- **Multi-Modal Traveler Information Systems.** These systems involve the use of traveler information media (monitors, kiosks, Internet, telephone, etc.) to provide real-time and/or static information on both transit and general traffic conditions to enable travelers to make fully informed mode choice decisions, both pre-trip and en route.

- **Personal Information Systems.** These systems provide traveler information that is subscriber based or tailored to meet an individual's needs (e.g., travel profile). The information might include incident notification, transit vehicle arrival alert, or other information. Information is received via individual-based technology such as email, personal digital assistants, pagers, etc.

- **Parking Guidance Systems (Smart Parking).** These systems can monitor the occupancy of parking bays at an intermodal transfer facility and direct drivers to the nearest open parking space.

## 4.5 MAINTENANCE

A clean and attractive site is essential to the retention or expansion of a successful park-and-ride operation. The type of site (new or existing), method of performing maintenance, and site location will generally determine the extent of maintenance required.

The daily commuter using the facility is impressed by the appearance of the site. As with restaurants, the user's opinions spread rapidly to other potential users of the facility. Therefore, a sound maintenance program, adequately funded, staffed, and scheduled, should be planned well ahead of the date a park-and-ride facility is placed into operation.

Determining the cost and the agency responsible for maintenance of a park-and-ride facility should be made early in the planning stages. The costs associated with maintenance activities are not well documented because of the limited experience of programs involving park-and-ride. Basically, those maintenance activities that should be considered are:

- Periodic inspection
- Pavement repair
- Information systems
- Traffic control devices (signs and pavement markings)
- Lighting
- Mowing
- Sweeping/trash pickup
- Landscaping
- Site furnishings
- Restroom and building maintenance
- Snow and ice maintenance
- Security/gates

Initial inspection of the site should be performed during the first few weeks following implementation of the park-and-ride, in order to assess the frequency of routine maintenance activities that will be required on a periodic basis.

A thoroughly detailed site maintenance manual should be developed which adequately addresses all of the site maintenance responsibilities; this includes cleaning, replacement, and maintenance of the items listed above.

The following items should be included on the initial inspection checklist:

- Mowing
- Sweeping/trash pickup
- Night time lighting and security
- Inspection frequency

The pavement should not require any substantial maintenance work for several years following construction, assuming that the pavement strength was designed for transit vehicle loads and drainage is adequate. Traffic control devices will probably not have a significant cost of maintenance, as replacement will normally be governed by the periodic inspection of the site. Pavement markings should not require greater than annual replacement for centerlines in the normal traffic circulation patterns within the lot. Parking stall markings may have adequate life that will only require biannual replacement, depending on the local environment and conditions.

Unless there are security problems at the site that require a gate or guard, there will normally be no cost associated with this activity. Snow removal cost estimates should be based on lot surface area estimates and the general frequency of snow experienced in the particular local geographic area.

Once the maintenance periods for the various items discussed in this section have been identified, the site maintenance manual should be amended to reflect this information. The responsible agency should then follow the manual to assure a long-lasting, clean, attractive facility that will be an asset to the user, the agency, and the community.

## 4.6 PERFORMANCE MONITORING

Monitoring and evaluation programs collect the necessary data to be used to estimate various measures of effectiveness. Potential impacts from transportation projects will be realized over time and the monitoring and evaluation program should be an ongoing process and automated to the extent possible. The results from a monitoring and evaluation program should be disseminated to public officials, the general public, and the media in order to keep everyone informed. The credibility of the monitoring and evaluation program is critical.

Park-and-ride facility operation should be accompanied by a systematic post-project evaluation process, analyzing the critical aspects of the transit service provided, the security attributes of the site and design, the maintenance costs and savings provided by the design, and the success of the site as reflected by parking demand, transit ridership, and other measures of effectiveness.

Construction of a proposed park-and-ride facility is the initial stage in an agency's involvement in providing regional park-and-ride service. As part of a regional plan, individual park-and-ride facility implementation should be viewed as an opportunity for continued refinement of the planning process within the region. Thus, implementation of a specific park-and-ride alternative should be used as a chance to gain new data to support future implementation(s) and to use as feedback into the regional planning process.

Community acceptance and attitudes towards the facility, both within the surrounding neighborhood and from the patron population, should be evaluated periodically using survey techniques so that changing needs can be identified. Such surveys should also extend to the nonusers in the vicinity of the park-and-ride facility to identify service needs not being met by the constructed facility.

There should be a systematic process for injecting ''lessons learned'' from the ongoing analysis of park-and-ride facility performance into the existing facility management process as well as into the planning of future facilities. In this manner, the park-and-ride system can continuously be improved and optimized.

# Chapter 5
# Design Considerations for Park-and-Ride Facilities

A number of differing views regarding the design of park-and-ride facilities are held throughout the engineering and planning profession. At one extreme, there is the belief that the primary design goal should be to maximize the efficiency of the parking facility as an extension of the highway or transit network. At the other extreme is the belief that the primary goal should be to maximize the community integration characteristics of the individual facility, with a much lower consideration of regional freeway connectivity needs.

When transit facilities such as park-and-ride lots are examined, experience will show that, to achieve a successful facility as measured by demand and operating expense, form must follow function in the pursuit of a design. Design professionals must take into consideration the various access and service modes associated with a park-and-ride facility, including on-site and off-site pedestrian and bicycle movements, placing these concerns and design requirements at the top of the design priority list.

Attention to these issues can produce an architecturally superior facility as well as a superior design, resulting in reduced maintenance requirements, lower operating costs, and manageable security risks. Throughout this chapter, a number of photos of successful rail-based and bus-based park-and-ride facilities are presented to highlight design concepts and to provide examples for future planning efforts.

This chapter provides a discussion of a number of physical design components that should be considered in the development and design of a successful park-and-ride facility. These components fall into seven categories:

- Functional or activity zones of a transit facility
- Designing a community integrated park-and-ride facility
- Providing for the design needs of pedestrians and bicyclists
- Design for accessibility (Includes federal ADA requirements as well as state and local requirements)
- Providing for the design requirements of transit vehicles
- Providing for the design requirements of automobiles
- Design considerations for park-and-ride facility access management

In order for a park-and-ride design to be successful in the spirit of multimodal and intermodal planning, the design must address each of these seven areas with equal competence. The level of community integration must be appropriate to the surrounding land uses. Because the pedestrian mode is a component of all commute trips accessing the park-and-ride facility, design considerations both within the park-and-ride facility and in the surrounding land uses must provide for and promote bicycle and pedestrian flow. Bicycle facility networks should be provided to residences within 3 to 8 km (2 to 5 mi) from the park-and-ride lot. Pedestrian facilities should be provided to residences within 0.8 km (0.5 mi) of the park-and-ride lot.

Likewise, transit access and accompanying facilities must provide for a smooth and seamless transfer between the private automobile and transit. The automobile must also be accommodated for on-site circulation and parking as well as from a facility access management perspective. Although a design hierarchy is appropriately and easily applied to these seven concepts, each is important to the success of the proposed facility.

Park-and-ride lots can vary in size depending on the estimated demand for the facility. The design of a particular facility will be based on site-specific characteristics such as the shape of the land parcel and available access *(20)*. Figures 5-1 through 5-4 illustrate example park-and-ride lots that can be classified as small-, medium-, and large-sized lots. The small P&R lot example in Figure 5-1 is located on a remnant 6-acre parcel along a freeway between an arterial and freeway exit and entrance ramps. It has a parking capacity of 550 spaces with a bus loading area along a parallel collector street *(20)*. The small-sized lot shown in Figure 5-2 is a 70-space parking garage located near an arterial street transit stop.

The medium P&R lot (Figure 5-3) is located on an 11-acre parcel and has a parking capacity of about 1,100 spaces. Rather than having a bus loading area running parallel to an adjacent street, this P&R lot example has a dedicated loop access driveway for buses *(20)*. The large P&R lot (Figure 5-4) is located on a 21-acre site and has a parking capacity of about 1,900 spaces. There are multiple bus loading areas designated for different destinations *(20)*.

## 5.1 FUNCTIONAL ZONES OF A TRANSIT FACILITY

Transit facilities are made up of functional zones associated with specific activities that are typically found at transit facilities for bus operations. Figure 5-5 shows an example of how the different zones of a transit facility might relate to one another *(38)*.

Depending upon specific planning, community, and environmental requirements, the need for a particular zone and the sizing of zones can be determined. For example, an informal or opportunistic lot may provide only long-term parking and a transit loading area. In another case, the functional requirements of bus operations may call for a specific number of bus loading positions, or bays, while identifying the need for independent arrival and/or departures of buses. Designers can then determine site layouts for accommodating the number of transit vehicles present and satisfying the needs of the remaining facility zones.

Care should be exercised so that the general design criteria fit local conditions. The goal of the design parameters provided in this chapter is to promote the greatest creative flexibility and therefore encourage solutions that fit local conditions. Furthermore, many of the design examples relate to the bus-oriented park-and-ride facility. However, the concepts are directly transferable to rail-oriented systems.

## 5.2 COMMUNITY INTEGRATION

Park-and-ride facilities are often criticized for their inability to discourage travel by the private automobile, their adverse community and environmental impacts, and the perception that they attract criminal activity.

In many locations, public opinion is increasingly more demanding of public works projects, including park-and-ride facilities, especially in communities where vacant land is scarce and cultural or environmental concerns are high. As transit is increasingly being looked to as a means of addressing traffic congestion as well as air pollution concerns, park-and-ride facilities designed to serve only a transfer from the automobile to transit mode and that are not integrated with the surrounding community may not provide the maximum benefit to be realized from a fully intermodal/multimodal park-and-ride facility (see Figures 5-6 and 5-7).

A community integrated park-and-ride facility can increase transit ridership and, given the right situations, increase the potential revenue stream to the transit agency and tax base of the surrounding community by providing a higher degree of accessibility which, in turn, encourages a higher density in surrounding development. Integrated park-and-ride facilities can also provide a suburban focal point, around which future urban developments can orient.

Developing an integrated park-and-ride facility cannot successfully occur within a vacuum. For successful integration, a coordinated effort is required, often spanning several jurisdictional agencies and including local community representatives. It can be demonstrated that supportive zoning and/or deed restrictions

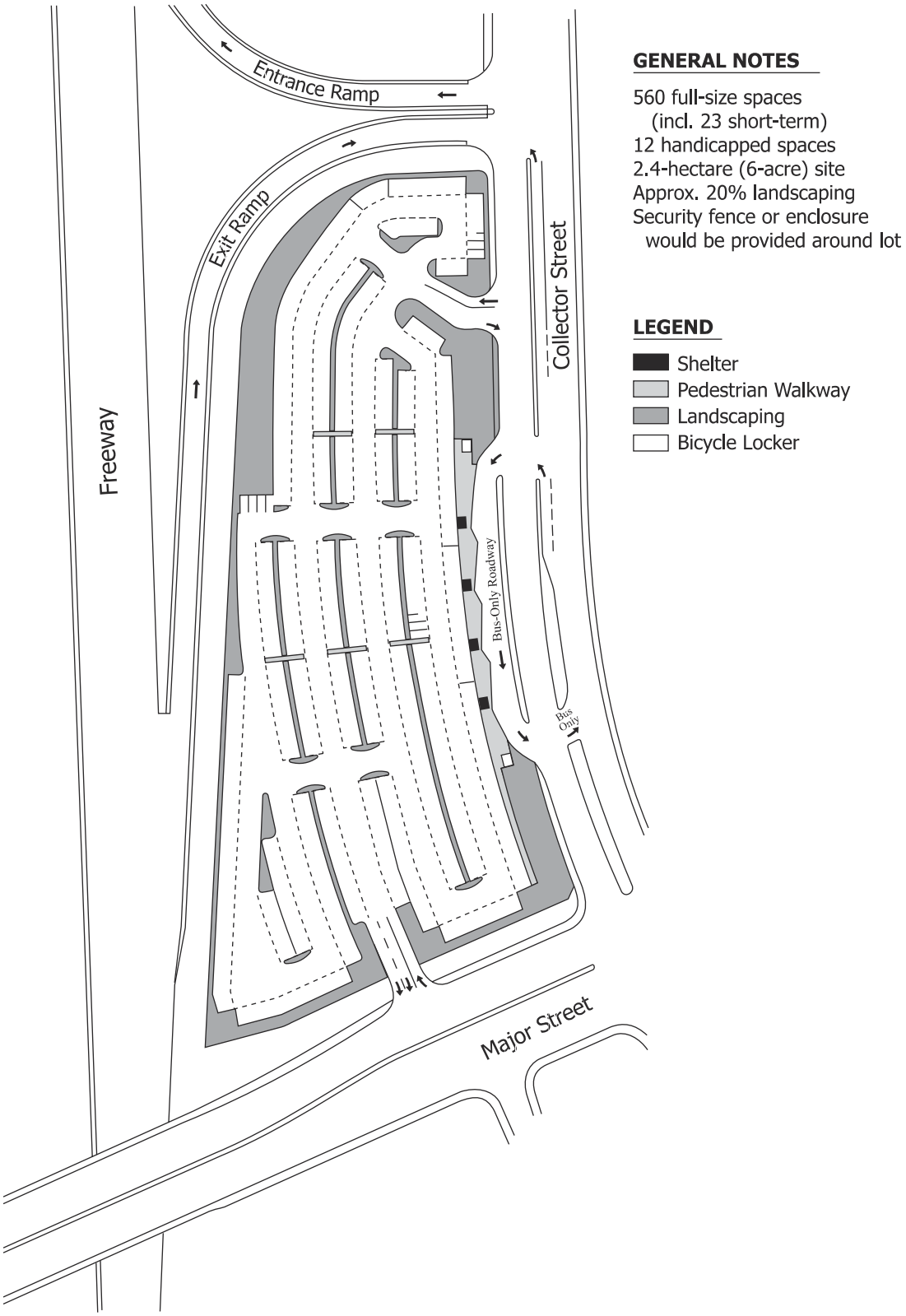


**FIGURE 5-1. Example Park-and-Ride Layout for a Small-Sized Lot. Adapted from Reference (*20*).**

**FIGURE 5-2. Small-Sized Lot with Parking Structure at I-15 and Ted Williams Parkway, San Diego, California.**
*Photo courtesy of Texas Transportation Institute.*

that promote transit-supportive land use development in the vicinity of the park-and-ride lot are extremely beneficial, if not absolutely necessary, for integration success. There must also be a market for the park-and-ride facility and accompanying transit services.

### 5.2.1 Land-Use Coordination and Integrated Park-and-Ride Facilities

Designing a park-and-ride facility to be an integral part of the surrounding community can be difficult, especially within a heavily auto-oriented travel market. However, there may be significant opportunities within the community to establish a park-and-ride facility such that it encourages transit-friendly design in the surrounding neighborhood. When the surrounding community is oriented towards transit-friendly design, then maximum use of the park-and-ride facility and intermodal transfer station can be accomplished.

Primary objectives and advantages of a community-compatible or integrated park-and-ride facility include:

- Adjacent residential, service-oriented, and commercial activities can provide transit patronage, services, and security to the transit agency operating the park-and-ride facility
- Multistory buildings located near the site can provide visual surveillance of the park-and-ride facility, thereby increasing its perceived safety
- Attractive designs providing high visibility can engender a sense of community ownership and stewardship
- Adequate attention to pedestrian and bicycle facilities, both on-site and in the surrounding developments, encourages a multimodal use of the lot *(1)* (See Figure 5-8)

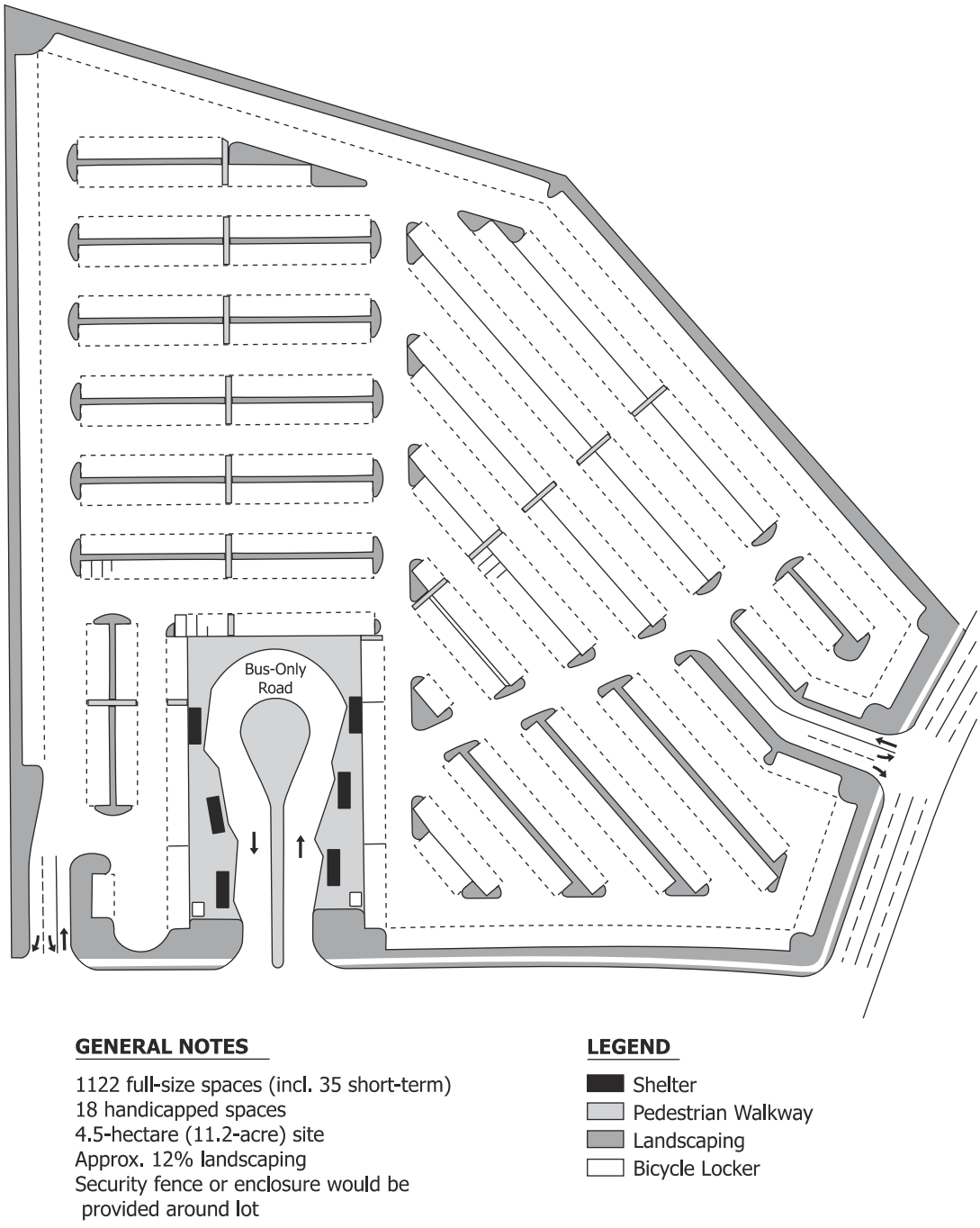


**FIGURE 5-3. Example Park-and-Ride Layout for a Medium-Sized Lot. Adapted from Reference (*20*).**

- Public investment in an integrated transit facility can serve as a focal point for suburban community development
- Increased massing of transit facilities and surrounding land uses increases the visibility of public transit and creates a potential for future markets
- Centralizing transportation services increases accessibility to surrounding land uses and the community

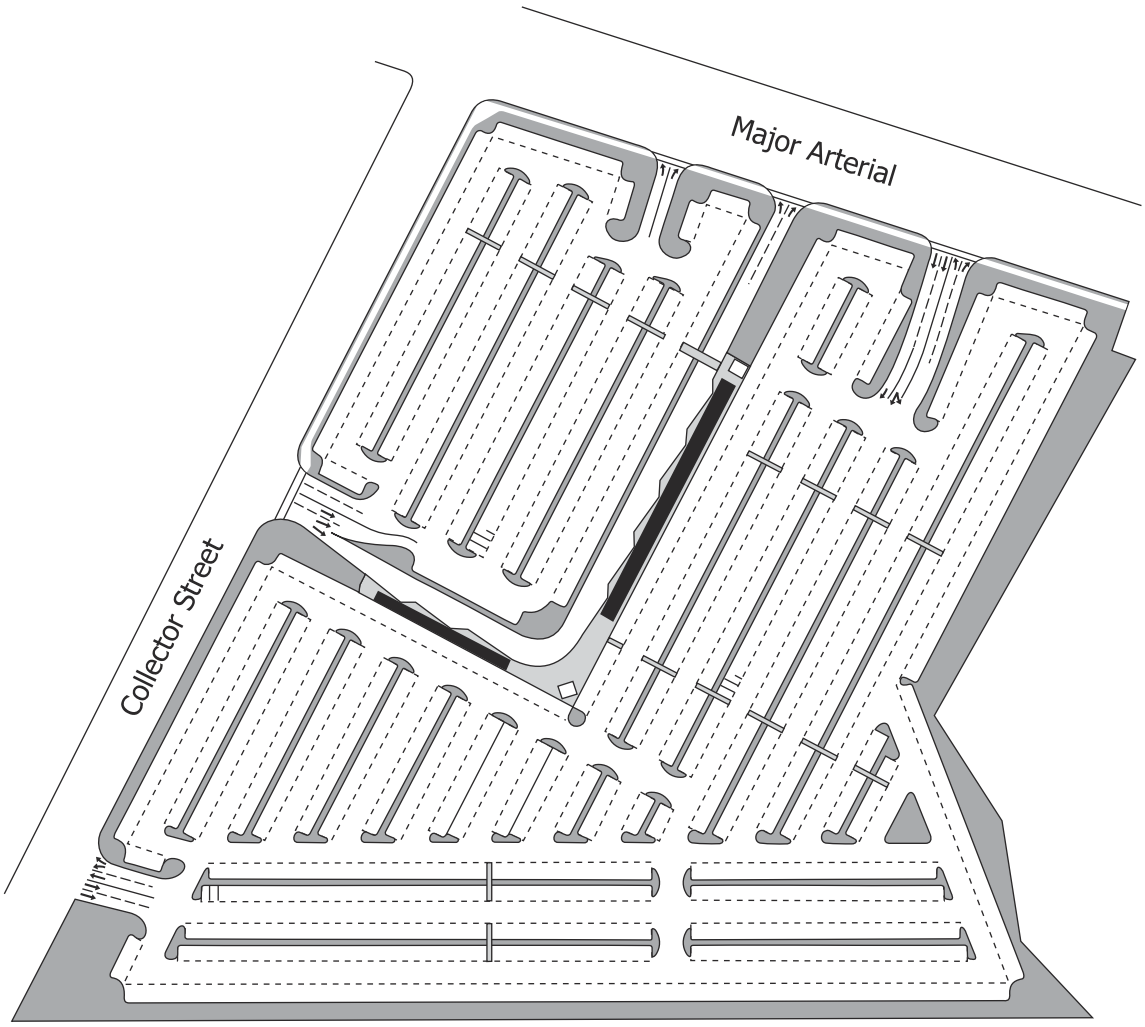


**FIGURE 5-4. Example Park-and-Ride Layout for a Large-Sized Lot. Adapted from Reference (*20*).**

### 5.2.2 Organization of Surrounding Land Use

Effective organization of land uses and land use mix in the vicinity of transit facilities can help to reduce the number of total trips within the area and eliminate the need to make some trips by autos, thus reducing the need to provide parking and encouraging additional pedestrian activities. Mixing of residential, commercial, and retail services in the vicinity of the park-and-ride lot can encourage residents to link trips that might otherwise occur separately. When such land use mixing policies are coordinated with specific design techniques, a transit-supportive, pedestrian-oriented environment can be developed.

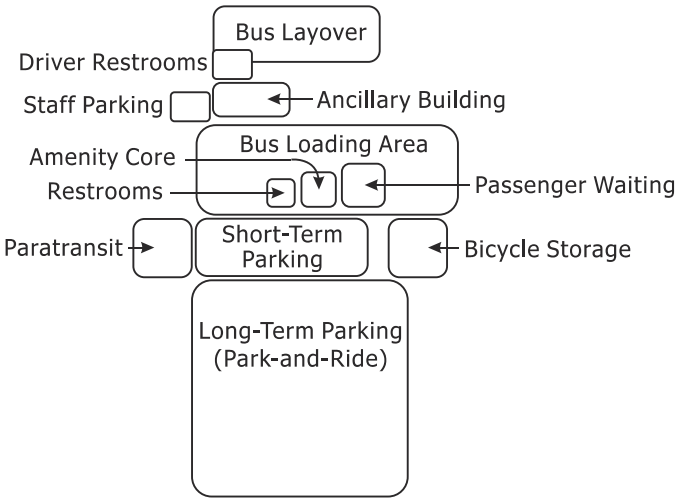


**FIGURE 5-5. Functional Zones of a Transit Facility. Adapted from Reference (*20*).**

Park-and-ride facilities are similar to other intermodal facilities and, if designed with the community in mind, can become an integral part of the urban fabric while remaining efficient change-of-mode facilities.

A key to land use organization is the process of providing a focal point around which to organize various urban and suburban uses. Extensive research on this topic by New Jersey Transit (NJ Transit) suggests that three important concepts must be embodied in the design of a transit facility if it is to be used as a focal point for the surrounding community:

- Emphasize pedestrian and bicycle modes of access within the surrounding community and within the park-and-ride facility. The pedestrian linkages between the lot and the surrounding neighborhood, as well as the linkages internal to the park-and-ride lot, give the intermodal facility its character. Any transit-related trip includes some portion on foot. The pedestrian environment and the pedestrian activity generated by the amenities provided within the intermodal facility are typically identified as the elements that give a place its sense of community. Therefore, it can be argued that a pedestrian-oriented environment makes for a good transit-friendly one, both at the neighborhood level and at the park-and-ride facility.

- Utilize traffic-calming techniques to emphasize the pedestrian and reduce the impacts of traffic circulation in and around the park-and-ride facility. By their nature, park-and-ride facilities require an interchange between the auto mode and transit. The auto's importance within this intermodal transfer must be accommodated and the use of traffic-calming techniques such as speed control devices within the lot can reduce or eliminate conflicts between the auto mode and pedestrian. This increases the opportunity for pedestrian linkages with surrounding land uses and encourages a more multimodal environment.

- Create a sense of place surrounding the park-and-ride facility and foster a sense of community stewardship. Often, transit is planned only as an afterthought and is located at the periphery of a community or suburban development. A bolder approach is to bring the park-and-ride facility and related transit service into the heart of the development so that it becomes a focal point for the surrounding land uses.

Careful planning of areas surrounding the intended park-and-ride lot can produce a sense of ownership for the park-and-ride lot within the surrounding community and provide a visible icon for the neighborhood. Architecturally unique pedestrian facilities, landscaping, and/or public art programs can add distinction to the park-and-ride facility, making it a focal point within the community. The design should not compromise the transit accessibility of the facility but assure that an acceptable level of efficiency is provided.

**FIGURE 5-6. Multimodal Approach to Park-and-Ride Lots (Bicycle Storage Rack). Northgate Transit Center, King County Department of Transportation, Seattle, Washington.**

*Photo courtesy of Parsons Brinckerhoff Quade & Douglas, Inc.*

### 5.2.3 Locate Supporting Land Uses in Proximity to the Park-and-Ride Facility

An important element in obtaining a community integrated park-and-ride facility is understanding the general travel and time characteristics of traditional land use types and then encouraging beneficial types to locate near the proposed park-and-ride facilities.

In outlying suburban communities, park-and-ride facilities situated near larger suburban employers can provide a destination for ''reverse'' commuters, those traveling from the traditional CBD to the suburban employment center or between different suburban employment centers if transit service allows. Such a park-and-ride facility can also serve as a transit center or hub for a suburban distribution system or local shuttle service.