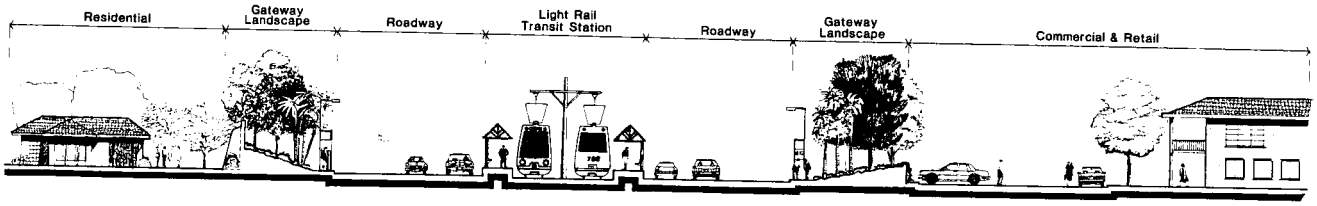
ORACLE-SOUTH SIXTH CORRIDOR STUDY

Final Report



The City of Tucson
Department
of Transportation

July 1991

prepared by

Parsons Brinckerhoff 100 YEARS

Rillito Consulting Group
Rogers, Gladwin & Rothman

ORACLE ROAD/SOUTH SIXTH AVENUE CORRIDOR STUDY

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1.0 INTRODUCTION

1.1 Background

During the Spring of 1989, as the Broadway Corridor Study-Phase II (Transitional Corridor Analysis) and the BAJA Study project were in progress, it became apparent to the Mayor and Council of the City of Tucson that the concept of a community-wide transit capital investment should be studied in more detail. As the Broadway Corridor Study-Phase II provided the City with technical tools to investigate various transit technologies in other high priority corridors, a work program was developed and approved by the Mayor and Council in May 1989 that would investigate various busway (buses operating on exclusive rights-of-way) and light rail transit (LRT) (operating mainly on exclusive rights-of-way) alternatives between the Tucson Mall and the Tucson International Airport (referred to as the Oracle Road/South Sixth Avenue Corridor).

In addition, alternatives would be tested that would combine the Oracle Road/South Sixth Avenue Corridor alternatives with compatible Broadway Corridor busway and LRT alternatives studied in the Broadway Corridor Study-Phase II. During this same time period, the City began a major Downtown Land Use and Circulation Study (DLUCS), and it was agreed that the Oracle Road/South Sixth Avenue Corridor Study would only analyze alternative alignments north and south of the downtown. Alignment assumptions within the Central Business District (CBD) were made on a generic basis to estimate the ridership and costs of the alternatives developed in the study.

1.2 Project Description

The Oracle Road/South Sixth Avenue Corridor Study work program defined the corridor as approximately one-mile wide. The corridor study area is shown in Figure 1.1 and includes the Broadway Corridor Study area, also.

The study work program stated that four alternative concepts would be developed and analyzed for transit ridership estimates. These were:

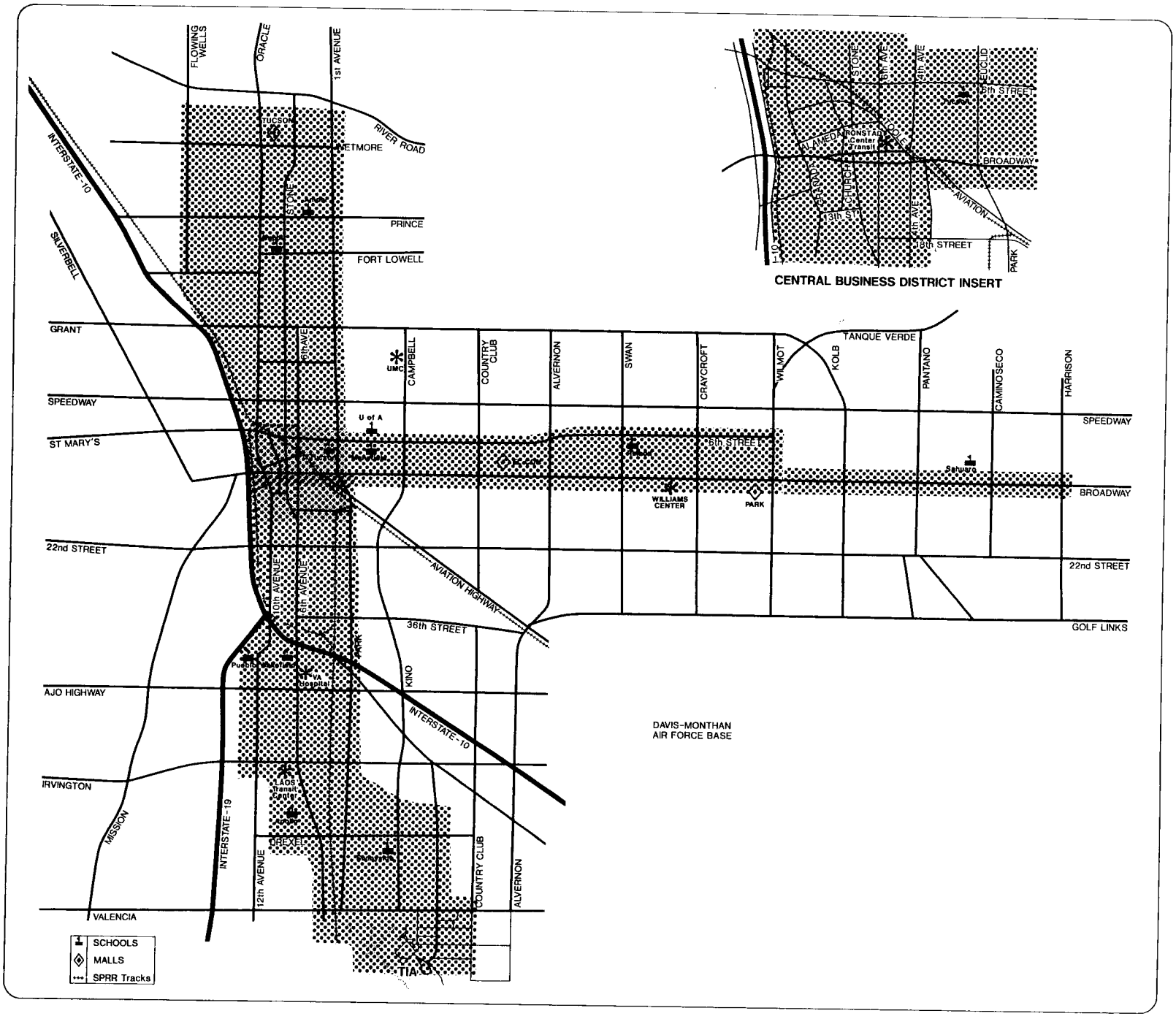
- Oracle Road and South Sixth Avenue combined for LRT,
- Oracle Road, South Sixth Avenue, and Broadway Boulevard combined for LRT,
- Oracle Road and South Sixth Avenue combined for a busway,
- Oracle Road, South Sixth Avenue, and Broadway Boulevard combined for a busway.

The study also included the analysis of three physical alignments north of the downtown to Tucson Mall including Oracle Road, 10th Avenue, and Stone Avenue. South of downtown to the Tucson International Airport (TIA), the Southern Pacific Railroad Drill Track alignment, South Sixth Avenue, and 12th Avenue were studied. South of the Laos Transit Center the route to the airport used Nogales Highway, Drexel, Kino-Campbell, Valencia, and Tucson Boulevard. The alternatives studied are described in more detail in Chapter 3.

The study estimated ridership, capital costs (including right-of-way), and operating and maintenance costs for each alternative.

In addition, the study included a community participation program (Chapter 2), a detailed right-of-way cost analysis (Chapter 4), and urban design concepts (Chapter 5).

Due to the somewhat technical nature of this report, a glossary of terms is included in Appendix A to aid the reader.



ORACLE/SOUTH SIXTH & BROADWAY CORRIDOR STUDY AREAS

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

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1.1 figure

0 mi 5 mi 1 mi 1.5 mi 2 mi 2.5 mi
north

2.0 COMMUNITY PARTICIPATION

The citizens of Tucson are very active in community programs and play a key role in transportation planning. Because of the nature of this involvement, a citizen participation program was established for the Oracle Road/South Sixth Avenue Corridor Study . This program was developed to ensure coordination with known interested and affected community groups. The program consisted of a Community Coordination Forum and public meetings, which provided the citizens with opportunities to review and comment on the findings of the study.

2.1 Community Coordination Forum

Following responses from a mailed invitation to over seventy individuals representing neighborhoods, business and commercial establishments, and community-wide groups in the study areas, two community advisory panels were organized; one for Oracle Road and one for South Sixth Avenue. Table 2.1 lists the members of these Community Coordination Forums. The role of these forums was to provide input, review, and comment at various stages throughout the project. Forum members, representing designated community groups, received notices of meetings scheduled as shown below:

July 19, 1989	Oracle Road Forum
July 20, 1989	South Sixth Avenue Forum
September 12, 1989	Both Forums

The Community Coordination Forum meetings were conducted in a workshop format. Staff from the City of Tucson, Department of Transportation and the consultant team provided an overview of the study corridors along with their understanding of the opportunities and constraints associated with each. This overview was followed by an extensive question and answer and discussion period whereby maximum input from the community participants was provided.

Two key elements of the consultant presentation materials included a slide show and preliminary design concepts. A slide show which provided an introduction and overview of the various elements associated with light rail transit (LRT) and examples of other system components utilized in other western cities were presented. The slide show also identified key elements within each of the study corridors to provide the viewers with a point of reference and an understanding of how the LRT would fit within the existing Tucson neighborhoods.

The second key presentation element was a series of aerial photos and cross section designs developed by the consultant. The aerial photos (at a scale of 1" = 100') depicted in plan view the alternative alignments under consideration. Cross sections, which identified the existing rights-of-way and travelways in elevation view along with showing how the implementation of LRT would modify it, were also presented for points along each corridor. The combination of the plan and elevation views provided the community coordination forum with a firm understanding of how the LRT would function within the Tucson neighborhood fabric. To maximize neighborhood review, alternatives both north and south of the downtown were presented at each meeting.

General topics discussed at the Forum meetings included the following:

- Options for disabled access to LRT vehicles.
- Transporting bicycles on vehicles.
- Land use density as a factor in cities with successful transit.
- The size of the downtown, employment, and activity centers in Tucson.
- Chances for federal funding; constraints in the federal funding process.
- The advantages of time and money savings if local funding is used.
- Redevelopment opportunities associated with LRT systems.
- Operating speeds, hours, car capacity, and ticket costs for light rail.
- Capital costs, maintenance costs, and maintenance facility requirements.
- Park-and-Ride lots at station, integrating bus feeder lines.
- Right-of-way needed at signals and intersections.
- Ridership demand in Tucson.
- Cost comparison between "best bus" and LRT.
- Station locations.
- New transit centers.

Progress of the study was also reviewed at the Broadway Corridor-Phase II Forum meetings held on July 25, and September 13, 1989. This was done to ensure coordination with ongoing studies.

Minutes of the Forum meetings including comments and input to the study are on file at the City of Tucson's Department of Transportation (TDOT) offices.

TABLE 2.1

Community Coordination Forum Representation

Tucson Unified School District
Hughes Aircraft Company
San Ignacio Yaqui Council
SAHBA
Armory Park Neighborhood Association
City of South Tucson
Tucson Airport Authority
South Tucson Business Association
El Presidio Neighborhood Association
Blue Moon Neighborhood Association
Northwest Neighborhood Center

2.2 Public Meeting

General public involvement was solicited for a major presentation and open house held on October 25, 1989 at the Tucson Convention Center from 4:30 - 9:00 p.m. The purpose of this open house was to discuss alignment options for light rail and busway in the Oracle and South Sixth corridors. The Broadway Corridor preliminary findings were also presented at this open house. The University of Arizona College of Architecture provided models and a special video that illustrated urban design concepts associated with light rail transit. The open house gave citizens an opportunity to see how the two studies correlated and how urban design can be incorporated into transit projects.

One hundred and fifty citizens attended the presentations, and forty turned in completed comment forms. Highlights of the comment form results showed a majority (66 percent) in favor of the City conducting further studies on light rail transit, busways, and other mass transit alternatives. Another 20 percent indicated they were somewhat in favor of further studies. Cleaner air was what most respondents liked best about LRT or busways in Tucson. Individuals who submitted comments characterized as negative were skeptical about implementation or had questions about impacts, costs, and funding. Comments about the Oracle and South Sixth Corridor alignments were mixed; comments regarding the eastern alignment (Stone Avenue) was mostly positive, and comments concerning the middle alignment (10th Avenue) indicated more pros than cons, however, the results were not conclusive.

3.0 SUMMARY OF ALTERNATIVES

3.1 Development of Alternatives

The initial process of developing alternatives for the Oracle Road and South Sixth Avenue primarily consisted of two steps. First, the alignments were laid out by the citizens advisory committee; second, technical feasibility was determined. This process, coupled with existing population, employment, and transit usage figures set the framework for the development of the alternatives studied.

Population and employment densities have a significant impact on travel demand. Table 3.1 displays the 1987 population and employment for the region and a breakdown by major area. The Oracle Road and South Sixth Corridors account for nearly 14% of the City's population and 9% of the County's population. The South Sixth Avenue corridor includes some of the most densely populated areas in the region. The corridor's employment is approximately 11% or 30,000 of the 278,300 jobs within Pima County. Existing employment in each of the corridors is almost equal to that of the Central Business District. The South Sixth Avenue corridor includes the airport area, which contains some of the largest employers in the region.

Location and intensity of population and employment shape travel demand more than any other factor. Figures 3.1 and 3.2 show this location and intensity in relation to the corridors, by displaying the general land use in the corridors. Magnet uses or areas which attract trips regionally, such as the VA Hospital, are also included in the figures. Figure 3.1 shows both Oracle Road and Stone Avenue lined with commercial uses in the midst of residential units; the area west of Oracle Road includes several blocks of high density residential uses. Figure 3.2 shows the primary land use in the South Sixth Corridor as residential, with several pockets of high density dispersed throughout the corridor. South Sixth Avenue is lined with some commercial uses in the northern portion of the corridor. Industrial areas are located on the periphery of the corridor, including hundreds of acres in the vicinity of the airport.

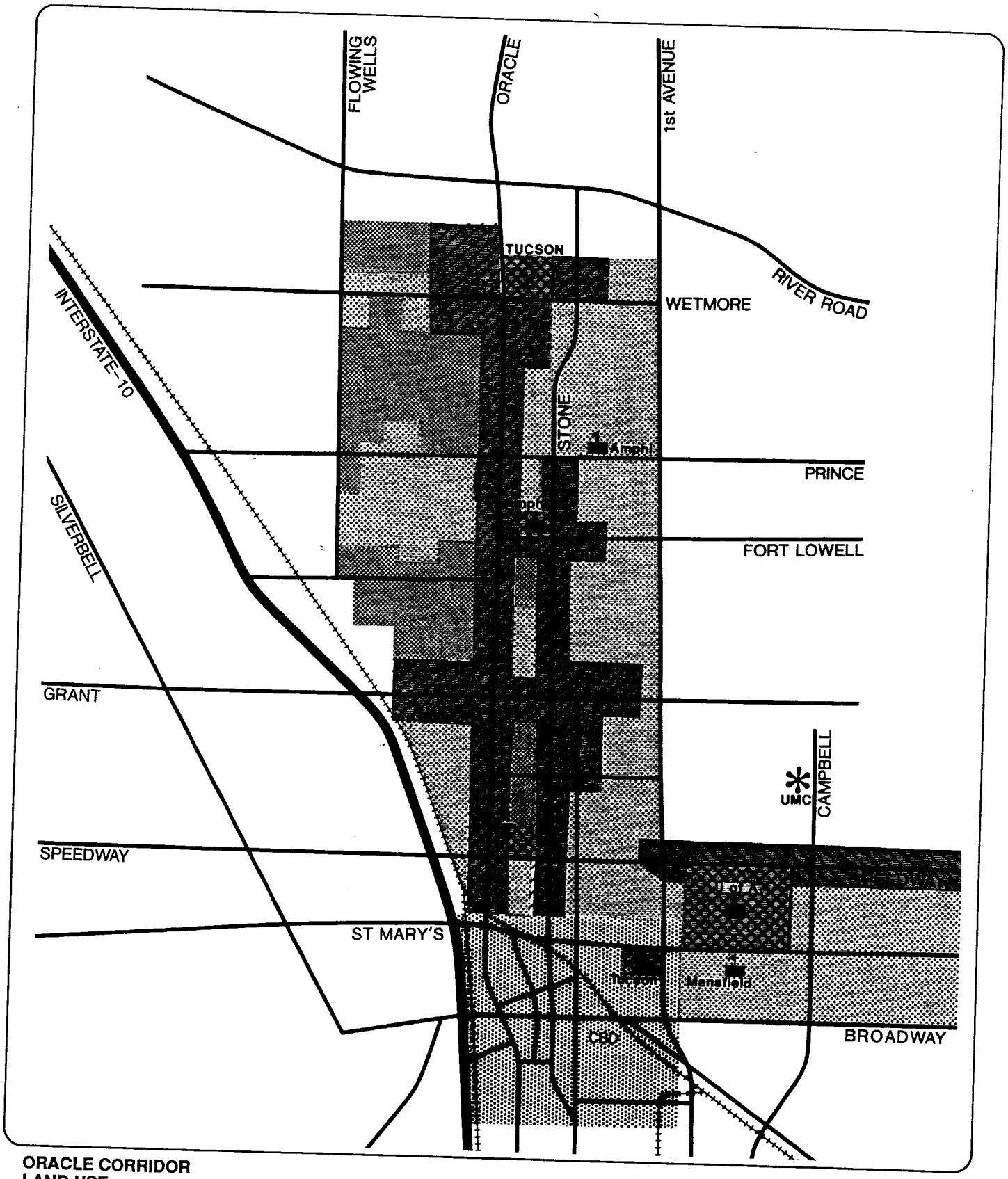
Current transit conditions and existing ridership, which reflect where the current demand exists, were also considered in development of alternatives. SunTran operates 142 buses during the a.m. peak period along approximately 30 local routes and 5 express routes. The frequency of service (time between the arrival of buses) ranges from 15 to 60 minutes for local routes and 60 to 90 minutes for the express routes. Existing transit ridership is the best in the South Sixth Corridor. SunTran's Route 8, which runs from the Laos Transit Center to the CBD out Broadway Boulevard to Camino Seco, has the highest ridership in the system. Route 16 (Oracle, South 12th Avenue) is also one of SunTran's top four routes, serving both the Oracle and the South Sixth Corridors.

Based on the 1988 On-Board Survey, average daily boardings were approximately 42,000 system-wide. Boardings on Route 8 were approximately 9,200, and 3,200 on Route 16. These two routes accounted for 30 percent of SunTran's ridership, indicating a significant demand in the Oracle Road and South Sixth Corridors.

TABLE 3.1

1987 Population and Employment

	Population	*Employment*
City of Tucson	405,900	NA
Pima County	640,000	278,300
Oracle Corridor (excludes CBD)	22,400	13,800
South Sixth Corridor (excludes CBD)	32,500	16,100
Broadway Corridor	73,900	52,600
Central Business District	2,700	16,300
University of Arizona	9,400	16,400



ORACLE CORRIDOR LAND USE

- Low Density Residential
- High Density Residential
- Commercial/Industrial
- Magnet Use Concentration
- Central Business District

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

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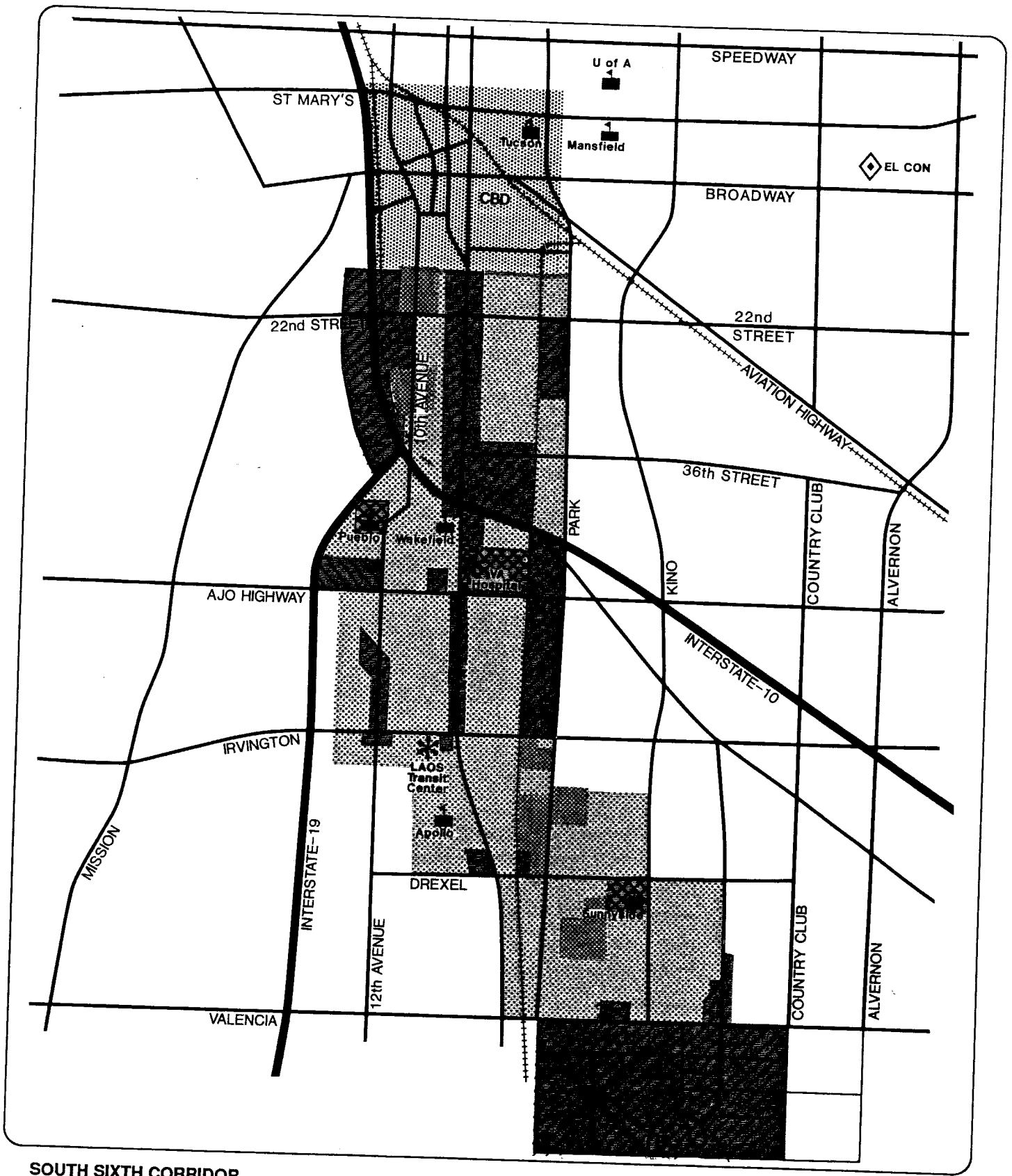
3.1 figure



SOUTH SIXTH CORRIDOR LAND USE

- Low Density Residential
- High Density Residential
- Commercial/Industrial
- Magnet Use Concentration
- Central Business District

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3.2 figure

3.2 Description of Alternatives

A summary description of the four transit alternatives analyzed for patronage forecasting are given below. Although patronage would vary only slightly by moving the alignment within the mile corridor, costs could vary substantially. Therefore, for costing purposes, three alignment options were analyzed. Figures 3.3 and 3.4 display these alignments. Alignment 1 follows Oracle Road in the north and 10th/12th Avenue to Irvington to Nogales Highway to Drexel to Campbell to Valencia to Tucson Boulevard in the south. Alignment 2 follows Stone Avenue in the north and Sixth Avenue to Nogales Highway to Drexel to Campbell to Valencia to Tucson Boulevard in the south. Alignment 3 follows 10th Avenue in the north and Sixth Avenue to Drexel to Campbell to Valencia to Tucson Boulevard in the south.

The background bus network or Best Bus/TSM was developed as part of the Broadway Corridor Study Phase II. This bus system was the starting point for each alternative and then modified to optimize the service needs applicable to each alternative, which are described below. The highway portion of each alternative remains constant throughout all four alternatives. The highway network assumes the "existing + committed + reasonable" highway elements of the Regional Transportation Plan (RTP), adopted in 1986 for the forecast year of 2010, as shown in Figure 3.5. The 1986 RTP was utilized for consistency with the Broadway Corridor Study.

The LRT alternative will require a separate maintenance and operations facility. A possible site was identified approximately one mile south of the CBD and south of 22nd Street on the South Yard Drill Tracks. Cost for this facility is included in the LRT alternatives.

Alternative A - LRT - Tucson International Airport to the Tucson Mall

Alternative A (Figure 3.6) provides for an at-grade, two-way, double-tracked LRT system between the Tucson International Airport and the Tucson Mall. The LRT would operate two-car trains at five minute headways in the peak periods and ten minute headways in the off-peak periods. This service would require 24 rail vehicles in the peak period. Figures 3.7 through 3.12 show the typical cross sections. These cross sections show the existing street section as well as the proposed cross sections at eight sample locations. Seventeen stations would be constructed along the route, providing access approximately every mile. In the South Sixth Avenue Corridor these locations are in the vicinity of the airport, Kino Boulevard at Valencia and Drexel, Nogales Highway and Drexel, Sixth Avenue at Irvington, Ajo Way, 36th Street, 22nd Street, and two in the CBD. The station locations are at Stone Avenue and 5th/6th Street, Speedway, Grant, Fort Lowell, Prince, Roger, and Wetmore in the Oracle Road Corridor. Figure 3.6 displays this alternative with station locations and pertinent features along the corridor.

The background bus network was modified to optimize the feeder bus service to the LRT line and applicable express bus services were eliminated where the LRT served those areas. This service required 664 buses.

Alternative B - LRT - The Tucson "T"- Broadway and Oracle/South Sixth

Alternative B (Figure 3.13) is a combination of Alternative A (above) and Alternative 5 from the Broadway Corridor Study-Phase II. It has the same alignment and cross section configuration, station locations, and operating headways as Alternative A. It also provides a LRT system on Broadway Boulevard between Pantano and the CBD, with five minute headways in the peak and 10 minute headways in the off-peak. The entire

LRT service would require 40 rail vehicles in the peak period. Typical cross sections for Broadway Boulevard and Congress Street are displayed in Figures 3.14 through 3.16. Nine stations would be constructed along Broadway at Pantano, Kolb, Wilmot, Craycroft, Swan, Alvernon, Tucson Blvd., Highland-Cherry and one in the CBD. This alternative would have a total of 26 stations including three in the CBD.

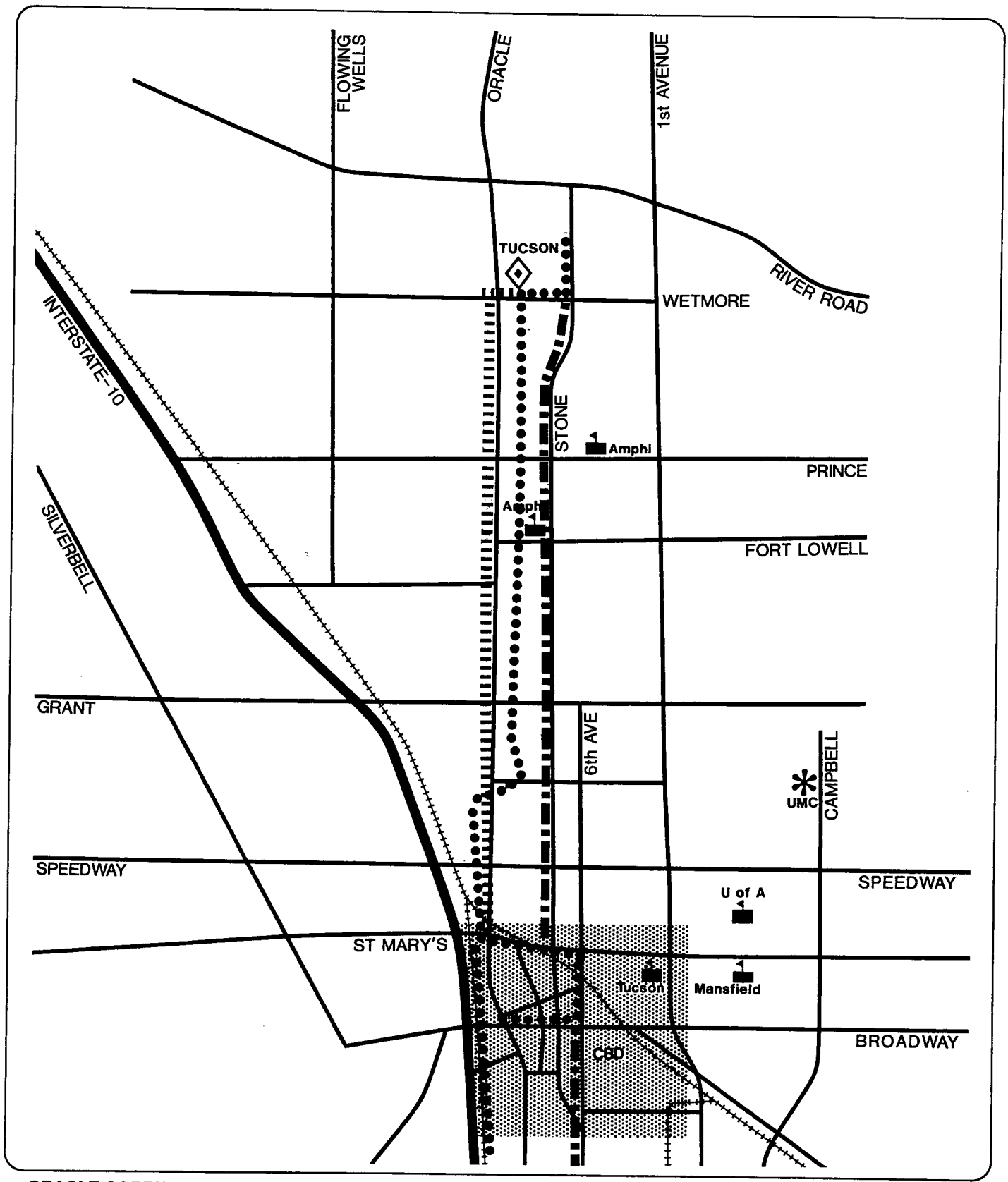
The background bus service was modified to feed the LRT system, and applicable express service was eliminated. A shuttle bus on Highland or Cherry would provide service to and from the University of Arizona's main campus. This bus service would require 605 buses.

Alternative C - Busway - Tucson International Airport to Tucson Mall

Alternative C (Figure 3.17) provides for a two-way busway in the median from the Tucson International Airport to the Tucson Mall. Several streets are utilized for the busway, beginning on Tucson Boulevard at the airport, then jogging over to South Sixth Avenue continuing to the downtown where the buses then operate in mixed flow through the CBD, return into the busway on Stone Avenue, and continue up to the Tucson Mall. The buses can enter the busway at approximately every mile with express stops at locations similar to the stations identified in Alternative A. Major transfer locations include the Laos Transit Center, the Ronstadt Transit Center, and the Tucson Mall. The background bus system was modified to include additional express service and neighborhood circulators to utilize the busway. The accumulative frequency in the busway is under five minutes. This service will require 820 buses.

Alternative D - Busway - The Tucson "T" - Broadway and Oracle/South Sixth

Alternative D (Figure 3.18) is a combination of Alternative C (above) and Alternative 3 from the Broadway Corridor Study-Phase II. In addition to the busway as described above, a busway is also included in the median of Broadway Boulevard from Pantano to the CBD. Again, access to the busway could occur approximately every mile. Local bus service is also maintained on Broadway Boulevard and a shuttle bus to the U of A is included. Frequency on the Broadway portion of the busway is approximately two minutes. This service will require 842 buses.



ORACLE CORRIDOR ALIGNMENT CONCEPTS

- Alignment ONE
- Alignment TWO
- Alignment THREE
- Central Business District

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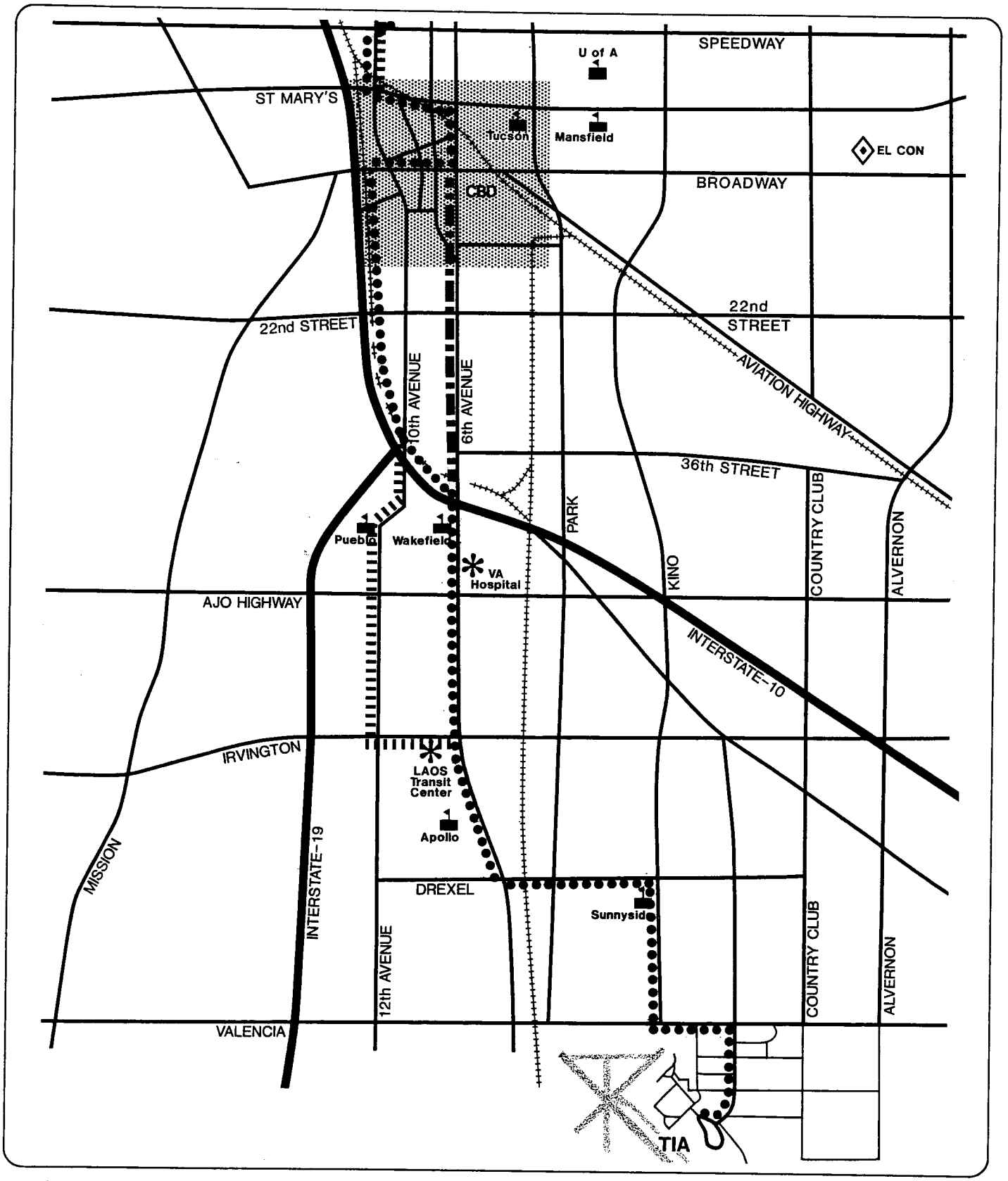
3.3 figure



SOUTH SIXTH CORRIDOR ALIGNMENT CONCEPTS

- Alignment ONE
- Alignment TWO
- Alignment THREE
- Central Business District

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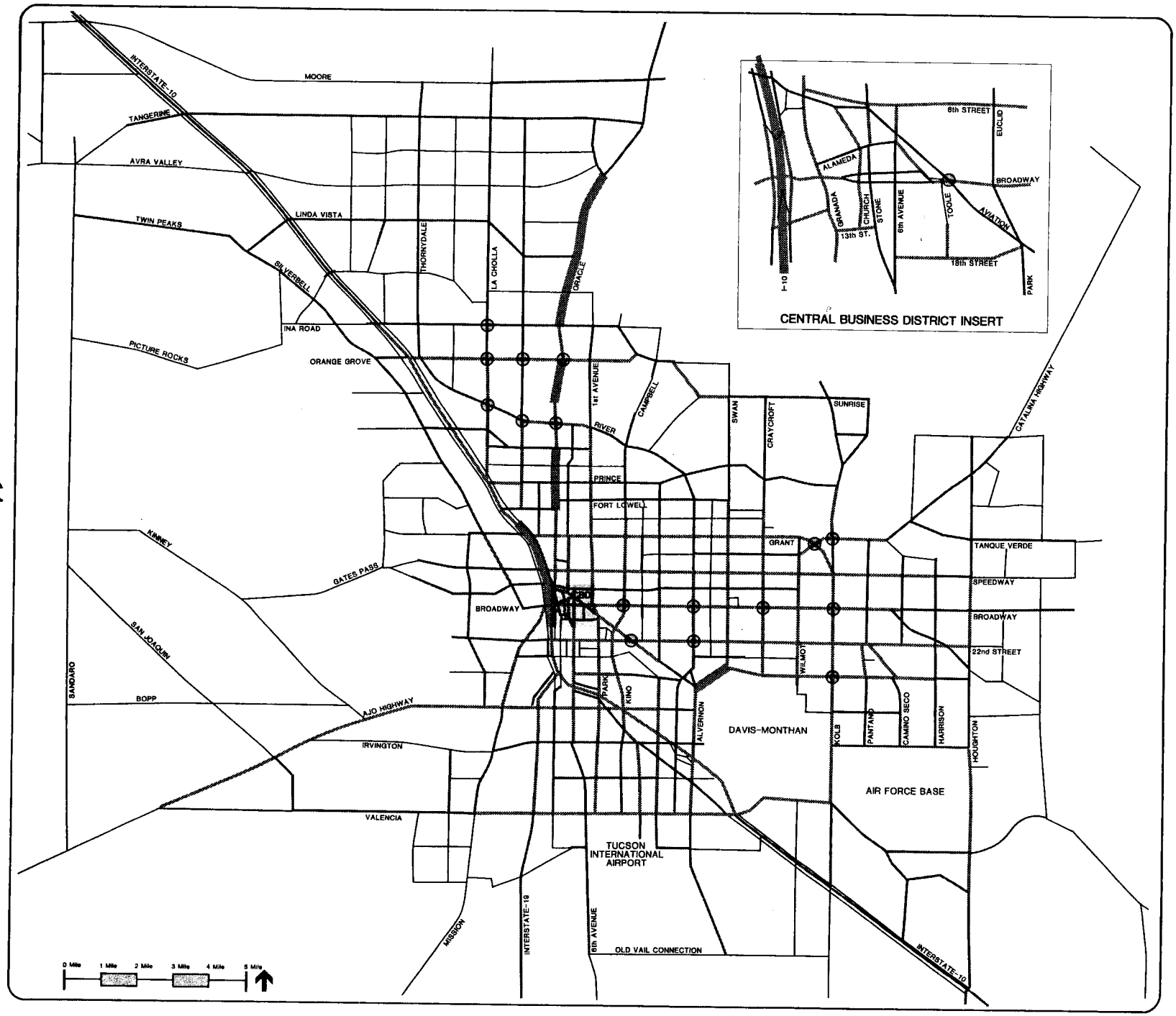
3.4 figure



YEAR 2010
BASE
HIGHWAY NETWORK '89

- 2 Lane
- 4 Lane
- 6 Lane
- 8 Lane
- Grade Separated Intersection

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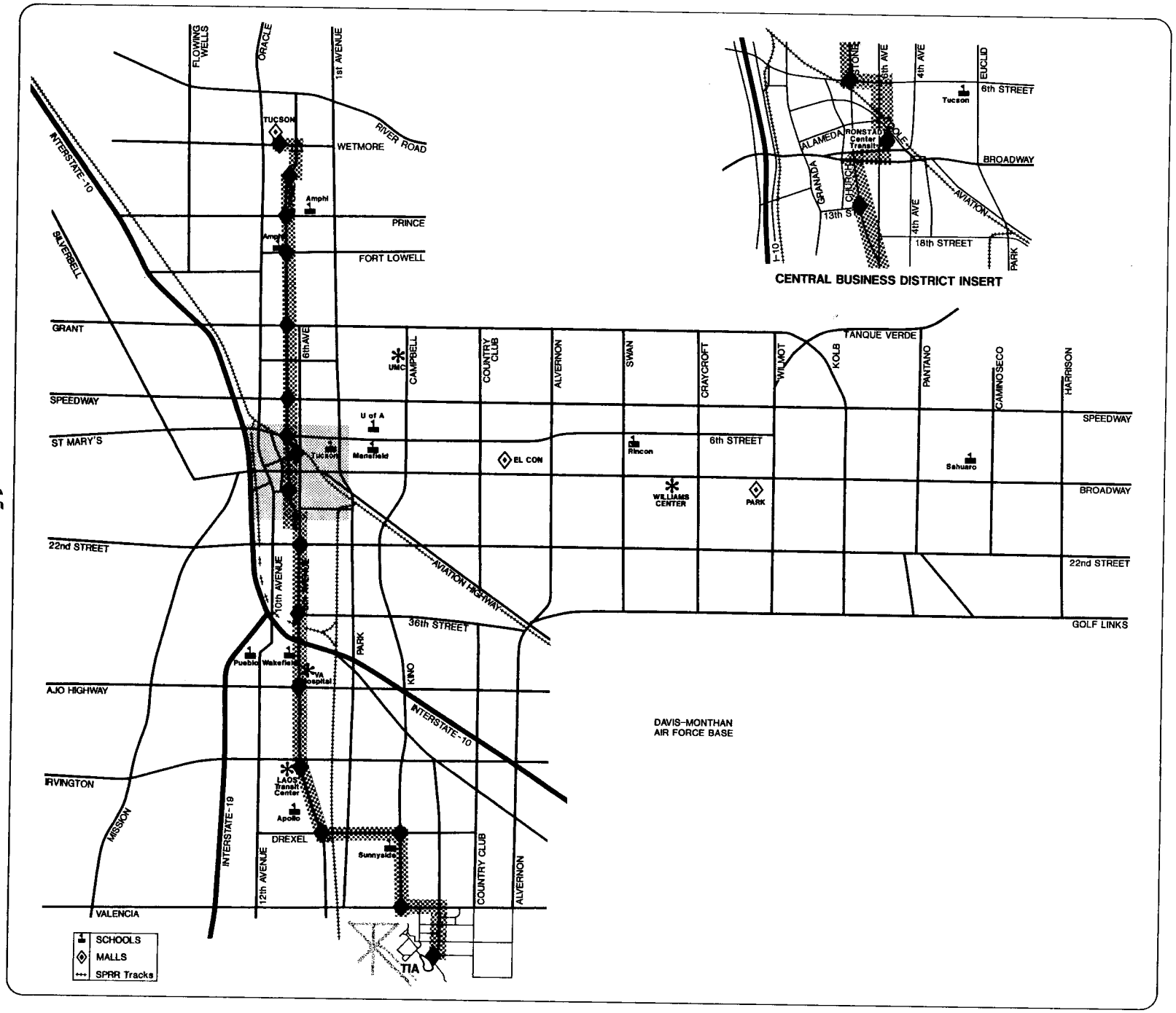
3.5 figure



ALTERNATIVE A:

LIGHT RAIL TRANSIT TO TUCSON MALL AND TUCSON INTERNATIONAL AIRPORT

Light Rail Transit

Station Stop

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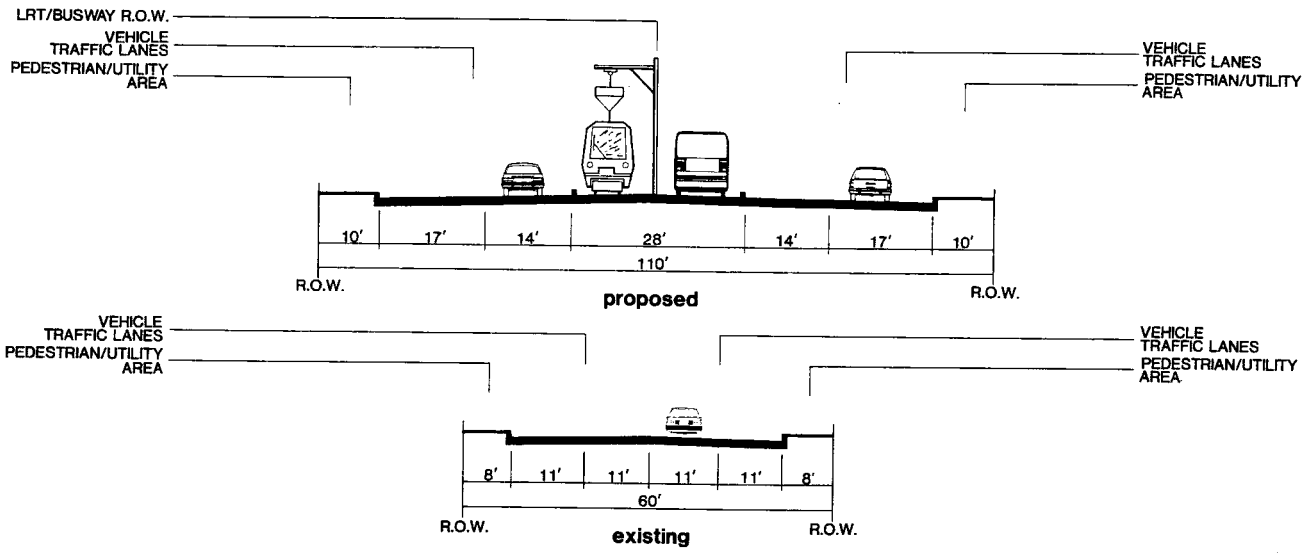
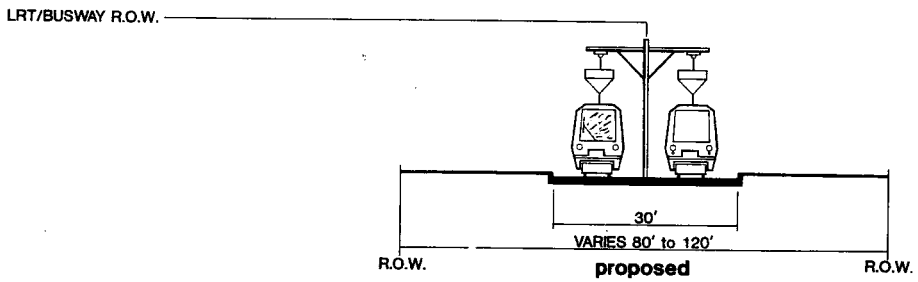
3.6 figure

0 mi .5 mi 1 mi 1.5 mi 2 mi 2.5 mi north

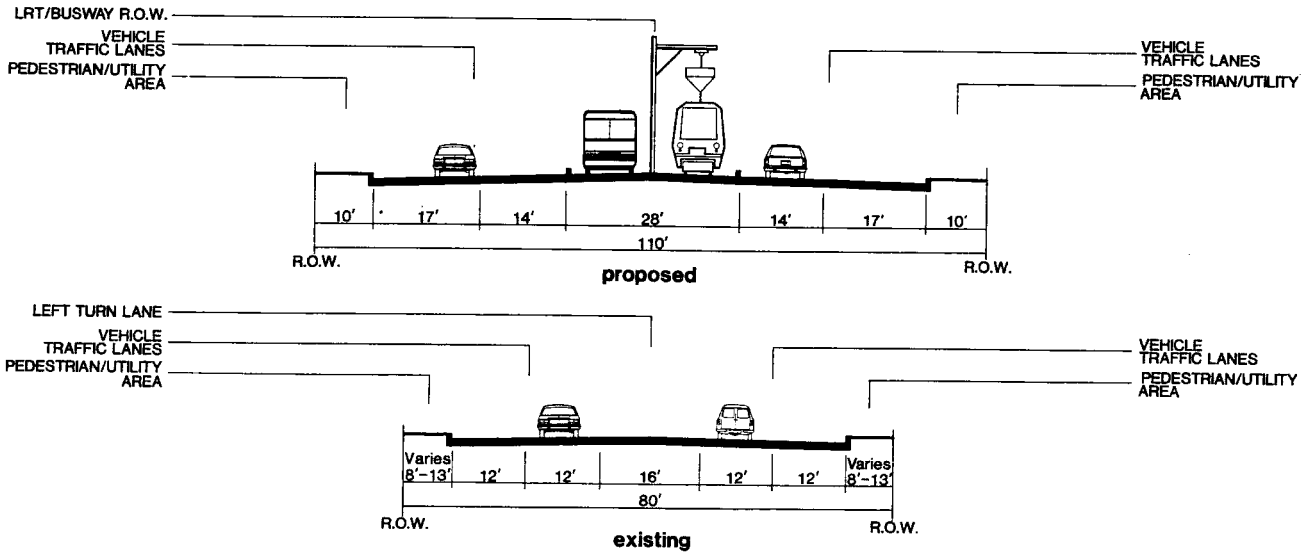
10th AVENUE - SOUTH YARD DRILL TRACK TO 12th STREET



SOUTH YARD DRILL TRACK



12th AVENUE - 10th STREET TO IRVINGTON



TYPICAL SOUTH SIXTH ALTERNATIVE CROSS-SECTIONS

0 ft 10 ft 20 ft 30 ft 40 ft 50 ft

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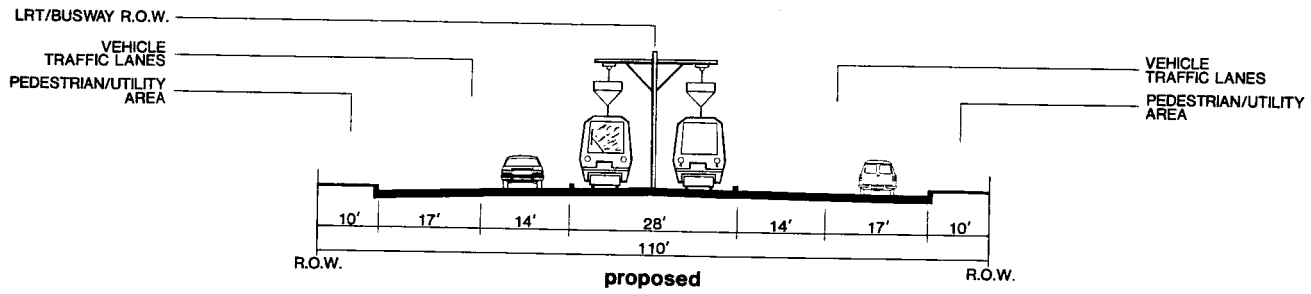
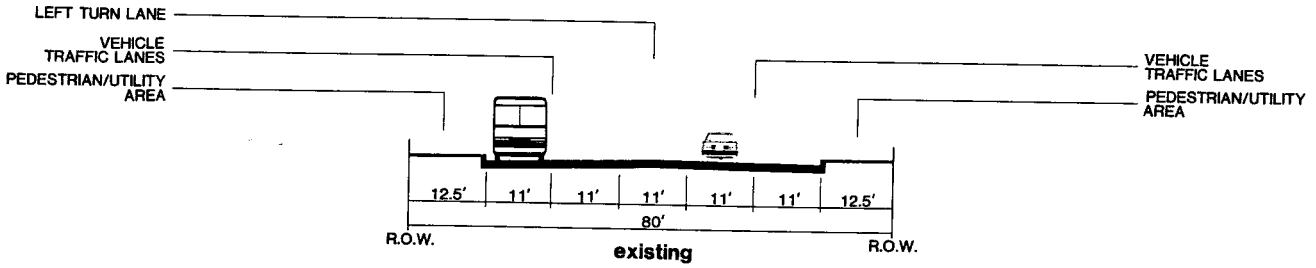
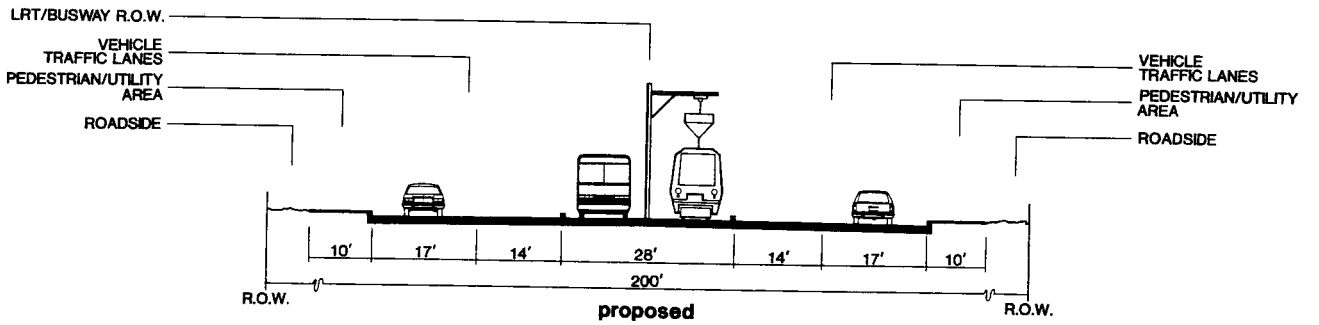
3.7 figure

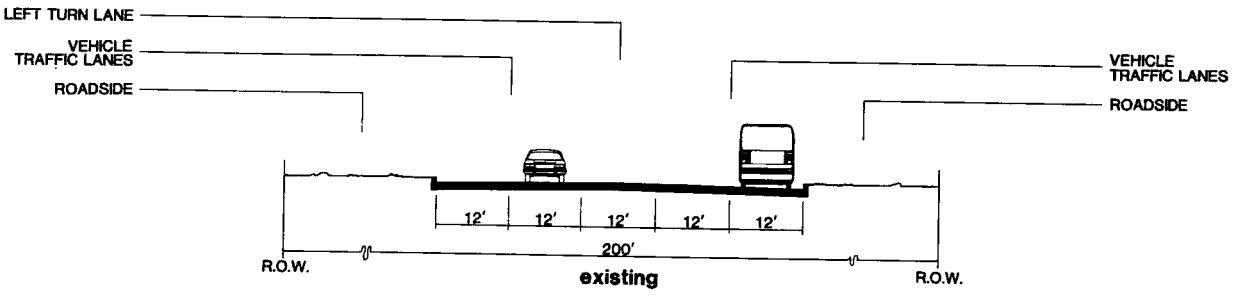
SIXTH AVENUE - CBD TO IRVINGTON





NOGALES HIGHWAY - IRVINGTON TO DREXEL





TYPICAL
SOUTH SIXTH ALTERNATIVE
CROSS-SECTIONS

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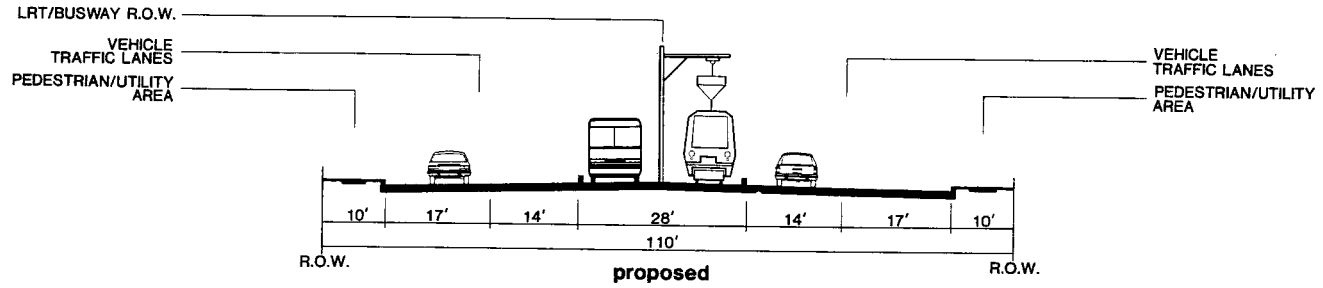
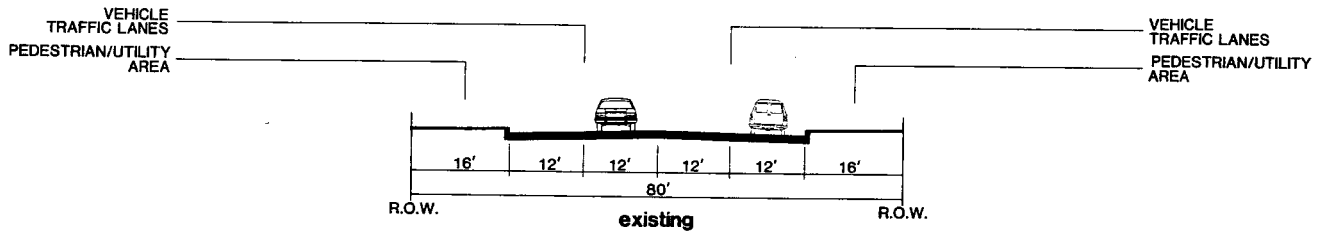
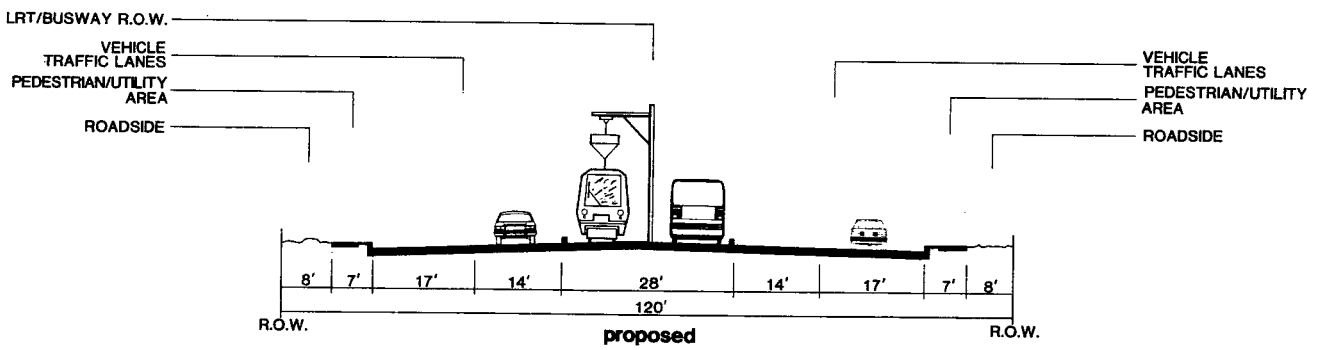
3.8 figure

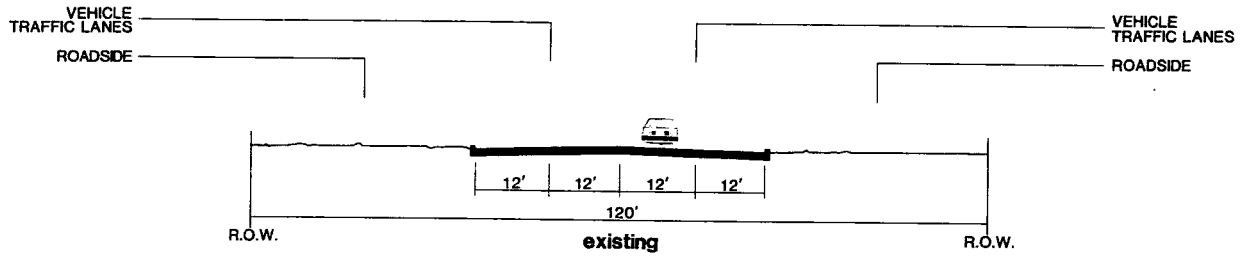
DREXEL AVENUE - NOGALES HIGHWAY TO CAMPBELL





CAMPBELL AVENUE - DREXEL TO VALENCIA





TYPICAL SOUTH SIXTH ALTERNATIVE CROSS-SECTIONS

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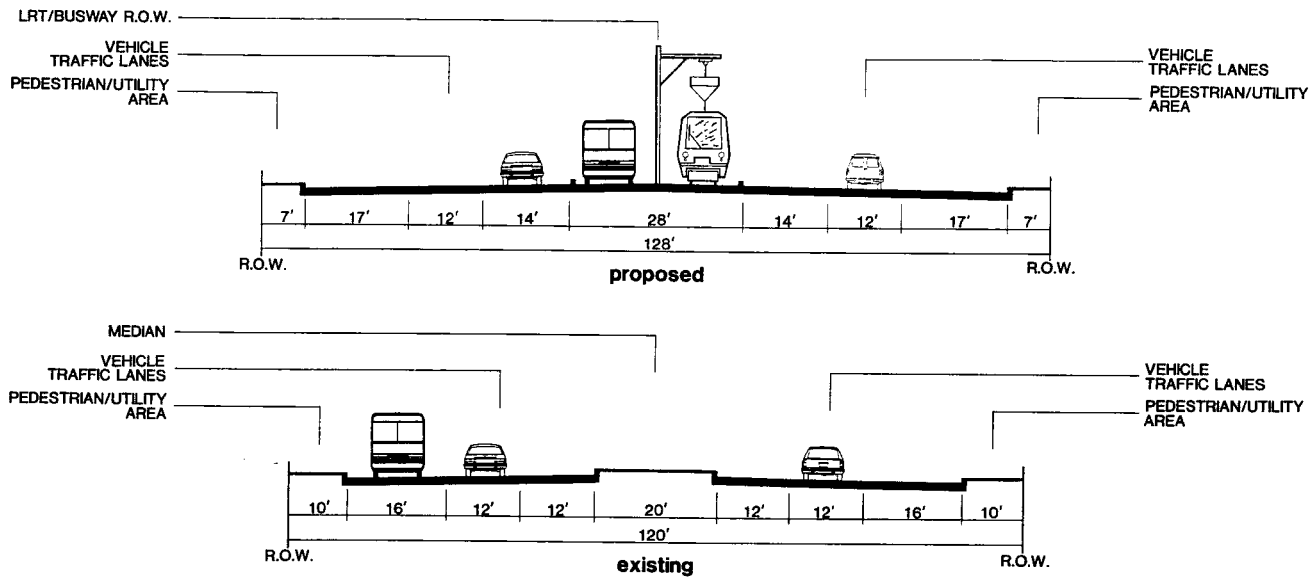
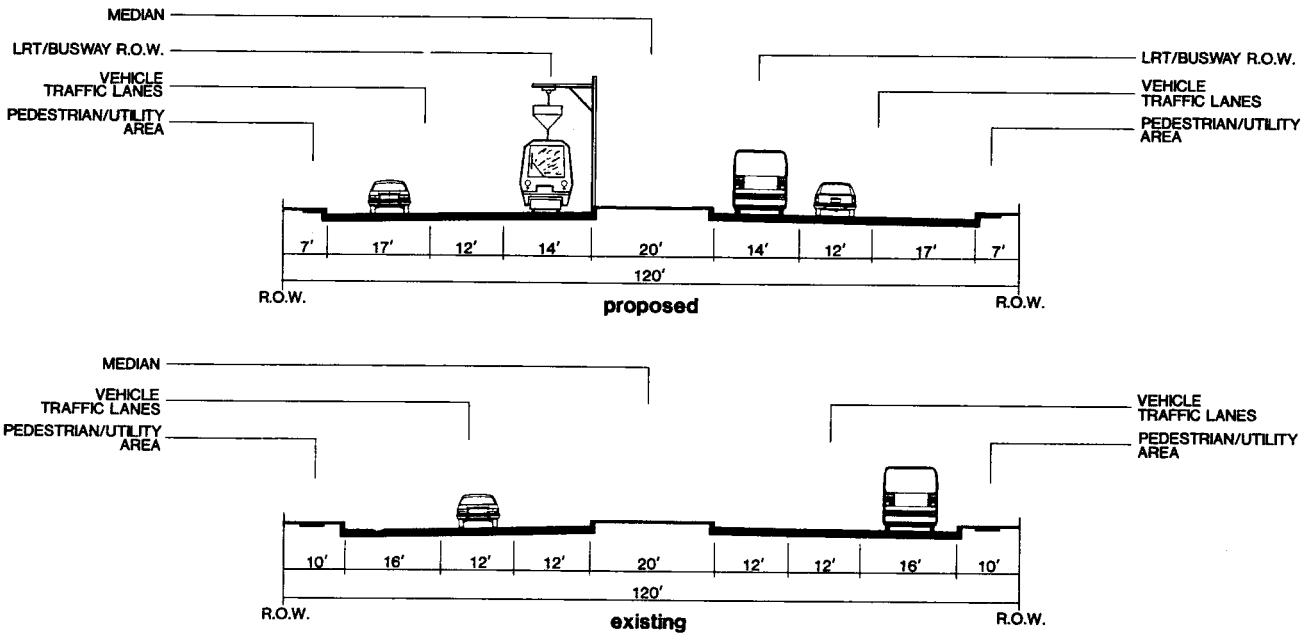
3.9 figure

VALENCIA ROAD - CAMPBELL TO TUCSON



TUCSON BOULEVARD - VALENCIA TO T.I.A.



TYPICAL SOUTH SIXTH ALTERNATIVE CROSS-SECTIONS

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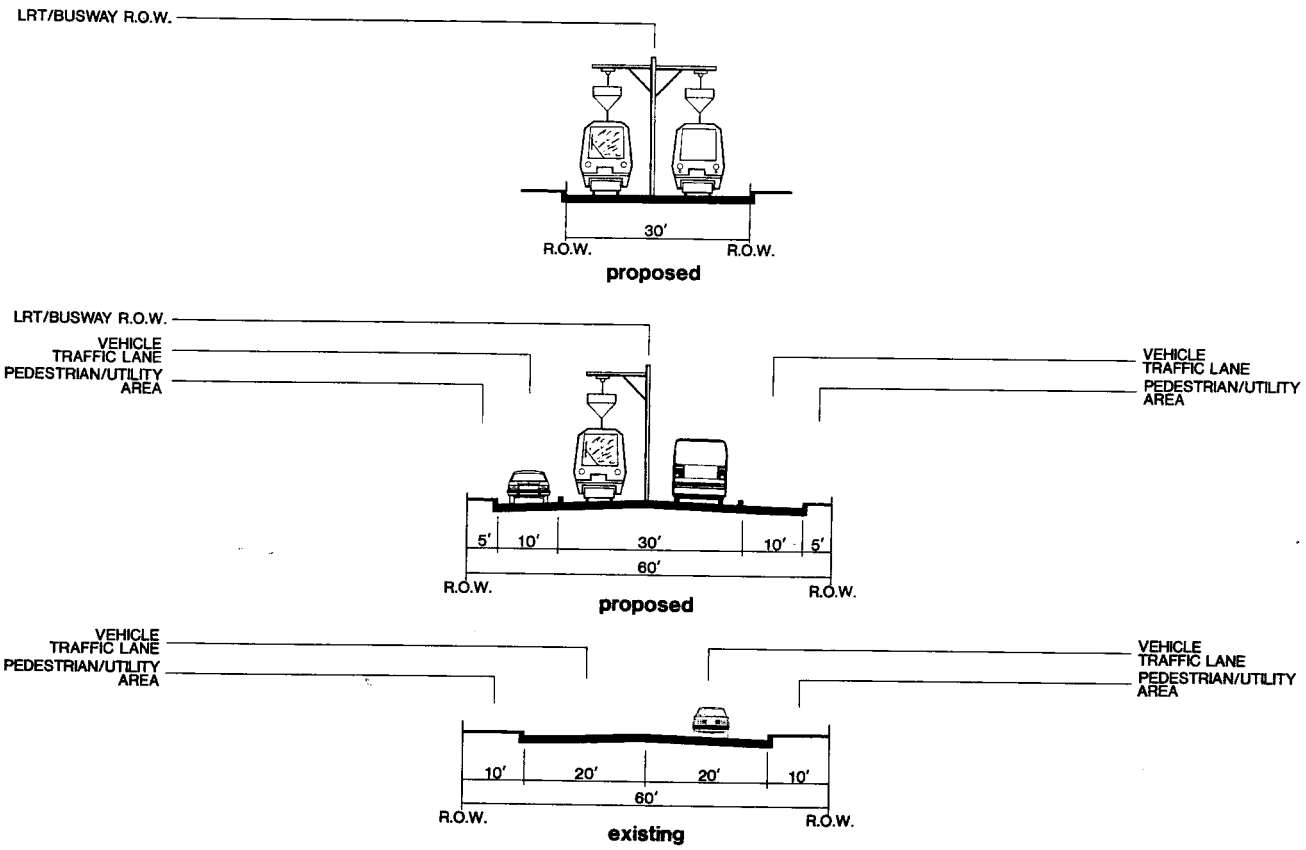
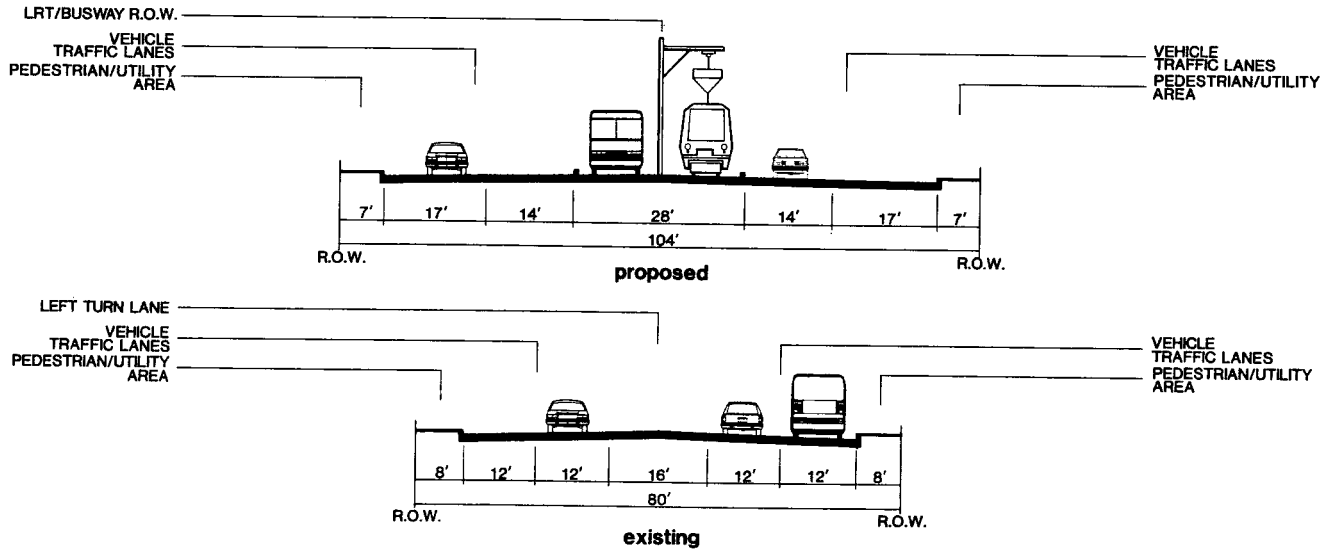
3.10 figure

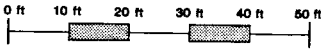
10th AVENUE NEIGHBORHOOD



STONE AVENUE



TYPICAL ORACLE ALTERNATIVE CROSS-SECTIONS



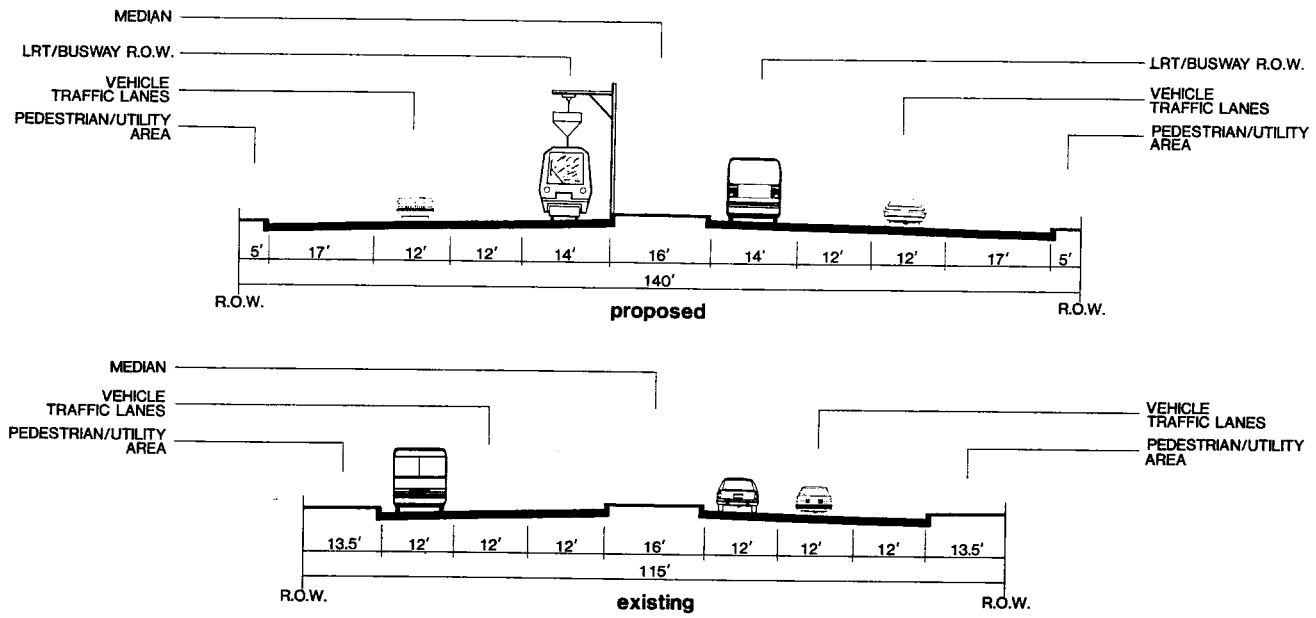
ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

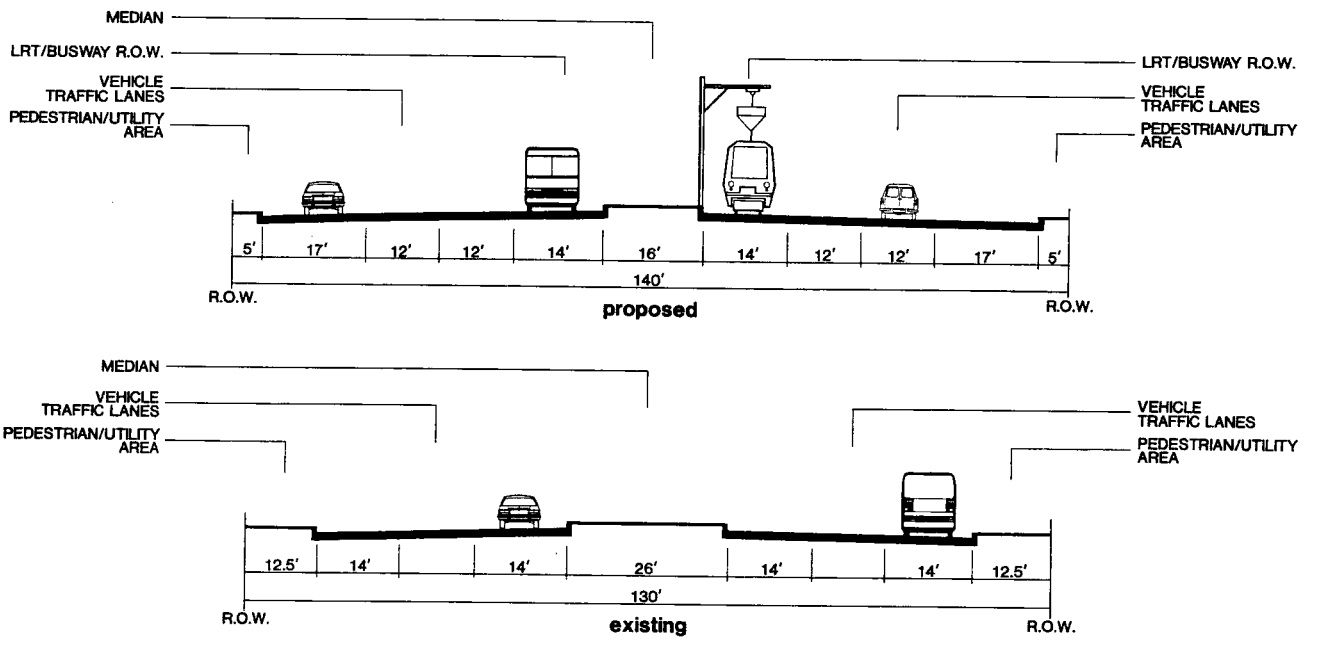
Parsons Brinckerhoff
Rillito Consulting Group
Rogers, Gladwin & Rothman

3.11 figure

ORACLE ROAD - MIRACLE MILE TO WETMORE



ORACLE ROAD - DRACHMAN TO MIRACLE MILE



TYPICAL ORACLE ALTERNATIVE CROSS-SECTIONS

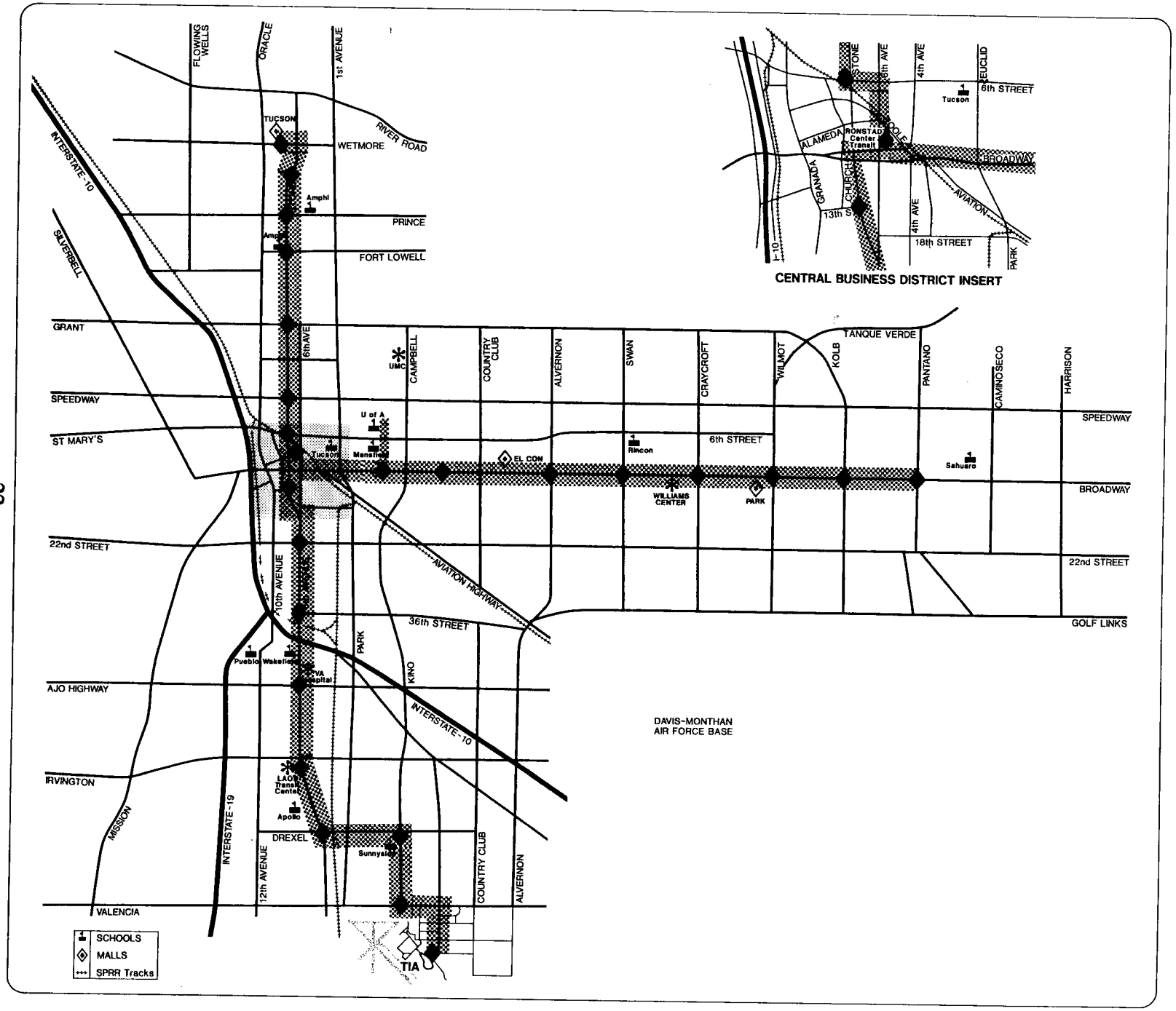
0 ft 10 ft 20 ft 30 ft 40 ft 50 ft

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

Parsons Brinckerhoff 100 YEARS
Rillito Consulting Group
Rogers, Gladwin & Rothman

3.12 figure



CENTRAL BUSINESS DISTRICT INSERT

ALTERNATIVE B:
LIGHT RAIL TRANSIT SYSTEM

- Light Rail Transit
- Station Stop

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

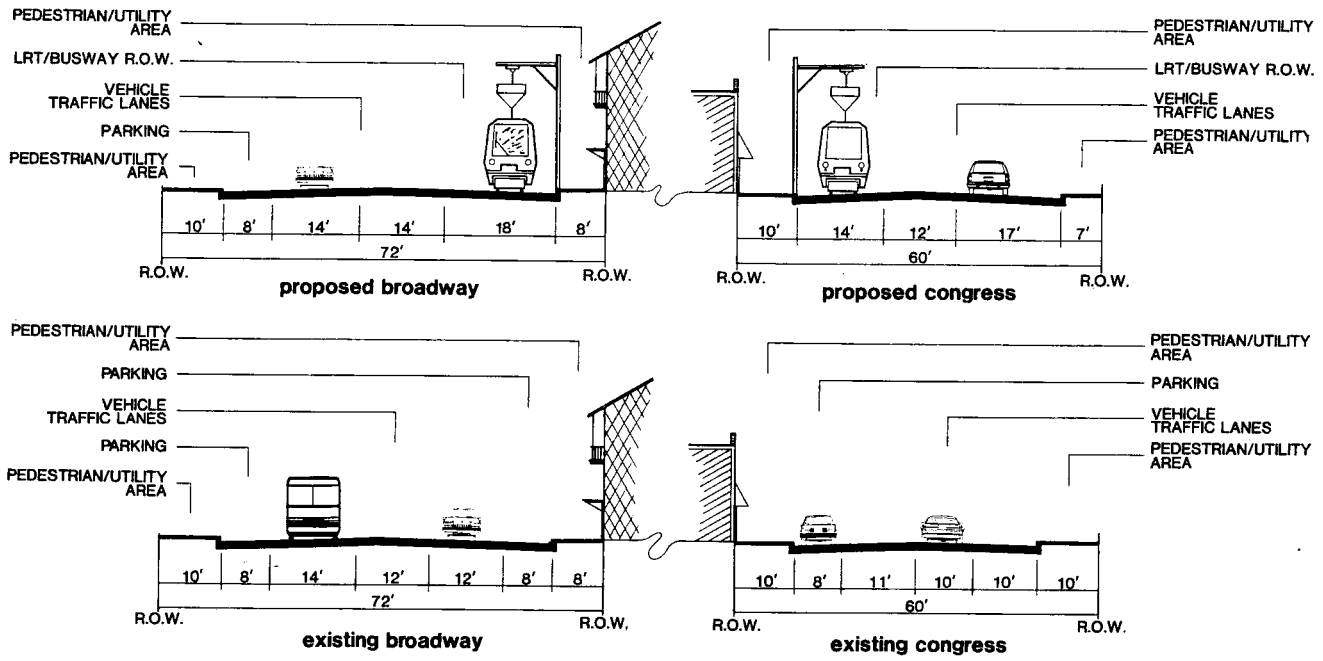
Parsons Brinckerhoff

Rillito Consulting Group
Rogers, Gladwin & Rothman

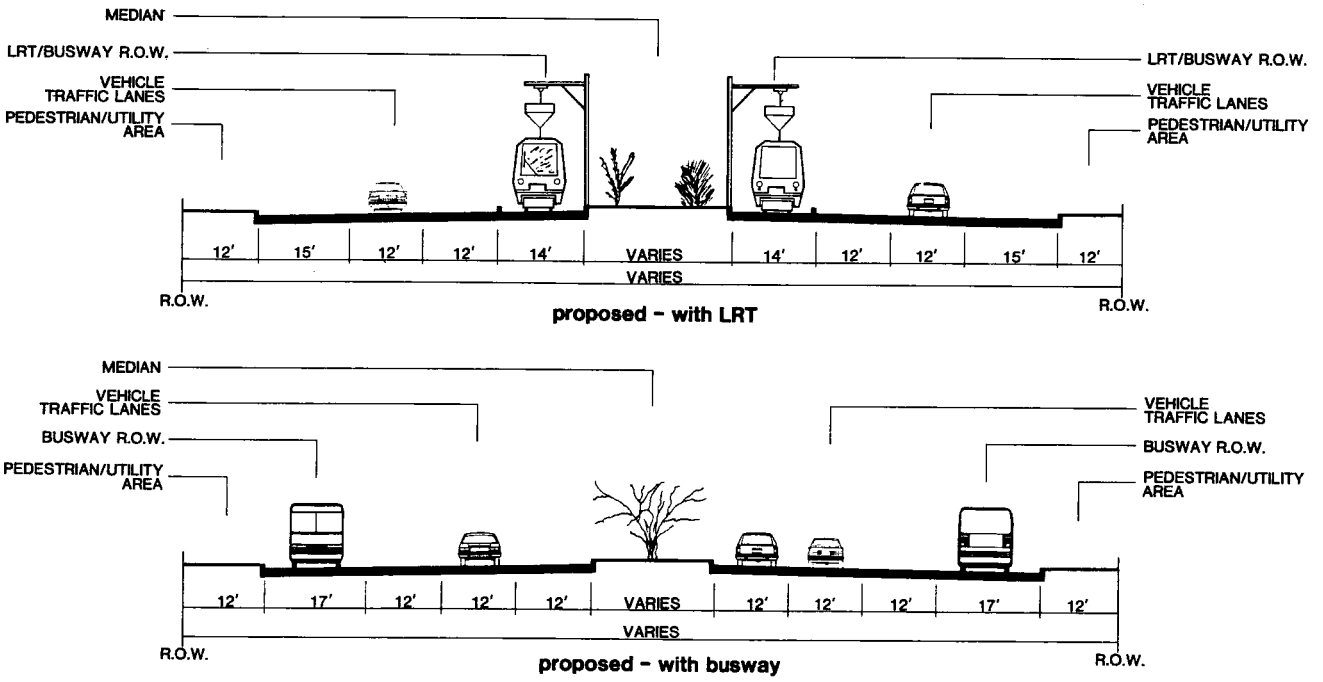
3.13 figure

0 mi .5 mi 1 mi 1.5 mi 2 mi 2.5 mi north

BROADWAY/CONGRESS DOWNTOWN - LOOKING WEST



BROADWAY TRAFFIC INTERCHANGE



TYPICAL BROADWAY CORRIDOR CROSS-SECTIONS

0 ft 10 ft 20 ft 30 ft 40 ft 50 ft

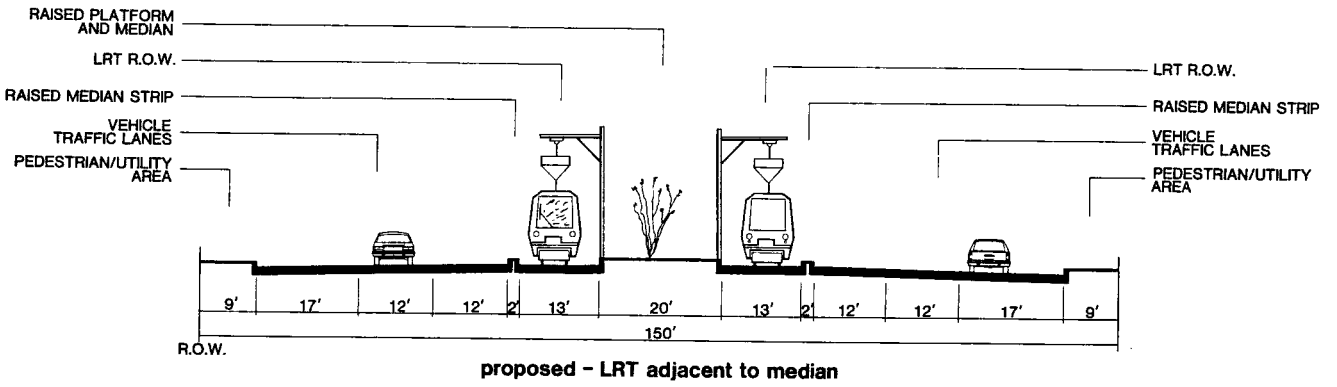
ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

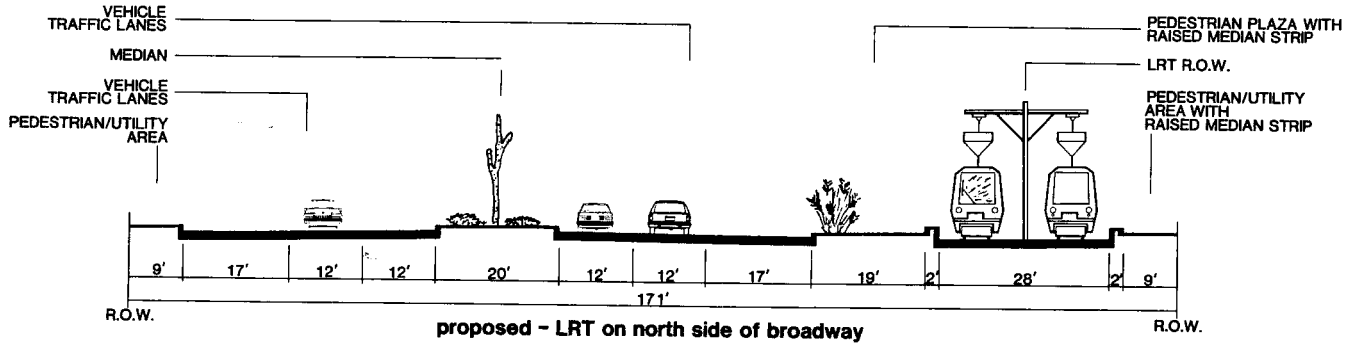
Parsons Brinckerhoff Quade & Douglas, Inc.
Rillito Consulting Group
Rogers, Gladwin & Rothman

3.14 figure

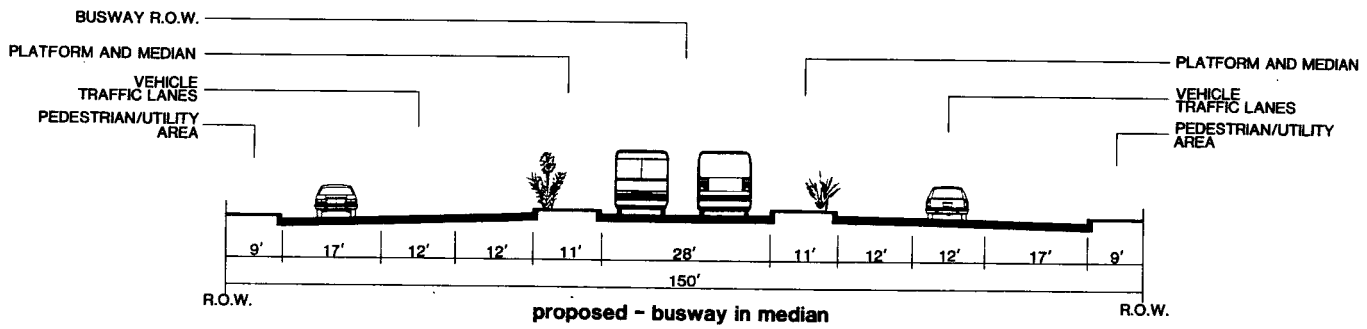
BROADWAY BOULEVARD - CBD TO COUNTRY CLUB



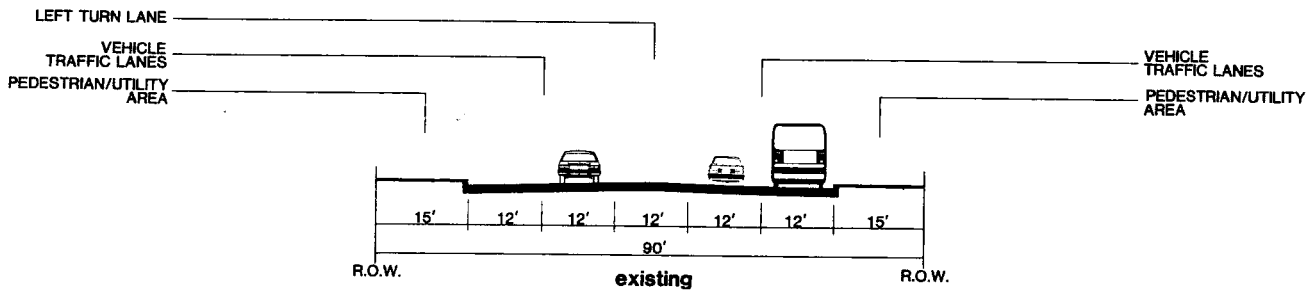
proposed - LRT adjacent to median



proposed - LRT on north side of broadway



proposed - busway in median



existing

TYPICAL BROADWAY CORRIDOR CROSS-SECTIONS

0 ft 10 ft 20 ft 30 ft 40 ft 50 ft

ORACLE-SOUTH SIXTH CORRIDOR STUDY

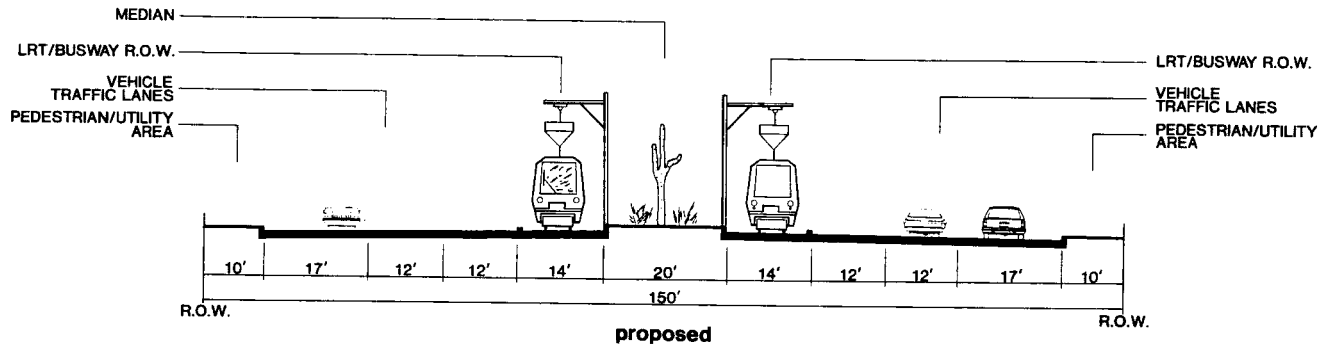
City of Tucson

Parsons Brinckerhoff

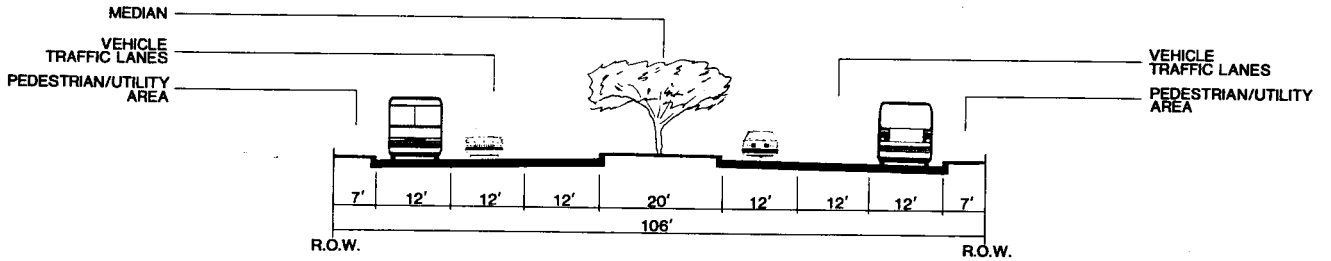
Rillito Consulting Group
Rogers, Gladwin & Rothman

3.15 figure

BROADWAY BOULEVARD - COUNTRY CLUB TO COLUMBUS

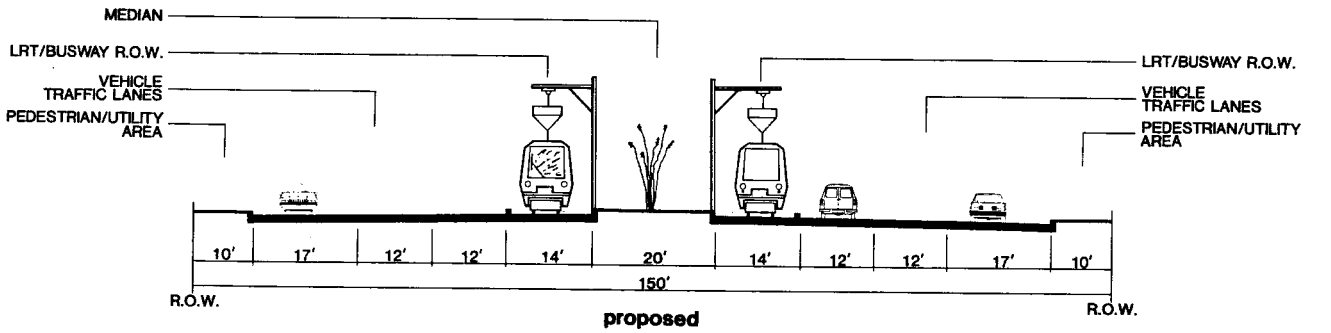


proposed

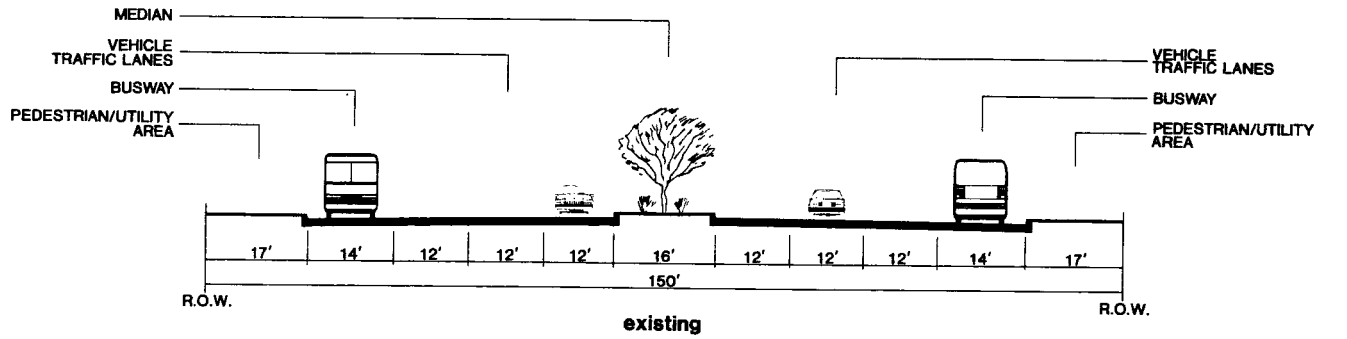


existing

BROADWAY BOULEVARD - COLUMBUS TO PANTANO



proposed



existing

TYPICAL BROADWAY CORRIDOR CROSS-SECTIONS

0 ft 10 ft 20 ft 30 ft 40 ft 50 ft

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

Parsons Brinckerhoff
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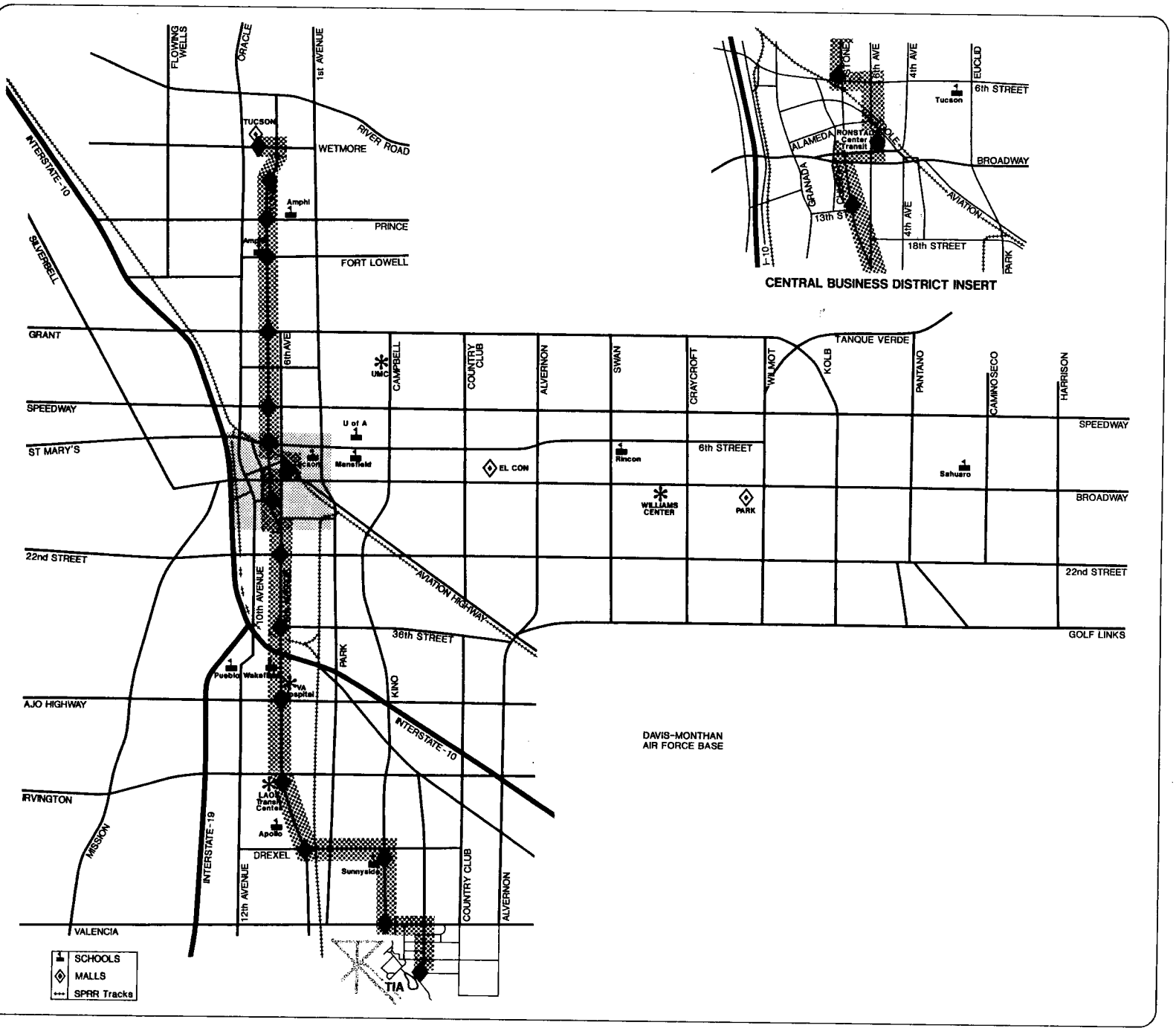
Rogers, Gladwin & Rothman

3.16 figure



ALTERNATIVE C:
BUSWAY TO TUCSON MALL AND TUCSON INTERNATIONAL AIRPORT

Busway

Station Stop

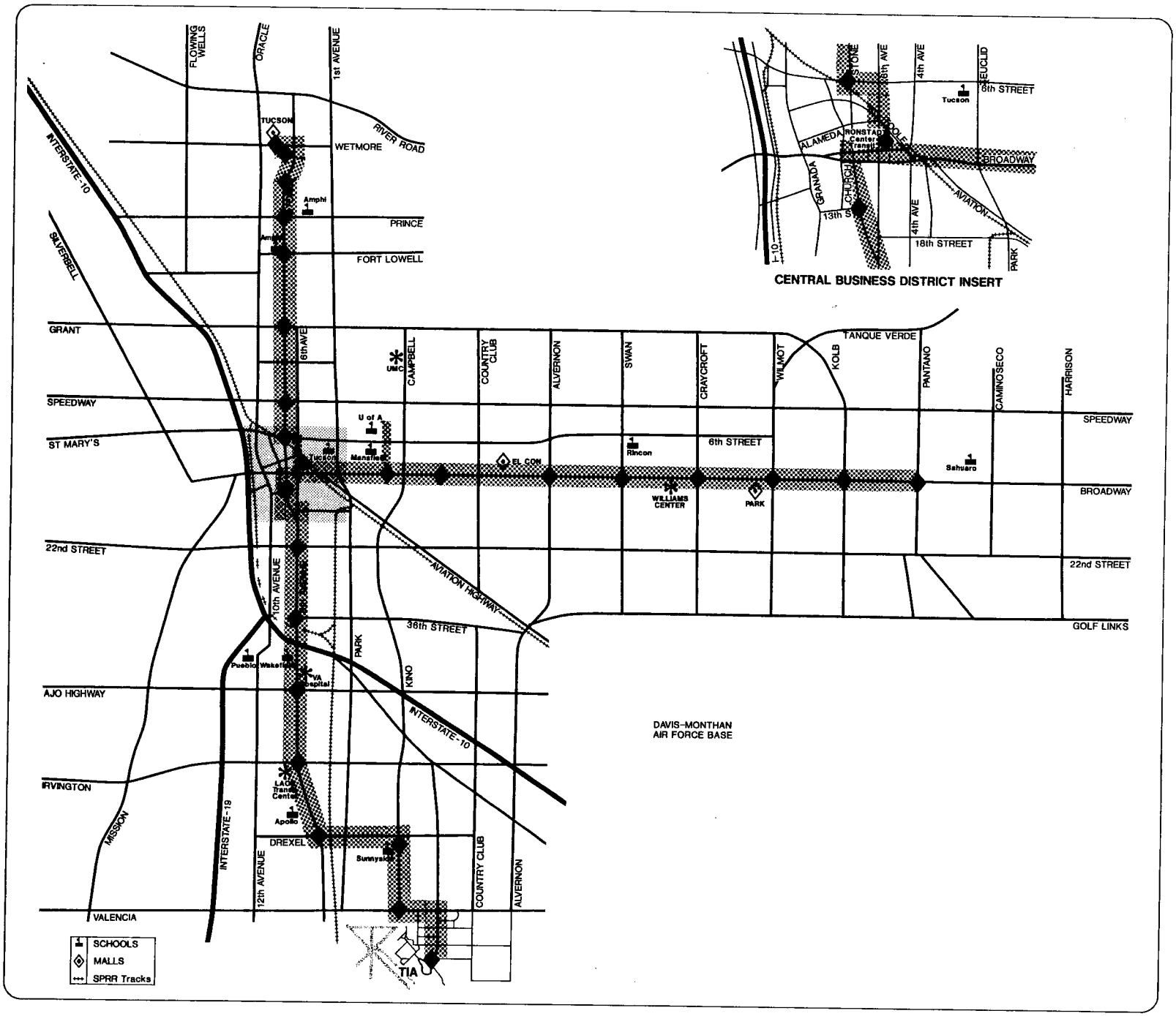
ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

Parsons Brinckerhoff Quade & Douglas, Inc.
Rillito Consulting Group
Rogers, Gladwin & Rothman

3.17 figure

0 mi .5 mi 1 mi 1.5 mi 2 mi 2.5 mi north



ALTERNATIVE D: BUSWAY SYSTEM

- Busway
- Station Stop

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

Parsons Brinckerhoff

Rillito Consulting Group
Rogers, Gladwin & Rothman

3.18 figure

0 mi .5 mi 1 mi 1.5 mi 2 mi 2.5 mi north

4.0 RIGHT-OF-WAY ANALYSIS

As part of this study, an analysis was conducted to determine the potential right-of-way costs and impacts associated with candidate LRT or busway alignments linking the Tucson Mall with the Tucson International Airport. Six alignments were analyzed; three from the CBD north to the Tucson Mall, and three from the CBD south to the airport as described in Chapter 3. This chapter describes the assumptions, methodology, and results of the right-of-way analysis.

4.1 Methodology of Costs and Impacts

The first step in the analysis defined the assumptions to be used, and are presented below:

- Right-of-way costs are based on 1989 assessed values. It should be understood that the actual fair market value for property is higher than the assessed values identified in this report. However, the relative relationship of one alignment to another would remain constant in terms of actual fair market values.

- The corridors' right-of-way costs may be understated if right-of-way purchased with Highway User Revenue Funds (HURF) monies requires repayment for non-auto uses of the right-of-way. Discussions with Arizona Department of Transportation (ADOT) officials identified uncertainty regarding this issue. Because it is unknown at this time whether a cost is associated with the purchase of HURF-acquired right-of-way, a cost has not been assigned in this analysis.

- The costs do not include any cost for right-of-way in the Central Business District as this area is not within the study boundaries. The excluded area is from Sixth Street south to Eighteenth Street.

- The number of full takes has been estimated based on engineering judgement and is subject to refinement.

The methodology used followed a straight-forward approach which began by determining the existing street cross section and right-of-way width. This information was acquired through field review and from as-built plans on file with the City of Tucson Engineering Division. The proposed cross section was then developed incorporating the necessary elements for an LRT/busway configuration and maintaining the existing number of vehicular traffic lanes. New right-of-way requirements were plotted on 100 scale (1" = 100') aerial photos to determine the impact of the new right-of-way on the adjacent parcels along each alignment.

Based on cross section needs, the parcels were analyzed and judged as to whether the parcel was a partial or full take. A full take was defined as necessary if both existing land and buildings were physically impacted by the proposed corridor project. A partial take was assumed necessary if only land was impacted by the corridor project. The extent of the necessary take was then measured for square footage to determine the associated cost for the necessary land.

Land values along the alternative alignments were established by determining assessed values from the city tax records for a sample of specific properties along each alternative alignment. A judgement of the average values for land only and the total land and building assessed value was then determined in dollars per square foot. Multiplying the

parcel's square footage by the dollars per square foot determined that specific parcel's value. A summation of all affected properties for each alignment alternative yielded the estimated right-of-way cost for each alignment.

4.2 Results

Average land values varied from $1.50 per square foot to $15.00 per square foot. Tables 4.1 and 4.2 display the estimated assessed valuation, estimated right-of-way costs, estimated fair market costs, and the number of full takes for the six alignments.

Assessed value costs were determined using the assumptions and methodology previously discussed. The total assessed value cost ranges from $5.8 million in the South Sixth Corridor to $15.9 million on the Stone Avenue alignment in the Oracle Road Corridor. The fair market value was calculated to be approximately 1.5 to 2.0 times the assessed value.

It should also be noted that an additional $2.0 million will be required for the South Yard Drill Track alignments to acquire the rail rights now serving the existing businesses north of 22nd Street.

Actual right-of-way costs for each alternative are probably higher than estimated, and cost savings could be realized through the sell back of excess right-of-way. However, the data presented is of sufficient detail to be used for comparison and order-or-magnitude definition of costs. A more detailed study of property values and an assessment of fair market pricing should be completed before programming of funds occurs.

TABLE 4.1

Oracle Corridors (CBD to Tucson Mall)

Alignment	*Assessed Value*	*Assessed Value Cost ($ millions)*	*Est. Fair Market Cost ($ millions)*	*Full Takes*
Oracle Road	Land = $12/sf Land & Bldg. = $15/sf	$10.2	$15.3- $20.4	8 Residential 21 Business
Neighborhood Alignment	Land & Bldg. = $15/sf	$ 8.8	$13.2- $17.6	22 Residential 1 Business
Stone Avenue	Land = $5/sf Land & Bldg. = $12/sf	$15.9	$23.9- $31.8	37 Residential 58 Business

TABLE 4.2

South Sixth Corridor (CBD to TIA)

Alignment	*Assessed Value*	*Assessed Value Cost ($ millions)*	*Est. Fair Market Cost ($ millions)*	*Full Takes*
South Yard Drill Track to 10th/12th to Irvington to Nogales Hwy. to Drexel to Campbell to Valencia to Tucson Blvd.	SPRR = $2/sf 12th Ave. Land = $1.50/sf Land & Bldg. = $3.50/sf	$ 5.8	$ 8.7- $11.6	72 Residential 39 Business
South Yard Drill Track to 6th Ave. to Drexel to Campbell to Valencia to Tucson Blvd.	SPRR = $2/sf 6th Ave. Land = $3/sf Land & Bldg. = $7/sf	$ 7.2	$10.8- $14.4	14 Residential 43 Business
6th Ave. to Nogales Hwy. to Drexel to Campbell to Valencia to Tucson Blvd.	6th Ave. Land = $3/sf Land & Bldg. = $7/sf	$ 9.3	$14.0- $18.6	14 Residential 80 Business

5.0 URBAN DESIGN CONCEPTS

Tucson is a city proud of its surroundings and natural beauty. The unique character of the city needs to be incorporated in major transportation investments. Therefore, as a part of this study, overall urban design and landscaping criteria were established for the corridors. This chapter describes the urban design aspect of the study.

5.1 Broadway Corridor Study Phase I Landscaping Concepts

An analysis of urban design themes and methods for improving pedestrian movement was completed during Phase I of the Broadway Corridor Study. Concepts were developed for landscaping and buffering schemes within the context of the Urban Land Institute/American Institute of Architects identification of Broadway Boulevard as a Gateway Route.

The four main elements of the landscaping plan developed for the Broadway Corridor, which are also applicable to the Oracle Road/South Sixth Avenue Corridor are as follows:

1) The development of transit and pedestrian nodes.

2) A landscaping theme which connects the transit nodes and stops along the corridor.

3) Walls to buffer neighborhoods and mitigate noise.

4) A design to channel the views of the mountains.

Transit and pedestrian nodes occur at major intersections, commercial areas, and transit stations. The nodes should have a strong sense of place or identity reinforced by the repeated use of a plant palette and specialty paving materials. Figure 5.1 illustrates a typical intersection concept with LRT.

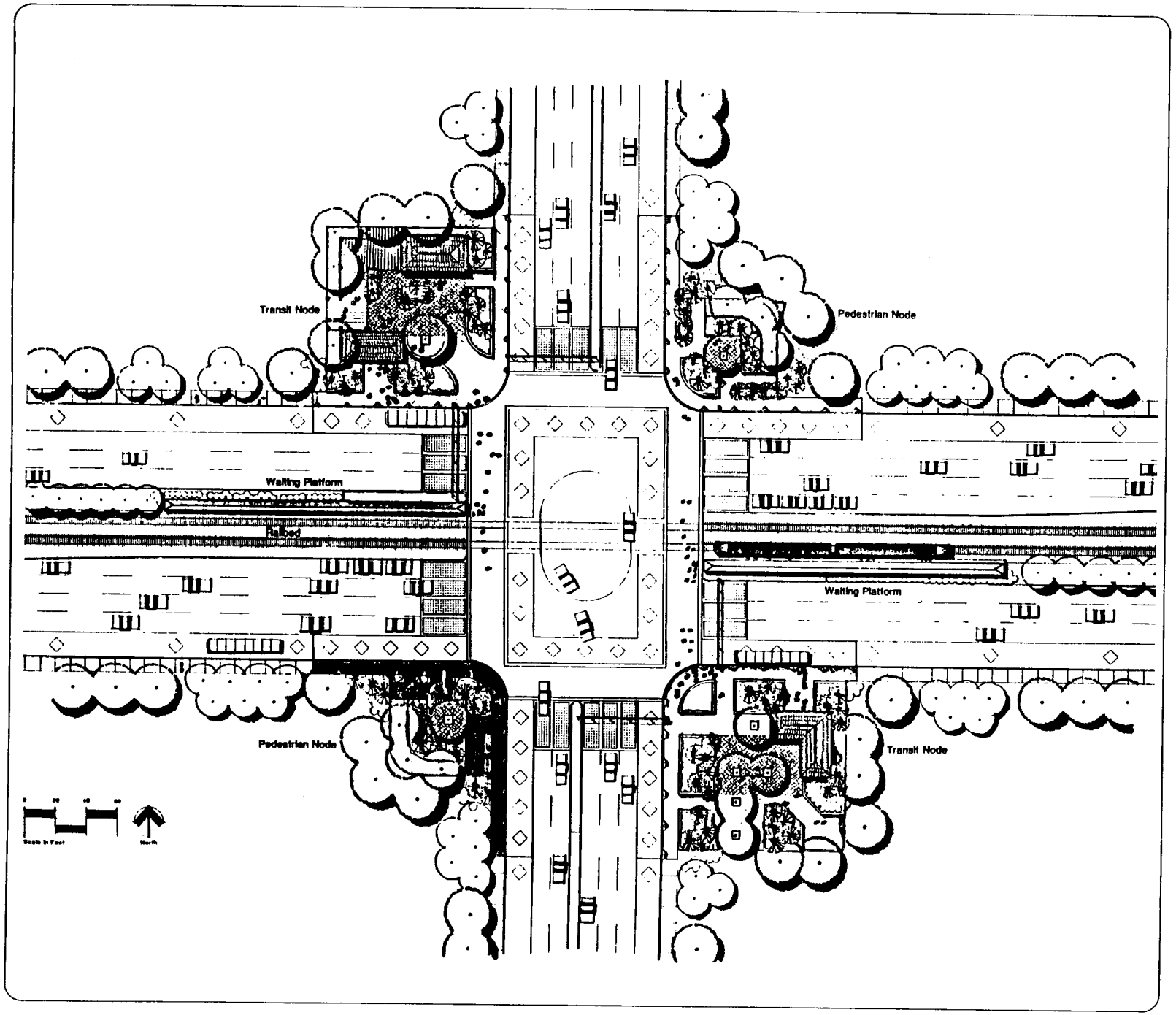
Figures 5.2 and 5.3 illustrate a sample design to connect the nodes and create a landscaping theme which responds to the vegetation changes, architecture, and character of the adjoining neighborhoods.

5.2 Oracle Road/South Sixth Avenue Concepts

As mentioned above, the main elements of the urban design and landscaping criteria were identified during the Broadway Corridor Study. Therefore, the main objective for this study was to establish consistency in these corridors.

An analysis was conducted for several alignments within the three corridors as described below:

1) CBD to the Tucson Mall
   a. Oracle Road
   b. 10th Avenue
   c. Stone Avenue



TRANSIT STATION AT MAJOR INTERSECTION

ORACLE-SOUTH SIXTH CORRIDOR STUDY

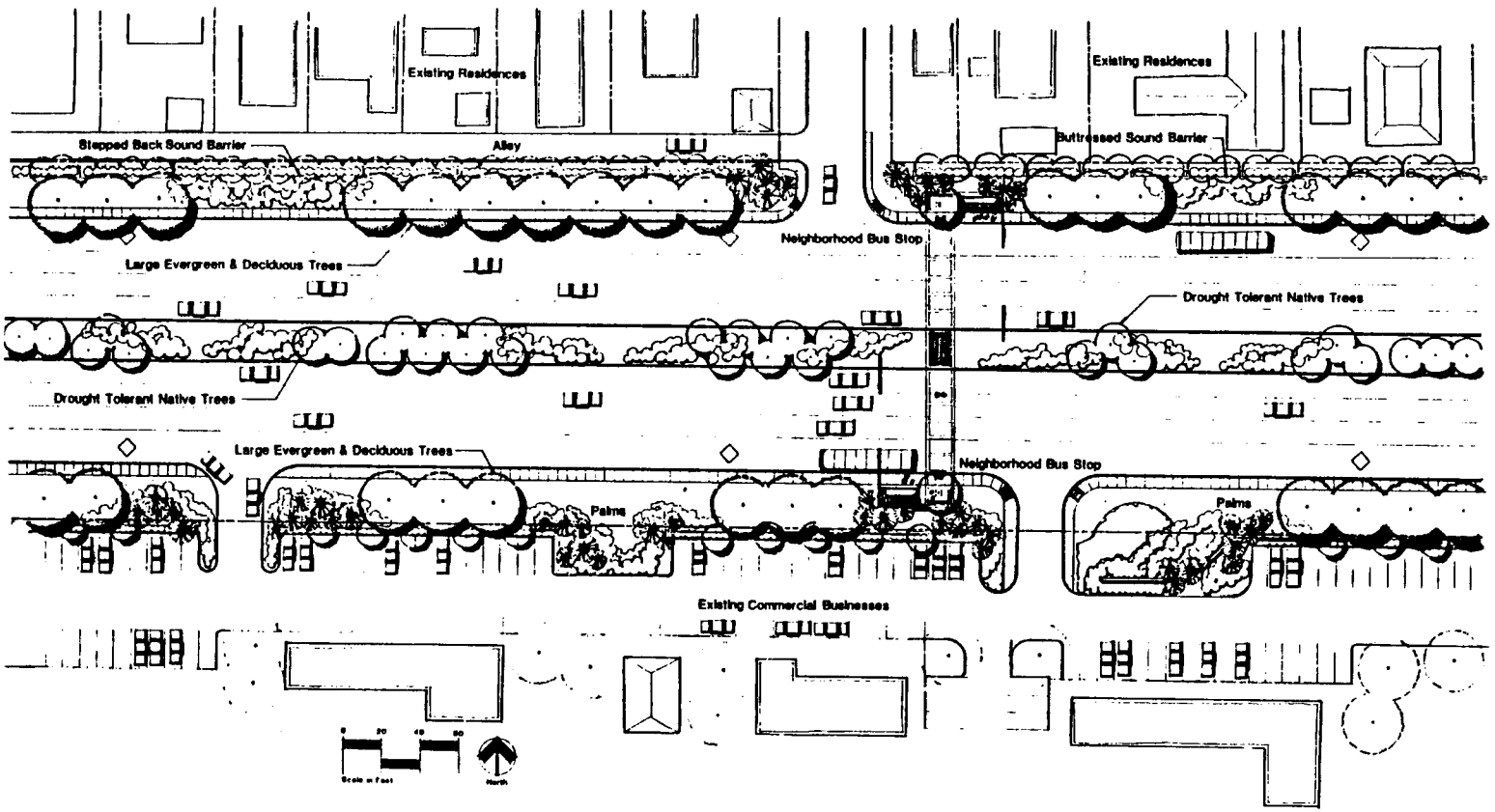
City of Tucson

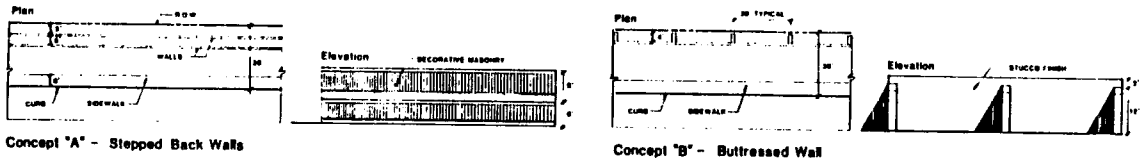
Parsons Brinckerhoff

Rillito Consulting Group
Rogers, Gladwin & Rothman

5.1 figure

LANDSCAPE CONCEPT PLAN FOR BROADWAY BOULEVARD





Concept "A" - Stepped Back Walls

Concept "B" - Buttressed Wall

NEIGHBORHOOD SOUND BARRIERS

ORACLE-SOUTH SIXTH CORRIDOR STUDY

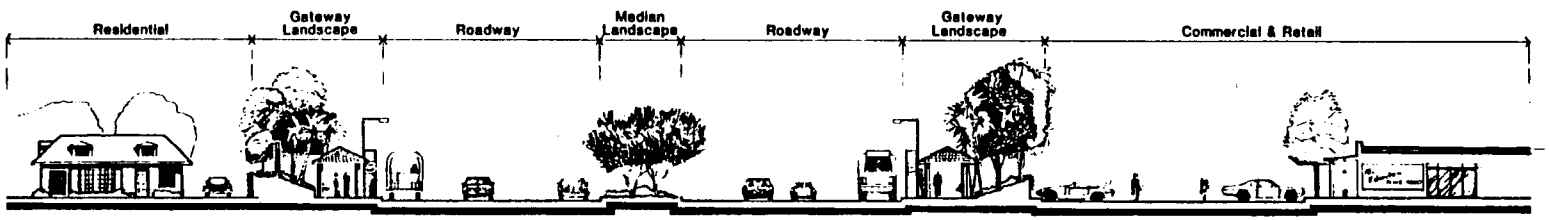
City of Tucson

Parsons Brinckerhoff

Rillito Consulting Group
Rogers, Gladwin & Rothman

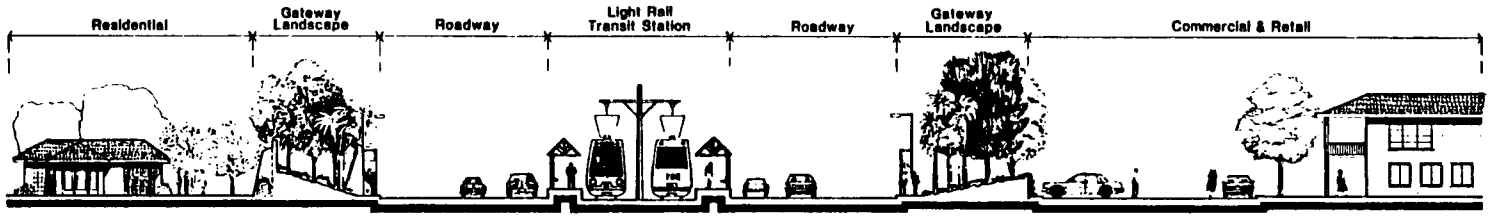
5.2 figure

north



SECTION "A"

BUS TRANSIT OPTION



SECTION "B"

LIGHT RAIL TRANSIT OPTION

ORACLE-SOUTH SIXTH CORRIDOR STUDY

City of Tucson

Parsons Brinckerhoff

Rillito Consulting Group
Rogers, Gladwin & Rothman

5.3 figure

north

2. CBD to the Tucson International Airport
   a. SPRR Right-of-way (team track)
   b. 10th/12th Avenues
   c. South Sixth Avenue
   d. Drexel/Campbell/Valencia/Tucson Blvd./Airport

3. Sixth Street
   a. Alvernon to 6th Avenue

A survey was conducted for each of the alignments to collect the physical characteristics which included, land use, architectural character, landscaping character, and other unique attributes.

None of the alignment alternatives have a strong repetitive or visually qualitative existing physical theme from either the architectural or landscape character. However, the alignments with the greatest degree of architectural and landscape continuity are Oracle Road, South Sixth Avenue, and Sixth Street.

5.3 Station Concepts

Two station prototypes have been designed for this study. The University of Arizona Transit Node at Highland Avenue is illustrated in Figure 5.4, and the South Sixth Avenue at Irvington Transit Node connecting to Laos Transit Center is illustrated in Figures 5.5 and 5.6.

5.4 Conclusions

The main conclusion of this component of the study is that no strong unifying elements exist upon which to base architectural or landscaping themes for the corridors. The physical design of the transit nodes and stops should be an overlay design theme complimentary to the existing corridor and neighborhood while having a strong sense of continuity and visual identity of its own. This visual continuity will strengthen the identity of the LRT system and help to unify the urban corridors through which it passes.

It is recommended that street side and median planting of small and medium sized canopy trees be utilized to the greatest extent possible to mitigate the skyline visual impact of the overhead wires. A palm tree and canopy tree theme featuring acacia and mesquite trees is recommended for the CBD to Tucson Mall route. A desert landscape theme is recommended for the CBD to airport route.

Climate controlled waiting stations should be provided at the major transit and pedestrian nodes. Cooling towers are also recommended for climate modification of shade structures. An example of a cooling tower is displayed in Figure 5.7.

Transit nodes should include but not be limited to the following design features:

- Specialty paving
- Vending machines (food and newspaper)
- Ticket machines
- Drinking Fountains
- Route maps and information
- Shade structures
- Handicap accessibility
- Cooling towers
- Shade trees and landscaping
- Seating, benches, and leaning rails
- Trash receptacles
- Train schedule and information
- Lighting
- Crossing signals