**SCOTTSDALE WATERFRONT**
**SWC SCOTTSDALE ROAD AND CAMELBACK ROAD**
**TRAFFIC IMPACT ANALYSIS SUMMARY**

**Summary Prepared by: Phillip Kercher, COS Traffic Engineering**
**Traffic Impact Study Prepared by: Dan Hartig, Parsons Brinckerhoff**

**Existing Conditions:**
The subject site is located along the north side of the Arizona Canal from Goldwater Boulevard to Scottsdale Road. The site has frontage on Camelback Road between Marshall Way and Scottsdale Road. The site has frontage on Goldwater Boulevard from Montecito Avenue to the Arizona Canal. There is also a small amount of site frontage on Scottsdale Road, approximately 100 feet.

West of Scottsdale Road, Camelback Road is designated as a major arterial on the Circulation Element of the City's General Plan. This section of Camelback Road is designated as a minor arterial on the proposed Streets Master Plan. Both plans designate Camelback Road as a minor arterial east of Scottsdale Road. From Marshall Way (71st Street alignment) west, the street is improved to a full six-lane arterial cross section. From Marshall Way to Scottsdale Road along the site frontage, Camelback is consists of three westbound lanes and two eastbound lanes. East of Scottsdale Road Camelback has four lanes. The current daily volume of traffic using this section of Camelback Road is 27,900 vehicles west of Scottsdale Road and 21,600 vehicles to the east.

Scottsdale Road is designated as a major arterial on the Circulation Element of the City's General Plan and the proposed Streets Master Plan. The street is improved to a full six-lane arterial cross section north of Camelback Road. South of Camelback Road, Scottsdale Road has three northbound lanes and two southbound lanes. The current daily volume of traffic using this section of Scottsdale Road is 40,600 vehicles north of Camelback Road and 27,900 vehicles to the south.

Goldwater Boulevard is designated as a couplet on the Circulation Element of the City's General Plan. It is designated as a major arterial on the proposed Streets Master Plan. The street is improved to a full couplet cross section – three southbound lanes and two northbound lanes separated by a raised median. The current daily volume of traffic using this section of Goldwater Boulevard is 19,700 vehicles south of Camelback Road.

Neither Marshall Way nor Montecito Avenue is designated on the Circulation Element of the City's General Plan or the proposed Streets Master Plan. They are both designed to a major collector cross section – two lanes in each direction separated by a raised median. Both of these streets were designed primarily to provide access to the parking structures that serve Fashion Square Mall and for future access to the subject site.

All four major intersections around the site are currently signalized: Camelback Road and Scottsdale Road, Camelback Road and Marshall Way, Camelback Road and Goldwater Boulevard, Goldwater Boulevard and Montecito Avenue. There are dual left-turn lanes on northbound and southbound approaches to Camelback Road at the Goldwater Boulevard and Scottsdale Road intersections.

For the section of Camelback Road from Scottsdale Road to Goldwater there were ten accidents reported in 2002; the accident rate for this segment of roadway was 3.93, higher than the city average rate of 1.49. For the section of Goldwater Boulevard from Camelback Road to Indian School Road, there were eight reported accidents in 2002; the accident rate for this segment of roadway was 2.03.

At the intersection of Camelback Road and Scottsdale Road, there were nineteen reported collisions in 2002; the accident rate for this intersection was 0.90, slightly higher than the city average rate of 0.54. At the intersection of Camelback Road and Goldwater Boulevard, there were fifteen accidents reported in 2002; the accident rate for this intersection was 0.70.

**Proposed Development:**
The 11.3-acre site currently has a zoning designation of Regional Commercial Office-Type 2 (D/RCO – Type 2) with a Planned Block Development (PBD) overlay. This zoning allows the development of 1.1 million square feet of mixed-use commercial development. The applicant is proposing to develop the site under the Infill Incentive District. The development plan proposed under this district would allow the development of 110,900 square feet of retail land use, 94,400 square feet of general office land use, and 366 residential dwelling units. There are eleven buildings proposed for the site, three west of Marshall Way near Goldwater Boulevard and eleven east of Marshall Way. The retail and office land uses are located along the Marshall Way, Montecito Avenue, and Camelback Road frontages. The residential land uses are located behind these buildings along the Arizona Canal. The trip generation numbers for proposed development plan are presented in the Table 1 below.

**TABLE 1 -Trip Generation for Proposed Site Plan**

| Land Use | Daily Total | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Condominium – 366 units | 1,961 | 24 | 118 | 142 | 120 | 59 | 179 |
| General Office - 94,400 s.f. | 1,270 | 157 | 21 | 178 | 31 | 154 | 185 |
| Retail – 110,900 s.f. | 7,286 | 104 | 66 | 170 | 323 | 350 | 673 |
| **Subtotal** | **10,517** | **285** | **205** | **490** | **474** | **563** | **1,037** |
| 10% Reduction for Internal Trips | 1,052 | 28 | 21 | 49 | 47 | 56 | 103 |
| Adjusted Subtotal | 9,465 | 257 | 184 | 441 | 427 | 507 | 934 |
| 5% Reduction for Other Modes | 473 | 13 | 9 | 22 | 21 | 25 | 46 |
| **Total Trips** | **8,992** | **244** | **175** | **419** | **406** | **482** | **888** |

This trip generation is based on data contained in the Institute of Transportation Engineer's *Trip Generation*. A traffic impact study was prepared by Parsons Brinckerhoff under the City's Traffic Impact and Mitigation Analysis (TIMA) guidelines. The study compares the trip generation characteristics of the proposal versus the previously approved site plan and examines the impacts from the proposed development. A ten percent reduction was applied to the site trip generation to account for the interaction between the various land uses proposed for the site – residential, office, and retail. In other words, it is likely that some of the office workers and residents in the site buildings will patronize the retail uses on the site. In addition, a five percent reduction was applied

to account for trips that will utilize non-vehicular modes of transportation. This is very likely considering that the site is located in an urbanized area of the city, with transit, trolley, and pedestrian amenities being provided on the site and in the vicinity of the site. This also reflects the ability of the residents who live on the site to walk to the nearby commercial land uses (Fashion Square Mall, downtown restaurants, etc.).

The trip generation numbers for the previously approved development plan are presented in Table 2 below. These trip generation numbers are based on data contained in the approved traffic study for the development plan approved in Zoning Case 43-ZN-1995. This study does not include traffic that would be generated by development on the site between Goldwater Boulevard and Marshall Way; this area is shown as a future phase. A comparison of the trips generated by the proposed development plan versus the land use and trip generation assumptions for the previously approved development plan is shown in Table 3. The trip generation numbers for the proposed development plan have been adjusted to remove the trips that will be generated by the portion of the site between Goldwater Boulevard and Marshall Way for comparison purposes.

**TABLE 2 - Trip Generation for Previous Development Plan (From Approved Traffic Study)**

| Land Use | Daily Total | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Restaurant – 60,000 s.f. | 5,397 | 33 | 16 | 49 | 301 | 148 | 449 |
| Retail – 208,480 s.f. | 10,933 | 151 | 97 | 248 | 489 | 530 | 1,019 |
| Cinema – 70,000 s.f. | 1,674 | 0 | 0 | 0 | 170 | 96 | 266 |
| Office – 134,900 s.f. | 1,670 | 208 | 28 | 236 | 39 | 191 | 230 |
| **Total** | **19,674** | **392** | **141** | **533** | **999** | **965** | **1,964** |

**TABLE 3 - Comparison Trip Generation**

| Land Use | Daily Total | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Previously Approved Site Plan | 19,674 | 392 | 141 | 533 | 999 | 965 | 1,964 |
| Proposed Site Plan | 8,666 | 209 | 169 | 378 | 393 | 451 | 844 |
| **Change** | **-11,008** | **-183** | **+28** | **-155** | **-627** | **-474** | **-1,101** |

Site access will primarily be provided via Marshall Way and Montecito Avenue, which extend into the site and intersect near the middle of the site. Both of these streets provide signalized access to the adjacent major streets on the perimeter of the site, Camelback Road and Goldwater Boulevard. There is also a proposed right-in, right-out only driveway on Camelback Road.

Parking is proposed to be provided primarily in underground parking structures. Some limited at grade parking will be provided. There are two parking structure entrances for the residential and commercial buildings east of Marshall Way. There are two parking structure entrances for the residential portion of the site west of Marshall Way.

The City is planning to extend Marshall Way south over the Arizona Canal. This would provide a connection to Sixth Avenue in the downtown area to the south of this site. Initially, this connection is proposed to be restricted to pedestrian and trolley access only. In conjunction with the development of this site, it is also proposed that Marshall Way and Montecito Avenue be modified to incorporate on-street angled parking. The cross sections would be reduced to one lane in each direction on both streets.

**Future Conditions:**
The submitted traffic study analyzes the traffic conditions for the Year 2010. Future traffic volumes on the adjacent streets were calculated by applying annualized growth rates to the existing traffic volumes. Capacity calculations were performed using three sets of data: existing traffic volumes, 2010 projected traffic volumes (background traffic), and 2010 projected traffic volumes plus site generated traffic (total traffic).

A summary of the results of the capacity analyses for the signalized intersections is shown in Table 4 below. All four of the study intersections will operate at LOS D or better using the total traffic volumes. The capacity calculations for the intersection of Camelback Road and Scottsdale Road assume that a dual eastbound left-turn will be provided. The capacity calculations for the intersection of Camelback Road and Marshall Way assume a two-lane northbound approach.

The right turn movements at the unsignalized site driveway on Camelback Road are expected to operate at LOS C or better in the Year 2010 with site traffic.

**TABLE 4**
**Signalized Intersections Capacity Analyses**
**Level of Service/Average Control Delay (in seconds)**

| Intersection | Existing Cond.'s 2003 Volumes | Background Traffic 2010 Volumes | Total Traffic 2010 Volumes |
|---|---|---|---|
| **A.M. Peak Hour** | | | |
| Camelback & Scottsdale | D / 41 | D / 48 | D / 50* |
| Camelback & Marshall Way | A / 6 | A / 5 | A / 5 |
| Camelback & Goldwater | D / 39 | D / 40 | D / 38 |
| Goldwater & Montecito | A / 2 | A / 2 | A / 5 |
| | | | |
| **P.M. Peak Hour** | | | |
| Camelback & Scottsdale | D / 50 | E / 61 | D / 51* |
| Camelback & Marshall Way | B / 14 | B / 19 | D / 54 |
| Camelback & Goldwater | D / 37 | D / 49 | D / 46 |
| Goldwater & Montecito | A / 9 | A / 9 | B / 16 |

* assumes dual left turn lanes eastbound on Camelback

**Summary:**
The approval of the proposed development plan under the Infill Incentive District will generate an estimated 8,991 trips per day, with approximately 420 trips generated in the a.m. peak hour and 890 trips generated in the p.m. peak hour. This represents more than a 50 percent reduction in daily and p.m. peak hour site-generated traffic from the previously approved development plan. This reduction is primarily the result of a

significant decrease in the amount of retail and restaurant square footage planned for the site.

The proposed mixture of residential, office, and retail land uses will reduce the amount of site-generated traffic due to the natural interaction of these land uses. The site location will encourage the use of alternative modes of transportation for those traveling to the site and for those residents who live on the site. A pedestrian and trolley bridge is planned to connect this site to the downtown area by extending Marshall Way over the Arizona Canal. The development is also providing transit stops on Camelback Road and Scottsdale Road directly adjacent to the site.

Site traffic will be distributed primarily to Camelback Road and Goldwater Boulevard via the existing signalized intersections of Marshall Way (on Camelback Road) and Montecito Avenue (on Goldwater Boulevard). Both Camelback Road and Goldwater Boulevard are under capacity for current and projected traffic volumes.

Capacity analyses for the Year 2010 indicate that the major signalized intersections in the vicinity of the site will operate at level of service D or better. These study intersections include Camelback Road and Scottsdale Road, Camelback Road and Marshall Way, Camelback Road and Goldwater Boulevard, and Goldwater Boulevard and Montecito Avenue. These capacity calculations are based on existing street improvements except at the signalized intersection of Camelback Road and Scottsdale Road; the capacity calculations for this intersection assume the provision of a dual-left turn lane for eastbound Camelback Road.

**Staff Concerns/Comments:**

- The developer should be responsible for completing the third eastbound lane on Camelback Road along the site frontage. This lane becomes a right-turn only lane at the intersection with Scottsdale Road.

- The developer should modify the Camelback Road and Scottsdale Road intersection to provide a dual left-turn for eastbound Camelback Road. This improvement will require modifications to the existing Camelback Road median. The east leg of the intersection is constrained by the existing bridge width over the Arizona Canal.

- The developers should remove the existing median opening on Camelback Road between Scottsdale Road and Marshall Way. This will allow the extension of the westbound left-turn lane at Marshall Way.

- The southbound left-turn lane on Goldwater Boulevard at Montecito Avenue is extremely short. The length is limited by an existing northbound left-turn lane into a private driveway on the west side of the street. A protected left-turn phase should be provided to improve the traffic signal operation and reduce the amount of vehicle queuing. Relocation of the private driveway should be explored to allow the southbound left-turn lane to be extended.

- A two-lane approach should be provided for northbound Marshall Way at Camelback Road. The lane configuration needs to be aligned with the existing

lanes on the north side of the intersection. Parking should not be located within the potential vehicle queuing area on Marshall Way.

- Transit stops should be provided on Camelback Road between Marshall Way and Scottsdale Road, and on Scottsdale Road just south of Camelback Road. These stops should be connected to pedestrian paths on the site. Trolley stop locations should be identified on Marshall Way to serve the retail portion of the site.

# Transportation Impact and Mitigation Analysis for

# Waterfront Development

## FINAL REPORT

## Scottsdale, Arizona

**September 2003**
**Revised September 25, 2003**

*Submitted to:*

*Submitted by:*

PB PARSONS BRINCKERHOFF

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# EXECUTIVE SUMMARY

## Introduction

The City of Scottsdale received an application for a development plan under the Infill Incentive District on an 11.3-acre parcel located on the southwest corner of Scottsdale Road and Camelback Road. This traffic study analyzes the impacts from the traffic that would result from the approval of this infill development.

The following tasks comprised the scope of the traffic analysis:

1. Existing daily traffic volumes were collected on Camelback Road, Scottsdale Road, and Goldwater Boulevard. Turning movement counts during the peak hours were obtained at the intersections of Camelback Road and Goldwater Boulevard, Camelback Road and Marshall Way, Camelback Road and Scottsdale Road, and Goldwater Boulevard and Montecito Avenue.
2. The projected traffic volumes that will be generated by the proposed development were estimated using the *ITE Trip Generation Handbook, 6th Edition*. These traffic projections were utilized to estimate peak hour volumes at the site driveways.
3. Comparison of the estimated traffic generated by the proposed development to estimated trip generation for previously approved development plans.
4. Estimate future traffic volumes on Camelback Road, Scottsdale Road, Goldwater Boulevard, Marshall Way, and Montecito Avenue using a year 2010 horizon.
5. Completion of capacity analyses at the signalized intersection of Camelback Road and Goldwater Boulevard, Camelback Road and Marshall Way, Camelback Road and Scottsdale Road, and Goldwater Boulevard and Montecito Avenue, and at the site driveway on Camelback Road. Level-of-service was determined for both the morning and evening peak hours at all study intersections. The analyses were based on methodology contained in the *2000 Highway Capacity Manual*.
6. Analysis of the traffic impacts assuming that the Marshall Way bridge over the Arizona Canal is open to vehicular traffic (not restricted to trolley and pedestrians.
7. Recommendations regarding minimum acceptable site access, site driveway location and configuration, modifications to existing left-turn lane lengths, and installation of deceleration lanes.
8. Analysis of the on-site circulation including parking structure entrance locations and recommendations for improvements if necessary.
9. Provide an overview of the alternative transportation opportunities for the site and proposed development with recommendations to enhance pedestrian and bicycle access.

## Site Information

The location of the proposed development is shown in Figure 1. The specific site plan considered by this report is depicted in Figure 2. The development consists of approximately 94,400 square feet of general office space, 110,900 square feet of retail space and 366 residential condominium units in eleven multi-story buildings on this 11.3-acre parcel of land. The roadway network around the development to serve the site traffic includes Camelback Road, Scottsdale Road, and Goldwater Boulevard. The site traffic will have a right/left turn in/right turn out driveway on Camelback Road and two signalized intersections, Camelback Road/Marshall Way and Goldwater Boulevard/Montecito Avenue, to enter and exit the site.

## Principal Findings

This traffic report contains the findings of the traffic impact study prepared for the proposed development. Overall, the development in the SWC of Scottsdale Road and Camelback Road will not adversely impact the surrounding street system adjacent to the site. Only one location, Scottsdale Road and Camelback Road, will experience a decrease in level of service (D to E), and that will only occur in the p.m. peak hour.

The analysis was based on projected traffic volumes on Camelback Road, Scottsdale Road and Goldwater Boulevard that result from the proposed development and anticipated future development in the area. The study included a capacity analysis at the intersections of Camelback Road and Goldwater Boulevard, Camelback Road and Marshall Way, Camelback Road and Scottsdale Road, and Goldwater Boulevard and Montecito Avenue, as well as at the proposed site driveway.

## Conclusions

Overall, the development in the SWC of Scottsdale Road and Camelback Road will not adversely impact the surrounding street system adjacent to the site. Only one intersection, Scottsdale Road and Camelback Road, will experience a decrease in level of service (D to E), and that will only occur in the p.m. peak hour.

Site access and circulation should be reviewed further as more detailed development plans are available. The function and capacity of the Marshall Way/Montecito loop roadway needs to accommodate 700 vehicles in the p.m. peak hour and provide adequate access for emergency vehicles.

A number of geometric and operation improvements as described in the next section should also be considered to improve the overall efficiency of the transportation system.

## Recommendations

- Provide two left turn lanes eastbound on Camelback Road at Scottsdale Road.
- Continue the third eastbound through lane on Camelback Road from Marshall Way to Scottsdale Road where it would become a right turn only lane.
- Incorporate a bus stop for eastbound Camelback Road into the project design.
- Close the existing median opening on Camelback Road between Scottsdale Road and Marshall Way.
- The Marshall Way approach to the signalized intersection at Camelback Road should have two lanes for approximately 110 feet.
- The Montecito approach to the signalized intersection at Goldwater Boulevard should have two lanes for approximately 150 feet.
- Adequate transitions should be provided from the two lane to four lane sections on the Marshall Way/Montecito loop.
- The entrances to the site garages from Marshall Way/Montecito should be treated as stop controlled intersections. Angle parking should not be permitted in the intersection area and the locations should align with the fashion square locations where practical. The south garage entrance on Marshall Way should align with Montecito.
- The number of lanes exiting the garage should be examined once the final size is known to ensure adequate queue lengths are provided.
- The geometry of Marshall Way south of Camelback Road and the entrance to Fashion Square north of Camelback Road must provide lane alignment that minimizes the offset for north-south movements.

# PROPOSED DEVELOPMENT

## Introduction

The purpose of this report is to address the impacts that a new mixed-use development located in the southwest corner of Camelback Road and Scottsdale Road will have on the adjacent street system and at the intersections surrounding the site. To determine these impacts, site traffic will be determined based on the current site plan and assigned to the streets and the intersections surrounding the site. Capacity analysis will be conducted for the a.m. and p.m. peak hour conditions for all the adjacent intersections including the site driveway.

## Description

The proposed development is located on a parcel of land at the southwest corner of Camelback Road and Scottsdale Road as shown in Figure 1. The specific site plan considered by this report is depicted in Figure 1a. The development consists of approximately 94,400 square feet of general office space, 110,900 square feet of retail space, and 366 residential condominium units in eleven multi-story buildings on the site.

The roadway network serving the site includes Camelback Road, Scottsdale Road and Goldwater Boulevard. The site plan includes one driveway (Driveway A) onto Camelback Road. Site traffic will use Driveway A onto Camelback Road and two signalized intersections to enter and exit the site. The signalized intersections are Camelback Road and Marshall Way, and Goldwater Boulevard and Montecito.

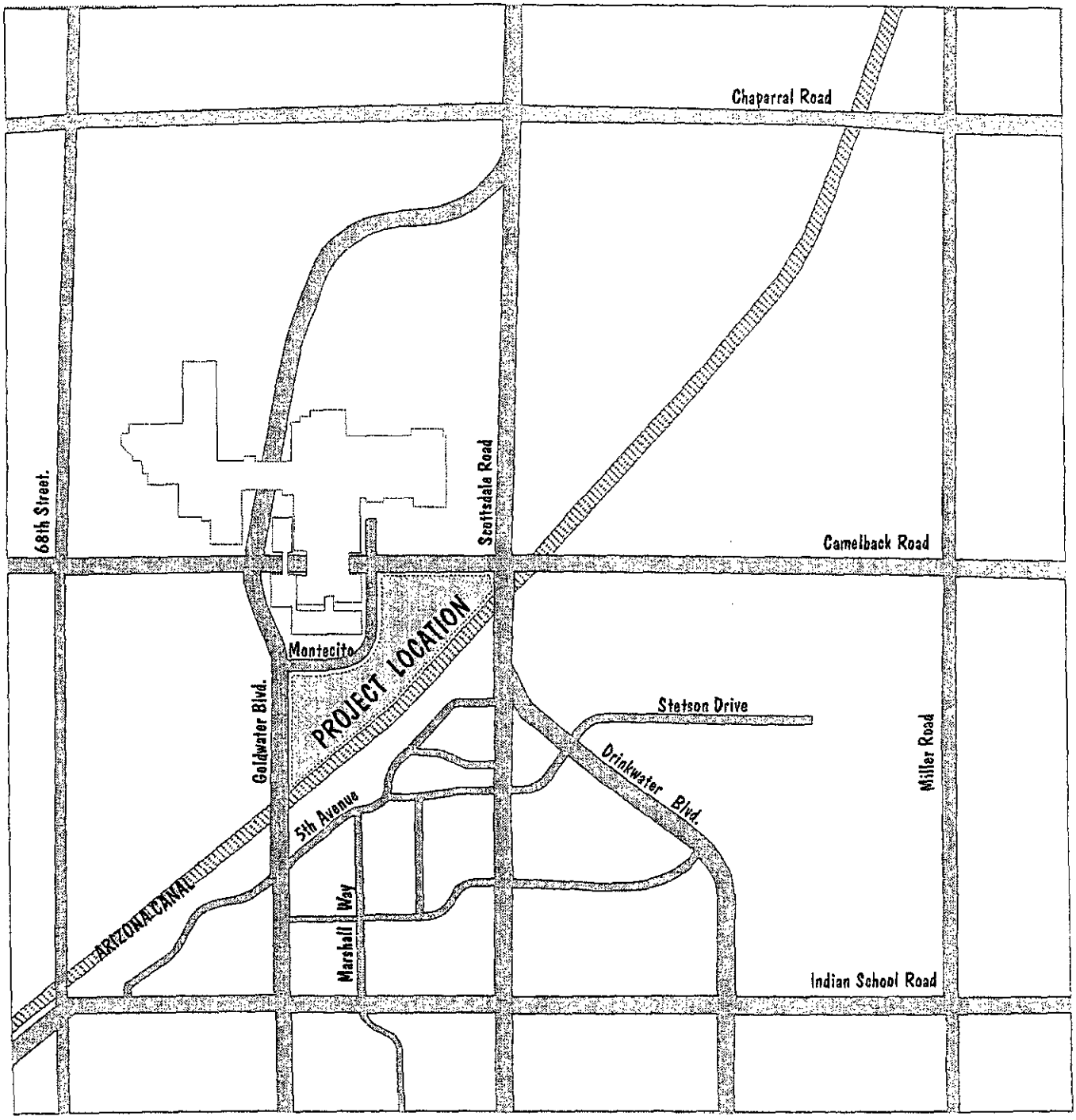
# AREA CONDITIONS

## Study Area

The study area is located in the downtown area of the city. The site is located south of the Scottsdale Fashion Square retail center located at Camelback Road and Scottsdale Road. The study area includes the following intersections:

- Camelback Road and Goldwater Boulevard
- Camelback Road and Marshall Way
- Camelback Road and Scottsdale Road
- Goldwater Boulevard and Montecito Avenue

Waterfront TIMA




## Vicinity Map

**FIGURE 1**

## Land Use

The 11.3-acre area available for the proposed development is zoned for Residential/Commercial/Office (D/RCO-2 PBD) land use. The current land uses for the surrounding areas are:

- To the north-Retail
- To the south-Retail
- To the east-Office/residential
- To the west-Office

## Site Accessibility

*Area Roadway System*
The existing major roadways that will provide access to the site are Camelback Road, Scottsdale Road and Goldwater Boulevard.

Camelback Road is an east-west minor arterial with a posted speed limit of 35 MPH in the vicinity of the site. There are three westbound lanes and two eastbound lanes adjacent to the site. There is an existing bus route on Camelback Road.

Scottsdale Road is a north-south major arterial with a posted speed limit of 40 MPH in the vicinity of the site. It is located east of the proposed site. Adjacent to the site, there are three lanes northbound and two lanes southbound. There is an existing bus route on Scottsdale Road.

Goldwater Boulevard is a north-south major arterial with a posted speed limit of 35 MPH in the vicinity of the site. It is located west of the proposed site. Adjacent to the site, there are three lanes northbound and two lanes southbound.

Marshall Way is classified as a local street in the north-south direction with a design speed of 25 MPH throughout the site. It will be used as one of the north access points to the proposed site. It contains two lanes in each direction and connects with Montecito Avenue at the south end of the road.

Montecito Avenue is classified as a local street in the east-west direction with a design speed of 25 MPH throughout the site. It will be used as the west access point to the proposed site. It contains two lanes in each direction and connects with Marshall Way at the east end of the road.

The signalized intersection of Camelback Road and Goldwater Boulevard is located northwest of the site. Camelback Road in the eastbound direction consists of one dedicated left turn lane, three through lanes and a dedicated right turn lane. In the westbound direction, Camelback Road consists of one dedicated left turn

lane, two through lanes, and a shared through/right turn lane. Goldwater Boulevard in the northbound direction consists of dual left turn lanes, two through lane and a dedicated right turn lane. The southbound direction, Goldwater Boulevard consists of dual left turn lanes, three through lanes and a dedicated right turn lane.

The signalized intersection of Camelback Road and Scottsdale Road is located to the north-east of the site. Camelback Road in the eastbound direction consists of a dedicated left turn lane, two through lanes and a dedicated right turn lane. In the westbound direction, Camelback Road consists of a dedicated left turn lane, two through lanes, and a shared through/right turn lane. Scottsdale Road in the northbound direction consists of dual left turn lanes, two through lanes, and a shared through/right turn lane. In the southbound direction, Scottsdale Road consists of dual left turn lanes, two through lanes and a dedicated right turn lane.

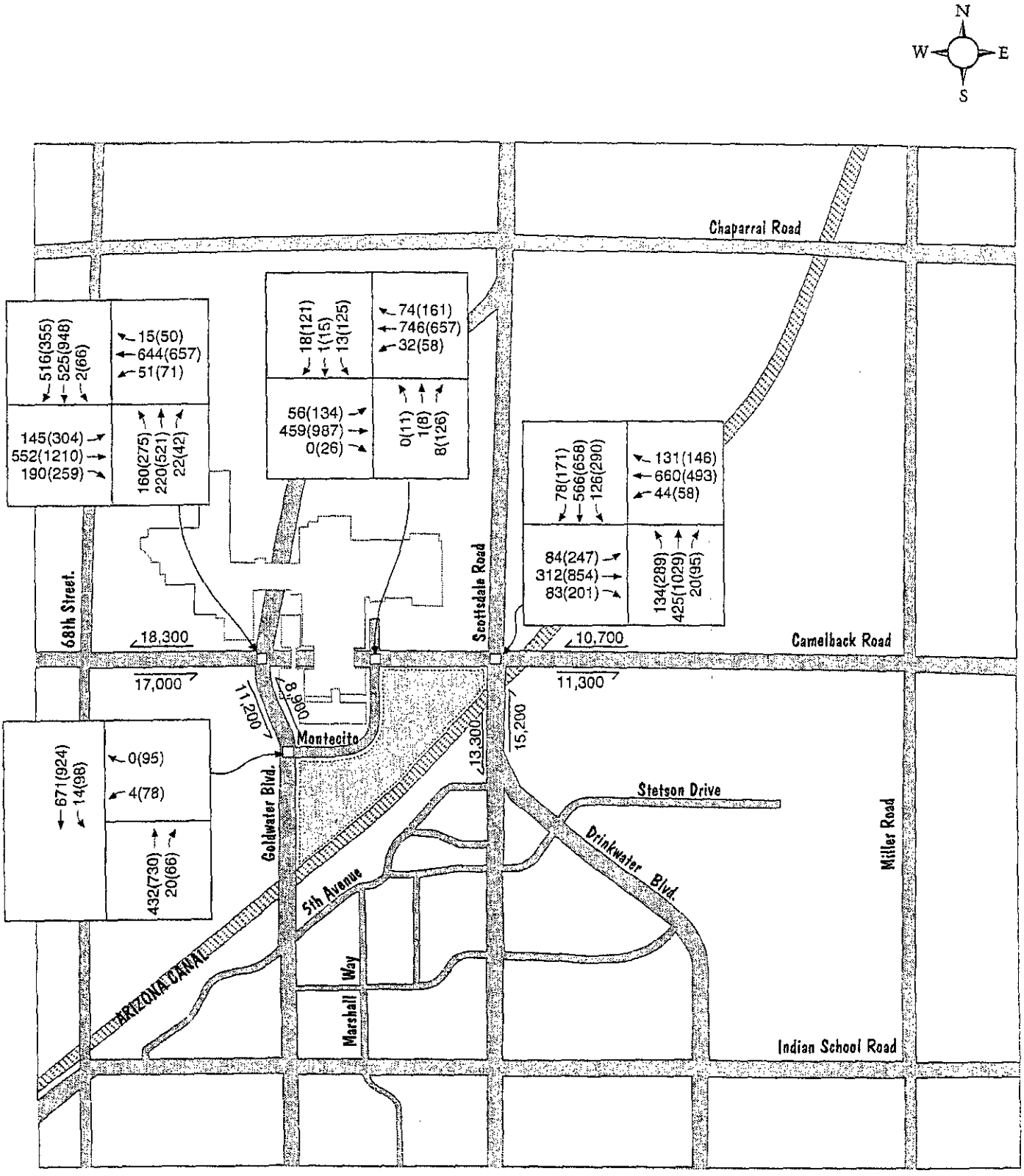
The Camelback Road and Marshall Way intersection provides access to the Fashion Square shopping center both north and south of Camelback Road. It is a signalized intersection that will also be used as an access point to the proposed site. The eastbound direction consists of a dedicated left turn lane, two through lanes and a dedicated right turn lane. The westbound direction consists of a dedicated left turn lane, three through lanes and a dedicated right turn lane. The north and south legs consist of two lanes that are shared between the through and their respective turning movements.

Goldwater Boulevard and Montecito Avenue, west of the site, also provides access to Fashion Square south of Camelback Road. It is a signalized intersection that will also be used as an access for the proposed site. On Goldwater Boulevard, the southbound direction consists of a dedicated left turn lane and three through lanes. In the northbound direction there are two through lanes and a dedicated right turn lane. On Montecito Avenue, there is a left turn lane and a right turn lane.

*Traffic Volumes*

Existing daily traffic volumes were collected on Camelback Road, Scottsdale Road, and Goldwater Boulevard on June 11, 2003. Turning movement counts were conducted during the morning (7 to 9 a.m.) and afternoon (4 to 6 p.m.) peak hours at the intersections of Camelback Road and Goldwater Boulevard, Camelback Road and Marshall Way, Camelback Road and Scottsdale Road, and Goldwater Boulevard and Montecito Avenue on June 12, 2003. Figure 2 depicts the peak hour and daily traffic volumes. The AM peak hour was from 7:45 to 8:45 at two locations and from 7:30 and 8:30 at the other two locations. The PM peak hour was from 4:45 and 5:45 at all four locations. The actual traffic counts are attached in Appendix A of this report. It should be noted that the actual volumes were increased two percent to represent the annual average.

Waterfront TIMA




(##) = A.M.(P.M.)

$\overline{\#\#}$ = Directional Daily Volume

## Existing Traffic Volumes

FIGURE 2

The existing daily traffic volumes are shown in Table 1. The directional daily volumes and the 'k' factor are shown for each location. The 'k' factor represents the percentage of daily traffic that occurs in the a.m. or p.m. peak hour.

**TABLE 1: EXISTING DAILY TRAFFIC VOLUMES**

| Locations | Direction | Volume | Percent of Total | K Factor | |
|---|---|---|---|---|---|
| | | | | AM | PM |
| **Camelback Road**-west of Goldwater Boulevard | EB | 17,000 | 48% | 7% | 9% |
| | WB | 18,300 | 52% | 7% | 7% |
| **Camelback Road**-east of Scottsdale Road | EB | 11,300 | 51% | 5% | 10% |
| | WB | 10,700 | 49% | 7% | 8% |
| **Scottsdale Road**-south of Camelback Road | NB | 15,200 | 53% | 7% | 8% |
| | SB | 13,300 | 47% | 6% | 7% |
| **Goldwater Boulevard**- south of Camelback Road | NB | 8,900 | 44% | 6% | 9% |
| | SB | 11,200 | 56% | 5% | 8% |

As can be seen from Table 1, the largest daily volume imbalance is on Goldwater Boulevard south of Camelback Road. This is not surprising since Goldwater Boulevard has three southbound lanes and two northbound lanes. The highest 'k' factor was found on Camelback Road, east of Scottsdale Road in the p.m. peak, while the lowest was found at the same location in the a.m. peak as well as on Goldwater Boulevard, south of Camelback Road in the a.m. peak. It is very common for the a.m. peak to have a lower 'k' factor than the p.m. peak, which is consistent with the data shown in Table 1.

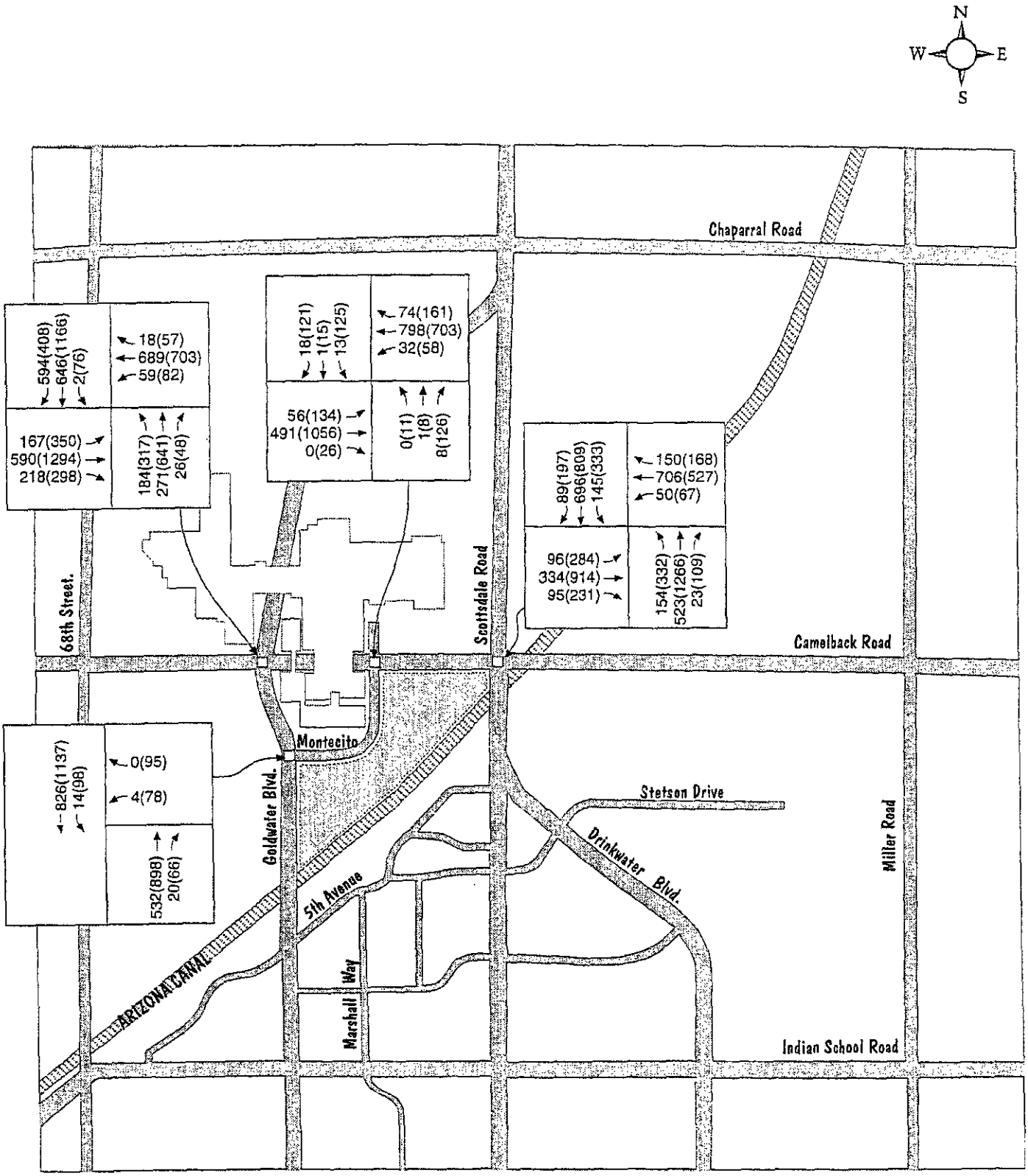
# PROJECTED TRAFFIC

## Background Traffic

Average daily traffic on Camelback Road for the horizon year of 2010 was obtained by assuming a growth rate of one percent a year. Average daily traffic on Scottsdale Road and Goldwater Boulevard for the horizon year of 2010 was obtained by assuming a growth rate of three percent a year. Using these rates, the turning movements at the study intersections were increased by the appropriate percent for the horizon year of 2010. The traffic volumes on Marshall Way and Montecito Avenue were not adjusted for growth.

Figure 3 shows the future base traffic for the study intersections in the a.m. and p.m. peak hours.

Waterfront TIMA




##(##) = A.M.(P.M.)

## Future Base Traffic Volumes

FIGURE 3

## Site Traffic

*Trip Generation*

The number of trips that would be generated by a proposed development can be estimated using trip generation rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 6th Edition* (1997). These rates represent years of data collection for a variety of different land uses around the country. For the land uses proposed for the site, ITE Land Use Codes 230 (Residential Condominium/Townhouse), 710 (General Office), and 820 (Shopping Center) were selected for the site uses. Table 2 presents a summary of the trip generation estimate for the site.

Also included in Table 2 is an estimate of internal trips and trips made on other modes. Internal trips are ones that are made between uses within the site or to Fashion Square and do not impact the surrounding street system. This was estimated to be 10 percent. Trips made on other modes can include transit, bicycle, walking, trolley, and was estimated to be five percent. The external trips from the site are estimated to be 8,992 on a daily basis with 419 (five percent) in the a.m. peak hour and 888 (10 percent) in the p.m. peak hour.

**TABLE 2: TRIP GENERATION**

| Development | ITE Land Use Code | Size | Trips Generated | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Daily | AM Peak Hour | | | PM Peak Hour | | |
| | | | | Enter | Exit | Total | Enter | Exit | Total |
| Residential Condominium/ Townhouse | 230 | 366 D.U. | 1,961 | 24 | 118 | 142 | 120 | 59 | 179 |
| General Office | 710 | 94,400 S.F. | 1,270 | 157 | 21 | 178 | 31 | 154 | 185 |
| Shopping Center | 820 | 110,900 S.F. | 7,286 | 104 | 66 | 170 | 323 | 350 | 673 |
| Sub-Total | | | 10,517 | 285 | 205 | 490 | 474 | 563 | 1,037 |
| Internal Trips (10%) | | | -1,052 | -28 | -21 | -49 | -47 | -56 | -103 |
| Other Modal Trips (5%) | | | -473 | -13 | -9 | -22 | -21 | -25 | -46 |
| **Total External** | | | **8,992** | **244** | **175** | **419** | **406** | **482** | **888** |

The estimated traffic that would be generated by the proposed development was compared to the estimated trip generation for the previously approved development plan known as Waterfront Mixed-Use Development. The traffic report was dated December 1995 and prepared by Kenig, Lindgren, O'Hara, Aboona, Inc. The previous approved development plan included 208,480 SF of retail; 60,000 SF of restaurant; 134,900 SF of office; and 70,000 SF of movie theater. It is interesting

to note that all of these uses were located in the eastern portion of the property and did not include the portion west of Marshall Way. For comparison purposes, the portion of the proposed site west of Marshall Way was subtracted from the trip generation shown in Table 2. The comparison of the current plan (east of Marshall Way) with the previously approved development is presented in Table 3.

**TABLE 3: COMPARISON OF TRIPS GENERATED BY PREVIOUSLY APPROVED PLAN**

| | ITE Land Use Codes | Trips Generated | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Daily | AM Peak Hour | | | PM Peak Hour | | |
| | | | Enter | Exit | Total | Enter | Exit | Total |
| Current Plan | 230, 710, and 820 | 8,666 | 209 | 169 | 378 | 393 | 451 | 844 |
| Previous Plan | 820, 832, 710, 220, and 444 | 19,674 | 392 | 141 | 533 | 1020 | 925 | 1945 |
| Difference | NA | -11,008 | -183 | 28 | -155 | -627 | -474 | -1,101 |

As can be seen from Table 3, the proposed use will generate substantially fewer trips than the previously approved development both on a daily basis and in each peak hour.

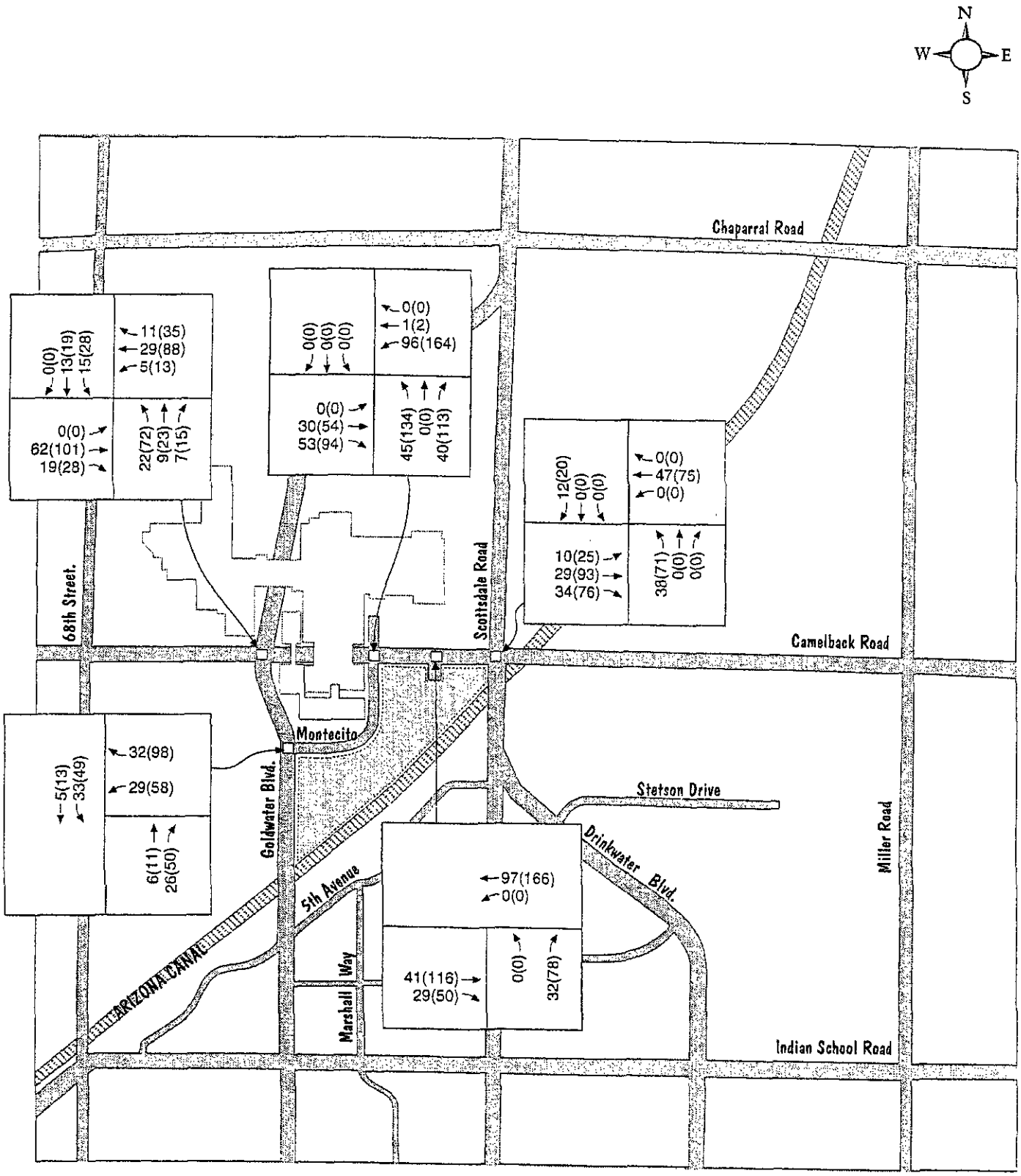
*Trip Distribution*

The trip distribution for site traffic was estimated by examining the population and employment distribution within a 5-mile and 15-mile radius around the site. The five-mile radius was used to estimate trips to/from the retail uses, while the 15-mile radius was used to estimates trips to/from the residential and office uses. Using these 5-mile and 15-mile radius circles, the proportion of population and employment within each quarter of the circles were calculated to estimate the distribution of trips by cardinal direction. As a result of this analysis, it is estimated that 17 percent of the traffic would be to/from the east, 30 percent would be to/from the west, 16 percent would be to/from the north, and 37 percent of the traffic would be to/from the south.

*Trip Assignment*

The site traffic was then assigned to the street network and to the site access points on Camelback Road and Goldwater Boulevard based on the trip distribution. The assignment of the site traffic is shown in Figure 4 for the a.m. and p.m. peak hour. It should be noted that the trip assignment does not necessarily match the trip distribution because of the street pattern. For example, traffic from the west could use SR 202 and SR 101, exit at Indian School Road and actually approach the site from the south.

Waterfront TIMA




##(##) = A.M.(P.M.)

## Site Traffic Assignment

FIGURE 4

### Total Traffic

The total 2010 traffic volumes were obtained by adding the background traffic and the site traffic at the study intersections. Figure 5 shows the estimated total traffic at the study intersections for the a.m. and p.m. peak hours in the year 2010.

## TRAFFIC ANALYSIS

### Site Access/Circulation

The site is separated into two distinct sections, east of Marshall Way and south of Montecito. Either section can be accessed from Camelback Road or Goldwater Boulevard because Montecito and Marshall Way form a continuous route northwest of the site.

The current site plan shows two access points from the east section of the site onto Marshall Way, one opposite the Fashion Square garage and one just north of the Montecito/Marshall Way intersection. Consideration should be given to adjusting the southern access point to be opposite Montecito to provide a four legged intersection.

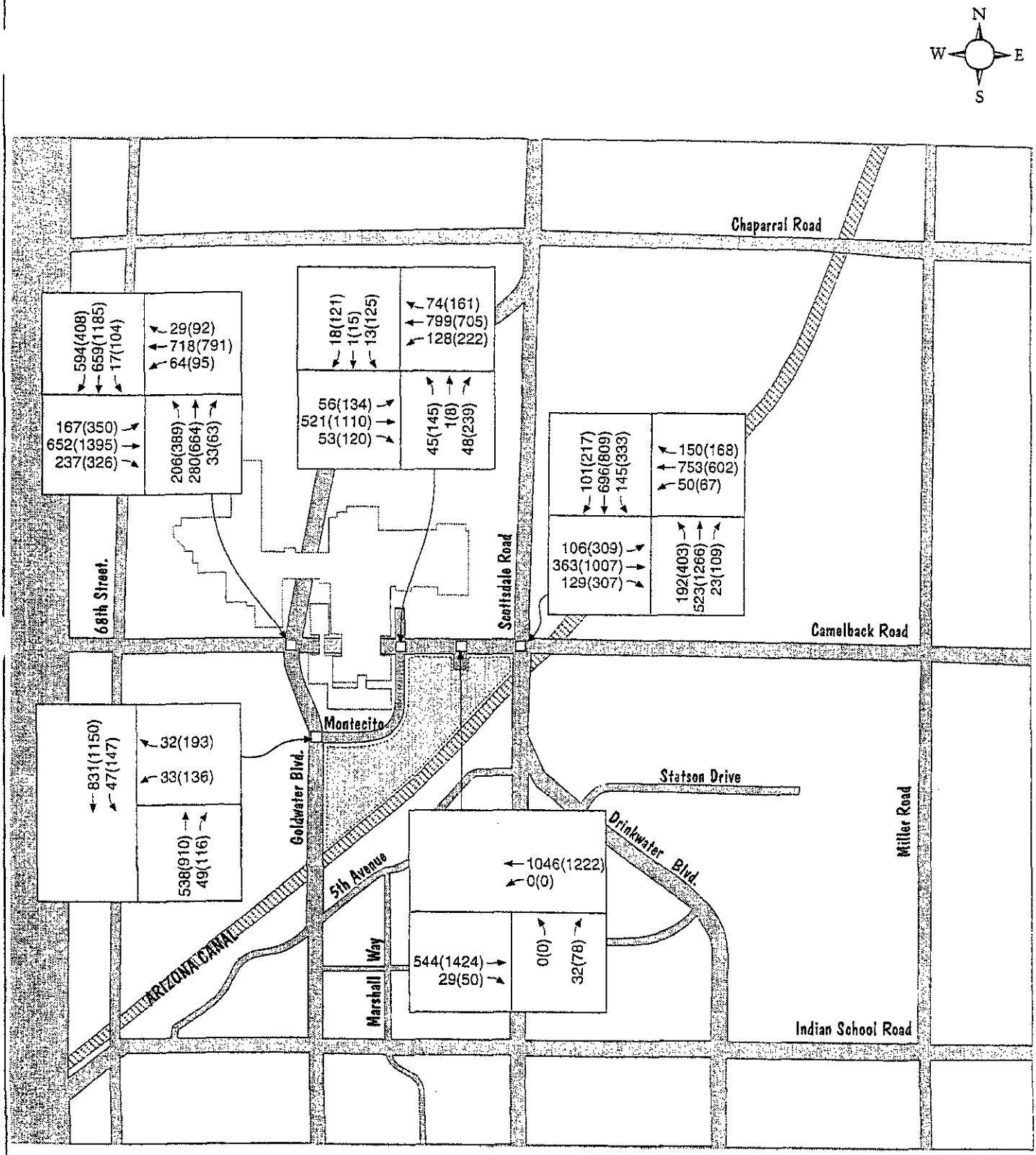
There is also one right turn in/right turn out driveway directly onto Camelback Road. The existing median opening on Camelback Road at this driveway should be closed.

There is one access point from the south section onto Montecito. This should align with the south garage access to Fashion Square.

The proposed site plan shows narrowing Marshal Way/Montecito to provide one lane in each direction with on-street angle parking. Angle parking should not be permitted within the intersection area at each access point. At a minimum, two northbound exit lanes should be provided approaching Camelback Road. The lane configuration north of Camelback Road may need to be adjusted to provide proper alignment with the final configuration on the south side. Two westbound exit lanes should be provided approaching Goldwater Boulevard.

Currently, there is a northbound right turn lane from Goldwater Boulevard onto Montecito and an eastbound right turn lane from Camelback Road onto Marshall Way. The Marshall Way/Montecito loop is four lanes with a raised median. There are two exiting lanes on Marshall Way at Camelback Road and from Montecito onto Goldwater Boulevard.

Waterfront TIMA




##(##) = A.M.(P.M.)

## Future Base + Site Traffic Volumes

FIGURE 5

## Level of Service

The intersections of Camelback Road and Goldwater Boulevard, Camelback Road and Marshall Way, Camelback Road and the site driveway, Goldwater Boulevard and Montecito Avenue, and Camelback Road and Scottsdale Road were analyzed to determine the current level of service and the expected level of service for the projected Year 2010 volumes.

The signalized intersections were analyzed using a 102 second cycle length. The intersection of Camelback and the site driveway is assumed to be stop-controlled with the stop signs located on the driveway. This driveway does not exist today and was only analyzed for the year 2010 with site condition.

Level of Service (LOS) is a term used to describe traffic operations. The various levels of service, which range from A to F, are generally defined as follows:

- **LEVEL OF SERVICE A** represents free flow operation.
- **LEVEL OF SERVICE B** is in the range of free flow, but the presence of other users in the traffic stream begins to be noticeable.
- **LEVEL OF SERVICE C** is in the range of stable flow, but marks the beginning of the range in which the operation of individual users becomes significantly affected by others.
- **LEVEL OF SERVICE D** represents high density but stable flow. Speed and freedom to maneuver are severely restricted, and the driver experiences a generally poor level of comfort and convenience.
- **LEVEL OF SERVICE E** represents operating conditions at or near the capacity level. All speed is reduced to a low but relatively uniform value.
- **LEVEL OF SERVICE F** is used to define forced or stop and go travel. This condition exists wherever the amount of traffic approaching a point exceeds the amount that can traverse the point.

The level of service analysis for signalized intersections was performed utilizing the methodology presented in the 2000 Highway Capacity Manual. This method uses the critical volumes passing through the intersection in one hour and compares those volumes to the capacity of the intersection and an associated delay. The analysis incorporates the effects of traffic volumes, geometry, traffic signal operation, truck and local bus volumes, pedestrian activity, and peaking characteristics. The result is a level of service determination for each approach and for the intersection as a whole.

The capacity criteria are presented in terms of average vehicle delay in Table 4.

**TABLE 4: CAPACITY CRITERIA FOR SIGNALIZED INTERSECTIONS***

| Level of Service (LOS) | Control Delay per Vehicle (sec) |
|---|---|
| A | less than 10 |
| B | 10.1-20 |
| C | 20.1-35 |
| D | 35.1-55 |
| E | 55.1-80 |
| F | over 80 |

*Source: Highway Capacity Manual

For unsignalized intersections with two-way stop control, the Highway Capacity Manual (HCM) procedure uses the conflicting flow and critical gap of an approach to calculate the capacity of the approach. The capacity is compared to the existing of projected demand to determine the available reserve capacity, which can be used to estimate a range of traffic delay and level of service for each approach. The level of service categories are defined in Table 5.

**TABLE 5: LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS***

| Level of Service | Expected Delay to Minor Street Traffic |
|---|---|
| A | little or no delay |
| B | short delays |
| C | average delays |
| D | long delays |
| E | very long delays |
| F | ** |

*SOURCE: Highway Capacity Manual

** When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing, which may cause severe congestion affecting other traffic movements in the intersection.

The Level of Service calculations were completed for both the signalized and stop sign controlled intersections based on the operational analysis method set forth in Synchro 5, which is based on the HCM procedure. The results of the analysis are summarized in Table 6. As can be seen from Table 6, all the study intersections are projected to operate at level of service D or better with the site traffic included, except Scottsdale Road and Camelback Road in the p.m. peak hour, which would operate at level of service E in 2010.

**TABLE 6 – INTERSECTION LEVEL OF SERVICE SUMMARY**

| | 2003 | | 2010 base | | 2010 with site | |
|---|---|---|---|---|---|---|
| **Intersection/ Approach Movement** | **AM** | **PM** | **AM** | **PM** | **AM** | **PM** |
| **Camelback Rd/ Driveway A (unsignalized)** | | | | | | |
| EB: right | | | | | A | A |
| NB: right | | | | | B | C |
| | | | | | | |
| **Camelback Rd/Goldwater Blvd (signalized)** | | | | | | |
| EB Approach: | C | D | C | E | C | D |
| WB Approach: | B | C | C | C | B | D |
| NB Approach | C | D | C | D | D | D |
| SB Approach: | E | C | E | D | E | D |
| **Intersection** | D | D | D | D | D | D |
| | | | | | | |
| **Camelback Rd/Marshall Way (signalized)** | | | | | | |
| EB Approach: | A | A | A | A | A | A |
| WB Approach: | A | A | A | A | A | B |
| NB Approach | D | D | D | D | D | F |
| SB Approach: | D | E | D | F | D | F |
| **Intersection** | A | B | A | B | A | D |
| | | | | | | |

**TABLE 6 – INTERSECTION LEVEL OF SERVICE SUMMARY (continued)**

| Intersection/ Approach Movement | 2003 | | 2010 base | | 2010 with site | |
|---|---|---|---|---|---|---|
| | AM | PM | AM | PM | AM | PM |
| **Camelback Rd/Scottsdale Rd (signalized)** | | | | | | |
| EB Approach: | D | F | D | F | E* | E* |
| WB Approach: | E | D | F | D | F | D |
| NB Approach | C | C | C | D | C | D |
| SB Approach: | C | D | C | D | C | D |
| **Intersection** | D | D | D | E | D* | D* |
| | | | | | | |
| **Goldwater Blvd/Montecito Ave (signalized)** | | | | | | |
| WB Approach: | D | D | D | D | D | E |
| NB Approach | A | A | A | A | A | A |
| SB Approach: | A | A | A | A | A | B |
| **Intersection** | A | A | A | A | A | B |

*with two left turn lanes EB on Camelback Road

## Accident Analysis

Accident data for the years 2000 and 2002 were reviewed using the City of Scottsdale 2002 Traffic Volume and Accident Rate Data report (June 2003). On the segment of Camelback Road west of Scottsdale Road, there were 10 accidents in 2002. At the intersection of Camelback Road and Scottsdale Road, there were 19 collisions and at the intersection of Camelback Road and Goldwater Boulevard, there were 15 collisions in 2002.

The accident rates for 2000 and 2002 are summarized in Table 7.

**TABLE 7 - ACCIDENT SUMMARY**

| Location | 2000 Accident rate* | 2002 Accident rate* |
|---|---|---|
| Segment: Camelback Road from Goldwater Blvd to Scottsdale Rd | 7.34 | 3.93 |
| Intersection: Camelback Rd & Scottsdale Rd | 0.79 | 0.90 |
| Intersection: Camelback Rd & Goldwater Blvd | 1.18 | 0.70 |

**Segment accident rate is accidents per million vehicle miles traveled and intersection accident rate is accidents per million entering vehicles.*

The city-wide average intersection accident rate for the year 2002 was 0.54 accidents per million entering vehicles. The city-wide average segment accident rate for the year 2002 was 1.49 accidents per million vehicle miles traveled. The rates listed in Table 7 are higher than the city-wide averages.

# IMPROVEMENT ANALYSIS

The results of the traffic analysis summarized in Table 6 shows that the addition of the site traffic in 2010 will decrease the overall intersection level of service at Scottsdale Road and Camelback Road from D to E in the p.m. peak hour. The average intersection delay increases from 47 seconds per vehicle to 57 seconds per vehicle with the addition of the site traffic. All other study intersections will operate at level of service D or better in both peak hours with site traffic.

Several options can be considered for Scottsdale Road and Camelback Road:

- Allow vehicular traffic on the planned bridge over the Arizona Canal connecting Marshall Way. This would divert site traffic as well as Fashion Square traffic from Scottsdale Road and Camelback Road to Marshall Way. The disadvantage of this option is additional traffic in the 5th Avenue shopping district.
- Modify the west leg of Camelback Road to provide two eastbound left turn lanes. A preliminary look at the intersection geometry indicates this option is viable.
- Accept a level of service E during one hour of the day in the year 2010.

The left turn storage lengths needed to accommodate the 2010 volumes with the site traffic were determined using the SYNCRO analysis. They are as follows.

- EB Camelback Road left turn at Scottsdale Road – 180' (assumes dual left turn lanes)
- WB Camelback Road left turn at Marshall Way – 165'
- WB Camelback Road left turn at Goldwater Boulevard – 290'
- NB Goldwater Boulevard left turn at Camelback Road – 195'
- SB Goldwater Boulevard left turn at Montecito – 112'

A review of the current lane configuration shows that adequate left turn storage can be provided at all locations except the southbound Goldwater Boulevard left turn at Montecito and the westbound Camelback Road left turn at Goldwater Boulevard. The southbound Goldwater left turn lane is approximately 60' long today and is 'back to back' with a northbound left turn lane to an existing parking garage. Some options to consider are:

- Relocate the northbound left turn to provide longer southbound storage
- Widen to provide dual left turn lanes southbound
- Provide a separate left turn phase for the southbound movement

The westbound Camelback Road left turn lane at Goldwater is 230 feet and is back to back with the eastbound left turn lane at Marshall Way, which is approximately 140 feet. The eastbound left turn lane at Marshall Way could be reduced to 100 feet, which would increase the westbound left turn at Goldwater Boulevard to 270 feet.

# CONCLUSIONS

Overall, the development in the SWC of Scottsdale Road and Camelback Road will not adversely impact the surrounding street system adjacent to the site. Only one intersection, Scottsdale Road and Camelback Road, will experience a decrease in level of service (D to E), and that will only occur in the p.m. peak hour.

Site access and circulation should be reviewed further as more detailed development plans are available. The function and capacity of the Marshall Way/Montecito loop roadway needs to accommodate 700 vehicles in the p.m. peak hour and provide adequate access for emergency vehicles.

A number of geometric and operation improvements as described in the next section should also be considered to improve the overall efficiency of the transportation system.

# RECOMMENDATIONS

- Provide two left turn lanes eastbound on Camelback Road at Scottsdale Road.
- Continue the third eastbound through lane on Camelback Road from Marshall Way to Scottsdale Road where it would become a right turn only lane.
- Incorporate a bus stop for eastbound Camelback Road into the project design.
- Close the existing median opening on Camelback Road between Scottsdale Road and Marshall Way.
- The Marshall Way approach to the signalized intersection at Camelback Road should have two lanes for approximately 110 feet.
- The Montecito approach to the signalized intersection at Goldwater Boulevard should have two lanes for approximately 150 feet.
- Adequate transitions should be provided from the two lane to four lane sections on the Marshall Way/Montecito loop.
- The entrances to the site garages from Marshall Way/Montecito should be treated as stop controlled intersections. Angle parking should not be permitted in the intersection area and the locations should align with the fashion square locations where practical. The south garage entrance on Marshall Way should align with Montecito.
- The number of lanes exiting the garage should be examined once the final size is known to ensure adequate queue lengths are provided.
- The geometry of Marshall Way south of Camelback Road and the entrance to Fashion Square north of Camelback Road must provide lane alignment that minimizes the offset for north-south movements.