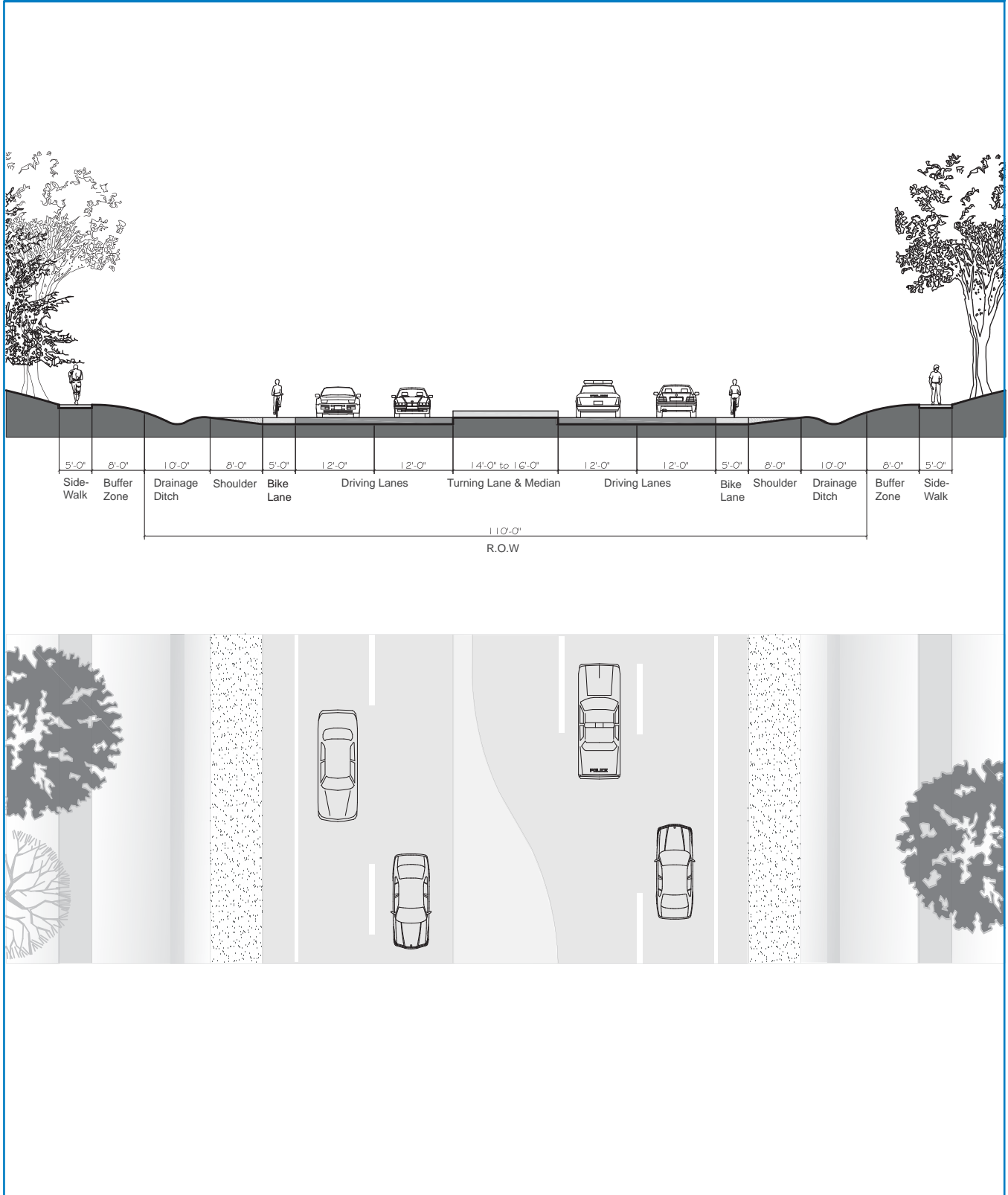


Figure 26: Arterial Road Example 2

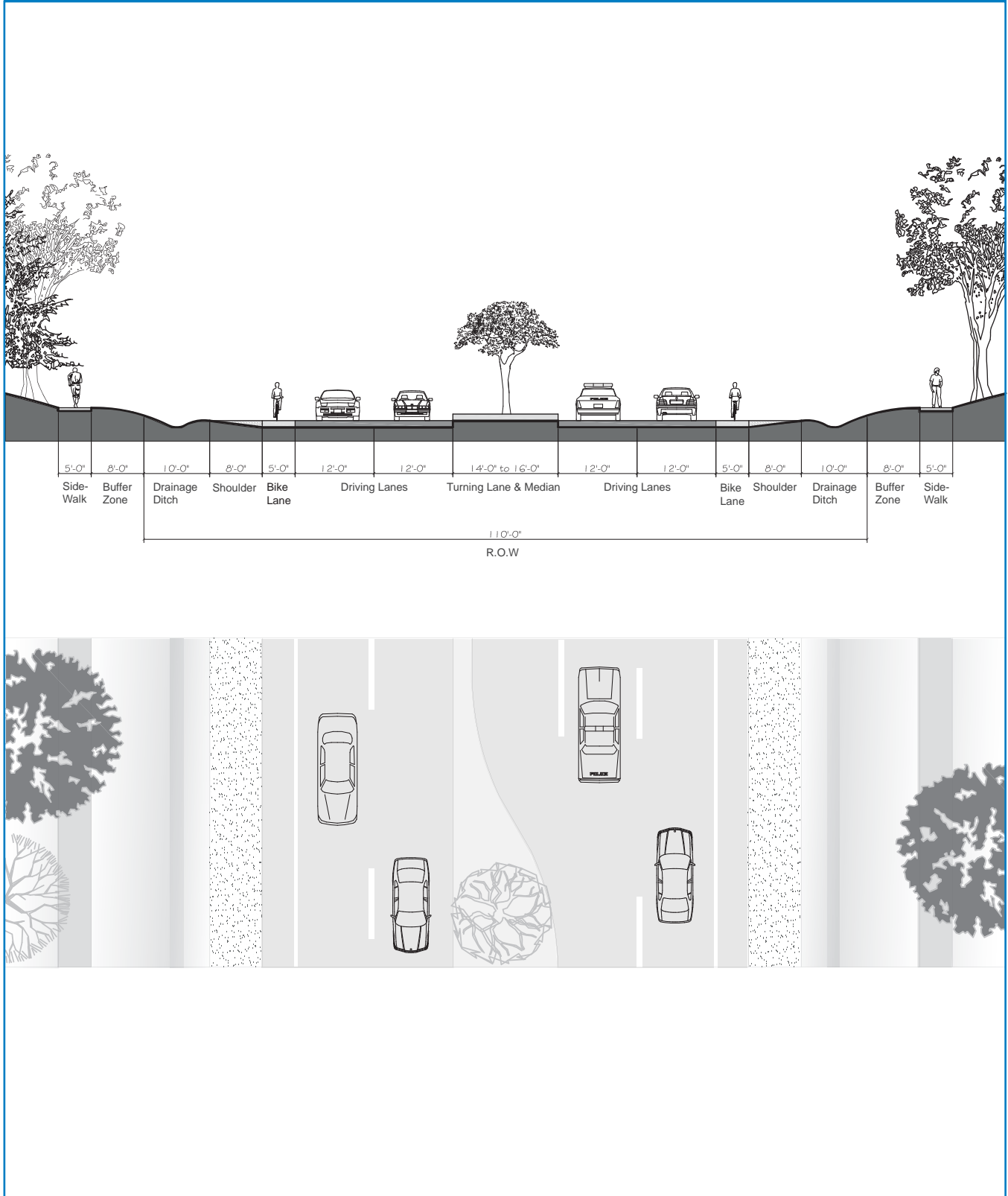




Figure 27: Arterial Road Example 3

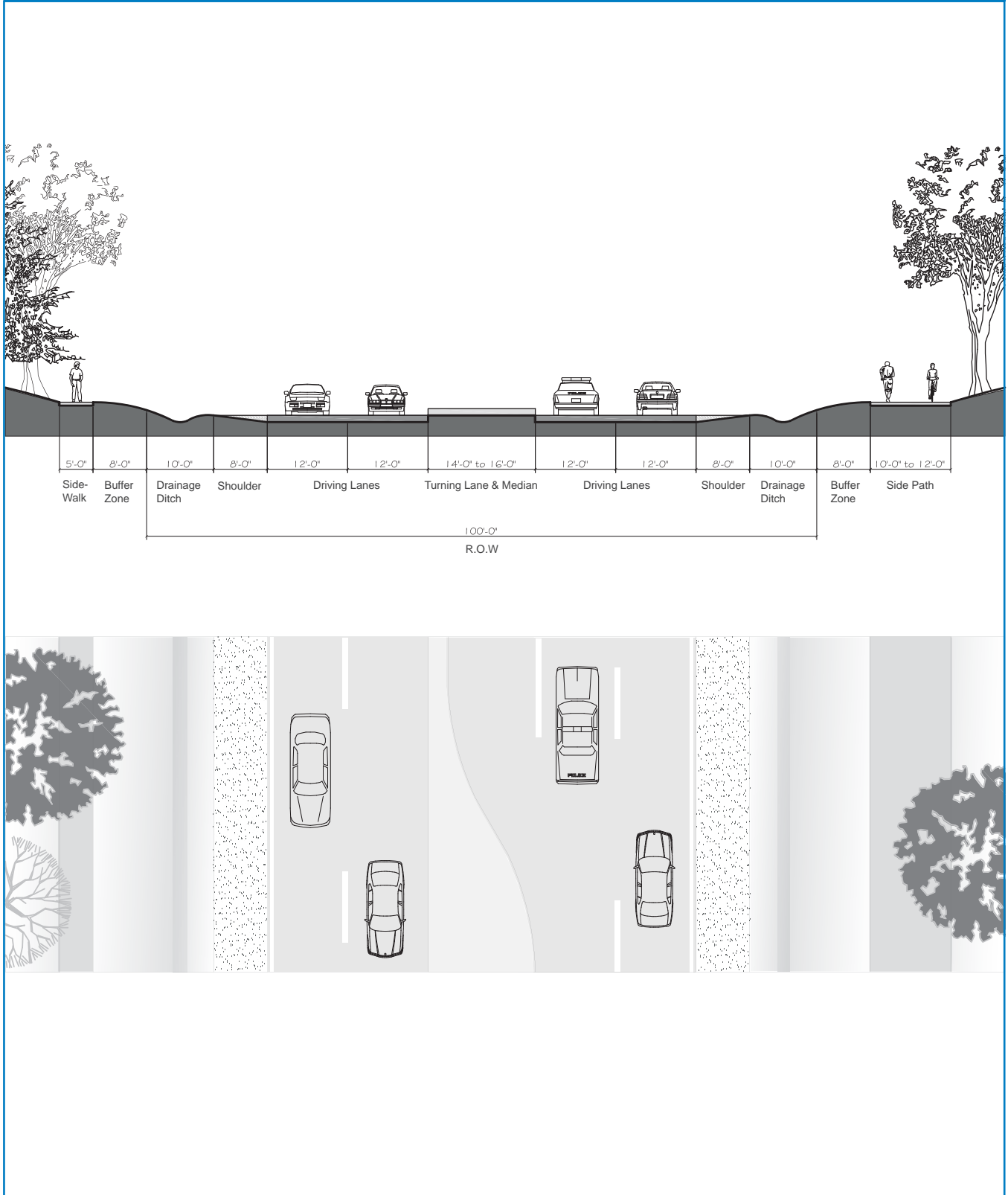
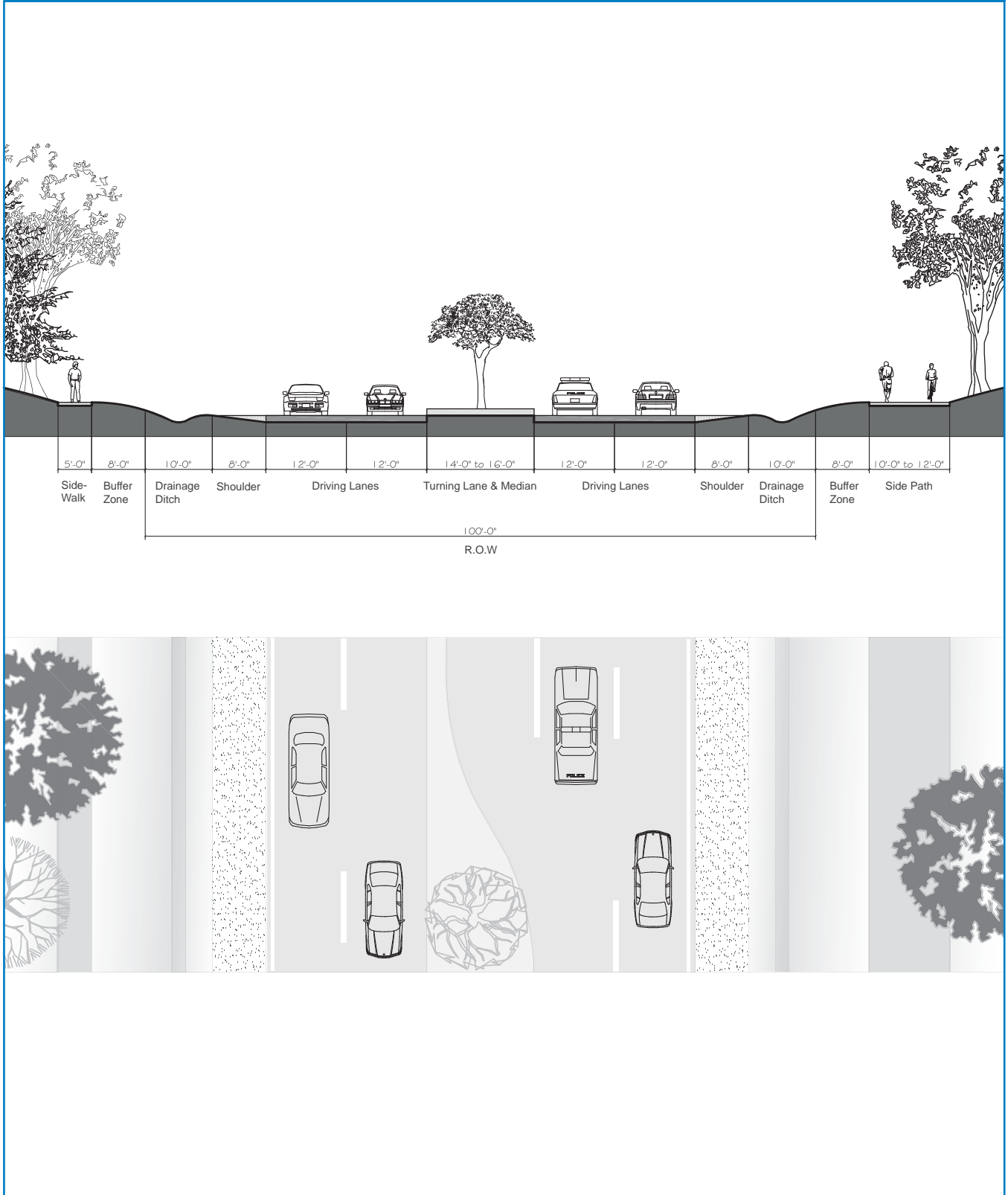


Figure 28: Arterial Road Example 4







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