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DEVELOPMENT OF METHODS OF ANALYSIS FOR PLANNING TRANSIT SYSTEM COMPONENTS IN AND AROUND MAJOR ACTIVITY CENTERS

PART III: MAJOR ACTIVITY CENTERS CIRCULATOR DESIGN STUDIES

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INTRODUCTION

This paper addresses the visual impact of elevated guideways for a people-mover system in a Major Activity Center (MAC) and the design of bus interchange (intercept) stations that will accommodate the movement of people between regular bus routes and a local circulator system. For our purposes, the local circulator system technology is assumed to be either Personal Rapid Transit (PRT) or a circulator bus/van system.

Factors assumed as givens include: a Major Activity Center anchored by a regional shopping center in close proximity to a regional transportation corridor; a Light Rail Transit (LRT) or other mass transit system located in close proximity to the regional transportation corridor; existing local bus service; medium to high density office and residential developments in close proximity to the regional shopping center; a suburban type medium to low density distribution of uses dispersed by surface level parking lots approximating six to seven parking spaces per Gross Leasable Floor Area (GLA) for retail and 2.2 spaces per GLA of office development. Pedestrian sidewalks are generally provided but distances between major activity components exceed comfortable walking distances of 800 to 1,000 feet.

METHODOLOGY

The methodology used to assess the visual impact of the PRT system and to visualize the station accommodation of bus/local circulator systems is a graphic representation of selected scenarios using eye level and aerial oblique sketches and plan diagrams. The assessment of visual PRT facility impacts was in many cases combined with the station design visualizations.

Emphasis is placed on a Personal Rapid Transit (PRT) system as a local circulator within a Major Activity Center because of the flexibility of the system as a transportation corridor/facility introduced into an existing retail/office/residential auto-oriented center. As is demonstrated in the Scenario Assessments, the PRT facility can be accommodated within existing or previously proposed mass transit/bus intercept stations with little modifications. It is also easily accommodated within regional shopping center and office complex developments, requiring little or no expansion to existing parking. Architectural modifications are required and can be compared to modifications of existing buildings to accommodate second level enclosed walkways in dense retail core areas.

SCENARIO ASSESSMENT: SHUTTLE BUS/VAN LOCAL CIRCULATOR STATION

A shuttle bus/van local circulator system intercept with a regular bus route system is similar in characteristics to a timed-transfer bus facility. Development requirements include: 1) adequate space for bus bays, necessitating a sizeable site not necessarily available in retail/office core areas; 2) proximity to major radial corridors; 3) proximity to business and commercial centers, within easy walking distance of major activity components; 4) linkage top pedestrian ways; 5) site flexibility for future expansion; 6) minimize walking distances between buses for transportation riders; 7) integration with character of the MAC; 8) minimize adverse impacts on traffic circulation; 9) capital costs of construction; 10) capital costs of rights-of-way; and, 11) opportunity for private sector participation through potential joint development. (Schneider, 1983).

Timed-transfer bus facilities, used as a model for shuttle bus/regular bus intercepts, functions at peak efficiency when available space is provided, when a part of a multiple use development area with immediate pedestrian connections, where pavement carrying capacities meet bus axial load requirements (not often

existing within shopping mall properties), and where turning radii and internal roads are designed for bus vehicle specifications. (Schneider et al, **1979).** A desirable location for such an intercept station would be a regional shopping center within the MAC or mass transit station in close proximity to a regional transportation corridor. Both present difficulties in accommodating bus-type local circulators for the following reasons: shopping center pavement types and circulation roads are designed for automobiles and limited service vehicles, not buses; have numerous bus/vehicle conflicts and pedestrian/bus conflicts complicated by multiple stop indicators, prolonging the trip time.

SCENARIO ASSESSMENT: MASS TRANSIT/PRT/REGULAR BUS ROUTE INTERCEPT STATION

Figure **1,** Mass Transit/PRT/Bus Intercept Plan depicts a mass transit/bus intercept station with drop-off/pick-up and parking facilities. An elevated PRT on-line (through traffic) guideway and off-line (station-stop) guideway are depicted between the bus bay area and an elevated mass transit regional facility. The PRT combined guideway (off/on-line) system occupies twelve to fifteen feet of right-of-way width with pedestrian circulation passing at-grade under the guideway structure.

Figure 2A, Mass Transit/PRT/Bus Intercept Section depicts all three modes in coordinated alignment. Stairs and elevator/escalator vertical access is required to accommodate the passenger intercept. Figure 2B, Light Rail/PRT/Bus Intercept Section B depicts an at-grade Light Rail system intercepting a PRT and regular bus route systems accommodated by a second level walkway from the elevated PRT station over the light rail tracks and connected to grade by stairs and elevator/escalators. Figure 3 is a perspective sketch of the mass transit/PRT/bus intercept station depicting on-line guideways merging into a protected station area connected by stairs and elevators to at-grade bus bays and an elevated mass transit stop.

SCENARIO ASSESSMENT: PRT/BUS INTERCEPT STATION

Figures 4 and 5, PRT/Bus Intercept Station Section depict an elevated PRT guideway (on-line/off-line) with an at-grade bus bay zone, park and ride lot, and a kiss and ride facility with shelter. The PRT guideway is accommodated above and on line with the bus shelter waiting zone, reducing the guideway corridor land requirements. Elevator/stair vertical circulation is required. Figure 6 is a sketch depicting the bus bay zone, shelter, kiss and ride zone, and PRT in the background with the off-line returning to grade as an option and where space permits.

SCENARIO ASSESSMENT: PRT STATION AT AN INSTITUTIONAL FACILITY

Figure 7, PRT Institutional Station, illustrates a second level entry design into an institutional complex, similar to a number of existing community college campuses in the Seattle metropolitan area. The guideway design can be modified to fit local architectural characteristics, in this case having larger width columns compatible with adjacent building design. An open shelter design with wind break panels connected to the main building complex is suitable for Pacific Northwest climate conditions. Institutional facilities can also be located under the guideway, as depicted in the sketch. Pedestrian walkways are accommodated at grade level under the guideways and station shelter.

SCENARIO ASSESSMENT: PRT/BUS INTERCEPT AT OFFICE BUILDING COMPLEX

Figure 8 depicts a combined at-grade bus stop facility and an above grade PRT station located along one edge of an office complex within a MAC. This station arrangement is best suited for building complexes with two stories or more in height and/or access to a pedestrian "mixing" space complete with elevator/escalator facilities. The station shelter, enclosed or open-sided, is an extension of the building roof design, or in the case of a multi-storey building an extension of an entry portico. The guideway itself can serve as a shelter for the at-

grade bus stop. Figure 8 also illustrates an on-line by-pass of the station, with a portion of the guideway acting as bus shelter, and an off-line guideway serving the building complex.

SCENARIO ASSESSMENT: REGIONAL SHOPPING CENTER MALL STATION OPTIONS

Figure 9 depicts a regional shopping center within a Major Activity Center surrounded by arterial oriented retail and general commercial uses, medium to high density residential uses, office complexes and institutional uses. A mass transit or Light Rail Transit station/park and ride lot is located immediately adjacent to a regional transportation corridor. Suburban parking standards cause a dispersal of buildings and building complexes with minimal accommodation for safe and convenient pedestrian walkways between major activities within the MAC.

OPTION A: REGIONAL SHOPPING CENTER/SHUTTLE BUS OR VAN STATIONS

Figure 10 depicts a shopping center with regular bus facilities serving as a local circulator within the MAC. Accommodating a multiple bus bay waiting zone within an established shopping center facility can be accommodated with the following guidelines: 1) auto-bus and pedestrian-bus conflicts must be reduced or eliminated within shopping center surface parking lots by using grade separated bus-ways and station areas or bus-only lanes into, through, and out of the center complex; and, 2) bus station areas should be removed from the immediate shopping center building edge in order to reduce air pollution from standing buses, to reduce noise levels from standing and departing buses, and to reduce visual interference by bus vehicles of store and associated advertising visibility.

Bus shelter and bus bay areas can be accommodated within the periphery of existing parking lots and connected to the main building complex by covered

walkways. Raised sidewalks with curbs would add to the safety and perceived safety of pedestrians walking from the building complex edge to the bus waiting areas.

With a bus-only lane scenario used within the parking lot of an existing shopping center, there are numerous auto-bus and pedestrian-bus conflicts that are unavoidable, creating potential safety hazards and causing time delays in bus operations. In Figure 10, from point A to point B, there are seven stop signs within the interior of the shopping center lot. Large bus sizes and wide turning radii also present problems in accommodating access to stations located in close proximity to the center. Mini-buses or vans could reduce the size and turning restrictions but not the frequent and multiple stops within the larger parking lot of a regional shopping center.

OPTION B: REGIONAL SHOPPING CENTER/PRT LOCAL CIRCULATOR STATIONS

Figure 11 depicts a PRT local circulator system connecting activities within the MAC with a station inside or immediately attached to the shopping center mall complex. Figure 12, PRT/MALL Exterior Station Sketch, illustrates an elevated guideway on-line/off-line station attached to the exterior face of a department store building at one end or corner of the shopping center mall. The three feet by three feet cross section guideway design and ninety feet column support distances reduce the visual profile of the guideway system. A limited bus bay zone is provided at grade in separate lanes under the PRT guideway. Pedestrian circulation would require specific designated crosswalk areas to reduce bus-pedestrian conflicts between the parking lot and building complexes if buses are to be accommodated in such a scheme.

Figure 13 depicts an interior sketch view of a shopping center mall. The PRT guideway is accommodated within the interior of the mall in this sketch, connected with the main mall area with escalators and an elevator. Limited bus

bays are provided along an exterior face with transparent canopies extending from the building facade providing shelter from the weather. Also illustrated in the sketch is a parking structure option that could be located in conjunction with th PRT station, sewing the shopping center and as a park and ride lot.

VISUAL IMPACTS ASSOCIATED WITH A PRT SYSTEM

Design options for reducing the visual impact of the elevated PRT guideway system are incorporated in the sketches of the station scenarios discussed previously. Regarding the system as a whole, other options worth considering include the alignment of the guideways either in landscaped parkways where right-of-way width permits; or, placing alignments within the interior of blocks along land use changes or service alleys to reduce the elevated visual impact along major circulation corridors. Figure 14, Guideway in Multiple Family Residential Area, illustrates an elevated PRT guideway within a parkway road design in a residential area. The column spacing is the maximum ninety feet with decorated capitols and landscape islands at the column bases. Raised planted areas protected by concrete curbs reduce the risk of vehicles colliding with the vertical supports.

In Figure 15, Interior Block Alignment, the guideway is configured within block interiors a much as possible to reduce view blockage. Station areas in all schemes can generate higher density land use on adjacent properties.

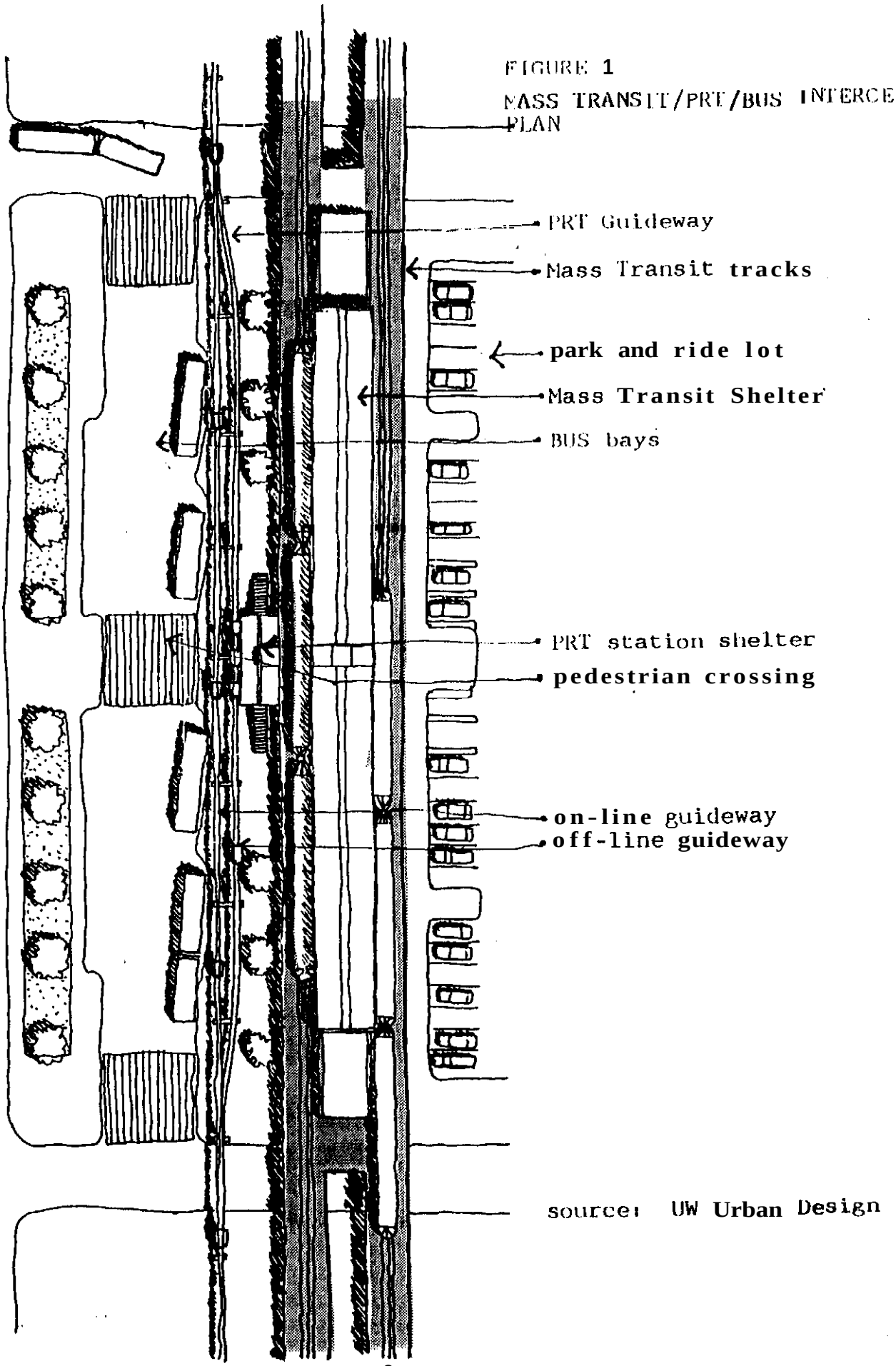


FIGURE 1

MASS TRANSIT/PRT/BUS INTERCEPT PLAN

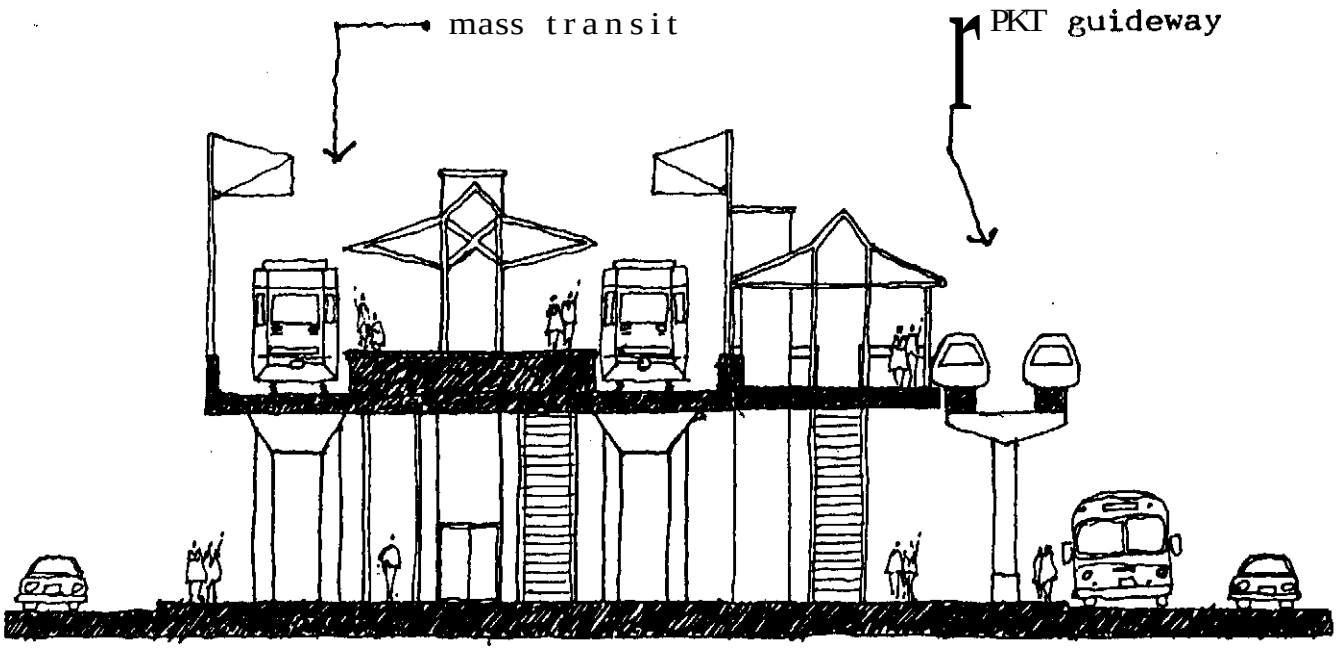


FIGURE 2A

MASS TRANSIT/PRT/BUS INTERCEPT SECTION A
source: UW Urban Design and Planning

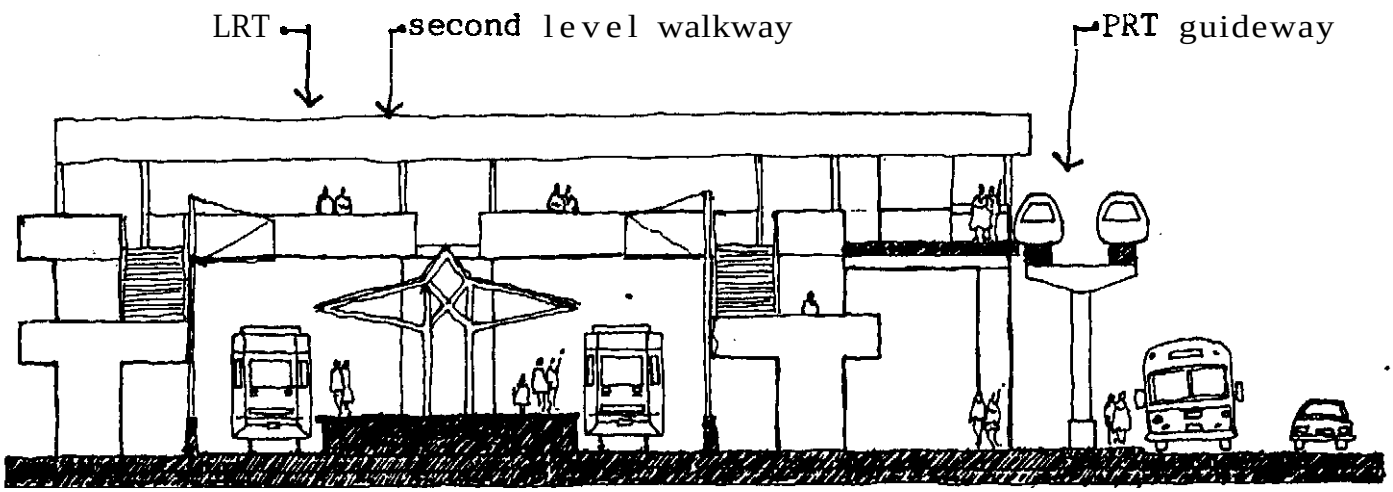


Figure 2B
LIGHT RAIL/PRT/BUS INTERCEPT SECTION B

source: UW Urban Design and Planning

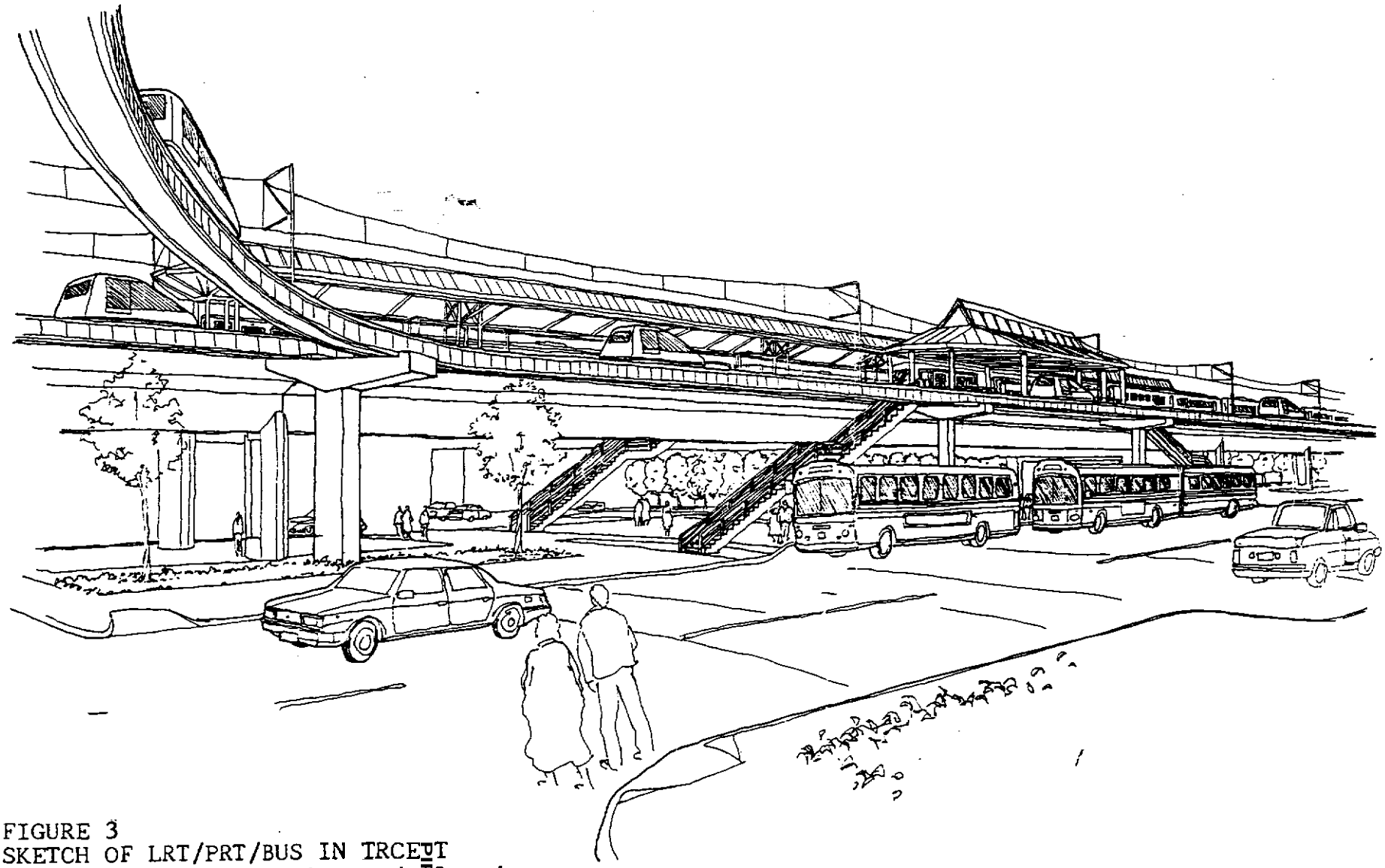


FIGURE 3
SKETCH OF LRT/PRT/BUS IN TRCE[illegible]T
source: UW Urban Design and [illegible]l aning

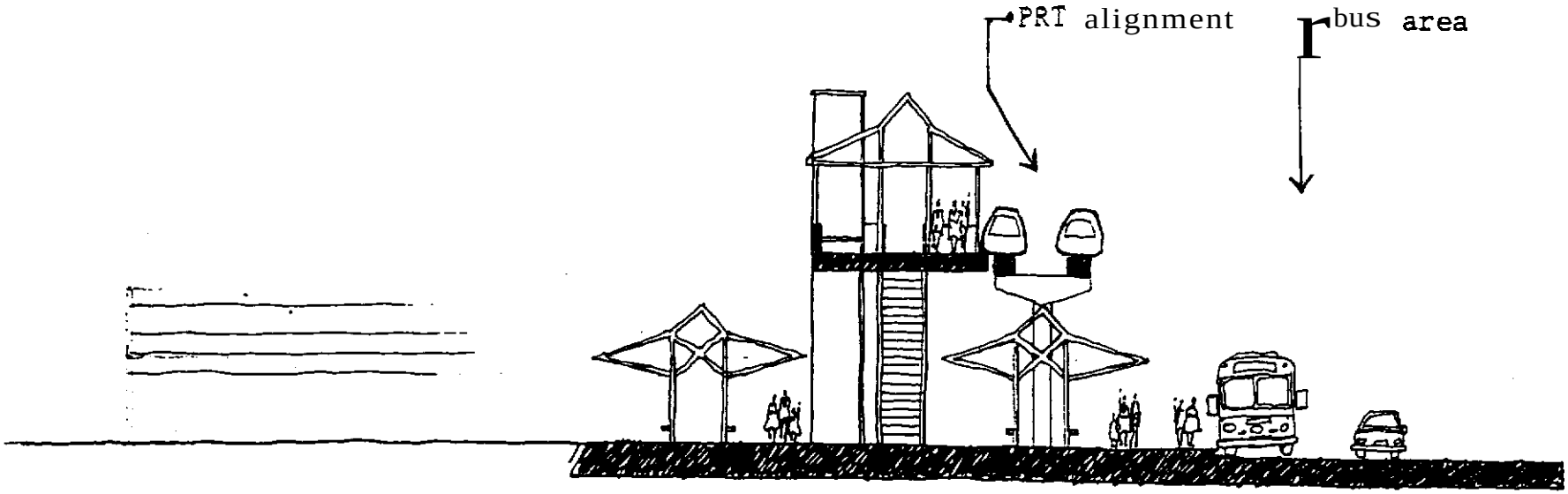


FIGURE *4*
PRT/BUS INTERCEPT **STATION**

source: UW Urban Design and Planning

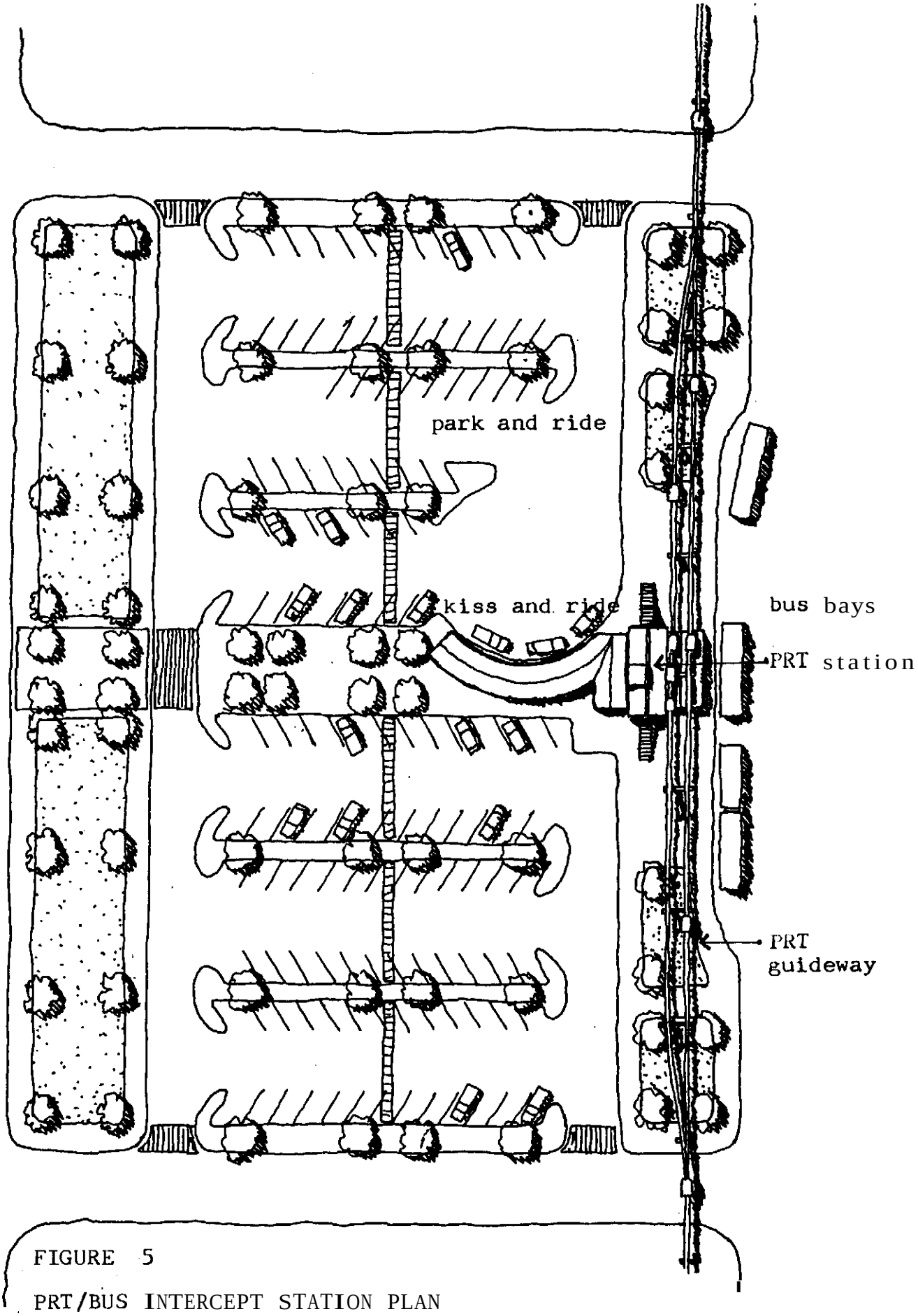


FIGURE 5

PRT/BUS INTERCEPT STATION PLAN
source: UW Urban Design and Planning

FIGURE 6

PRT/BUS **INTERCEPT STATION SKETCH**
source: **UW Urban Design and Planning**

FIGURE 7

PRT/INSTITUTION STATION SKETCH
source: UW Urban Design and Planning

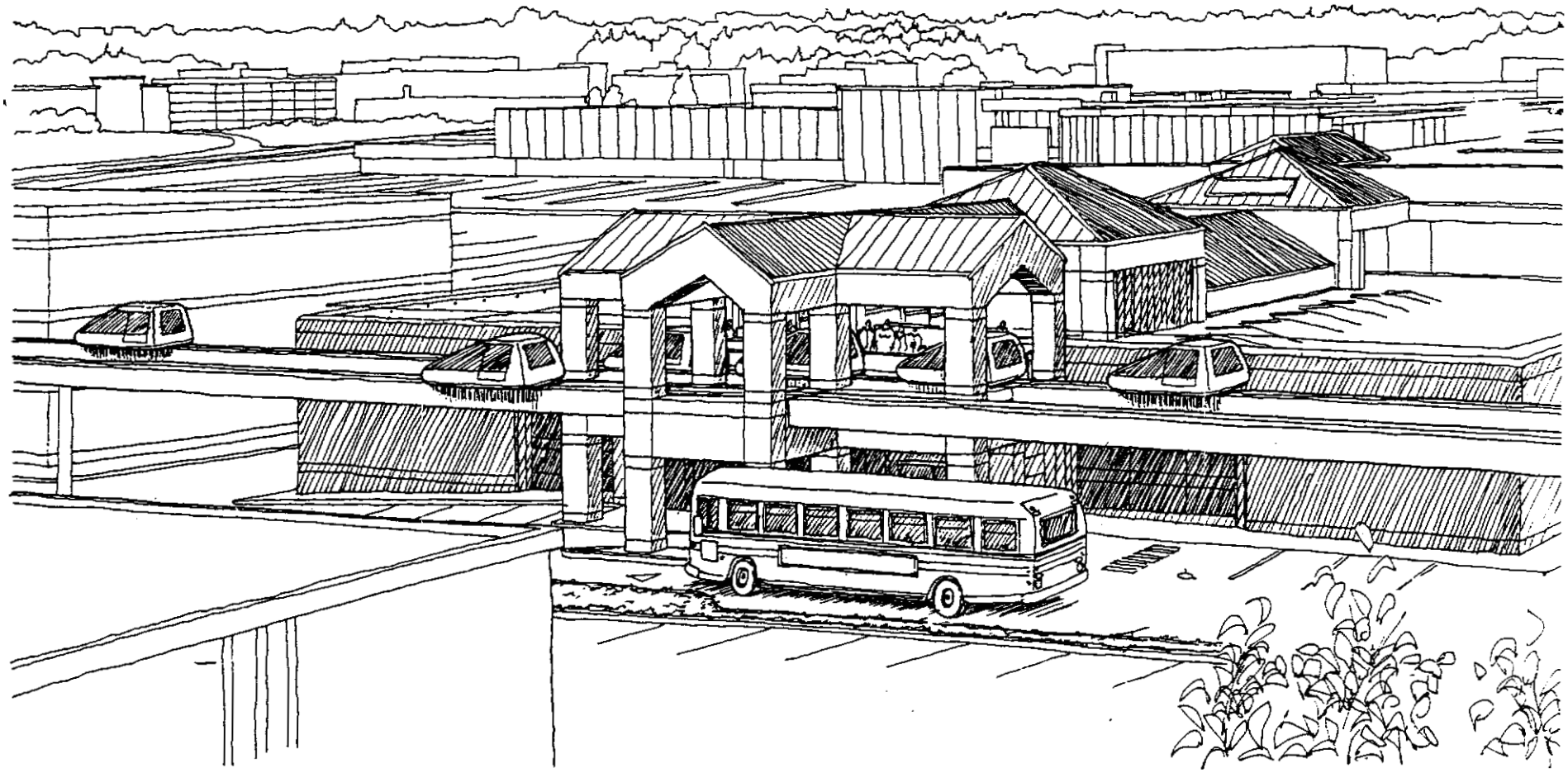


FIGURE 8

PRT/OFFICE COMPLEX STATION SKETCH
source: UW Urban Design and Planning

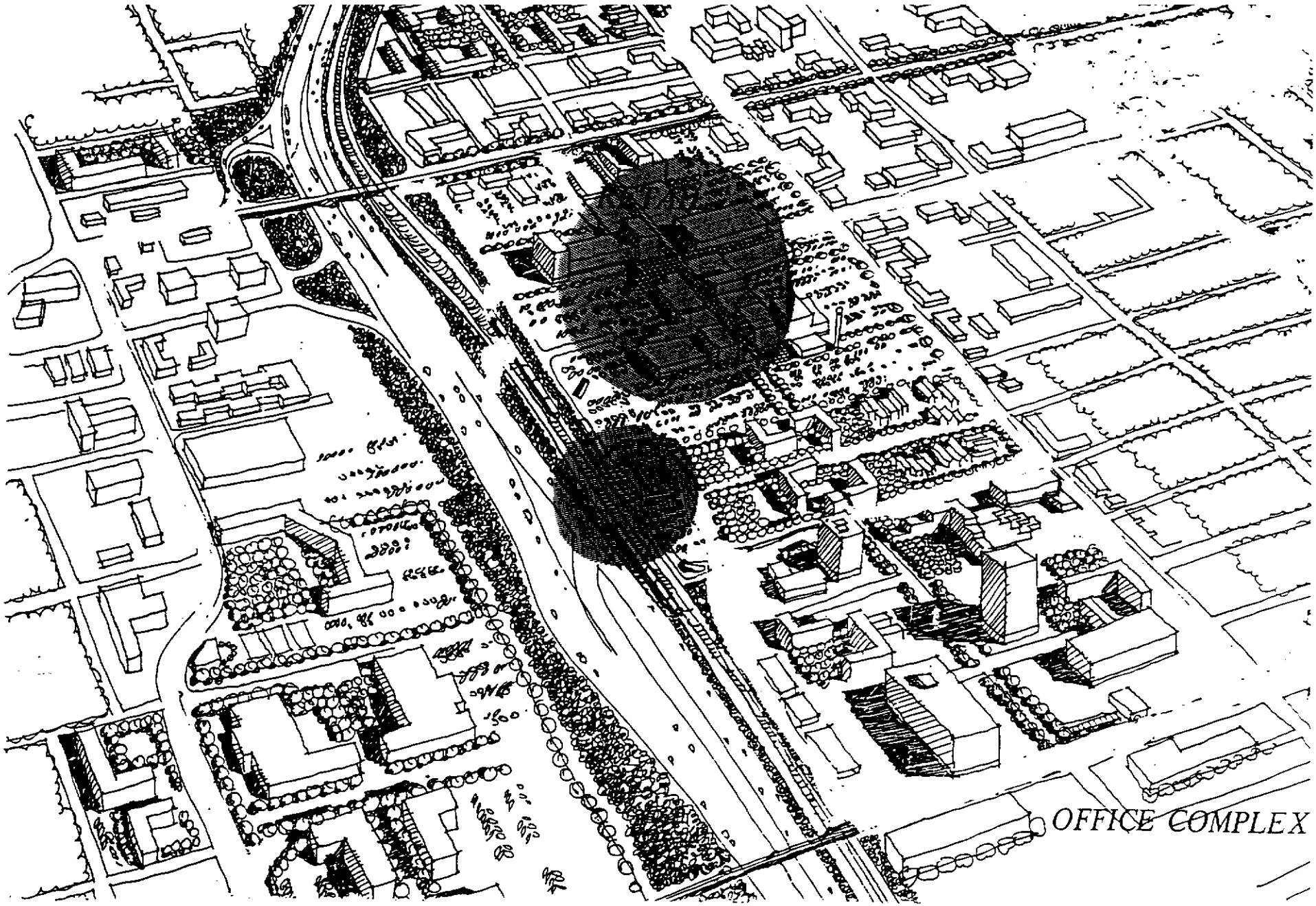


FIGURE 9
REGIONAL SHOPPING CENTER

source: UW Urban Design and Planning

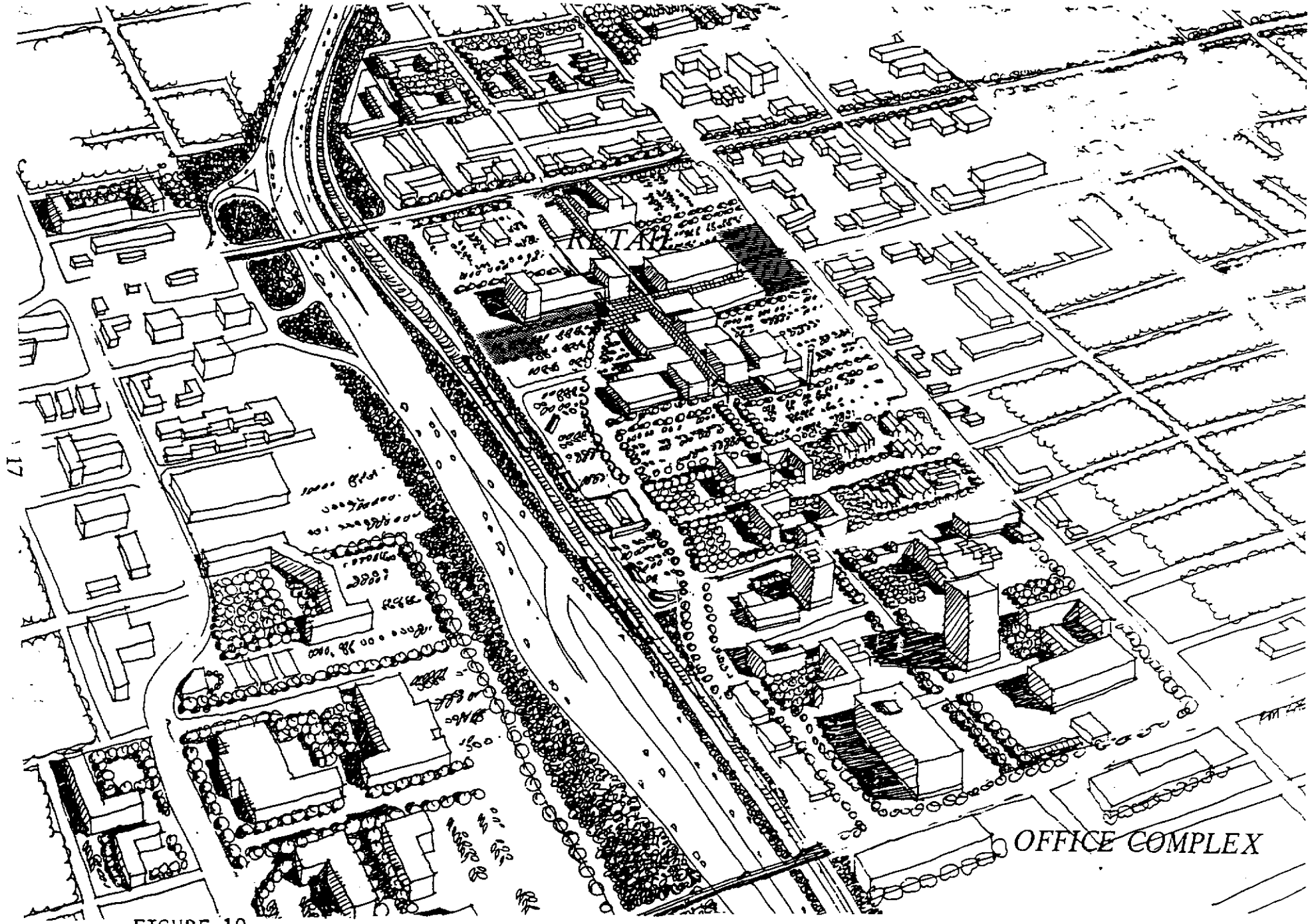


FIGURE 10
REGIONAL SHOPPING CENTER/BUS LOCAL CIRCULATOR

source: UW Urban Design

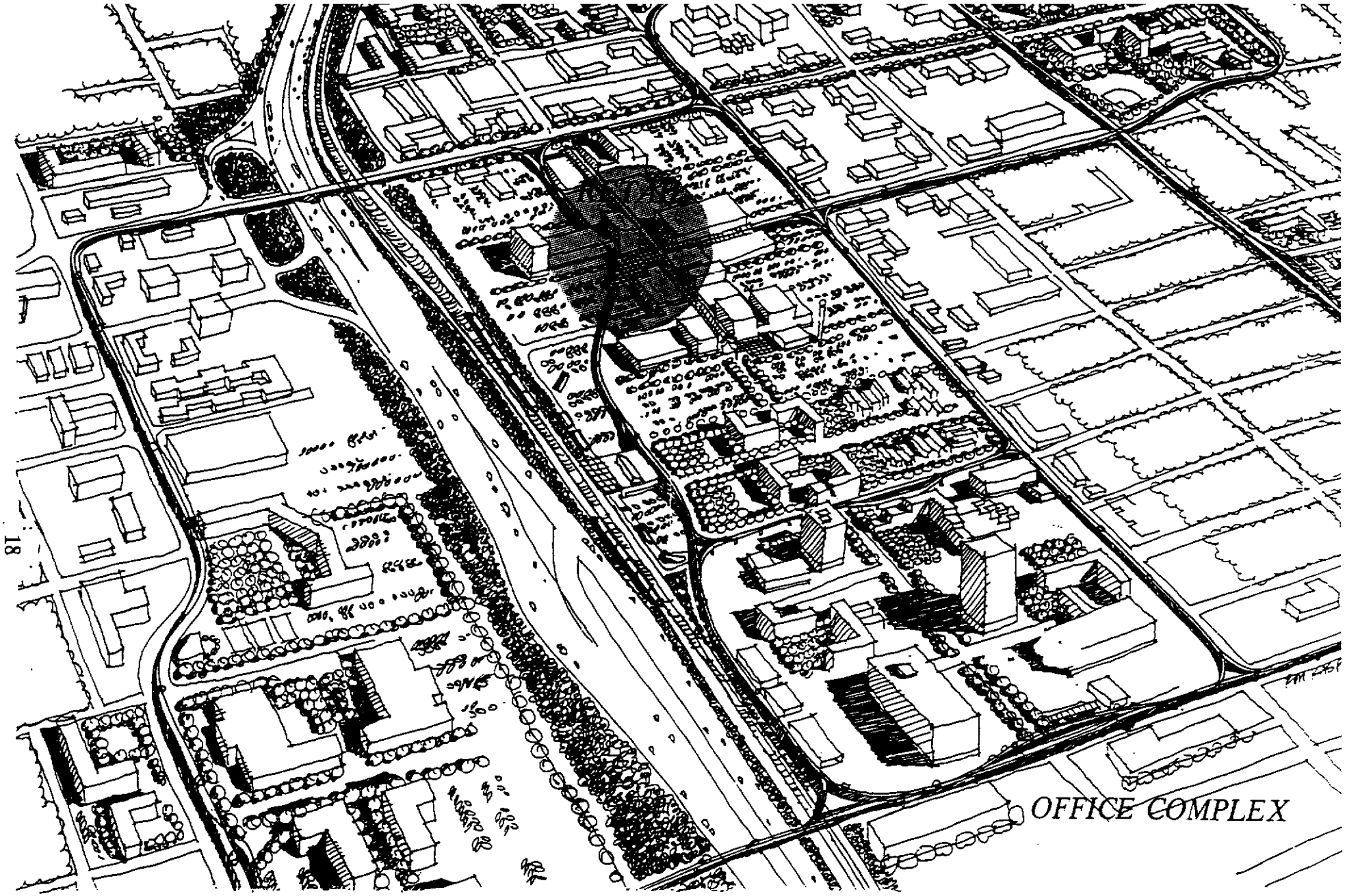


FIGURE 11
REGIONAL SHOPPING CENTER/PRT STATION

source: UW Urban Design and Planning

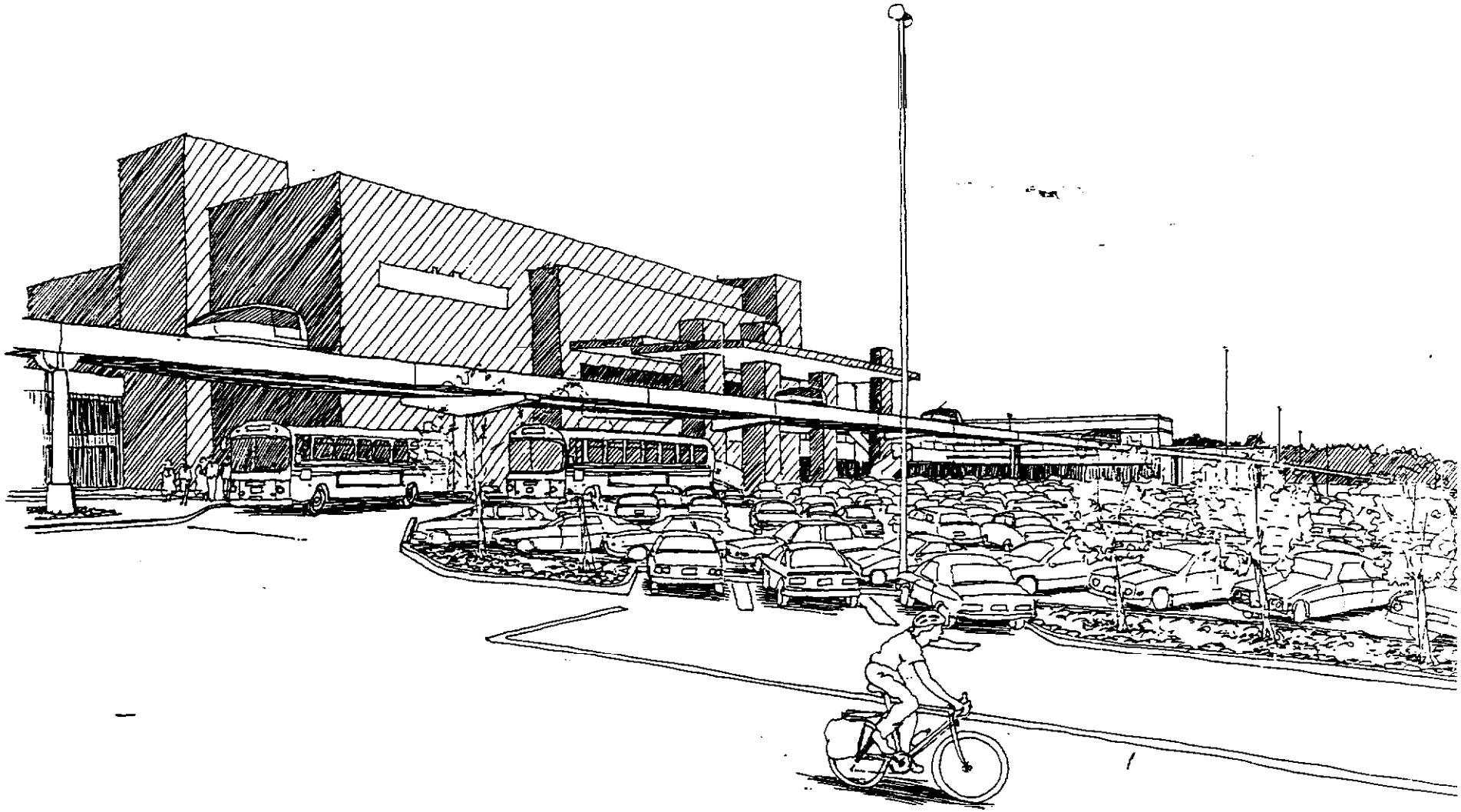
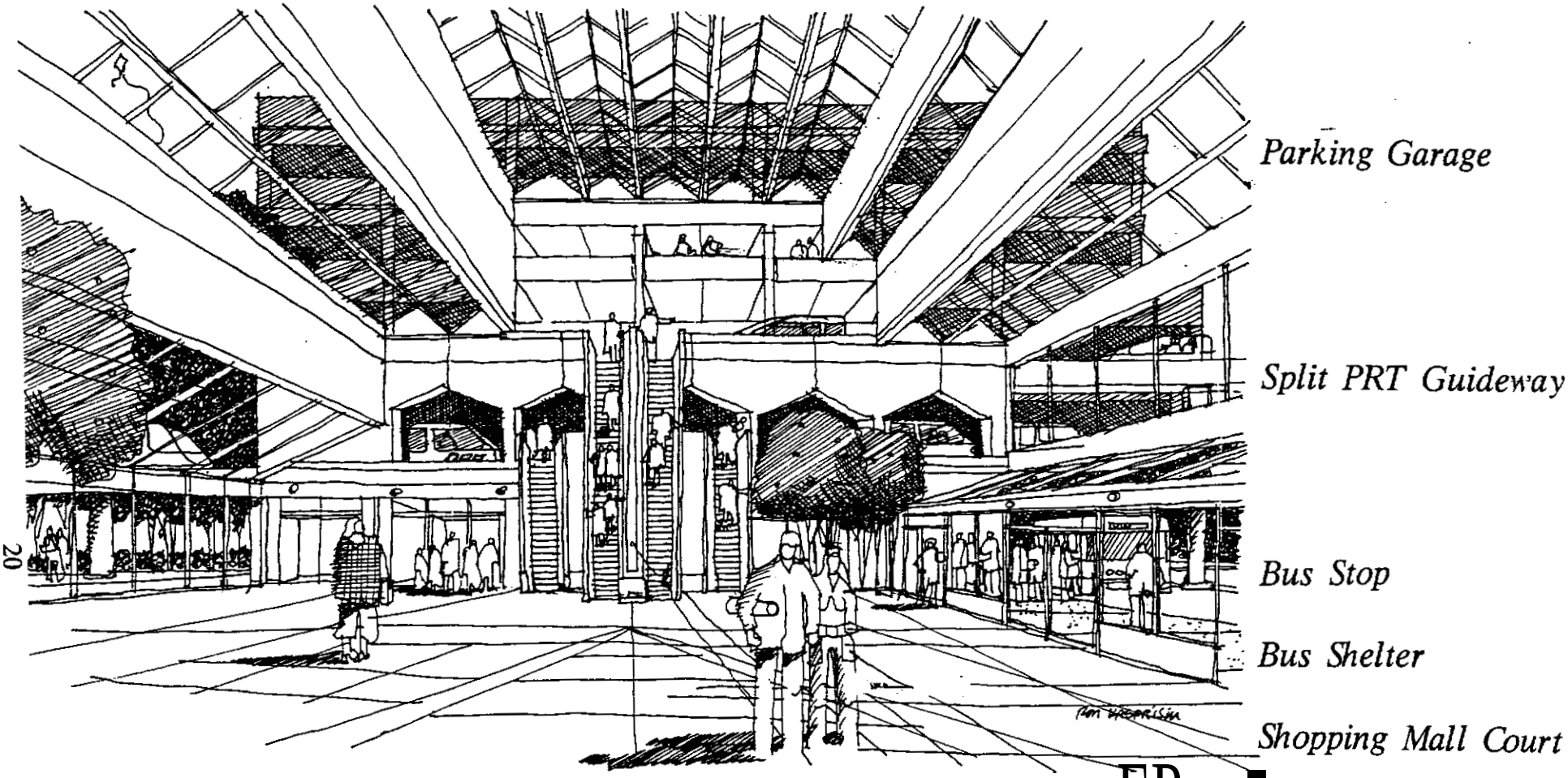


FIGURE 12
PRT/MALL EXTERIOR **STATION** SKETCH

source: UW Urban Design and Planning



EXAMPLE OF PRT/BUS INTERCEPT IN SHOPPING MALL

FIGURE 13
PRT/MALL STATION INTERIOR SKETCH
source: UW Urban Design and Planning

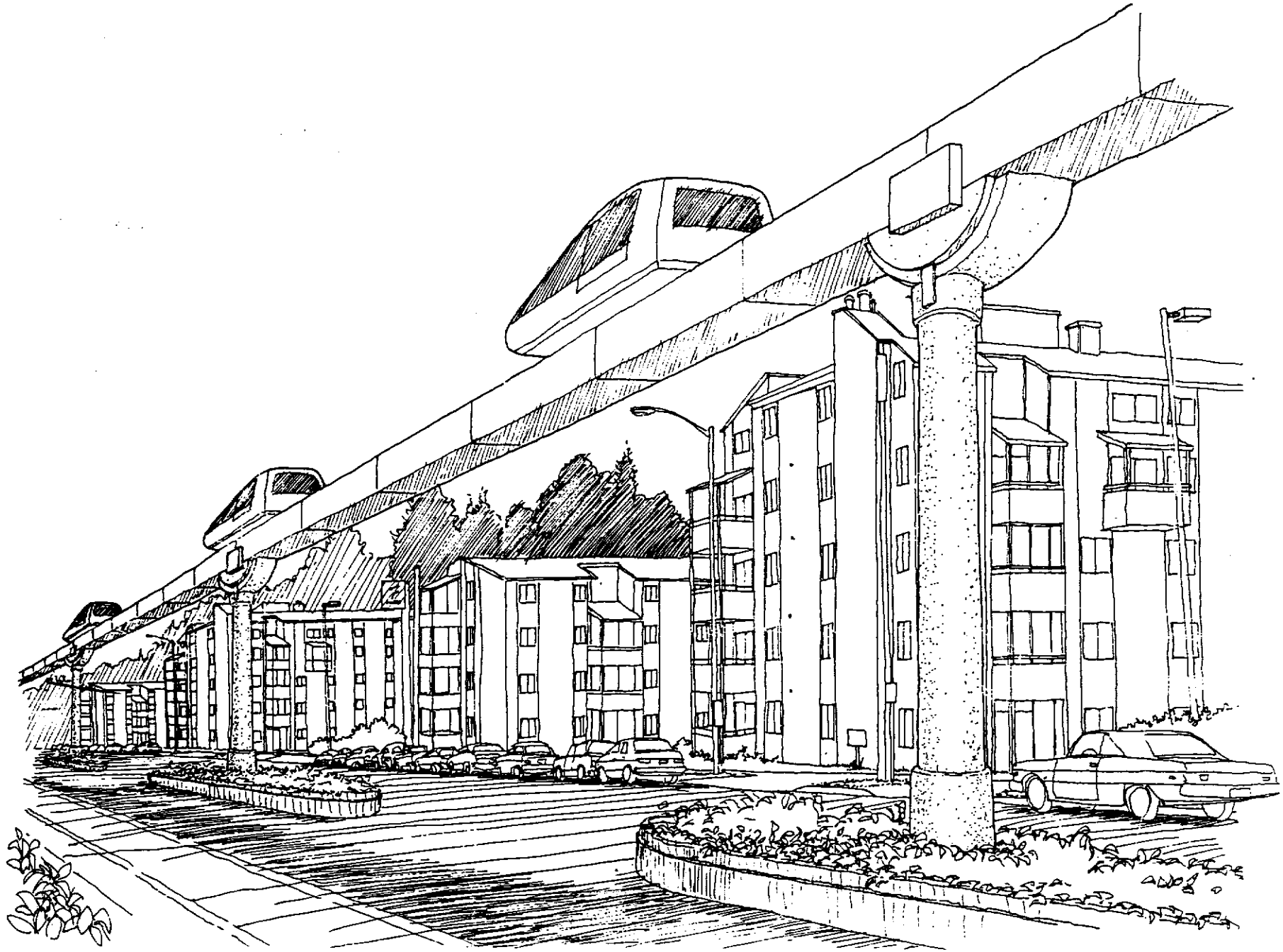


FIGURE 14
GUIDEWAY IN MULTIPLE FAMILY RESIDENTIAL AREA
source: UW Urban Design and Planning

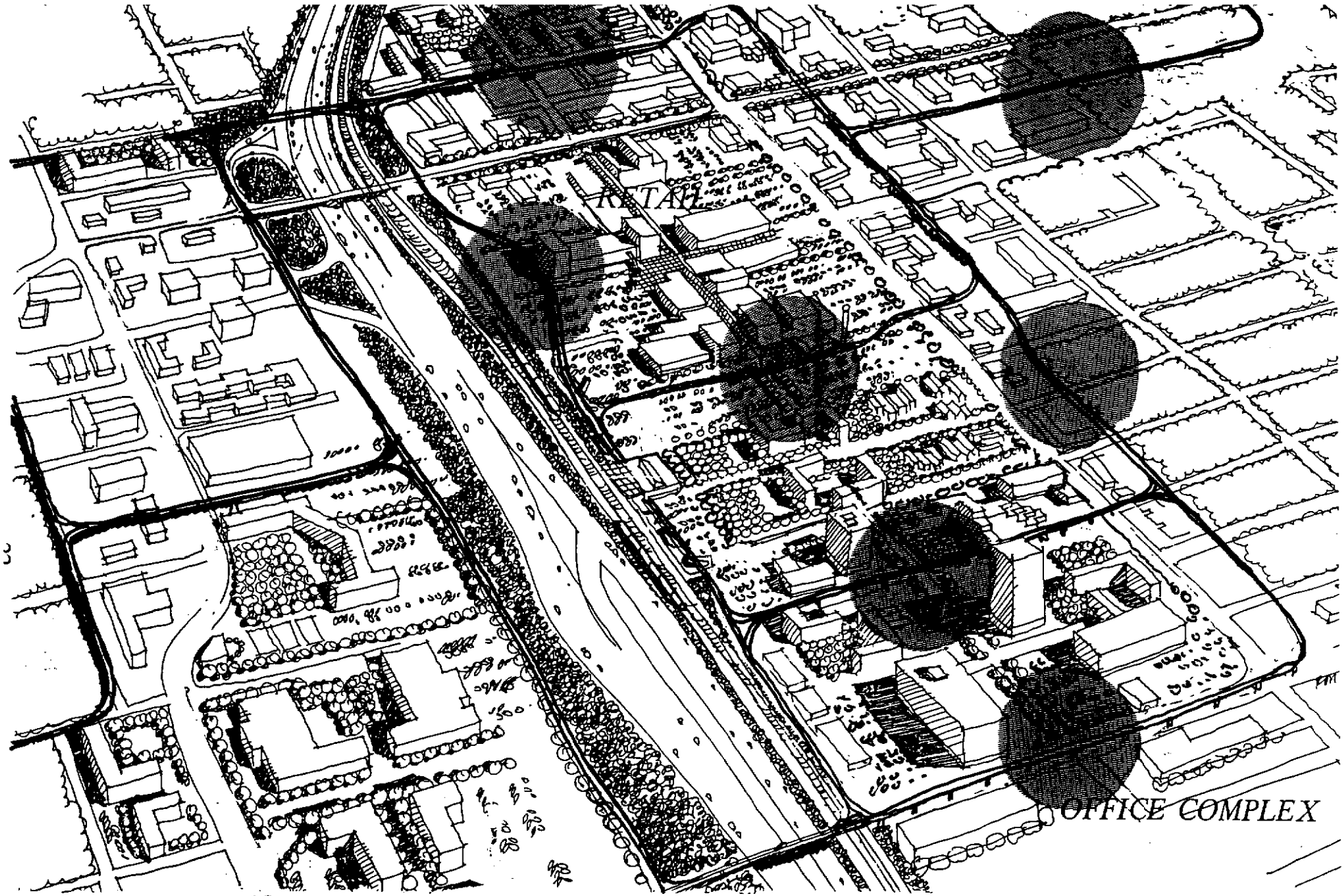


FIGURE 15
INTERIOR BLOCK ALIGNMENT

source: UW Urban Design and Planning