



Archaeological Resources
Airport Vicinity Development Checklist
Parking Study
Trip Generation Comparison
Parking Master Plan

94th Street and Bell Road Multi-Use Fields

Scottsdale, Arizona

Traffic Study

Lee Engineering Project No. 1079.06

November 2020

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering, LLC
3610 N. 44th Street
Suite 100
Phoenix, AZ 85018
(602) 955-7206

Gavan and Barker
3030 N. Central Ave., Suite 1530
Phoenix, AZ 85012



LEE ENGINEERING

**Northwest Corner, 94th Street and Bell Road
Multi-Use Fields**

Traffic Study

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering

3610 N. 44th Street, Suite 100
Phoenix, Arizona, 85018
602-955-7206

Gavan and Barker

3030 N. Central Ave., Suite 1530
Phoenix, Arizona, 85012



November 2020

CONTENTS

1.0	BACKGROUND	1
1.1	Scope	3
2.0	STUDY AREA CHARACTERISTICS.....	3
3.0	DATA COLLECTION	4
3.1	Traffic Volume.....	4
3.2	Ice Den Way Video	9
4.0	CRASH DATA	11
5.0	PROPOSED DEVELOPMENT	14
5.1	Development Description.....	14
5.2	Projected Traffic.....	14
5.3	Traffic Operations	22
5.4	Turn Lanes.....	26
5.5	Sight Distance	28
6.0	CONCLUSIONS AND RECOMMENDATIONS.....	28

APPENDIX A: TRAFFIC VOLUME DATA

APPENDIX B: CRASH DATA

APPENDIX C: SYNCHRO ANALYSIS RESULTS

LIST OF TABLES

Table 1. Existing Traffic Volume	5
Table 2. Site Trip Generation – ITE Method	15
Table 3. Site Trip Generation – Comparison Site Method	16
Table 4. Site Trip Distribution	16
Table 5. Level of Service Criteria for Unsignalized Intersections.....	23
Table 6. Level of Service and Delay (seconds) at Bell Road and Ice Den Way	24

LIST OF FIGURES

Figure 1: Vicinity Map.....	1
Figure 2: Preliminary Site Plan.....	2
Figure 3: Existing Study-Area Peak-Hour Traffic Volumes – As Collected.....	6
Figure 4: Existing Study-Area Peak-Hour Traffic Volumes – With 25% Adjustment	7
Figure 5: Existing Study-Area Daily Traffic Volumes – As Collected	8
Figure 6: Existing Study-Area Daily Traffic Volumes – With 25% Adjustment.....	9
Figure 7: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way – As Collected	11
Figure 8: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way – With 25% Adjustment.....	11
Figure 9: Study Area Crashes	13
Figure 10: Study Area Site-Generated Peak Hour Traffic Volumes	17
Figure 11: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	18
Figure 12: Study Area Site-Generated Daily Traffic Volumes	19
Figure 13: Total Future Study Area Peak Hour Traffic Volumes	20
Figure 14: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	21
Figure 15: Total Future Study Area Daily Traffic Volumes.....	22

1.0 BACKGROUND

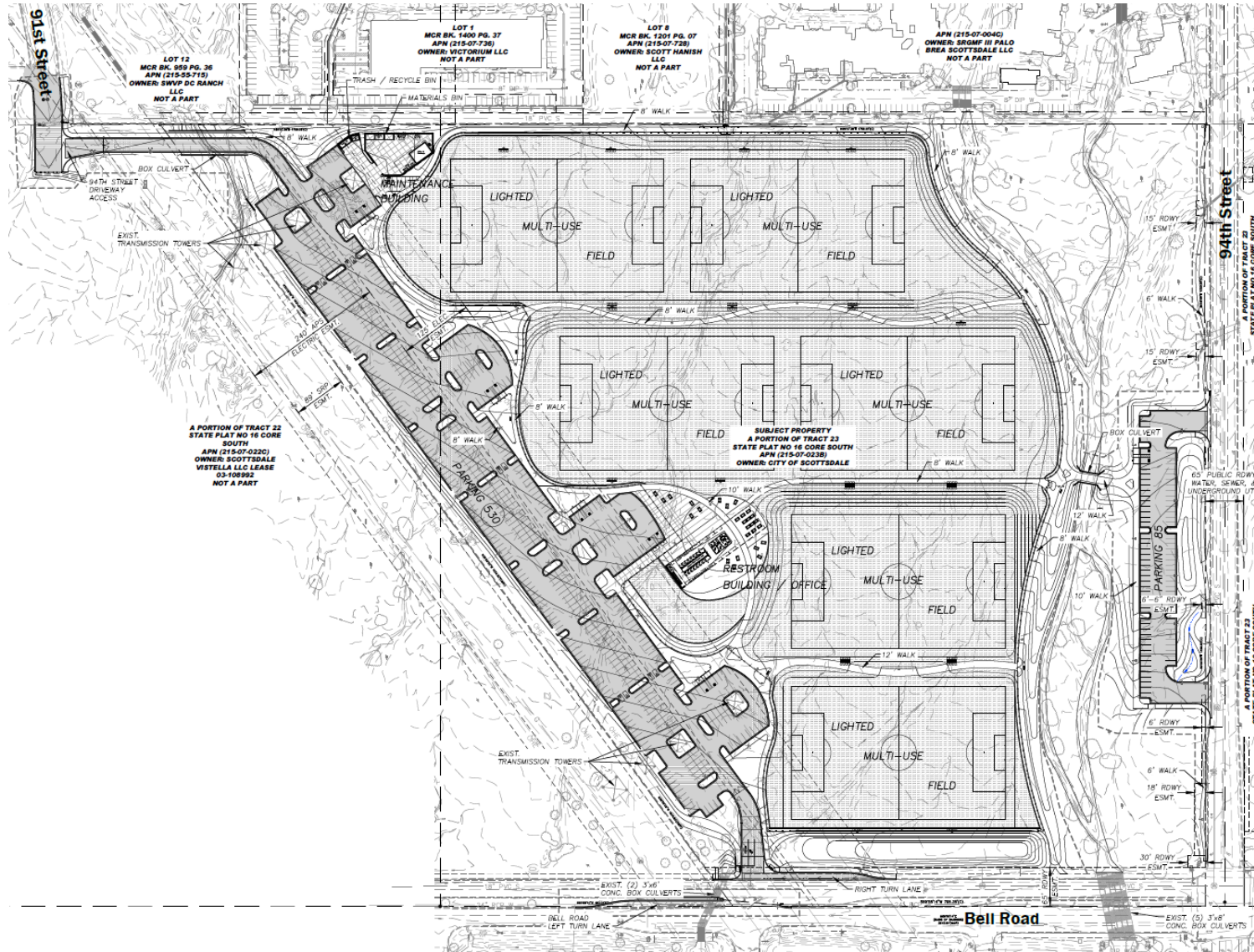
A City of Scottsdale Capital Project proposes to construct a series of multi-use fields, suitable for soccer and other sports, on a parcel on the northwest corner of 94th Street and Bell Road in Scottsdale, Arizona. Lee Engineering was recently engaged to conduct a traffic analysis of the complex for the purposes of estimating its traffic impacts on the adjacent roadway network.

The location of the site is shown in Figure 1; a preliminary site plan is shown in Figure 2.

Figure 1: Vicinity Map



Figure 2: Preliminary Site Plan



1.1 Scope

In a conference call on August 13, 2020, the City of Scottsdale requested that this study include the following elements:

- Daily traffic volume data collection at these sites:
 - 91st Street between Trailside View and Palo Brea Bend
 - Bell Road between 91st and 94th Streets
 - 94th Street between Bell Road and Palo Brea Bend
- Video camera recording of the intersection of Bell Road and Ice Den Way
- Crash analysis for crashes adjacent to the site for a 3-year period
- Trip generation, distribution, and assignment for the proposed soccer complex
- Traffic analysis for the site's opening year at the site's primary access point, which will be the fourth (north) leg of the intersection of Bell Road and Ice Den Way. The analysis will include intersection operations, storage length requirements, and pavement marking or design improvements.

In a subsequent conference call on October 15, 2020, the city requested that the study include comparable trip generation data from other similar Scottsdale sites, and agreed to provide such count data in support of the study.

The remainder of this report will address these scope elements in turn.

2.0 STUDY AREA CHARACTERISTICS

According to the City of Scottsdale Street Classification map, Bell Road is classified as a “minor arterial – suburban” in the vicinity of the proposed development. Bell Road carries two vehicular lanes and one bicycle lane in each direction, separated by a raised median. It is also equipped with sidewalks on both north and south sides of the street. Eastbound right-turn lanes are provided at all driveways and intersections on the south side of Bell Road between 91st and 94th Streets. Breaks in the raised median exist at 91st Street, Ice Den Way, and 94th Street, and left-turn lanes are provided approaching each break. However, no eastbound left-turn lanes are provided approaching Ice Den Way or 91st Street because these intersections do not have a north leg. The speed limit on Bell Road is 45 mph.

Ice Den Way is a private street/driveway about 36 feet wide that has its northern terminus at Bell Road. Although it has the design characteristics of a driveway, rather than a street, it is equipped with a street name sign and a STOP sign at the Bell Road intersection. Ice Den Way is generally unmarked, although it does have marked right-turn and left-turn lanes for about 50 feet approaching Bell Road. (The markings do not comply with the *Manual on Uniform Traffic Control Devices*.) Ice Den Way has speed bumps that are more severe than the speed humps used on public streets, and in some segments it serves as access to adjacent perpendicular parking stalls. There are no sidewalks along either side of Ice Den Way.

South of Bell Road, 94th Street has a much different character than to the north. To the south, between Bell Road and Bahia Drive, it is a 4-lane roadway with bicycle lanes and sidewalks in both directions and a short segment of raised median. The street widens significantly approaching Bell Road, with two northbound left-turn lanes, one through lane, and one right-turn lane. North of Bell

Road, the street narrows to about 44 feet wide, with one through lane and a bicycle lane in each direction separated by a two-way left-turn lane (TWLTL) without sidewalks. The southbound approach to Bell Road also widens, but not as much as in the northbound direction. The southbound lane configuration consists of one lane each for left turns, through traffic, and right turns. The street is classified as a “minor collector – suburban” near Bell Road. The speed limit on 94th Street is posted 40 mph north of Bell Road and 35 mph south of Bell Road.

To the northwest of the proposed development, 91st Street has a similar cross-section as 94th Street north of Bell—one lane and a bicycle lane in each direction separated by a TWLTL. It also has a wide sidewalk on the east side of the street, separated from the street by a landscaped buffer. This street is not currently continuous north of Bell Road, and is not expected to be connected as part of the proposed development. The segment north of the proposed development is expected to have very low volume because it is a dead end, while the segment south of Bell Road is a four-lane divided roadway between Bell Road and Bahia Drive. Although 91st Street is not fully constructed, its entire length near the site, including the unconstructed portion, is classified as a “major collector – suburban.”

State Route 101 is slightly more than ½ mile west of the proposed development along Bell Road. This major freeway facility has an interchange with Bell Road that is likely to be used by much traffic approaching the soccer complex, but it also has an interchange with Princess Drive/Pima Road about ½ mile north of Bell Road that is expected to be used by some site traffic. Not all traffic movements are provided directly at the two closely-spaced interchanges; some movements are served by a frontage road system that connects Bell and Pima Roads.

Traffic signals exist at both 91st Street and 94th Street intersections with Bell Road.

The intersection of Ice Den Way and Bell Road is minor-street stop-controlled. At this intersection, a merge lane is provided in the median for northbound Ice Den Way traffic turning left onto westbound Bell Road. The lane allows left-turning vehicles to cross the eastbound lanes of Bell Road, then wait in the merge lane for a gap in the westbound lanes. The merge lane was constructed in 2016, according to historical aerial photos. It is about 120 feet long, plus a taper, which is not long enough to be considered a full acceleration lane, but it can help facilitate two-stage left-turns onto Bell Road.

Overhead utility lines pass through the study area on a diagonal alignment to the west of the proposed development, constraining the western boundary of the site.

South of Bell Road, development is largely commercial, while north of the proposed site and east of 94th Street, existing development is residential.

3.0 DATA COLLECTION

3.1 Traffic Volume

Lee Engineering arranged for traffic volume data collection at the locations specified in Section 1.1 for a four-day period, from Thursday, August 27, through Sunday, August 30, 2020. Traffic volume was collected in 15-minute intervals for the entire period, which allows calculation of weekday and

weekend average daily traffic and peak-hour traffic volume on both weekdays and weekends. A summary of the collected traffic volume is shown in Table 1, and complete results are provided in Appendix A.

Table 1. Existing Traffic Volume

Route	Location	Direction	ADT	AM PkHr	AM PkVol	PM PkHr	PM PkVol
N 94TH ST	Btwn BELL RD & E PALO BREA BEND	NB	1883	11:15	155	16:30	180
		SB	1924	11:30	160	15:00	156
BELL RD	Btwn N 91ST ST & N 94TH ST	EB	5463	11:45	422	16:45	465
		WB	5612	11:30	467	12:00	455
N 91ST ST	Btwn E TRAILSIDE VIEW & E PALO BREA BEND	NB	952	11:45	81	17:15	82
		SB	990	11:45	78	17:00	82

Data collection occurred during a time when the global coronavirus pandemic has impacted some events and businesses. City of Scottsdale staff reports that they have been tracking the impact of the pandemic on traffic volumes in the city. The city estimates that the collected traffic volumes should be increased by 25 percent to account for reduced volume during the data collection period due to the pandemic and the lack of school traffic. As such, the traffic volumes shown in Table 1 were increased by 25 percent for use in the traffic operational analysis described later in this report.

Raw traffic volume on Bell Road averaged about 11,000 vehicles per day (vpd) during the four-day data collection period. Volume was notably higher on weekdays, with over 13,000 vpd on Thursday, dropping to about 8,000 vpd on Sunday. The morning peak on Bell Road actually occurred during the midday on each of the four days. A local peak did occur during typical commute time on Thursday, 7:30 to 8:30 a.m., but the volume during this time period was slightly lower than the midday peak that began at 11:30 a.m. that day. Midday peak volume on Saturday was higher than the midday volume on any other data collection day.

Volume on 94th Street averaged about 3,800 vpd, with patterns by day of week very similar to Bell Road. Daily traffic was its highest on Thursday, with about 4,400 vpd, and its lowest on Sunday, with about 2,800 vpd. Unlike Bell Road, however, 94th Street did see a morning peak at a conventional commute time on both Thursday and Friday, but only in the southbound direction. When considering both directions and all four days, the midday peak was higher than the morning peak.

As expected, 91st Street carries the lowest traffic of the three data collection sites: about 1,900 vpd. Daily volume ranged from 1,400 vpd on Sunday to 2,300 vpd on Thursday.

All the streets in the study area have volume that is appropriate for the cross-section and classification. According to the Maricopa County *Roadway Design Manual*, a four-lane divided

urban minor arterial can support a traffic volume of about 31,000 vpd¹, suggesting ample reserve capacity on Bell Road, where weekday average daily traffic reaches about 13,000 vpd. Likewise, an urban minor collector can support a traffic volume of about 9,000 vpd, and an urban major collector can support about 10,000 vpd, both well above the actual volume on either 94th Street (4,400 vpd) or 91st Street (2,300 vpd). It should be noted that the future volume on 91st Street is likely to increase considerably if and when it is connected across Bell Road. This connection may draw traffic away from 94th Street, but future development may also generally increase traffic volume in the study area.

Raw peak-hour traffic volumes at the three data collection sites are shown in Figure 3, and adjusted peak-hour traffic volumes, reflecting the 25 percent adjustment, are shown in Figure 4. Raw daily traffic volumes at the site on weekdays (average of Thursday and Friday) and Saturday are shown in Figure 5, and adjusted daily volumes are shown in Figure 6.

Figure 3: Existing Study-Area Peak-Hour Traffic Volumes – As Collected



¹ Maricopa County Roadway Design Manual, 2019 Update, Table 2.1: Roadway Planning Level Traffic Volumes, p. 2-3.

Figure 4: Existing Study-Area Peak-Hour Traffic Volumes – With 25% Adjustment



Figure 5: Existing Study-Area Daily Traffic Volumes – As Collected



Figure 6: Existing Study-Area Daily Traffic Volumes – With 25% Adjustment



3.2 Ice Den Way Video

Video was collected on Thursday, August 27, 2020, showing the intersection of Ice Den Way and Bell Road from 6:00 a.m. to 7:00 p.m. The video was reviewed to understand patterns of traffic movement at the intersection, particularly related to left-turning traffic.

The four-day data collection indicated that the peak hours on Bell Road on August 27 were from 11:30 a.m. to 12:30 p.m. and from 4:45 to 5:45 p.m., and these hours were reviewed in detail on the video.

Initial impressions from the video show that Bell Road has relatively low volume compared with its capacity, and queues on Bell Road were never observed extending near Ice Den Way from the nearby traffic signals. Gaps exist in both directions, and they are artificially increased in size and frequency because of the two traffic signals on either side of Ice Den Way, each less than ¼ mile away.

The video also reveals that left-turn volume both into and out of Ice Den Way is generally low during peak hours. Some queues were observed both entering and exiting, but they tended to

dissipate quickly. Exiting (northbound) queues in the afternoon peak hour were notably longer than those during the midday peak.

Some outbound left-turning vehicles used the merge lane as designed and intended, and some vehicles were observed to wait at the stop bar even when a long gap was available in eastbound traffic, turning only when gaps were sufficient in both directions on Bell Road at the same time. However, the merge lane appears to provide a traffic operational benefit at the intersection. During the afternoon peak hour when exiting volume is highest, the merge lane helps to keep traffic from queueing exclusively at the stop bar. Anecdotally, a higher percentage of vehicles were observed to use the merge lane as designed during the higher-volume afternoon peak hour.

The following additional observations were made from the video:

- Several bike lane users were observed on Bell Road, including both bicyclists and travelers using other modes, such as scooters. A few pedestrians were observed, despite the August heat.
- During the two peak hours, 17 vehicles were observed making westbound U-turns. U-turners accounted for about 35 percent of traffic in the left-turn bay during the midday peak, dropping to less than 10 percent in the afternoon peak. Virtually all U-turning vehicles proceeded eastbound on Bell Road only as far as the next driveway, where no median break exists.
- One vehicle was observed to make an eastbound U-turn, despite the posted NO U-TURN regulatory sign and the complicated routing of this movement due to the presence of the island in the median.
- Two vehicles making northbound left turns did not use the merge lane, but rather turned on the right side of the island as though it were a roundabout. These vehicles did not cause conflicts with other vehicles because the westbound left-turn lane was unoccupied in both cases.

To facilitate traffic operational analysis, turning movement volumes were collected from the video data during the 11:30 a.m. and 4:45 p.m. peak hours. These volumes, along with the volume on Bell Road collected during the same time of the four-day count, provide an indication of existing traffic volume at this intersection. The midday and afternoon raw peak-hour volumes are shown in Figure 7. Turning movement count data was adjusted using the same 25 percent adjustment factor discussed earlier. Adjusted existing turning movement volumes are presented in Figure 8.

Video was not recorded on Saturday, but because Saturday is critical for evaluating the proposed development, it is assumed that traffic entering and exiting Ice Den Way during the Saturday peak hour is equal to the weekday afternoon peak hour. Saturday peak-hour traffic on Bell Road is taken from the four-day count, which showed a peak hour beginning at 12:00 noon. Estimated Saturday volumes at the intersection are also shown in Figure 7 and Figure 8.

Figure 7: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way – As Collected

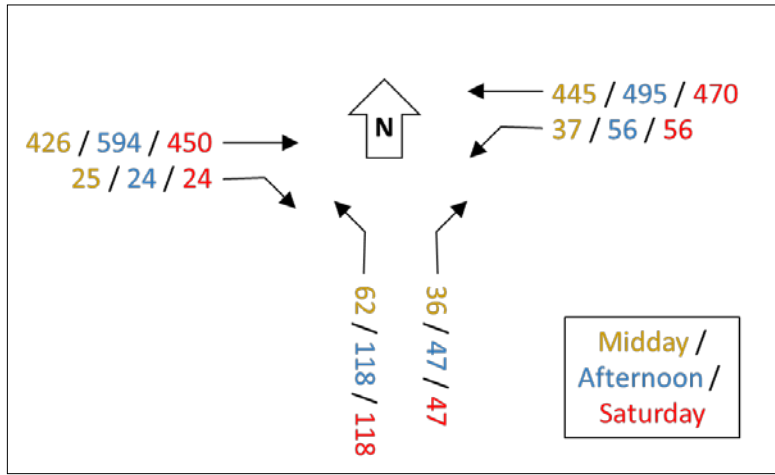
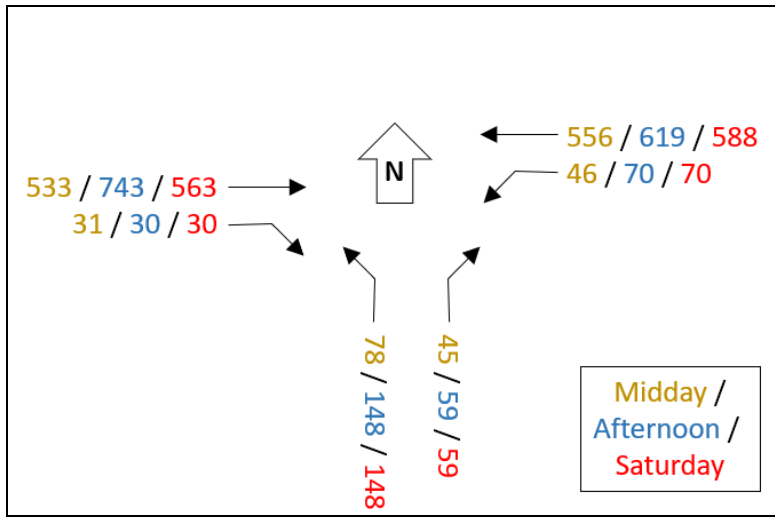


Figure 8: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way – With 25% Adjustment



4.0 CRASH DATA

Lee Engineering queried ADOT’s Traffic Safety DataMart to identify crashes that occurred along the frontage of the site on Bell Road, 94th Street, and 91st Street. Crashes were queried that occurred in the three-year period from 2016 through 2018, the most recent three-year period for which data is available.

As shown in Figure 9, a total of 22 crashes were identified in the vicinity of the proposed development, an average of about 7 crashes per year. All 22 crashes occurred along the Bell Road corridor, with 15 of the crashes (68 percent) at the 94th Street intersection. Only 2 crashes (9

percent) occurred at the Bell Road/91st Street intersection, and the remaining 5 crashes (23 percent) occurred between these two traffic signals. Notably, no crashes occurred at or within 250 feet of the Ice Den Way intersection.

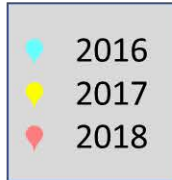
The crashes were distributed by year relatively uniformly. Eight crashes took place in both 2016 and 2018, and six crashes occurred in 2017. No crashes involved fatalities, and 8 of the 22 crashes (36 percent) involved at least one injury. The remaining 14 crashes (64 percent) involved property damage only. No crashes involved non-motorists.

Crashes in the study area overwhelmingly occurred during daylight hours. Only two crashes (9 percent) occurred after dark. Five crashes (23 percent) occurred between 6:00 and 10:00 a.m., the conventional morning peak period, and seven crashes (32 percent) occurred between 3:00 and 7:00 p.m. The remaining eight crashes (36 percent) occurred in the midday period between 10:00 a.m. and 3:00 p.m.

Three crashes occurred on Bell Road between Ice Den Way and 94th Street. Among these three crashes, one was a same-direction sideswipe, one was a single-vehicle run-off road crash, and one was coded as a left-turn crash, although the location where the crash is coded does not have any opportunity for left turns to be made.

Other than the crashes at the 94th Street and Bell Road intersection, no particular crash pattern was observed along the frontage of the proposed site. A more detailed summary of crashes can be found in Appendix B.

Figure 9: Study Area Crashes



5.0 PROPOSED DEVELOPMENT

5.1 Development Description

The proposed development is expected to consist of six rectangular multi-use athletic fields along with a restroom and office building near the center of the site and a maintenance building near the north site boundary.

Two parking lots are proposed. The larger of the two lots is proposed to consist of 530 parking spaces and is west of the athletic fields. It will have two access points: the main access point will add the fourth (north) leg to the intersection of Ice Den Way and Bell Road. This access point is proposed to be unsignalized, and it would require removal of the existing merge lane for northbound left turns to make room for an eastbound left-turn lane to enter the site. The second access point, also unsignalized, is near the cul-de-sac at the south end of 91st Street north of Bell Road.

The smaller of the two parking lots, with 85 parking spaces, is located east of the athletic fields. The access will be exclusively from 94th Street, with two access points about 450 feet apart. While the site is fully accessible on foot, no vehicular access will be provided to connect the two parking lots.

The large parking lot will provide new vehicular connectivity between 91st Street north of Bell Road and the Bell Road/Ice Den Way intersection. It is possible that this new connectivity may be on the shortest path for some existing or future vehicular trips that are unrelated to the soccer complex. The large parking lot is proposed to include traffic calming devices intended to discourage such “cut-through” traffic and to reduce vehicle speed and improve safety. The lot is also proposed to be gated during hours when the fields are not in operation. Because of these proposed measures, the amount of cut-through traffic is expected to be negligible and is not quantified as part of this study.

5.2 Projected Traffic

5.2.1 Trip Generation

The first step in estimating traffic to and from the proposed development is to calculate trip generation, which is the total vehicle trips to and from the site over a given time period. Two methods were used to estimate trip generation.

ITE Method

The *Trip Generation* Manual, 10th Edition, published by the Institute of Transportation Engineers (ITE) provides trip generation estimates for a wide variety of land uses. Based on the site’s expected use, the ITE land use code (LUC) that best represents the site is LUC #488, Soccer Complex.

Trip Generation includes limited information about LUC #488 because of a small sample size of similar developments. The small sample size tends to limit confidence in the trip generation estimate, which is one reason a second trip generation method was used, as discussed later.

Trip Generation does include information for both weekday morning and afternoon peak hours both for the generator and for adjacent street traffic. For both morning and afternoon periods, the peak hour of the generator was used. In both cases, the value is slightly higher than the peak of the adjacent street traffic, and it is recognized that the morning peak hour occurs at a non-traditional

time, which suggests that the peak hour of the generator may be a better representation of overall conditions.

Only one time period (Saturday peak hour) includes a fitted curve, but the average trip rate was used for all time periods evaluated. The difference between the fitted curve and the average rate for the Saturday peak hour is small, and the average rate shows a slightly higher (more conservative) number of trips.

Table 2 presents the trip generation data for the site using the ITE method. In total, this method predicts that site is expected to generate about 430 trips on a typical weekday, with about 100 of those trips in the afternoon peak hour. Traffic is expected to be much higher on weekends than on weekdays. Expected daily traffic is more than 5 times greater on Saturday than on a weekday, and Saturday’s peak hour traffic is more than double the weekday afternoon peak hour. ITE does not provide a daily traffic estimate for Sunday, but Sunday peak hour traffic is expected to be about 70 percent greater than the weekday afternoon peak hour.

No trip reduction factors were applied to the ITE trip forecast, so all trips generated by the site are considered to be new trips added to the adjacent roadway network.

Table 2. Site Trip Generation – ITE Method

94th St & Bell Rd. Multi-Use Fields												
Land Use: (488) Soccer Complex												
# of Fields	Weekday Daily		Weekday AM Peak		Weekday PM Peak		Saturday Daily		Saturday Peak Hour		Sunday Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
6												
Dir. Dist.	50%	50%	53%	47%	47%	53%	50%	50%	48%	52%	46%	54%
ITE Trip Rate	71.33		1.77		16.9		404.88		40.1		28.78	
Trips	214	214	6	5	48	54	1215	1215	115	125	79	93
	428		11		101		2429		241		173	

Comparison Site Method

Because the ITE method relies a limited supply of data, the City of Scottsdale collected traffic volume information for a similar nearby site, located on the northeast corner of Bell and Hayden Roads. Data at this site was collected from October 14 through 18, 2020, and reflects the fact that only seven of the comparison site’s ten athletic fields were in use during this period. The City of Scottsdale provided the trip generation information shown in Table 3, reflecting the volume collected at the comparison site.

Table 3. Site Trip Generation – Comparison Site Method

94th St & Bell Rd. Multi-Use Fields												
Land Use: (488) Soccer Complex												
# of Fields	Weekday Daily		Weekday AM Peak		Weekday PM Peak		Saturday Daily		Saturday Peak Hour		Sunday Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
6												
Dir. Dist.	50%	50%	53%	47%	47%	53%	50%	50%	48%	52%	46%	54%
Trip Rate	120		8		34		305		47		38	
Trips	360	360	25	23	96	108	915	915	135	147	105	123
	720		48		204		1830		282		228	

The city’s data reflects only a single data collection period at one site, but the results are considered more applicable to similar local developments nearby.

The differences between the two trip generation methods are as follows:

- The comparison site method predicts considerably more trips on weekdays, including both morning and afternoon peak hours. About twice as many site trips are predicted using the local method during the weekday afternoon peak hour.
- The comparison site method predicts about 25 percent fewer trips than the ITE method during the day on Saturday, though Saturday peak hour volume is slightly higher by about 17 percent.
- The comparison site method predicts about 32 percent more trips during the Sunday peak hour.

Considering that the comparison site method produced a higher estimate of trip generation for most time periods evaluated, this method’s trip generation will be used for the remainder of the analysis, to provide a more conservative estimate of conditions.

5.2.2 Trip Distribution and Assignment

Site-generated trips have been distributed onto the adjacent roadway network based in part on existing traffic volume collected in this study and in part on engineering judgment, considering traffic patterns in the nearby and broader area. The distribution percentages assumed for this study are presented in Table 4.

Table 4. Site Trip Distribution

To/from west on Bell Road (including access to SR 101 interchange at Bell Road):	65%
To/from east on Bell Road	5%
To/from north on 94th Street	10%
To/from north on 91st Street (including access to SR 101 interchange via Pima Road):	20%

Of the traffic destined to and from the north on 91st Street, about half is expected to use Trailside View and Pima Road to SR 101 to and from the west. The other half is expected to use Legacy Boulevard or Trailside View to Pima Road to and from the north.

Traffic destined to and from the north on 91st Street is assumed to park in the large parking lot and use the north (91st Street) point of access to the lot. Traffic arriving via Bell Road in either direction is assumed to park in the large parking lot and use the south (Bell Road) access. Traffic destined to and from the north on 94th Street is assumed to park in the small lot, with access directly from 94th Street. The small lot, with a capacity of 85 spaces, is sufficient to support parking for the small percentage of traffic assumed to arrive at the site from 94th Street.

Based on the trip generation values and distribution percentages above, the hourly site-generated traffic volumes in the study area are expected to be as shown in Figure 10. Hourly site-generated volumes at the Bell Road/Ice Den Way intersection are presented in Figure 11. Daily site-generated volumes in the study area are presented in Figure 12.

Figure 10: Study Area Site-Generated Peak Hour Traffic Volumes



Figure 11: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way

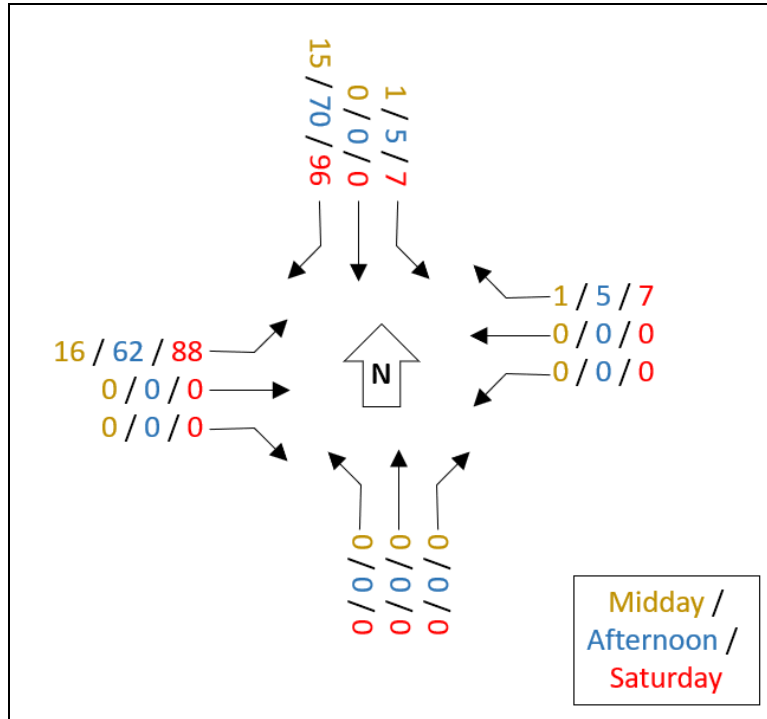
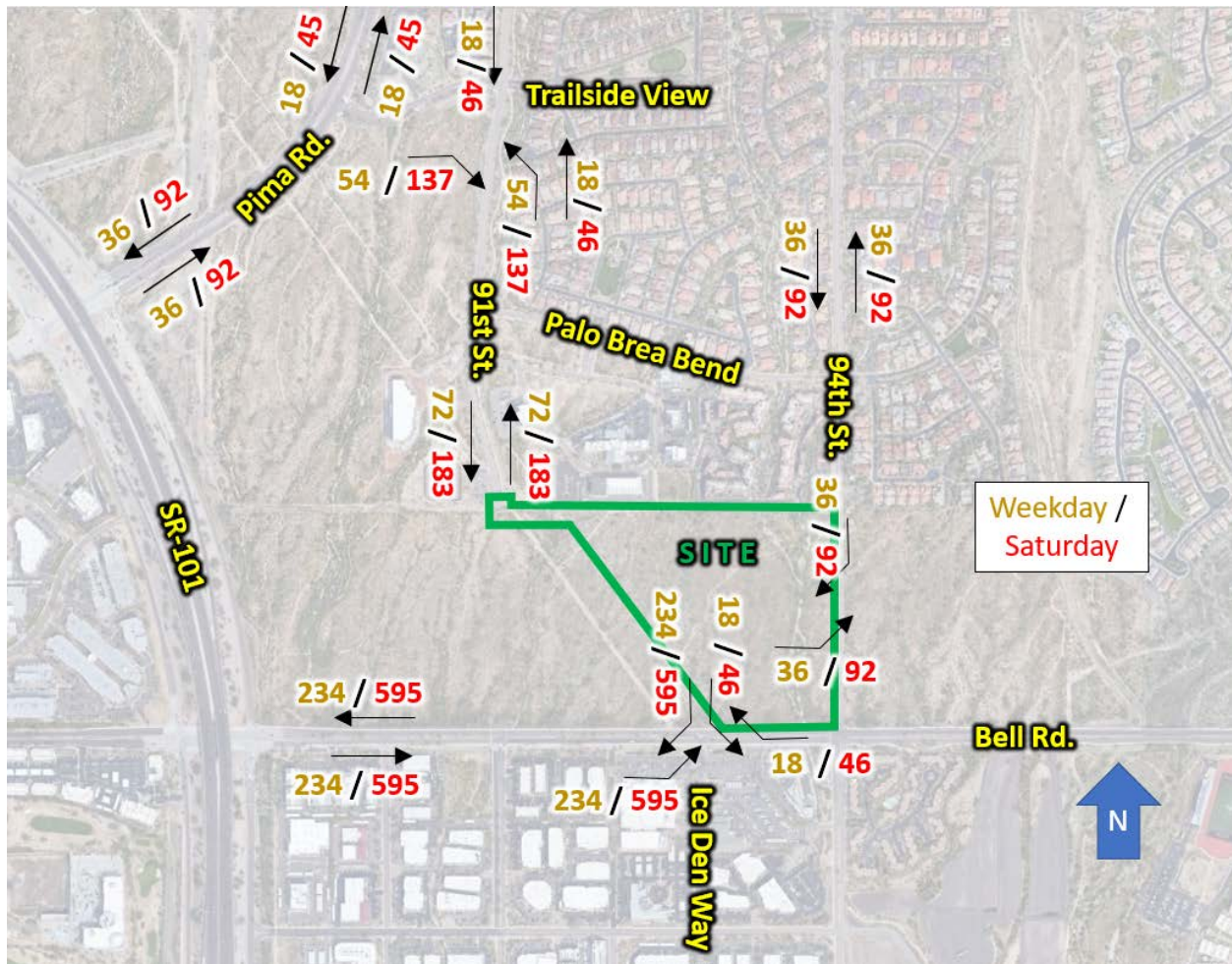


Figure 12: Study Area Site-Generated Daily Traffic Volumes



Total traffic volume, including existing plus predicted site traffic, are shown in the next series of figures. However, daily volumes in these figures are limited to the three locations where four-day data collection was conducted as part of this study. Hourly volumes are available at these three locations plus the Ice Den Way intersection, subject to the assumptions discussed earlier. All of the subsequent figures include the 25 percent increase in collected traffic volume to account for pandemic-related traffic reductions. Figure 13 presents expected total hourly traffic volumes in the study area, and Figure 14 presents hourly volumes at the Ice Den Way intersection. Figure 15 presents expected total daily traffic volume in the study area.

Figure 13: Total Future Study Area Peak Hour Traffic Volumes



Figure 14: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way

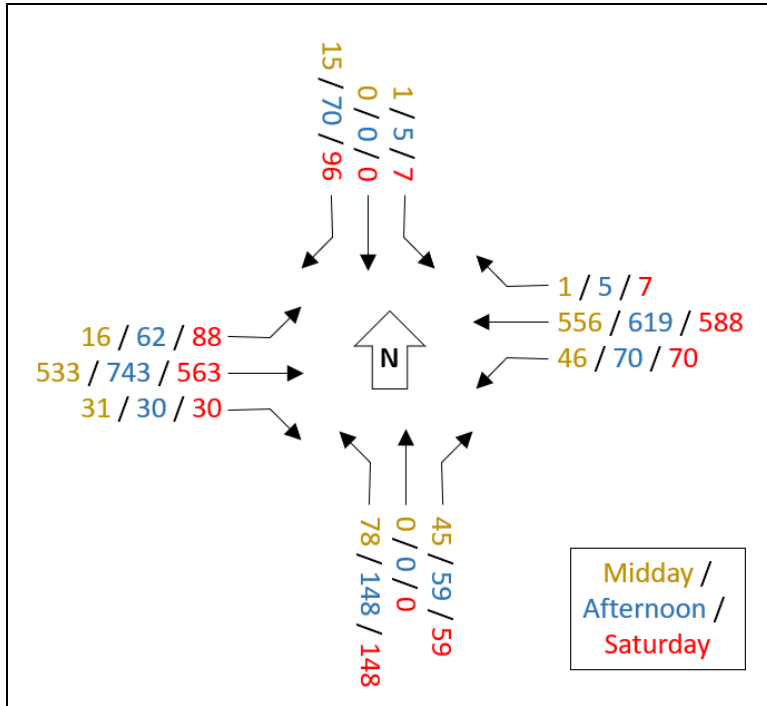


Figure 15: Total Future Study Area Daily Traffic Volumes



5.3 Traffic Operations

5.3.1 Bell Road/Ice Den Way

The traffic operational characteristics of the intersection of Bell Road and Ice Den Way were evaluated using Synchro software, version 10, which implements the methodologies of the *Highway Capacity Manual* (HCM), 6th edition. The analysis is based on the volumes presented above, along with existing and proposed lane configuration data.

To provide an indication of intersection performance, intersections are typically reported in terms of Levels of Service (LOS). Unsignalized two-way-stop-controlled (TWSC) intersection analysis is based on the minor street approach or critical movement, whichever is applicable. The capacity criteria for unsignalized intersection analysis are presented in Table 5.

Table 5. Level of Service Criteria for Unsignalized Intersections

Level of Service (LOS)	Average Control Delay (seconds)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operation. The HCM offers the following in Chapter 19:

“For a typical major street with two lanes in each direction and an average traffic volume in the range of 15,000 to 20,000 vehicles/day (roughly equivalent to a peak hour flow rate of 1,500 to 2,000 vehicles/hour), the delay equation will predict greater than 50s of delay (LOS F) for many urban two-way-stop-controlled (TWSC) intersections that allow minor-street left-turn movements. LOS F will be predicted regardless of the volume of minor-street left-turning traffic. Even with a LOS F estimate, most low-volume minor-street approaches would not meet any of the volume or delay warrants for signalization noted in the *Manual on Uniform Traffic Control Devices*. As a result, analysts who use the HCM LOS thresholds as the sole measure to determine the design accuracy of TWSC intersections should do so with caution. In evaluating the overall performance of TWSC intersections, it is important to consider measures of effectiveness such as volume-to-capacity ratios for individual movements, average queue lengths, and 95th percentile queue lengths in addition to considering delay. By focusing on a single measure of effectiveness for the worst movement only, such as delay for the minor-street left-turn, users may make less effective traffic control decisions.”

Considering the above guidance, for the purposes of this study, TWSC movements operating at LOS E or F with v/c ratios under 0.80 and acceptable queue lengths will be considered as operating at an acceptable level when the side street traffic volumes do not warrant a traffic signal.

The intersection was evaluated for both existing conditions, as a 3-leg intersection, and future conditions, as a 4-leg intersection with the north leg accessing the site. Traffic volume on Bell Road was assumed to be constant between the two scenarios. It is possible that traffic volume may increase on Bell Road in the future, but any increase is expected to be small in percentage terms in the relatively short time prior to construction of the subject site. Likewise, no changes were assumed in traffic turning to and from the south on Ice Den Way.

It is likely that traffic volume making a left-turn into the site from Bell Road is likely to decline once the street infrastructure (notably, 94th Street) in the area is completed.

Table 6 shows a summary of the traffic operational results of the two scenarios, and complete results can be found in Appendix C. Note that as a TWSC-controlled intersection, delay and level of service values are only provided for the stop-controlled movements, not the mainline movements, which are free-flow.

Table 6. Level of Service and Delay (seconds) at Bell Road and Ice Den Way

Movement	Existing			With Site		
	Weekday		Sat	Weekday		Sat
	Midday	PM		Midday	PM	
NBL	B (12)	C (16)	B (14)	B (12)	C (19)	C (21)
NBR	A (9)	A (10)	A (10)	A (9)	A (10)	A (10)
SBL	Not applicable			B (12)	B (14)	B (14)
SBR				A (9)	A (10)	A (10)

Table 6 shows that all movements appear to operate with low delay, LOS C conditions or better, in both existing and future scenarios during all three time periods evaluated. Attainment of this LOS and delay result relies on accounting for the gaps created by the adjacent traffic signals at 91st and 94th Street, a methodology permitted by the 6th edition of the HCM. Operational parameters at the intersection, including queue length and v/c ratio, are reasonable in all scenarios evaluated.

Traffic generated by the site is expected to increase average delay for the northbound left-turn movement during afternoon and Saturday peak hours. The increase in delay is expected to be minor, about 3 seconds per vehicle, in the weekday afternoon peak hour, and reach as high as 7 seconds per vehicle during the Saturday peak hour. The movement is expected to remain at LOS C in all cases, considered operationally reasonable, although the increased delay is likely to be notable to travelers, particularly when combined with the removal of the merge lane to facilitate two-stage left turns.

The volume of traffic at the intersection, including conflicting through and left-turn movements, is relatively high, particularly noting nearly 100 westbound left turns and over 100 northbound left turns during the peak hour on Saturday. The use of recreational fields can cause sharp traffic peaking patterns, in which traffic may arrive at an intersection in a crush rather than uniformly distributed throughout the peak hour. During these crush times, it is likely that delays may be greater than predicted by the Synchro analysis.

When delays are excessive, motorists may consider one of a few actions:

- Motorists may avoid making left turns, particularly outbound lefts. They may reroute to a right turn followed by a U-turn, or some other alternative route.
- Motorists may choose to use the 91st Street access point to the parking lot.
- Motorists may choose to use the 94th Street parking lot.
- Motorists may change their time or mode of travel.

It is not recommended that mitigation measures to address this potential conflict be incorporated into the project, noting the lack of confidence in the trip generation forecast and the potential for motorists to consider alternative actions if delays increase. Rather, the city may wish to monitor operations at the intersection after opening to confirm the operational characteristics.

5.3.2 94th Street

The predicted site volumes entering and exiting the 94th Street site parking lot are very low, reaching only as high as 15 vehicles per hour (vph) on Saturday, distributed between the two site access points. The small 85-space capacity of the parking lot also limits the traffic volume that will access the lot via 94th Street. Low site volumes and modest existing traffic on 94th Street suggest that the site access points will operate without excessive delay to traffic exiting the parking lot.

The city asked that this study consider whether the 94th Street parking lot should be configured with one-way operation to concentrate exiting and entering traffic at different points rather than introduce these conflicting movements at two points. A one-way configuration would likely operate satisfactorily, but two-way traffic is recommended. The low traffic volume, modest parking lot capacity, and adequate 450-foot separation between the two driveways suggest that conflicts will be manageable with a two-way configuration. One-way operation would introduce the following disadvantages:

- It is often difficult to enforce one-way operation in low-volume conditions. Drivers tend to take the shortest path to their destination even when the path conflicts with signs and pavement markings indicating a one-way route. Unenforced one-way operation can result in head-on conflicts.
- Additional signing and pavement marking would be required, introducing both capital and ongoing maintenance expense to ensure the traffic control devices remain highly visible.
- Drivers are most likely to comply with one-way parking aisles when angled parking, rather than perpendicular parking, is used. However, angled parking stalls would strongly discourage users from backing in to parking spaces, which is likely to be preferred by many users to load and unload athletic equipment from the rear of vehicles.

5.3.3 91st Street

The 91st Street access point is expected to operate with no conflicts, considering that 91st Street will end at the site access point immediately after opening.

Site traffic entering and exiting via 91st Street also will traverse additional nearby intersections. Traffic volumes were not collected at these intersections, so it is not possible to conduct detailed traffic operational analyses. However, the following qualitative observations are provided about each of the intersections with a potential to accommodate site traffic:

- *Trailside View and 91st Street.* This intersection is two-way stop controlled, with dedicated turn lanes for traffic destined to and from the site (northbound left and eastbound right). Anticipated site traffic volumes at the intersection are low, suggesting that it is not likely to require any site-related mitigation measures. However, the intersection may be a candidate for a roundabout or a mini-roundabout as traffic volumes increase.

- *Trailside View and Pima Road.* Pima Road is a 6-lane arterial that carries high volume, providing access to SR 101. Trailside View intersects Pima Road at a minor-street stop-controlled intersection, with dedicated left- and right-turn lanes on westbound Trailside View. According to the City of Scottsdale, a traffic signal has been requested at this intersection. The amount of site traffic predicted to use the intersection is very low during peak hours, reaching no more than 20 vph, so it is unlikely that the site would cause the intersection to meet a traffic signal warrant. However, it is unknown whether the intersection already meets traffic signal warrants or if a traffic signal would be beneficial to overall operations. The configuration of the intersection and the width of Pima Road suggest that a traffic signal may be a logical mitigation measure if delay is excessive under minor-street stop control. The city has engaged Lee Engineering to conduct a separate study of the intersection to determine if traffic signal control would be beneficial.
- *91st Street and Legacy Boulevard.* This intersection is signalized, with double northbound left-turn lanes and ample capacity on Legacy Boulevard. The traffic signal control allows the intersection to respond to changes in traffic patterns, and it is not expected to experience major changes in operational performance due to the low volume of site traffic that may use the intersection.

5.4 Turn Lanes

This section evaluates the necessity and appropriateness of turn lanes for each approach at each site access point.

5.4.1 Bell Road/Ice Den Way Intersection

Eastbound Left-Turn Lane

Scottsdale requires left-turn lanes at all intersections on major collectors and arterials.² An eastbound left-turn lane approaching the site is shown on the site plan, in conformance with this requirement. In all three time periods evaluated, the eastbound left-turn movement has a 95th percentile queue length less than one vehicle length, suggesting that a minimum-length turn bay is acceptable for the site. The site plan shows a full-width left-turn bay about 175 feet long, which is suitable for site conditions.

Westbound Left-Turn Lane

The existing westbound left-turn lane is about 120 feet long, when measured along its full-width portion, plus a taper. The video data collection shows this turn bay to operate effectively at this length. Rarely is more than one car observed queued in the turn bay at the same time, even during peak hours, and vehicles that enter the bay tend to find a gap and turn quickly. The addition of the north leg to the intersection has little impact on the westbound left turn, because these vehicles must yield only to eastbound through traffic, which is not expected to change as a result of site development. The operational analysis results show that the westbound left-turn movement also has a 95th percentile queue less than one vehicle length, and as such, no changes to the westbound left-turn lane are necessary.

² Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E2, p. 21.

Eastbound Right-Turn Lane

The existing eastbound right-turn lane on Bell Road measures about 120 feet plus a short taper, which is acceptable for the modest right-turn volume entering Ice Den Way. The length complies with Scottsdale's minimum 100-foot length requirement for right-turn lanes,³ but it does not comply with the 150-foot "standard storage length." No changes to the existing turn lane are required, as this movement is not impacted by the proposed development.

Westbound Right-Turn Lane

The site plan proposes a right-turn lane with a 150-foot storage length plus a taper, in compliance with the city's "standard" length noted earlier. This design is sufficient to accommodate the volume of traffic making the movement.

5.4.2 94th Street

Northbound left turns into the small parking lot on 94th Street can be accommodated in the existing two-way left-turn lane.

The City of Scottsdale does not require right-turn lanes by policy on 94th Street since it is a minor collector street. Southbound right-turn lanes on collector streets are required when the following criteria are met:

- At least 5,000 vehicles per day are expected to use the street
- The 85th percentile speed on the street is at least 35 mph; or 45 mph for a two-lane (one lane each direction) roadway
- At least 30 vehicles will make right turns into the driveway during a one-hour period⁴

Raw traffic volume data collected on 94th Street is somewhat less than the 5,000 vpd threshold, with average weekday volume collected at 4,400 vpd. However, after increasing the volume by 25 percent to account for pandemic-related traffic reductions, as discussed earlier, the volume reaches about 5,100 vpd. Even if the 25 percent factor is not accurate, it is foreseeable that collected volume on 94th Street will increase above 5,000 vpd in the near term due to new development, so this criterion is considered met.

Actual travel speeds on 94th Street were not collected as part of this study. However, considering driver speed choice on other streets, it would not be surprising to find 85th percentile speeds of at least 45 mph on a street like 94th Street with a posted speed limit of 40 mph. This criterion is also considered to be met.

Southbound right-turn traffic volume entering the site from 94th Street is expected to reach about 14 vehicles per hour during the highest peak hour on Saturday. Since this volume is forecast to be considerably below the 30-vph threshold, a right-turn deceleration lane on 94th Street is not recommended.

³ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E1, p. 21.

⁴ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.206, p. 34.

5.4.3 91st Street

Upon initial construction, the north site driveway to 91st Street will access the street at its southern terminus, so there will be no conflicting movements that require turn lanes. Additional review of site access should be conducted if 91st Street is extended south to Bell Road in the future.

5.5 Sight Distance

All site access points should be designed to accommodate sight distance recommendations in *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO). A review of the site reveals that the roadways near the proposed access points are generally on horizontal tangent alignments with little vertical profile, suggesting that roadway elements are not likely to constrain sight distance. Existing native desert landscaping may need to be adjusted to ensure adequate sight distance.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study has documented the following conclusions and recommendations:

- The proposed development consists of a set of six rectangular multi-use athletic fields on the northwest corner of Bell Road and 94th Street. A large parking lot, proposed to contain 530 parking spaces, is proposed to have access both from Bell Road and 91st Street west of the athletic fields. A smaller 85-space lot is proposed with two access points on 94th Street on the east side of the fields. The site's Bell Road access point would add a fourth (north) leg to the existing intersection of Ice Den Way, a private driveway.
- Traffic volume data collection shows that Bell Road, 91st Street, and 94th Street in the study area carry more traffic during the midday peak hour than the conventional morning commuter peak hour. Traffic conditions were evaluated for weekday midday and afternoon peak hours in addition to the Saturday peak hour. The City of Scottsdale requested that collected traffic volume be increased by 25 percent to account for traffic reductions due to the coronavirus pandemic.
- Crash data showed no notable pattern of crashes adjacent to the site. The intersection of 94th Street and Bell Road has experienced about 5 crashes per year, a level that is not unusual considering its traffic volume.
- Site trip generation was forecast using two methods:
 - ITE Land Use Code #488 (Soccer Complex) is the most representative land-use code from the nationally-recognized *Trip Generation Manual*, but the manual has limited data for this land use.
 - The City of Scottsdale collected traffic data at a comparable nearby soccer complex, which showed somewhat higher levels of trip generation per field than the ITE method during most time periods evaluated. To ensure a conservative analysis, the higher Scottsdale values were used in the study.

- The selected trip generation method projects the site will generate the most trips on Saturday, with about 1,800 site vehicles per day and about 280 trips during the peak hour. Weekday trips are forecast at about 720 trips per day and 200 trips during the higher-volume afternoon peak hour. A daily trip forecast is not available for Sunday, but Sunday peak-hour volume is forecast at about 230 trips.
- Site trip distribution assumes most trips (65 percent) will arrive and depart to and from the west on Bell Road, considering its ease of access to SR-101. The 91st Street access point is expected to account for about 20 percent of site trips via both Pima Road and its interchange with SR 101. Other routes approaching the site are likely mostly limited to local trips with origins no more than about two miles from the site.
- The traffic operational analysis of the Bell Road/Ice Den Way intersection shows that stop-controlled movements operate at mostly LOS A and B conditions today, and all movements are expected to operate at LOS C or better with the athletic fields in place, overall very good operational performance.
- Two-way traffic flow is recommended in the small (94th Street) parking lot.
- It is unlikely that site-related traffic mitigation measures will be necessary at intersections north of Bell Road, including Trailside View intersections with 91st Street or Pima Road, and 91st Street and Legacy Boulevard, because of low site traffic assignment through these intersections. Traffic volume data was not collected at these intersections at the city's request. However, a traffic signal has been requested at the intersection of Pima Road at Trailside View. It is unknown whether the intersection currently meets any traffic signal warrants or if a traffic signal would improve the intersection's operations, but a traffic signal may be a logical mitigation measure for this intersection if delays become unacceptably high under minor-street stop control. The City of Scottsdale has engaged Lee Engineering to conduct a separate traffic signal study at this intersection.
- An eastbound left-turn lane and a westbound right-turn lane are required approaching the site driveway on Bell Road. No changes to existing turn bays would be required. No turn bays are required at the 91st Street or 94th Street access points; the existing TWLTL on 94th Street can be used for northbound left-turn access.

APPENDIX A: TRAFFIC VOLUME DATA

File Number: 2002056
Route: N 94TH ST
Location: Btwn BELL RD & E PALO BREA BEND

Direction: NB
Latitude: 33.6433
Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	30	1	36	2	56	1	42			1	41
00:15	0	37	1	37	2	32	1	31			1	34
00:30	0	37	2	50	0	44	2	30			1	40
00:45	1	36	0	39	2	38	2	30			1	36
01:00	1	37	1	37	1	35	4	23			2	33
01:15	1	34	0	47	1	31	2	24			1	34
01:30	0	31	1	39	1	44	1	37			1	38
01:45	0	38	0	32	1	35	0	30			0	34
02:00	1	33	1	40	0	53	1	35			1	40
02:15	0	36	1	50	1	32	1	29			1	37
02:30	0	34	0	33	1	36	0	25			0	32
02:45	0	41	0	47	0	31	2	22			1	35
03:00	0	50	1	45	0	34	0	27			0	39
03:15	1	54	0	54	0	35	0	42			0	46
03:30	2	48	0	40	0	38	0	25			1	38
03:45	1	36	0	53	0	22	0	26			0	34
04:00	0	45	0	38	0	20	0	27			0	33
04:15	1	51	1	62	1	36	0	29			1	45
04:30	1	58	3	60	0	33	1	27			1	45
04:45	1	66	0	47	0	41	1	22			1	44
05:00	5	65	2	49	0	42	0	26			2	46
05:15	5	61	4	61	4	30	2	34			4	47
05:30	5	72	6	49	7	31	1	25			5	44
05:45	5	51	6	47	4	40	2	39			4	44
06:00	19	48	10	52	5	24	1	20			9	36
06:15	13	35	12	41	7	34	7	24			10	34
06:30	25	49	18	36	6	26	7	28			14	35
06:45	23	41	8	42	13	24	6	22			13	32
07:00	17	33	23	20	15	32	5	18			15	26
07:15	25	36	19	21	19	20	9	18			18	24
07:30	22	29	24	23	20	15	14	14			20	20
07:45	23	35	14	21	19	30	10	12			17	25
08:00	33	20	25	23	21	13	9	17			22	18
08:15	28	13	30	15	15	24	11	12			21	16
08:30	18	18	18	22	21	18	10	11			17	17
08:45	21	11	35	16	22	13	21	10			25	13
09:00	22	11	24	16	27	12	15	8			22	12
09:15	23	10	22	13	31	1	19	5			24	7
09:30	21	8	24	9	17	10	29	6			23	8
09:45	19	8	30	10	27	13	34	3			28	9
10:00	22	4	22	10	31	10	26	3			25	7
10:15	22	4	27	11	36	8	23	1			27	6
10:30	27	10	33	7	26	7	25	2			28	7
10:45	31	2	34	5	38	6	33	1			34	4
11:00	23	1	26	8	44	4	26	3			30	4
11:15	49	1	37	5	46	10	17	1			37	4
11:30	32	0	46	1	51	6	33	0			41	2
11:45	38	1	33	3	40	1	34	0			36	1
Totals	627	1509	625	1522	625	1230	448	946	0	0	581	1302
Day Total	2136		2147		1855		1394		0		1883	
AM Pct	29.4%		29.1%		33.7%		32.1%				30.9%	
Peak Hour	11:15	16:45	11:45	16:15	11:15	12:00	11:30	12:00			11:15	16:30
Peak Volume	149	264	156	218	193	170	140	133			155	181

File Number: 2002057
 Route: N 94TH ST
 Location: Btwn BELL RD & E PALO BREA BEND

Direction: SB
 Latitude: 33.6433
 Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	1	32	0	54	1	30	1	39			1	39
00:15	1	41	0	34	5	51	4	30			3	39
00:30	1	41	0	30	1	34	4	25			2	33
00:45	0	37	0	35	1	43	2	35			1	38
01:00	0	27	0	41	0	39	1	31			0	35
01:15	0	34	0	31	0	48	0	22			0	34
01:30	0	30	0	35	1	30	0	33			0	32
01:45	0	47	0	43	0	28	0	38			0	39
02:00	0	37	1	37	1	45	0	27			1	37
02:15	0	53	0	49	0	34	3	25			1	40
02:30	0	43	0	49	0	37	0	31			0	40
02:45	2	36	1	48	0	29	0	22			1	34
03:00	0	52	0	53	0	37	0	22			0	41
03:15	2	54	0	57	0	29	0	21			1	40
03:30	0	49	0	49	1	32	0	23			0	38
03:45	2	44	1	53	1	29	0	21			1	37
04:00	1	49	1	51	0	22	1	25			1	37
04:15	3	54	2	60	0	29	1	28			2	43
04:30	4	40	2	47	1	33	1	33			2	38
04:45	9	45	3	48	0	38	1	21			3	38
05:00	15	50	6	43	3	24	2	21			7	35
05:15	15	40	11	44	1	21	0	27			7	33
05:30	14	52	7	47	7	36	1	26			7	40
05:45	12	62	9	32	10	27	8	25			10	37
06:00	15	29	10	32	3	35	8	22			9	30
06:15	11	40	14	23	8	23	4	23			9	27
06:30	21	18	12	19	11	23	8	16			13	19
06:45	21	42	22	25	18	28	7	10			17	26
07:00	37	22	22	24	21	18	13	13			23	19
07:15	35	21	40	14	11	9	11	16			24	15
07:30	50	15	40	22	18	19	10	11			30	17
07:45	41	10	35	17	29	17	20	4			31	12
08:00	40	18	41	12	22	16	12	10			29	14
08:15	40	17	43	15	19	13	15	9			29	14
08:30	36	8	42	9	24	5	19	9			30	8
08:45	42	10	59	14	38	9	26	9			41	11
09:00	38	7	34	7	33	7	16	9			30	8
09:15	36	5	29	5	34	7	29	6			32	6
09:30	42	1	37	8	32	10	21	3			33	6
09:45	46	4	53	10	45	7	29	1			43	6
10:00	37	4	28	8	41	4	29	0			34	4
10:15	37	1	49	2	42	4	38	3			42	3
10:30	27	7	35	6	30	6	28	1			30	5
10:45	40	4	37	4	54	6	39	1			43	4
11:00	27	1	30	2	45	3	33	0			34	2
11:15	39	3	34	3	41	8	28	1			36	4
11:30	37	0	33	2	38	6	37	0			36	2
11:45	53	0	34	4	62	1	34	0			46	1
Totals	930	1336	857	1357	753	1089	544	828	0	0	771	1153
Day Total	2266		2214		1842		1372		0		1924	
AM Pct	41.0%		38.7%		40.9%		39.7%				40.1%	
Peak Hour	7:30	17:00	8:00	15:30	11:00	12:15	11:30	12:00			11:30	15:00
Peak Volume	171	204	185	213	186	167	140	129			160	156

File Number: 2002058
 Route: BELL RD
 Location: Btwn N 91ST ST & N 94TH ST

Direction: EB
 Latitude: 33.6401
 Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020		Average			
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
00:00	2	97	4	99	12	133	7	87	6	104		
00:15	2	102	2	117	7	125	4	73	4	104		
00:30	1	88	5	117	4	106	7	104	4	104		
00:45	1	108	3	116	5	104	6	71	4	100		
01:00	3	101	0	119	8	86	5	83	4	97		
01:15	5	113	0	122	4	105	5	86	4	107		
01:30	0	84	3	103	3	101	3	76	2	91		
01:45	0	122	0	120	3	101	3	80	2	106		
02:00	2	99	0	108	1	106	2	82	1	99		
02:15	0	108	1	113	1	61	2	71	1	88		
02:30	1	102	1	98	5	84	2	76	2	90		
02:45	3	114	1	128	1	91	3	93	2	107		
03:00	3	103	2	126	1	88	0	94	2	103		
03:15	3	131	0	108	3	89	1	64	2	98		
03:30	5	123	1	120	0	104	0	80	2	107		
03:45	4	132	4	128	0	79	2	54	3	98		
04:00	4	130	5	129	1	81	1	93	3	108		
04:15	3	129	1	145	2	98	1	106	2	120		
04:30	8	156	7	132	3	85	2	79	5	113		
04:45	16	147	11	137	4	88	3	90	9	116		
05:00	27	146	17	153	9	93	3	72	14	116		
05:15	46	133	31	134	15	93	14	80	27	110		
05:30	28	192	31	134	25	97	18	70	26	123		
05:45	51	120	42	127	24	79	17	61	34	97		
06:00	43	122	49	137	22	85	12	71	32	104		
06:15	46	102	43	107	17	93	15	64	30	92		
06:30	62	110	59	101	28	75	22	72	43	90		
06:45	89	99	84	88	25	86	21	55	55	82		
07:00	91	101	93	74	35	74	19	39	60	72		
07:15	93	71	104	78	41	59	25	44	66	63		
07:30	99	77	74	73	52	54	38	50	66	64		
07:45	103	70	92	51	63	49	33	33	73	51		
08:00	114	53	112	71	60	61	44	37	83	56		
08:15	111	41	104	44	73	37	45	30	83	38		
08:30	91	37	98	39	62	33	38	17	72	32		
08:45	114	31	116	28	75	27	51	18	89	26		
09:00	99	33	110	28	64	29	53	29	82	30		
09:15	89	19	99	25	70	20	52	21	78	21		
09:30	100	20	80	19	86	30	60	15	82	21		
09:45	118	10	100	33	98	28	56	14	93	21		
10:00	93	11	84	24	107	21	68	16	88	18		
10:15	95	9	83	23	89	24	76	9	86	16		
10:30	78	12	92	25	80	16	69	11	80	16		
10:45	100	4	107	17	92	14	98	6	99	10		
11:00	109	9	108	10	118	13	67	9	101	10		
11:15	104	5	96	11	120	14	86	4	102	9		
11:30	127	2	112	10	87	6	76	3	101	5		
11:45	114	3	119	6	105	9	101	5	110	6		
Totals	2500	3931	2390	4055	1810	3234	1336	2597	0	0	2009	3454
Day Total	6431		6445		5044		3933		0		5463	
AM Pct	38.9%		37.1%		35.9%		34.0%				36.8%	
Peak Hour	11:00	16:45	11:45	16:15	11:45	12:00	11:45	16:00			11:45	16:45
Peak Volume	454	618	452	567	469	468	365	368			422	465

File Number: 2002059
 Route: BELL RD
 Location: Btwn N 91ST ST & N 94TH ST

Direction: WB
 Latitude: 33.6401
 Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	2	125	3	101	7	122	12	111			6	115
00:15	2	130	3	107	1	130	5	95			3	116
00:30	3	117	1	95	2	123	6	98			3	108
00:45	0	128	4	104	0	137	7	98			3	117
01:00	0	122	3	90	0	113	1	116			1	110
01:15	0	127	3	93	2	119	2	105			2	111
01:30	0	111	0	99	5	122	0	92			1	106
01:45	0	113	1	97	3	120	2	98			2	107
02:00	5	114	0	92	1	126	1	115			2	112
02:15	2	119	0	93	2	104	6	72			3	97
02:30	0	125	0	124	3	98	1	88			1	109
02:45	1	119	4	135	3	96	0	89			2	110
03:00	0	138	0	108	0	113	2	90			1	112
03:15	1	137	6	140	0	84	5	97			3	115
03:30	4	134	0	124	5	125	2	64			3	112
03:45	4	154	6	137	1	103	1	71			3	116
04:00	4	138	3	120	2	98	0	65			2	105
04:15	5	126	12	155	0	106	0	70			4	114
04:30	8	135	10	127	0	78	3	75			5	104
04:45	8	140	4	91	5	124	4	61			5	104
05:00	19	156	19	138	9	81	3	60			13	109
05:15	14	130	9	165	5	87	6	67			9	112
05:30	31	125	30	59	22	76	10	72			23	83
05:45	28	139	25	75	16	89	12	49			20	88
06:00	35	127	15	179	19	103	20	62			22	118
06:15	46	107	36	91	21	93	15	57			30	87
06:30	60	86	32	31	25	70	12	59			32	62
06:45	78	107	70	16	43	70	19	36			53	57
07:00	92	77	43	12	41	73	22	41			50	51
07:15	94	116	55	77	38	59	34	41			55	73
07:30	123	71	88	114	68	96	41	42			80	81
07:45	118	68	69	39	74	51	48	23			77	45
08:00	121	57	84	29	52	36	38	30			74	38
08:15	98	73	63	27	83	45	63	26			77	43
08:30	136	33	71	45	85	40	57	19			87	34
08:45	123	45	79	69	87	31	62	29			88	44
09:00	96	41	68	35	92	36	51	26			77	35
09:15	103	41	74	19	100	25	75	18			88	26
09:30	104	24	74	14	102	37	114	23			99	25
09:45	114	20	94	16	124	51	81	15			103	26
10:00	113	27	88	0	116	40	106	11			106	20
10:15	95	17	114	12	109	18	109	15			107	16
10:30	122	15	81	6	106	22	99	12			102	14
10:45	139	20	95	10	119	22	115	3			117	14
11:00	100	9	86	0	120	12	109	0			104	5
11:15	109	11	86	9	142	26	105	3			111	12
11:30	134	1	88	7	143	7	101	1			117	4
11:45	124	0	110	3	124	14	122	2			120	5
Totals	2618	4295	1909	3529	2127	3651	1709	2612	0	0	2091	3522
Day Total	6913		5438		5778		4321		0		5613	
AM Pct	37.9%		35.1%		36.8%		39.6%				37.3%	
Peak Hour	11:30	15:00	11:45	15:45	11:15	12:00	11:15	12:30			11:30	12:00
Peak Volume	513	563	413	539	531	512	439	417			467	455

File Number: 2002060
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: NB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	1	29	1	27	0	21			1	24
00:15	0	22	0	15	0	10	0	31			0	20
00:30	0	19	0	21	2	21	2	16			1	19
00:45	0	12	0	20	0	17	1	10			0	15
01:00	1	15	0	25	0	16	1	21			1	19
01:15	0	18	1	19	4	28	0	14			1	20
01:30	0	15	0	14	0	27	0	10			0	17
01:45	0	20	0	29	1	9	1	9			1	17
02:00	0	16	1	18	0	8	2	14			1	14
02:15	0	15	0	30	3	25	0	20			1	23
02:30	0	20	0	27	0	37	0	12			0	24
02:45	1	12	2	11	1	13	1	8			1	11
03:00	1	24	1	22	1	10	0	12			1	17
03:15	1	28	0	15	2	12	0	11			1	17
03:30	3	24	0	28	1	9	0	6			1	17
03:45	0	16	1	26	0	6	1	9			1	14
04:00	0	26	0	31	0	11	0	14			0	21
04:15	0	28	7	31	1	7	0	14			2	20
04:30	1	19	3	34	0	14	0	18			1	21
04:45	5	34	1	22	0	15	0	8			2	20
05:00	5	24	2	17	0	8	2	8			2	14
05:15	4	27	4	20	6	18	1	11			4	19
05:30	5	43	6	21	3	15	2	12			4	23
05:45	4	27	9	21	3	11	1	13			4	18
06:00	17	28	8	23	5	17	5	20			9	22
06:15	15	14	9	12	7	9	5	12			9	12
06:30	8	18	15	19	5	7	12	17			10	15
06:45	11	24	9	19	7	13	9	7			9	16
07:00	18	13	11	11	7	19	2	8			10	13
07:15	15	15	18	13	7	9	4	4			11	10
07:30	15	7	18	14	9	3	2	9			11	8
07:45	19	7	12	12	11	8	8	3			13	8
08:00	17	13	17	8	6	1	10	7			13	7
08:15	20	32	19	13	13	7	5	8			14	15
08:30	15	4	12	7	8	2	1	3			9	4
08:45	18	4	9	10	9	0	7	5			11	5
09:00	19	5	15	4	21	7	7	3			16	5
09:15	10	2	9	6	10	3	7	1			9	3
09:30	17	3	12	3	21	5	17	1			17	3
09:45	22	1	17	1	14	2	13	3			17	2
10:00	16	1	16	2	23	4	10	0			16	2
10:15	14	0	12	3	14	2	13	2			13	2
10:30	16	5	15	4	12	1	17	1			15	3
10:45	16	1	26	5	21	6	19	1			21	3
11:00	24	1	11	2	21	5	18	2			19	3
11:15	18	2	12	4	20	2	13	0			16	2
11:30	17	1	18	1	12	1	15	1			16	1
11:45	16	1	29	2	12	3	19	0			19	2
Totals	424	723	388	744	324	510	253	440	0	0	347	604
Day Total	1147		1132		834		693		0		952	
AM Pct	37.0%		34.3%		38.8%		36.5%				36.5%	
Peak Hour	10:45	16:45	11:45	15:45	10:30	12:45	11:45	12:00			11:45	17:15
Peak Volume	75	128	94	122	74	88	87	78			81	82

File Number: 2002061
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: SB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	0	23	2	18	1	23			1	20
00:15	2	15	0	16	2	21	3	14			2	17
00:30	0	19	0	18	2	26	5	20			2	21
00:45	0	10	2	15	0	26	0	24			1	19
01:00	0	16	0	13	1	20	1	12			1	15
01:15	0	16	0	17	1	24	0	9			0	17
01:30	0	19	0	20	0	12	0	8			0	15
01:45	0	27	1	24	4	16	1	13			2	20
02:00	0	13	1	9	2	8	1	32			1	16
02:15	0	20	0	17	2	19	0	5			1	15
02:30	0	17	2	23	0	15	0	5			1	15
02:45	0	18	0	21	1	8	1	9			1	14
03:00	3	26	1	27	0	12	3	18			2	21
03:15	3	37	4	26	2	8	0	14			2	21
03:30	4	24	0	15	0	9	1	9			1	14
03:45	0	20	1	20	0	14	1	13			1	17
04:00	4	13	6	30	1	8	1	15			3	17
04:15	2	28	2	18	0	11	0	14			1	18
04:30	2	24	1	20	0	11	0	10			1	16
04:45	6	19	8	13	0	19	0	14			4	16
05:00	8	23	4	13	1	14	3	11			4	15
05:15	14	28	13	18	0	17	2	12			7	19
05:30	10	30	5	26	3	16	0	10			5	21
05:45	19	44	16	32	12	20	10	14			14	28
06:00	16	14	16	17	7	13	3	9			11	13
06:15	8	15	10	14	9	12	2	10			7	13
06:30	14	15	16	11	6	13	7	8			11	12
06:45	21	20	23	18	7	9	1	7			13	14
07:00	23	12	14	13	6	7	3	10			12	11
07:15	19	9	24	7	9	10	5	8			14	9
07:30	17	16	23	8	12	6	11	7			16	9
07:45	26	11	34	8	19	8	11	8			23	9
08:00	20	13	20	13	4	8	4	4			12	10
08:15	22	9	23	7	6	10	3	6			14	8
08:30	18	5	17	8	9	3	8	5			13	5
08:45	25	6	27	4	14	10	5	3			18	6
09:00	19	8	16	2	16	7	3	6			14	6
09:15	20	2	14	8	11	4	11	5			14	5
09:30	5	2	19	9	21	4	11	3			14	5
09:45	23	4	20	4	14	3	12	1			17	3
10:00	16	2	16	8	12	3	15	0			15	3
10:15	19	1	14	2	14	4	23	3			18	3
10:30	21	2	21	2	19	5	12	3			18	3
10:45	14	1	19	4	19	3	17	2			17	3
11:00	22	0	17	5	12	2	12	1			16	2
11:15	15	2	28	1	13	3	18	0			19	2
11:30	13	0	16	1	24	4	14	1			17	2
11:45	17	0	19	2	32	1	16	0			21	1
Totals	510	692	533	650	351	524	261	438	0	0	414	576
Day Total	1202		1183		875		699		0		990	
AM Pct	42.4%		45.1%		40.1%		37.3%				41.8%	
Peak Hour	7:45	17:00	7:15	14:30	11:45	12:30	11:45	12:00			11:45	17:00
Peak Volume	86	125	101	97	97	96	73	81			79	82

APPENDIX B: CRASH DATA

IncidentID	IncidentDateTime	CollisionManner	LightCondition	TotalInjuries	TotalFatalities	TotalMotoristsInjuries	InjurySeverity	Onroad	CrossingFeature	Offset	Latitude	Longitude	IntersectionType	JunctionRelation	Weather	Offset Direction
3051751	1/16/2016 10:47	6	1	2	0	2	3	Bell Rd	94th St	-0.076	33.6400962	-111.87975	0	0	1	4
3054871	1/31/2016 15:54	1	1	0	0	0	1	Bell Rd	94th St	-0.095	33.6400963	-111.88008	0	0	2	0
3069271	3/26/2016 18:14	3	1	1	0	1	4	Bell Rd	94th St	-0.1	33.6400962	-111.88017	2	1	1	4
3087902	4/30/2016 16:45	4	1	0	0	0	1	Bell Rd	91st St	0.0379	33.6400921	-111.88428	0	0	2	2
3089519	5/12/2016 15:58	3	1	0	0	0	1	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095209	5/25/2016 13:49	3	1	1	0	1	3	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095227	5/26/2016 8:16	2	1	0	0	0	1	94th St	Bell Rd	0	33.6400951	-111.87844	1	1	1	0
3110396	7/16/2016 11:11	4	1	0	0	0	1	Bell Rd	91st St	-0.017	33.6400916	-111.88523	2	2	1	4
3198943	2/13/2017 11:37	2	1	1	0	1	2	Bell Rd	07 91ST ST C	-0.01	33.6400909	-111.88512	2	2	1	4
3206942	3/16/2017 13:37	3	1	2	0	2	3	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	1	1	0
3218839	4/14/2017 10:25	2	1	0	0	0	1	94th St	07 BELL RD	0	33.6400933	-111.87844	1	2	1	0
3243085	5/30/2017 17:45	2	1	0	0	0	1	Bell Rd	07 94TH ST	-0.028	33.6400938	-111.87893	0	0	1	4
3274865	9/9/2017 23:09	1	4	1	0	1	2	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	2	1	0
3278215	9/18/2017 10:29	1	1	1	0	1	3	Bell Rd	07 94TH ST	-0.002	33.6400934	-111.87847	1	2	1	4
3334984	1/8/2018 15:37	2	1	0	0	3	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3342524	2/2/2018 16:38	1	1	0	0	2	1	07 BELL RD	94th St	14	33.6400984	-111.8784	1	2	1	2
3349455	3/6/2018 6:47	3	1	2	0	2	3	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397725	7/22/2018 12:31	2	1	0	0	2	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397751	7/20/2018 8:22	2	1	0	0	2	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3408960	8/8/2018 19:53	3	4	0	0	3	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	4	0
3424614	9/24/2018 9:29	1	1	0	0	1	1	07 BELL RD	91st St	200	33.6400955	-111.88429	0	0	1	2
3460963	11/20/2018 7:22	4	1	0	0	5	1	07 BELL RD	94th St	-15	33.6400985	-111.8785	1	2	1	4

APPENDIX C: SYNCHRO ANALYSIS RESULTS

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection						
Int Delay, s/veh	1.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	533	31	46	556	78	45
Future Vol, veh/h	533	31	46	556	78	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	579	34	50	604	85	49

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	613	0	998
Stage 1	-	-	-	-	596
Stage 2	-	-	-	-	402
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1284	-	*609
Stage 1	-	-	-	-	*816
Stage 2	-	-	-	-	*816
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1284	-	*585
Mov Cap-2 Maneuver	-	-	-	-	*585
Stage 1	-	-	-	-	*816
Stage 2	-	-	-	-	*784

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	585	865	-	-	1284	-
HCM Lane V/C Ratio	0.145	0.057	-	-	0.039	-
HCM Control Delay (s)	12.2	9.4	-	-	7.9	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.2	-	-	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	743	30	70	619	148	59
Future Vol, veh/h	743	30	70	619	148	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	808	33	76	673	161	64

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	841	0	1314
Stage 1	-	-	-	-	825
Stage 2	-	-	-	-	489
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1133	-	*511
Stage 1	-	-	-	-	*719
Stage 2	-	-	-	-	*783
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1133	-	*477
Mov Cap-2 Maneuver	-	-	-	-	*477
Stage 1	-	-	-	-	*719
Stage 2	-	-	-	-	*731

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	14.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	477	795	-	-	1133	-
HCM Lane V/C Ratio	0.337	0.081	-	-	0.067	-
HCM Control Delay (s)	16.3	9.9	-	-	8.4	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	1.5	0.3	-	-	0.2	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	563	30	70	588	148	59
Future Vol, veh/h	563	30	70	588	148	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	612	33	76	639	161	64

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	645	0	1101
Stage 1	-	-	-	-	629
Stage 2	-	-	-	-	472
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1241	-	*609
Stage 1	-	-	-	-	*790
Stage 2	-	-	-	-	*816
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1241	-	*572
Mov Cap-2 Maneuver	-	-	-	-	*572
Stage 1	-	-	-	-	*790
Stage 2	-	-	-	-	*766

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	572	865	-	-	1241	-
HCM Lane V/C Ratio	0.281	0.074	-	-	0.061	-
HCM Control Delay (s)	13.7	9.5	-	-	8.1	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	1.1	0.2	-	-	0.2	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↗		↖	↗	
Traffic Vol, veh/h	16	533	31	46	556	1	78	0	45	1	0	15
Future Vol, veh/h	16	533	31	46	556	1	78	0	45	1	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	579	34	50	604	1	85	0	49	1	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	605	0	0	613	0	0	1032	1335	307	1029	1352	303
Stage 1	-	-	-	-	-	-	630	630	-	705	705	-
Stage 2	-	-	-	-	-	-	402	705	-	324	647	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	*1293	-	-	1284	-	-	*609	410	*865	*609	395	*865
Stage 1	-	-	-	-	-	-	*783	694	-	*691	631	-
Stage 2	-	-	-	-	-	-	*815	631	-	*815	679	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	*1293	-	-	1284	-	-	*574	389	*865	*552	375	*865
Mov Cap-2 Maneuver	-	-	-	-	-	-	*574	389	-	*552	375	-
Stage 1	-	-	-	-	-	-	*773	685	-	*682	607	-
Stage 2	-	-	-	-	-	-	*769	607	-	*759	670	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.6			11.3			9.3		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	574	865	*1293	-	-	1284	-	-	552	865
HCM Lane V/C Ratio	0.148	0.057	0.013	-	-	0.039	-	-	0.002	0.019
HCM Control Delay (s)	12.4	9.4	7.8	-	-	7.9	-	-	11.5	9.2
HCM Lane LOS	B	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.5	0.2	0	-	-	0.1	-	-	0	0.1

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕		↖	↕		↖	↕	
Traffic Vol, veh/h	62	743	30	70	619	5	148	0	59	5	0	70
Future Vol, veh/h	62	743	30	70	619	5	148	0	59	5	0	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	67	808	33	76	673	5	161	0	64	5	0	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	678	0	0	841	0	0	1448	1789	421	1366	1803	339
Stage 1	-	-	-	-	-	-	959	959	-	828	828	-
Stage 2	-	-	-	-	-	-	489	830	-	538	975	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	*1241	-	-	1133	-	-	*511	212	*795	*511	205	*830
Stage 1	-	-	-	-	-	-	*559	529	-	*628	582	-
Stage 2	-	-	-	-	-	-	*782	581	-	*750	517	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	*1241	-	-	1133	-	-	*422	187	*795	*428	181	*830
Mov Cap-2 Maneuver	-	-	-	-	-	-	*422	187	-	*428	181	-
Stage 1	-	-	-	-	-	-	*529	500	-	*594	543	-
Stage 2	-	-	-	-	-	-	*663	542	-	*652	489	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			0.8			16.2			10		
HCM LOS							C			B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	422	795	* 1241	-	-	1133	-	-	428	830
HCM Lane V/C Ratio	0.381	0.081	0.054	-	-	0.067	-	-	0.013	0.092
HCM Control Delay (s)	18.7	9.9	8.1	-	-	8.4	-	-	13.5	9.8
HCM Lane LOS	C	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	1.8	0.3	0.2	-	-	0.2	-	-	0	0.3

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

11/03/2020

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↕↗		↵	↕↗		↵	↗		↵	↗	
Traffic Vol, veh/h	88	563	30	70	588	7	148	0	59	7	0	96
Future Vol, veh/h	88	563	30	70	588	7	148	0	59	7	0	96
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	96	612	33	76	639	8	161	0	64	8	0	104

Major/Minor	Major1		Major2		Minor1			Minor2				
Conflicting Flow All	647	0	0	645	0	0	1293	1620	323	1293	1632	324
Stage 1	-	-	-	-	-	-	821	821	-	795	795	-
Stage 2	-	-	-	-	-	-	472	799	-	498	837	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1238	-	-	1241	-	-	*488	220	*865	*488	214	*865
Stage 1	-	-	-	-	-	-	*568	546	-	*594	564	-
Stage 2	-	-	-	-	-	-	*815	562	-	*815	536	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	1238	-	-	1241	-	-	*385	190	*865	*406	185	*865
Mov Cap-2 Maneuver	-	-	-	-	-	-	*385	190	-	*406	185	-
Stage 1	-	-	-	-	-	-	*524	503	-	*548	530	-
Stage 2	-	-	-	-	-	-	*673	528	-	*696	494	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	1.1		0.9		17.7		10	
HCM LOS					C		B	

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	385	865	1238	-	-	1241	-	-	406	865
HCM Lane V/C Ratio	0.418	0.074	0.077	-	-	0.061	-	-	0.019	0.121
HCM Control Delay (s)	20.9	9.5	8.2	-	-	8.1	-	-	14	9.7
HCM Lane LOS	C	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	2	0.2	0.3	-	-	0.2	-	-	0.1	0.4

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

94th Street and Bell Road Multi-Use Fields

Scottsdale, Arizona

Traffic Study

Lee Engineering Project No. 1079.06

October 2020

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering, LLC
3610 N. 44th Street
Suite 100
Phoenix, AZ 85018
(602) 955-7206

Gavan and Barker
3030 N. Central Ave., Suite 1530
Phoenix, AZ 85012



LEE ENGINEERING

**Northwest Corner, 94th Street and Bell Road
Multi-Use Fields**

Traffic Study

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering

3610 N. 44th Street, Suite 100
Phoenix, Arizona, 85018
602-955-7206

Gavan and Barker

3030 N. Central Ave., Suite 1530
Phoenix, Arizona, 85012



October 2020

1079.06

CONTENTS

1.0	BACKGROUND	1
1.1	Scope	3
2.0	STUDY AREA CHARACTERISTICS.....	3
3.0	DATA COLLECTION	4
3.1	Traffic Volume.....	4
3.2	Ice Den Way Video	7
4.0	CRASH DATA	8
5.0	PROPOSED DEVELOPMENT	11
5.1	Development Description.....	11
5.2	Projected Traffic.....	11
5.3	Traffic Operations	18
5.4	Turn Lanes.....	22
5.5	Sight Distance	23
6.0	CONCLUSIONS AND RECOMMENDATIONS.....	24

APPENDIX A: TRAFFIC VOLUME DATA

APPENDIX B: CRASH DATA

APPENDIX C: SYNCHRO ANALYSIS RESULTS

LIST OF TABLES

Table 1. Existing Traffic Volume	5
Table 2. Site Trip Generation.....	12
Table 3. Site Trip Distribution	13
Table 4. Level of Service Criteria for Unsignalized Intersections.....	19
Table 5. Level of Service and Delay (seconds) at Bell Road and Ice Den Way	20

LIST OF FIGURES

Figure 1: Vicinity Map.....	1
Figure 2: Preliminary Site Plan.....	2
Figure 3: Existing Study-Area Peak-Hour Traffic Volumes	6
Figure 4: Existing Study-Area Daily Traffic Volumes.....	7
Figure 5: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way.....	9
Figure 6: Study Area Crashes	10
Figure 7: Study Area Site-Generated Peak Hour Traffic Volumes	13
Figure 8: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	14
Figure 9: Study Area Site-Generated Daily Traffic Volumes	15
Figure 10: Total Future Study Area Peak Hour Traffic Volumes	16
Figure 11: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	17
Figure 12: Total Future Study Area Daily Traffic Volumes.....	18

1.0 BACKGROUND

A City of Scottsdale Capital Project proposes to construct a series of multi-use fields, suitable for soccer and other sports, on a parcel on the northwest corner of 94th Street and Bell Road in Scottsdale, Arizona. Lee Engineering was recently engaged to conduct a traffic analysis of the complex for the purposes of estimating its traffic impacts on the adjacent roadway network.

The location of the site is shown in Figure 1; a preliminary site plan is shown in Figure 2.

Figure 1: Vicinity Map

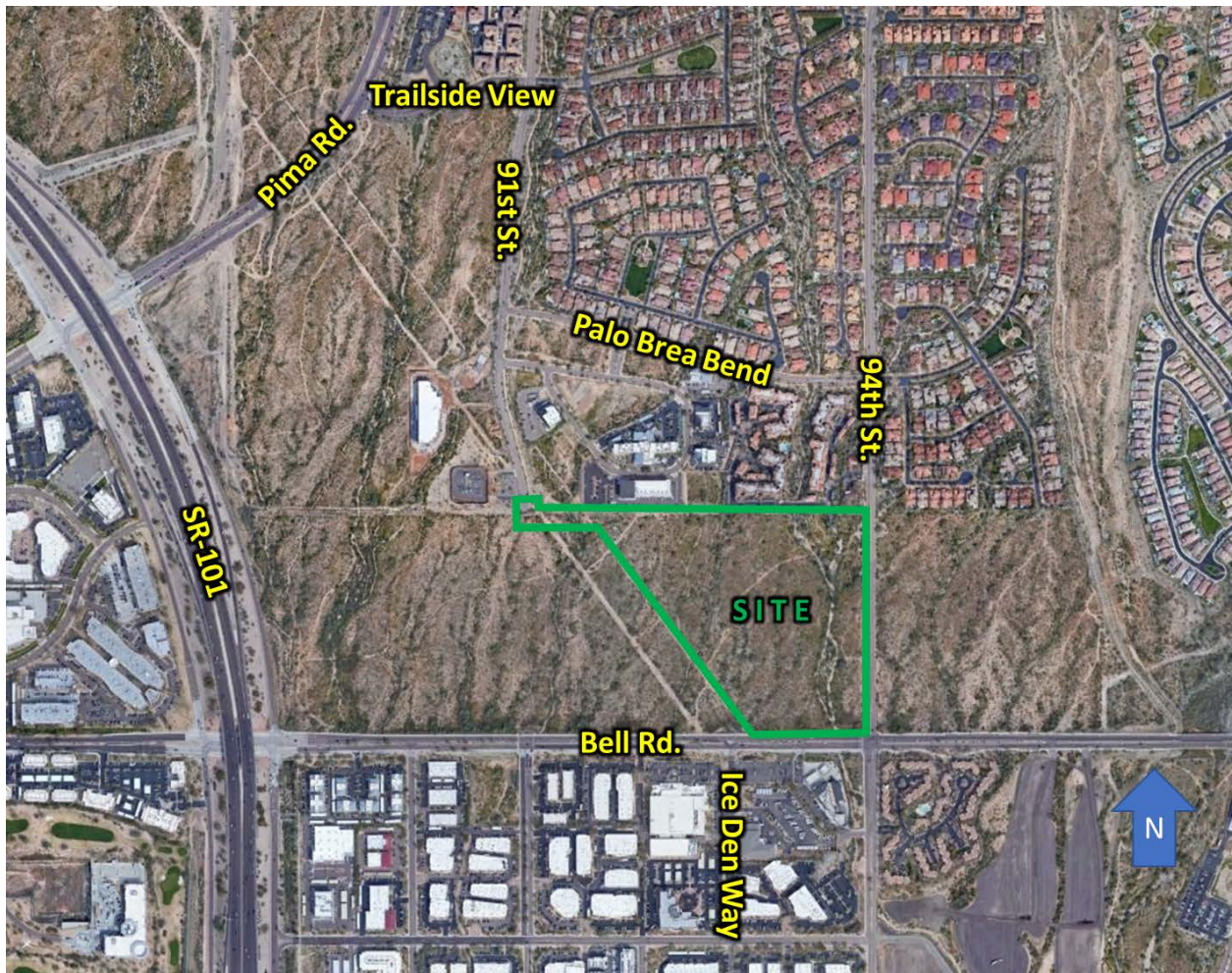
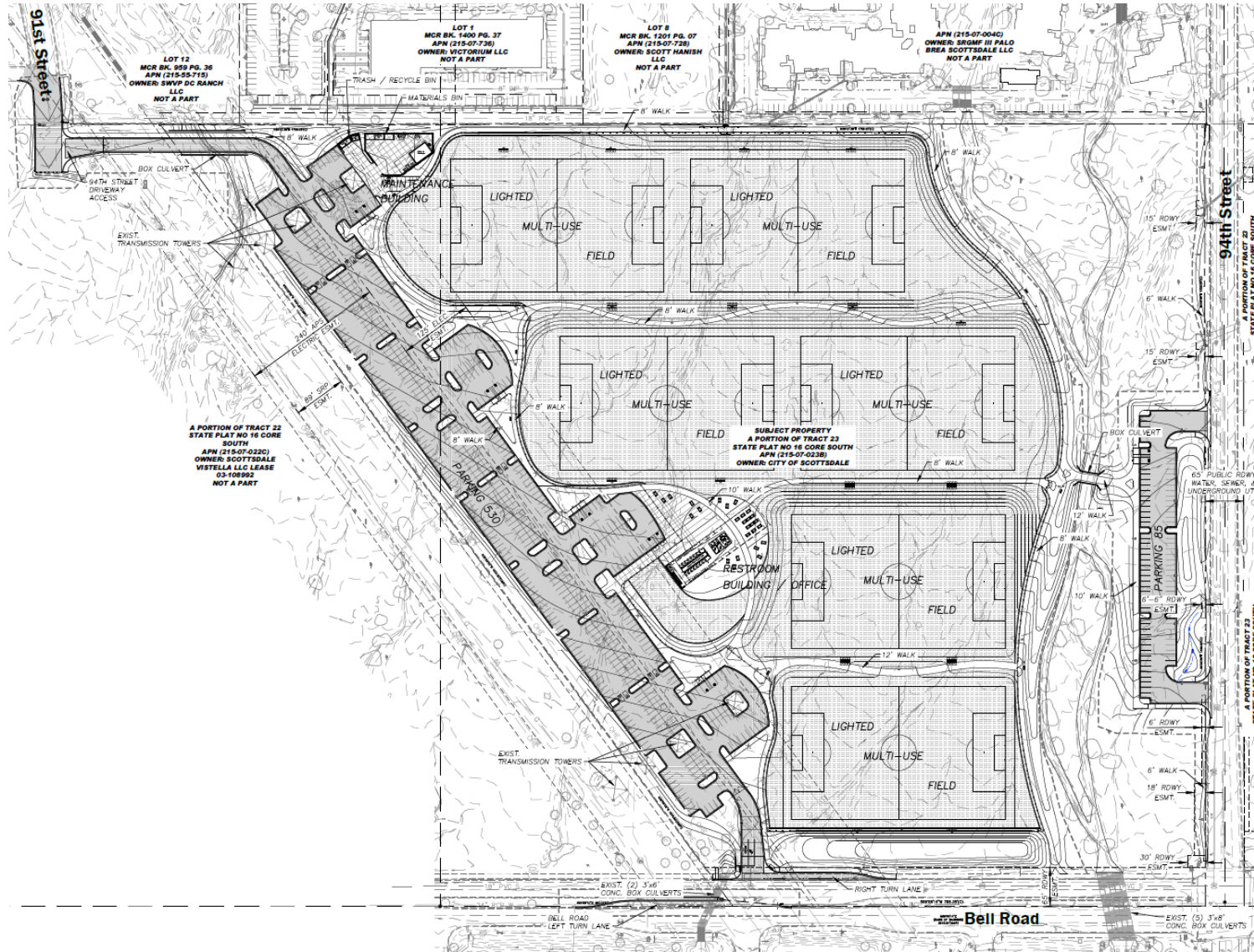


Figure 2: Preliminary Site Plan



1.1 Scope

In a conference call on August 13, 2020, the City of Scottsdale requested that this study include the following elements:

- Daily traffic volume data collection at these sites:
 - 91st Street between Trailside View and Palo Brea Bend
 - Bell Road between 91st and 94th Streets
 - 94th Street between Bell Road and Palo Brea Bend
- Video camera recording of the intersection of Bell Road and Ice Den Way
- Crash analysis for crashes adjacent to the site for a 3-year period
- Trip generation, distribution, and assignment for the proposed soccer complex
- Traffic analysis for the site's opening year at the site's primary access point, which will be the fourth (north) leg of the intersection of Bell Road and Ice Den Way. The analysis will include intersection operations, storage length requirements, and pavement marking or design improvements.

The remainder of this report will address these scope elements in turn.

2.0 STUDY AREA CHARACTERISTICS

According to the City of Scottsdale Street Classification map, Bell Road is classified as a “minor arterial – suburban” in the vicinity of the proposed development. Bell Road carries two vehicular lanes and one bicycle lane in each direction, separated by a raised median. It is also equipped with sidewalks on both north and south sides of the street. Eastbound right-turn lanes are provided at all driveways and intersections on the south side of Bell Road between 91st and 94th Streets. Breaks in the raised median exist at 91st Street, Ice Den Way, and 94th Street, and left-turn lanes are provided approaching each break. However, no eastbound left-turn lanes are provided approaching Ice Den Way or 91st Street because these intersections do not have a north leg. The speed limit on Bell Road is 45 mph.

Ice Den Way is a private street/driveway about 36 feet wide that has its northern terminus at Bell Road. Although it has the design characteristics of a driveway, rather than a street, it is equipped with a street name sign and a STOP sign at the Bell Road intersection. Ice Den Way is generally unmarked, although it does have designated right-turn and left-turn lanes marked for about 50 feet approaching Bell Road. (The markings do not comply with the *Manual on Uniform Traffic Control Devices*.) Ice Den Way has speed bumps that are more severe than the speed humps used on public streets, and in some segments it serves as access to adjacent perpendicular parking stalls. There are no sidewalks along either side of Ice Den Way.

South of Bell Road, 94th Street has a much different character than to the north. To the south, between Bell Road and Bahia Drive, it is a 4-lane roadway with bicycle lanes and sidewalks in both directions and a short segment of raised median. The street widens significantly approaching Bell Road, with two northbound left-turn lanes, one through lane, and one right-turn lane. North of Bell Road, the street narrows to about 44 feet wide, with one through lane and a bicycle lane in each direction separated by a two-way left-turn lane (TWLTL) without sidewalks. The southbound approach to Bell Road also widens, but not as much as in the northbound direction. The southbound lane configuration consists of one lane each for left turns, through traffic, and right turns. The street

is classified as a “minor collector – suburban” near Bell Road. The speed limit on 94th Street is posted 40 mph north of Bell Road and 35 mph south of Bell Road.

To the northwest of the proposed development, 91st Street has a similar cross-section as 94th Street north of Bell—one lane and a bicycle lane in each direction separated by a TWLTL. It also has a wide sidewalk on the east side of the street, separated from the street by a landscaped buffer. This street is not currently continuous north of Bell Road, and is not expected to be connected as part of the proposed development. The segment north of the proposed development is expected to have very low volume because it is a dead end, while the segment south of Bell Road is a four-lane divided roadway between Bell Road and Bahia Drive. Although 91st Street is not fully constructed, its entire length near the site, including the unconstructed portion, is classified as a “major collector – suburban.”

State Route 101 is slightly more than ½ mile west of the proposed development along Bell Road. This major freeway facility has an interchange with Bell Road that is likely to be used by much traffic approaching the soccer complex, but it also has an interchange with Princess Drive/Pima Road about ½ mile north of Bell Road that could be used by some site traffic. Not all traffic movements are provided directly at the two closely-spaced interchanges; some movements are served by a frontage road system that connects Bell and Pima Roads.

Traffic signals exist at both 91st Street and 94th Street intersections with Bell Road.

The intersection of Ice Den Way and Bell Road is minor-street stop-controlled. At this intersection, a merge lane is provided in the median for northbound Ice Den Way traffic turning left onto westbound Bell Road. The lane allows left-turning vehicles to cross the eastbound lanes of Bell Road, then wait in the merge lane for a gap in the westbound lanes. The merge lane was constructed in 2016, according to historical aerial photos. It is about 120 feet long, plus a taper, which is not long enough to be considered a full acceleration lane, but it can help facilitate two-stage left-turns onto Bell Road.

Overhead utility lines pass through the study area on a diagonal alignment to the west of the proposed development, constraining the western boundary of the site.

South of Bell Road, development is largely commercial, while north of the proposed site and east of 94th Street, existing development is residential.

3.0 DATA COLLECTION

3.1 Traffic Volume

Lee Engineering arranged for traffic volume data collection at the locations specified above for a four-day period, from Thursday, August 27, through Sunday, August 30, 2020. Traffic volume was collected in 15-minute intervals for the entire period, which allows calculation of weekday and weekend average daily traffic and peak-hour traffic volume on both weekdays and weekends. A summary of the collected traffic volume is shown in Table 1, and complete results are provided in Appendix A.

It should be noted that data collection occurred during a time when the global coronavirus pandemic has impacted some events and businesses. While some studies have shown that traffic reached (or was near) pre-pandemic levels by the end of August, the exact impact of the pandemic on the study-area traffic volume is unknown.

Table 1. Existing Traffic Volume

Route	Location	Direction	ADT	AM PkHr	AM PkVol	PM PkHr	PM PkVol
N 94TH ST	Btwn BELL RD & E PALO BREA BEND	NB	1883	11:15	155	16:30	180
		SB	1924	11:30	160	15:00	156
BELL RD	Btwn N 91ST ST & N 94TH ST	EB	5463	11:45	422	16:45	465
		WB	5612	11:30	467	12:00	455
N 91ST ST	Btwn E TRAILSIDE VIEW & E PALO BREA BEND	NB	952	11:45	81	17:15	82
		SB	990	11:45	78	17:00	82

Traffic volume on Bell Road averaged about 11,000 vehicles per day (vpd) during the four-day data collection period. Volume was notably higher on weekdays, with over 13,000 vpd on Thursday, dropping to about 8,000 vpd on Sunday. The morning peak on Bell Road actually occurred during the midday on each of the four days. A local peak did occur during typical commute time on Thursday, 7:30 to 8:30 a.m., but the volume during this time period was slightly lower than the midday peak that began at 11:30 a.m. that day. Midday peak volume on Saturday was higher than the midday volume on any other data collection day.

Volume on 94th Street averaged about 3,800 vpd, with patterns by day of week very similar to Bell Road. Daily traffic was its highest on Thursday, with about 4,400 vpd, and its lowest on Sunday, with about 2,800 vpd. Unlike Bell Road, however, 94th Street did see a morning peak at a conventional commute time on both Thursday and Friday, but only in the southbound direction. When considering both directions and all four days, the midday peak was higher than the morning peak.

As expected, 91st Street carries the lowest traffic of the three data collection sites: about 1,900 vpd. Daily volume ranged from 1,400 vpd on Sunday to 2,300 vpd on Thursday.

All the streets in the study area have volume that is appropriate for the cross-section and classification. According to the Maricopa County *Roadway Design Manual*, a four-lane divided urban minor arterial can support a traffic volume of about 31,000 vpd¹, suggesting ample reserve capacity on Bell Road, where weekday average daily traffic reaches about 13,000 vpd. Likewise, an urban minor collector can support a traffic volume of about 9,000 vpd, and an urban major collector can support about 10,000 vpd, both well above the actual volume on either 94th Street (4,400 vpd) or 91st Street (2,300 vpd). It should be noted that the future volume on 91st Street is likely to increase considerably if and when it is connected across Bell Road. This connection may draw traffic away

¹ Maricopa County *Roadway Design Manual*, 2019 Update, Table 2.1: Roadway Planning Level Traffic Volumes, p. 2-3.

from 94th Street, but future development may also generally increase traffic volume in the study area.

Peak-hour traffic volumes at the three data collection sites are shown in Figure 3, and daily traffic volumes at the sites on weekdays (average of Thursday and Friday) and Saturday are shown in Figure 4.

Figure 3: Existing Study-Area Peak-Hour Traffic Volumes



Figure 4: Existing Study-Area Daily Traffic Volumes



3.2 Ice Den Way Video

Video was collected on Thursday, August 27, 2020, showing the intersection of Ice Den Way and Bell Road from 6:00 a.m. to 7:00 p.m. The video was reviewed to understand patterns of traffic movement at the intersection, particularly related to left-turning traffic.

The four-day data collection indicated that the peak hours on Bell Road on August 27 were from 11:30 a.m. to 12:30 p.m. and from 4:45 to 5:45 p.m., and these hours were reviewed in detail on the video.

Initial impressions from the video show that Bell Road has relatively low volume compared with its capacity, and queues on Bell Road were never observed extending near Ice Den Way from the nearby traffic signals. Gaps exist in both directions, and they are artificially increased in size and frequency because of the two traffic signals on either side of Ice Den Way, each less than ¼ mile away.

The video also reveals that left-turn volume both into and out of Ice Den Way is generally low during peak hours. Some queues were observed both entering and exiting, but they tended to

dissipate quickly. Exiting (northbound) queues in the afternoon peak hour were notably longer than those during the midday peak.

Some outbound left-turning vehicles used the merge lane as designed and intended, and some vehicles were observed to wait at the stop bar even when a long gap was available in eastbound traffic, turning only when gaps were sufficient in both directions on Bell Road at the same time. However, the merge lane appears to provide a traffic operational benefit at the intersection. During the afternoon peak hour when exiting volume is highest, the merge lane helps to keep traffic from queueing exclusively at the stop bar. Anecdotally, a higher percentage of vehicles were observed to use the merge lane as designed during the higher-volume afternoon peak hour.

The following additional observations were made from the video:

- Several bike lane users were observed on Bell Road, including both bicyclists and travelers using other modes, such as scooters. A few pedestrians were observed, despite the August heat.
- During the two peak hours, 17 vehicles were observed making westbound U-turns. U-turners accounted for about 35 percent of traffic in the left-turn bay during the midday peak, dropping to less than 10 percent in the afternoon peak. Virtually all U-turning vehicles proceeded eastbound on Bell Road only as far as the next driveway, where no median break exists.
- One vehicle was observed to make an eastbound U-turn, despite the posted NO U-TURN regulatory sign and the complicated routing of this movement due to the presence of the island in the median.
- Two vehicles making northbound left turns did not use the merge lane, but rather turned on the right side of the island as though it were a roundabout. These vehicles did not cause conflicts with other vehicles because the westbound left-turn lane was unoccupied in both cases.

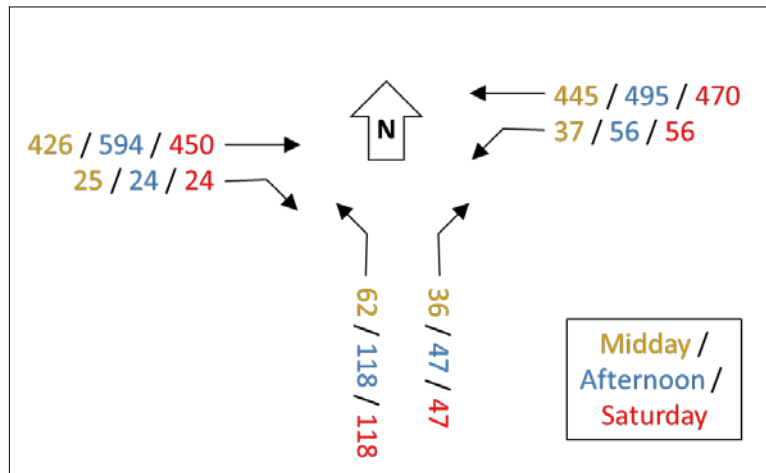
To facilitate traffic operational analysis, turning movement volumes were collected from the video data during the 11:30 a.m. and 4:45 p.m. peak hours. These volumes, along with the volume on Bell Road collected during the same time of the four-day count, provide an indication of existing traffic volume at this intersection. The midday and afternoon peak-hour volumes are shown in Figure 5.

Video was not recorded on Saturday, but because Saturday is critical for evaluating the proposed development, it is assumed that traffic entering and exiting Ice Den Way during the Saturday peak hour is equal to the weekday afternoon peak hour. Saturday peak-hour traffic on Bell Road is taken from the four-day count, which showed a peak hour beginning at 12:00 noon. Estimated Saturday volumes at the intersection are also shown in Figure 5.

4.0 CRASH DATA

Lee Engineering queried ADOT's Traffic Safety DataMart to identify crashes that occurred along the frontage of the site on Bell Road, 94th Street, and 91st Street. Crashes were queried that occurred in the three-year period from 2016 through 2018, the most recent three-year period for which data is available.

Figure 5: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way



As shown in Figure 6, a total of 22 crashes were identified in the vicinity of the proposed development, an average of about 7 crashes per year. All 22 crashes occurred along the Bell Road corridor, with 15 of the crashes (68 percent) at the 94th Street intersection. Only 2 crashes (9 percent) occurred at the Bell Road/91st Street intersection, and the remaining 5 crashes (23 percent) occurred between these two traffic signals. Notably, no crashes occurred at or within 250 feet of the Ice Den Way intersection.

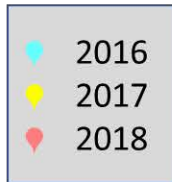
The crashes were distributed by year relatively uniformly. Eight crashes took place in both 2016 and 2018, and six crashes occurred in 2017. No crashes involved fatalities, and 8 of the 22 crashes (36 percent) involved at least one injury. The remaining 14 crashes (64 percent) involved property damage only. No crashes involved non-motorists.

Crashes in the study area overwhelmingly occurred during daylight hours. Only two crashes (9 percent) occurred after dark. Five crashes (23 percent) occurred between 6:00 and 10:00 a.m., the conventional morning peak period, and seven crashes (32 percent) occurred between 3:00 and 7:00 p.m. The remaining eight crashes (36 percent) occurred in the midday period between 10:00 a.m. and 3:00 p.m.

Three crashes occurred on Bell Road between Ice Den Way and 94th Street. Among these three crashes, one was a same-direction sideswipe, one was a single-vehicle run-off road crash, and one was coded as a left-turn crash, although the location where the crash is coded does not have any opportunity for left turns to be made.

Other than the crashes at the 94th Street and Bell Road intersection, no particular crash pattern was observed along the frontage of the proposed site. A more detailed summary of crashes can be found in Appendix B.

Figure 6: Study Area Crashes



5.0 PROPOSED DEVELOPMENT

5.1 Development Description

The proposed development is expected to consist of six rectangular multi-use athletic fields along with a restroom and office building near the center of the site and a maintenance building near the north site boundary.

Two parking lots are proposed. The larger of the two lots is proposed to consist of 530 parking spaces and is west of the athletic fields. It will have two access points: the main access point will add the fourth (north) leg to the intersection of Ice Den Way and Bell Road. This access point is proposed to be unsignalized, and it would require removal of the existing merge lane for northbound left turns to make room for an eastbound left-turn lane to enter the site. The second access point, also unsignalized, is near the cul-de-sac at the south end of 91st Street north of Bell Road.

The smaller of the two parking lots, with 85 parking spaces, is located east of the athletic fields. The access will be exclusively from 94th Street, with two access points about 450 feet apart. While the site is fully accessible on foot, no vehicular access will be provided to connect the two parking lots.

The large parking lot will provide new vehicular connectivity between 91st Street north of Bell Road and the Bell Road/Ice Den Way intersection. It is possible that this new connectivity may be on the shortest path for some existing or future vehicular trips that are unrelated to the soccer complex. The large parking lot is proposed to include traffic calming devices intended to discourage such “cut-through” traffic and to reduce vehicle speed and improve safety. The lot is also proposed to be gated during hours when the fields are not in operation. Because of these proposed measures, the amount of cut-through traffic is expected to be negligible and is not quantified as part of this study.

5.2 Projected Traffic

5.2.1 Trip Generation

The first step in estimating traffic to and from the proposed development is to calculate trip generation, which is the total vehicle trips to and from the site over a given time period. The Institute of Transportation Engineers *Trip Generation Manual*, 10th Edition, has been used to estimate site traffic. Based on the site plan provided, the ITE land use code (LUC) that best represents the site is LUC #488, Soccer Complex.

Trip Generation includes limited information about LUC #488 because of a small sample size of similar developments. The small sample size tends to limit confidence in the trip generation estimate. The City of Scottsdale Parks Department was contacted to determine if local information is available about trip generation for soccer field sites elsewhere in the city. However, Parks Department staff does not have information about local trip generation.

Trip Generation does include information for both weekday morning and afternoon peak hours both for the generator and for the adjacent street traffic. For both morning and afternoon periods, the peak hour of the generator was used. In both cases, the value is slightly higher than the peak of the adjacent street traffic, and it is recognized that the morning peak hour occurs at a non-traditional

time, which suggests that the peak hour of the generator may be a better representation of overall conditions.

Only one time period (Saturday peak hour) includes a fitted curve, but the average trip rate was used for all time periods evaluated. The difference between the fitted curve and the average rate for the Saturday peak hour is small, and the average rate shows a slightly higher (more conservative) number of trips.

Table 2 presents the trip generation data for the site. In total, the site is expected to generate about 430 trips on a typical weekday, with about 100 of those trips in the afternoon peak hour. Traffic is expected to be much higher on weekends than on weekdays. Expected daily traffic is more than 5 times greater on Saturday than on a weekday, and Saturday’s peak hour traffic is more than double the weekday afternoon peak hour. ITE does not provide a daily traffic estimate for Sunday, but Sunday peak hour traffic is expected to be about 70 percent greater than the weekday afternoon peak hour.

No trip reduction factors were applied to the ITE trip forecast, so all trips generated by the site are considered to be new trips added to the adjacent roadway network.

Table 2. Site Trip Generation

94th St & Bell Rd. Multi-Use Fields												
Land Use: (488) Soccer Complex												
# of Fields	Weekday Daily		Weekday AM Peak		Weekday PM Peak		Saturday Daily		Saturday Peak Hour		Sunday Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
6												
Dir. Dist.	50%	50%	53%	47%	47%	53%	50%	50%	48%	52%	46%	54%
ITE Trip Rate	71.33		1.77		16.9		404.88		40.1		28.78	
Trips	214	214	6	5	48	54	1215	1215	115	125	79	93
	428		11		101		2429		241		173	

5.2.2 Trip Distribution and Assignment

The site-generated trips have been distributed onto the adjacent roadway network based in part on existing traffic volume collected as a result of this study and in part on engineering judgment, considering traffic patterns in the nearby and broader area. The distribution percentages assumed for this study are presented in Table 3.

Of the traffic destined to and from the north on 91st Street, about half is expected to use Trailside View and Pima Road to SR 101 to and from the west. The other half is expected to use Legacy Boulevard or Trailside View to Pima Road to and from the north.

Traffic destined to and from the north on 91st Street is assumed to park in the large parking lot and use the north (91st Street) point of access to the lot. Traffic arriving via Bell Road in either direction is assumed to park in the large parking lot and use the south (Bell Road) access. Traffic destined to and from the north on 94th Street is assumed to park in the small lot, with access directly from 94th Street. The small lot, with a capacity of 85 spaces, is sufficient to support parking for the small percentage of traffic assumed to arrive at the site from 94th Street.

Table 3. Site Trip Distribution

To/from west on Bell Road (including access to SR 101 interchange at Bell Road):	80%
To/from east on Bell Road	5%
To/from north on 94th Street	5%
To/from north on 91st Street (including access to SR 101 interchange via Pima Road):	10%

Based on the trip generation values and distribution percentages above, the hourly site-generated traffic volumes in the study area are expected to be as shown in Figure 7. Hourly site-generated volumes at the Bell Road/Ice Den Way intersection are presented in Figure 8. Daily site-generated volumes in the study area are presented in Figure 9.

Figure 7: Study Area Site-Generated Peak Hour Traffic Volumes



Figure 8: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way

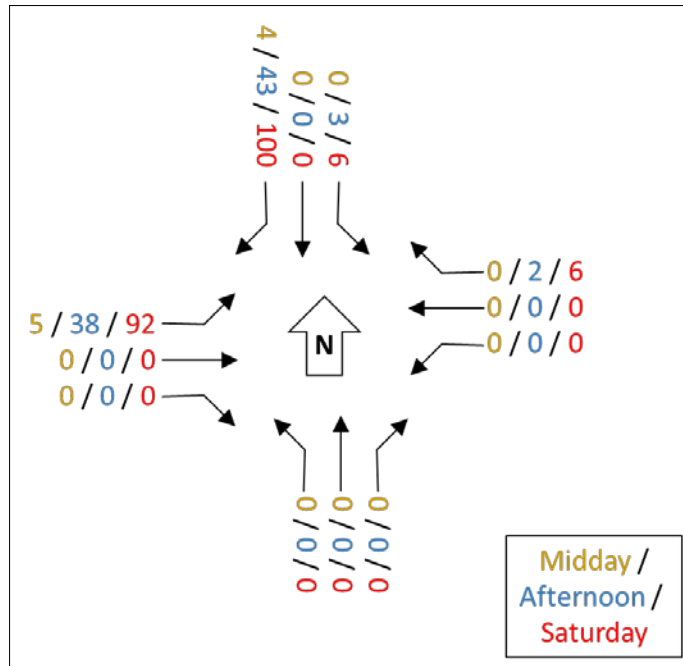


Figure 9: Study Area Site-Generated Daily Traffic Volumes



Total traffic volume, including existing plus predicted site traffic, are shown in the next series of figures. However, daily volumes in these figures are limited to the three locations where four-day data collection was conducted as part of this study. Hourly volumes are available at these three locations plus the Ice Den Way intersection, subject to the assumptions discussed earlier. Figure 10 presents expected total hourly traffic volumes in the study area, and Figure 11 presents hourly volumes at the Ice Den Way intersection. Figure 12 presents expected total daily traffic volume in the study area.

Figure 10: Total Future Study Area Peak Hour Traffic Volumes



Figure 11: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way

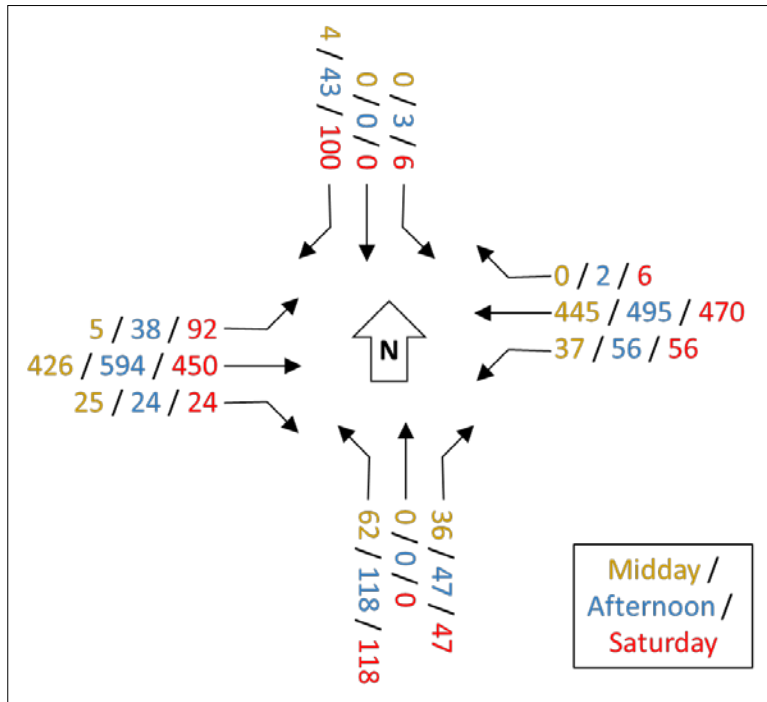


Figure 12: Total Future Study Area Daily Traffic Volumes



5.3 Traffic Operations

5.3.1 Bell Road/Ice Den Way

The traffic operational characteristics of the intersection of Bell Road and Ice Den Way were evaluated using Synchro software, version 10, which implements the methodologies of the *Highway Capacity Manual* (HCM), 6th edition. The analysis is based on the volumes presented above, along with existing and proposed lane configuration data.

To provide an indication of intersection performance, intersections are typically reported in terms of Levels of Service (LOS). Unsignalized two-way-stop-controlled (TWSC) intersection analysis is based on the minor street approach or critical movement, whichever is applicable. The capacity criteria for unsignalized intersection analysis are presented in Table 4.

Table 4. Level of Service Criteria for Unsignalized Intersections

Level of Service (LOS)	Average Control Delay (seconds)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operation. The HCM offers the following in Chapter 19:

“For a typical major street with two lanes in each direction and an average traffic volume in the range of 15,000 to 20,000 vehicles/day (roughly equivalent to a peak hour flow rate of 1,500 to 2,000 vehicles/hour), the delay equation will predict greater than 50s of delay (LOS F) for many urban two-way-stop-controlled (TWSC) intersections that allow minor-street left-turn movements. LOS F will be predicted regardless of the volume of minor-street left-turning traffic. Even with a LOS F estimate, most low-volume minor-street approaches would not meet any of the volume or delay warrants for signalization noted in the *Manual on Uniform Traffic Control Devices*. As a result, analysts who use the HCM LOS thresholds as the sole measure to determine the design accuracy of TWSC intersections should do so with caution. In evaluating the overall performance of TWSC intersections, it is important to consider measures of effectiveness such as volume-to-capacity ratios for individual movements, average queue lengths, and 95th percentile queue lengths in addition to considering delay. By focusing on a single measure of effectiveness for the worst movement only, such as delay for the minor-street left-turn, users may make less effective traffic control decisions.”

Considering the above guidance, for the purposes of this study, TWSC movements operating at LOS E or F with v/c ratios under 0.80 and acceptable queue lengths will be considered as operating at an acceptable level when the side street traffic volumes do not warrant a traffic signal.

The intersection was evaluated for both existing conditions, as a 3-leg intersection, and future conditions, as a 4-leg intersection with the north leg accessing the site. Traffic volume on Bell Road was assumed to be constant between the two scenarios. It is possible that traffic volume may increase on Bell Road in the future, but any increase is expected to be small in percentage terms in the relatively short time prior to construction of the subject site. Likewise, no changes were assumed in traffic turning to and from Ice Den Way.

Table 5 shows a summary of the traffic operational results of the two scenarios, and complete results can be found in Appendix C. Note that as a TWSC-controlled intersection, delay and level of service values are only provided for the stop-controlled movements, not the mainline movements, which are free-flow.

Table 5. Level of Service and Delay (seconds) at Bell Road and Ice Den Way

Movement	Existing			With Site		
	Weekday		Sat	Weekday		Sat
	Midday	PM		Midday	PM	
NBL	B (11)	B (13)	B (12)	B (11)	B (14)	C (16)
NBR	A (9)	A (9)	A (9)	A (9)	A (9)	A (9)
SBL	Not applicable			B (11)	B (11)	B (12)
SBR				A (9)	A (9)	A (10)

Table 5 shows that all movements appear to operate with low delay, LOS C conditions or better, in both existing and future scenarios during all three time periods evaluated. Attainment of this LOS and delay result relies on accounting for the gaps created by the adjacent traffic signals at 91st and 94th Street, a methodology permitted by the 6th edition of the HCM. Operational parameters at the intersection, including queue length and v/c ratio, are reasonable in all scenarios evaluated.

The volume of traffic at the intersection, including conflicting through and left-turn movements, is relatively high, particularly noting nearly 100 westbound left turns and over 100 northbound left turns during the peak hour on Saturday. The use of recreational fields can cause sharp traffic peaking patterns, in which traffic may arrive at an intersection in a crush rather than uniformly distributed throughout the peak hour. During these crush times, it is likely that delays may be greater than predicted by the Synchro analysis.

When delays are excessive, motorists may consider one of a few actions:

- Motorists may avoid making left turns, particularly outbound lefts. They may reroute to a right turn followed by a U-turn, or some other alternative route.
- Motorists may choose to use the 91st Street access point to the parking lot.
- Motorists may choose to use the 94th Street parking lot.
- Motorists may change their time or mode of travel.

It is not recommended that mitigation measures to address this potential conflict be incorporated into the project, noting the lack of confidence in the trip generation forecast and the potential for motorists to consider alternative actions if delays increase. Rather, the city may wish to monitor operations at the intersection after opening to confirm the operational characteristics.

5.3.2 94th Street

The predicted site volumes entering and exiting the 94th Street site parking lot are very low, reaching only as high as 6 vehicles per hour (vph) on Saturday, distributed between the two site access points. The small 85-space capacity of the parking lot also limits the traffic volume that will access the lot via 94th Street. Low site volumes and modest existing traffic on 94th Street suggest that the site access points will operate without excessive delay to traffic exiting the parking lot.

The city asked that this study consider whether the 94th Street parking lot should be configured with one-way operation to concentrate exiting and entering traffic at different points rather than introduce these conflicting movements at two points. A one-way configuration would likely operate satisfactorily, but two-way traffic is recommended. The low traffic volume, modest parking lot capacity, and adequate 450-foot separation between the two driveways suggest that conflicts will be manageable with a two-way configuration. One-way operation would introduce the following disadvantages:

- It is often difficult to enforce one-way operation in low-volume conditions. Drivers tend to take the shortest path to their destination even when the path conflicts with signs and pavement markings indicating a one-way route. Unenforced one-way operation can result in head-on conflicts.
- Additional signing and pavement marking would be required, introducing both capital and ongoing maintenance expense to ensure the traffic control devices remain highly visible.
- Drivers are most likely to comply with one-way parking aisles when angled parking, rather than perpendicular parking, is used. However, angled parking stalls would strongly discourage users from backing in to parking spaces, which is likely to be preferred by many users to load and unload athletic equipment from the rear of vehicles.

5.3.3 91st Street

The 91st Street access point is expected to operate with no conflicts, considering that 91st Street will end at the site access point immediately after opening.

Site traffic entering and exiting via 91st Street also will traverse additional nearby intersections. Traffic volumes were not collected at these intersections, so it is not possible to conduct detailed traffic operational analyses. However, the following qualitative observations are provided about each of the intersections with a potential to accommodate site traffic:

- *Trailside View and 91st Street.* This intersection is two-way stop controlled, with dedicated turn lanes for traffic destined to and from the site (northbound left and eastbound right). Anticipated site traffic volumes at the intersection are low, suggesting that it is not likely to require any site-related mitigation measures. However, the intersection may be a candidate for a roundabout or a mini-roundabout as traffic volumes increase.
- *Trailside View and Pima Road.* Pima Road is a 6-lane arterial that carries high volume, providing access to SR 101. Trailside View intersects Pima Road at a minor-street stop-controlled intersection, with dedicated left- and right-turn lanes on westbound Trailside View. According to the City of Scottsdale, a traffic signal has been requested at this intersection. The amount of traffic predicted to use the intersection is very low during peak hours, reaching no more than 6 vph, so it is unlikely that the site would cause the intersection to meet a traffic signal warrant. However, it is unknown whether the intersection already meets traffic signal warrants or if a traffic signal would be beneficial to overall operations. (The city did not request that this study include a traffic signal warrant study at the intersection.) The configuration of the intersection and the width of Pima Road suggest that a traffic signal is the most logical mitigation measure if delay is excessive under minor-street stop control.

- *91st Street and Legacy Boulevard.* This intersection is signalized, with double northbound left-turn lanes and ample capacity on Legacy Boulevard. The traffic signal control allows the intersection to respond to changes in traffic patterns, and it is not expected to experience major changes in operational performance due to the low volume of site traffic that may use the intersection.

5.4 Turn Lanes

This section evaluates the necessity and appropriateness of turn lanes for each approach at each site access point.

5.4.1 Bell Road/Ice Den Way Intersection

Eastbound Left-Turn Lane

Scottsdale requires left-turn lanes at all intersections on major collectors and arterials.² An eastbound left-turn lane approaching the site is shown on the site plan, in conformance with this requirement. In all three time periods evaluated, the eastbound left-turn movement has a 95th percentile queue length less than one vehicle length, suggesting that a minimum-length turn bay is acceptable for the site. The site plan shows a full-width left-turn bay about 175 feet long, which is suitable for site conditions.

Westbound Left-Turn Lane

The existing westbound left-turn lane is about 120 feet long, when measured along its full-width portion, plus a taper. The video data collection shows this turn bay to operate effectively at this length. Rarely is more than one car observed queued in the turn bay at the same time, even during peak hours, and vehicles that enter the bay tend to find a gap and turn quickly. The addition of the north leg to the intersection has little impact on the westbound left turn, because these vehicles must yield only to eastbound through traffic, which is not expected to change as a result of site development. The operational analysis results show that the westbound left-turn movement also has a 95th percentile queue less than one vehicle length, and as such, no changes to the westbound left-turn lane are necessary.

Eastbound Right-Turn Lane

The existing eastbound right-turn lane on Bell Road measures about 120 feet plus a short taper, which is acceptable for the modest right-turn volume entering Ice Den Way. The length complies with Scottsdale's minimum 100-foot length requirement for right-turn lanes,³ but it does not comply with the 150-foot "standard storage length." No changes to the existing turn lane are required, as this movement is not impacted by the proposed development.

Westbound Right-Turn Lane

The site plan proposes a right-turn lane with a 150-foot storage length plus a taper, in compliance with the city's "standard" length noted earlier. This design is sufficient to accommodate the volume of traffic making the movement.

² Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E2, p. 21.

³ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E1, p. 21.

5.4.2 94th Street

Northbound left turns into the small parking lot on 94th Street can be accommodated in the existing two-way left-turn lane.

The City of Scottsdale does not require right-turn lanes by policy on 94th Street since it is a minor collector street. Southbound right-turn lanes on collector streets are required when the following criteria are met:

- At least 5,000 vehicles per day are expected to use the street
- The 85th percentile speed on the street is at least 35 mph; or 45 mph for a two-lane (one lane each direction) roadway
- At least 30 vehicles will make right turns into the driveway during a one-hour period⁴

Traffic volume on 94th Street is somewhat less than the 5,000 vpd threshold, with average weekday volume collected at 4,400 vpd. Nevertheless, it is foreseeable that volume on 94th Street will increase above 5,000 vpd in the near term, so it is expected that this criterion will soon be met.

Actual travel speeds on 94th Street were not collected as part of this study. However, considering driver speed choice on other streets, it would not be surprising to find 85th percentile speeds of at least 45 mph on a street like 94th Street with a posted speed limit of 40 mph.

Southbound right-turn traffic volume entering the site from 94th Street is expected to be 5 percent of total traffic entering the site. The highest-volume peak hour (on Saturday) shows trip generation of 115 entering trips per hour, which suggests that about 6 vehicles per hour are likely to enter the small parking lot via a southbound right turn from 94th Street. Since this volume is forecast to be considerably below the 30-vph threshold, a right-turn deceleration lane on 94th Street is not recommended.

5.4.3 91st Street

Upon initial construction, the north site driveway to 91st Street will access the street at its southern terminus, so there will be no conflicting movements that require turn lanes. Additional review of site access should be conducted if 91st Street is extended south to Bell Road in the future.

5.5 Sight Distance

All site access points should be designed to accommodate sight distance recommendations in *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO). A review of the site reveals that the roadways near the proposed access points are generally on horizontal tangent alignments with little vertical profile, suggesting that roadway elements are not likely to constrain sight distance. Existing native desert landscaping may need to be ensure adequate sight distance.

⁴ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.206, p. 34.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study has documented the following conclusions and recommendations:

- The proposed development consists of a set of six rectangular multi-use athletic fields on the northwest corner of Bell Road and 94th Street. A large parking lot, proposed to contain 530 parking spaces, is proposed to have access both from Bell Road and 91st Street west of the athletic fields. A smaller 85-space lot is proposed with two access points on 94th Street on the east side of the fields. The site's Bell Road access point would add a fourth (north) leg to the existing intersection of Ice Den Way, a private driveway.
- Traffic volume data collection shows that Bell Road, 91st Street, and 94th Street in the study area carry more traffic during the midday peak hour than the conventional morning commuter peak hour. Traffic conditions were evaluated for weekday midday and afternoon peak hours in addition to the Saturday peak hour.
- Crash data showed no notable pattern of crashes adjacent to the site. The intersection of 94th Street and Bell Road has experienced about 5 crashes per year, a level that is not unusual considering its traffic volume.
- Site trip generation was forecast using ITE Land Use Code #488 (Soccer Complex). The site is projected to generate the most trips on Saturday, with about 2,400 site vehicles per day and about 240 trips during the peak hour. Weekday trips are forecast at about 430 trips per day and 100 trips during the higher-volume afternoon peak hour. A daily trip forecast is not available for Sunday, but Sunday peak-hour volume is forecast at 170 trips.
- Site trip distribution assumes most trips (80 percent) will arrive and depart to and from the west on Bell Road, considering its ease of access to SR-101. Other routes approaching the site are likely mostly limited to local trips with origins no more than about two miles from the site.
- The traffic operational analysis of the Bell Road/Ice Den Way intersection shows that stop-controlled movements operate at LOS A and B conditions today, and all movements are expected to operate at LOS C or better with the athletic fields in place, overall very good operational performance.
- Two-way traffic flow is recommended in the small (94th Street) parking lot.
- It is unlikely that site-related traffic mitigation measures will be necessary at intersections north of Bell Road, including Trailside View intersections with 91st Street or Pima Road, and 91st Street and Legacy Boulevard, because of low site traffic assignment through these intersections. Traffic volume data was not collected at these intersections at the city's request. However, a traffic signal has been requested at the intersection of Pima Road at Trailside View. It is unknown whether the intersection currently meets any traffic signal warrants or if a traffic signal would improve the intersection's operations, but a traffic signal

is a logical mitigation measure for this intersection if delays become unacceptably high under minor-street stop control.

- An eastbound left-turn lane and a westbound right-turn lane are required approaching the site driveway on Bell Road. No changes to existing turn bays would be required. No turn bays are required at the 91st Street or 94th Street access points; the existing TWLTL on 94th Street can be used for northbound left-turn access.

APPENDIX A: TRAFFIC VOLUME DATA

File Number: 2002056
 Route: N 94TH ST
 Location: Btwn BELL RD & E PALO BREA BEND

Direction: NB
 Latitude: 33.6433
 Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	30	1	36	2	56	1	42			1	41
00:15	0	37	1	37	2	32	1	31			1	34
00:30	0	37	2	50	0	44	2	30			1	40
00:45	1	36	0	39	2	38	2	30			1	36
01:00	1	37	1	37	1	35	4	23			2	33
01:15	1	34	0	47	1	31	2	24			1	34
01:30	0	31	1	39	1	44	1	37			1	38
01:45	0	38	0	32	1	35	0	30			0	34
02:00	1	33	1	40	0	53	1	35			1	40
02:15	0	36	1	50	1	32	1	29			1	37
02:30	0	34	0	33	1	36	0	25			0	32
02:45	0	41	0	47	0	31	2	22			1	35
03:00	0	50	1	45	0	34	0	27			0	39
03:15	1	54	0	54	0	35	0	42			0	46
03:30	2	48	0	40	0	38	0	25			1	38
03:45	1	36	0	53	0	22	0	26			0	34
04:00	0	45	0	38	0	20	0	27			0	33
04:15	1	51	1	62	1	36	0	29			1	45
04:30	1	58	3	60	0	33	1	27			1	45
04:45	1	66	0	47	0	41	1	22			1	44
05:00	5	65	2	49	0	42	0	26			2	46
05:15	5	61	4	61	4	30	2	34			4	47
05:30	5	72	6	49	7	31	1	25			5	44
05:45	5	51	6	47	4	40	2	39			4	44
06:00	19	48	10	52	5	24	1	20			9	36
06:15	13	35	12	41	7	34	7	24			10	34
06:30	25	49	18	36	6	26	7	28			14	35
06:45	23	41	8	42	13	24	6	22			13	32
07:00	17	33	23	20	15	32	5	18			15	26
07:15	25	36	19	21	19	20	9	18			18	24
07:30	22	29	24	23	20	15	14	14			20	20
07:45	23	35	14	21	19	30	10	12			17	25
08:00	33	20	25	23	21	13	9	17			22	18
08:15	28	13	30	15	15	24	11	12			21	16
08:30	18	18	18	22	21	18	10	11			17	17
08:45	21	11	35	16	22	13	21	10			25	13
09:00	22	11	24	16	27	12	15	8			22	12
09:15	23	10	22	13	31	1	19	5			24	7
09:30	21	8	24	9	17	10	29	6			23	8
09:45	19	8	30	10	27	13	34	3			28	9
10:00	22	4	22	10	31	10	26	3			25	7
10:15	22	4	27	11	36	8	23	1			27	6
10:30	27	10	33	7	26	7	25	2			28	7
10:45	31	2	34	5	38	6	33	1			34	4
11:00	23	1	26	8	44	4	26	3			30	4
11:15	49	1	37	5	46	10	17	1			37	4
11:30	32	0	46	1	51	6	33	0			41	2
11:45	38	1	33	3	40	1	34	0			36	1
Totals	627	1509	625	1522	625	1230	448	946	0	0	581	1302
Day Total	2136		2147		1855		1394		0		1883	
AM Pct	29.4%		29.1%		33.7%		32.1%				30.9%	
Peak Hour	11:15	16:45	11:45	16:15	11:15	12:00	11:30	12:00			11:15	16:30
Peak Volume	149	264	156	218	193	170	140	133			155	181

File Number: 2002057
 Route: N 94TH ST
 Location: Btwn BELL RD & E PALO BREA BEND

Direction: SB
 Latitude: 33.6433
 Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020		Average			
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
00:00	1	32	0	54	1	30	1	39	1	39		
00:15	1	41	0	34	5	51	4	30	3	39		
00:30	1	41	0	30	1	34	4	25	2	33		
00:45	0	37	0	35	1	43	2	35	1	38		
01:00	0	27	0	41	0	39	1	31	0	35		
01:15	0	34	0	31	0	48	0	22	0	34		
01:30	0	30	0	35	1	30	0	33	0	32		
01:45	0	47	0	43	0	28	0	38	0	39		
02:00	0	37	1	37	1	45	0	27	1	37		
02:15	0	53	0	49	0	34	3	25	1	40		
02:30	0	43	0	49	0	37	0	31	0	40		
02:45	2	36	1	48	0	29	0	22	1	34		
03:00	0	52	0	53	0	37	0	22	0	41		
03:15	2	54	0	57	0	29	0	21	1	40		
03:30	0	49	0	49	1	32	0	23	0	38		
03:45	2	44	1	53	1	29	0	21	1	37		
04:00	1	49	1	51	0	22	1	25	1	37		
04:15	3	54	2	60	0	29	1	28	2	43		
04:30	4	40	2	47	1	33	1	33	2	38		
04:45	9	45	3	48	0	38	1	21	3	38		
05:00	15	50	6	43	3	24	2	21	7	35		
05:15	15	40	11	44	1	21	0	27	7	33		
05:30	14	52	7	47	7	36	1	26	7	40		
05:45	12	62	9	32	10	27	8	25	10	37		
06:00	15	29	10	32	3	35	8	22	9	30		
06:15	11	40	14	23	8	23	4	23	9	27		
06:30	21	18	12	19	11	23	8	16	13	19		
06:45	21	42	22	25	18	28	7	10	17	26		
07:00	37	22	22	24	21	18	13	13	23	19		
07:15	35	21	40	14	11	9	11	16	24	15		
07:30	50	15	40	22	18	19	10	11	30	17		
07:45	41	10	35	17	29	17	20	4	31	12		
08:00	40	18	41	12	22	16	12	10	29	14		
08:15	40	17	43	15	19	13	15	9	29	14		
08:30	36	8	42	9	24	5	19	9	30	8		
08:45	42	10	59	14	38	9	26	9	41	11		
09:00	38	7	34	7	33	7	16	9	30	8		
09:15	36	5	29	5	34	7	29	6	32	6		
09:30	42	1	37	8	32	10	21	3	33	6		
09:45	46	4	53	10	45	7	29	1	43	6		
10:00	37	4	28	8	41	4	29	0	34	4		
10:15	37	1	49	2	42	4	38	3	42	3		
10:30	27	7	35	6	30	6	28	1	30	5		
10:45	40	4	37	4	54	6	39	1	43	4		
11:00	27	1	30	2	45	3	33	0	34	2		
11:15	39	3	34	3	41	8	28	1	36	4		
11:30	37	0	33	2	38	6	37	0	36	2		
11:45	53	0	34	4	62	1	34	0	46	1		
Totals	930	1336	857	1357	753	1089	544	828	0	0	771	1153
Day Total	2266		2214		1842		1372		0		1924	
AM Pct	41.0%		38.7%		40.9%		39.7%				40.1%	
Peak Hour	7:30	17:00	8:00	15:30	11:00	12:15	11:30	12:00			11:30	15:00
Peak Volume	171	204	185	213	186	167	140	129			160	156

File Number: 2002058
 Route: BELL RD
 Location: Btwn N 91ST ST & N 94TH ST

Direction: EB
 Latitude: 33.6401
 Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020		Average			
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
00:00	2	97	4	99	12	133	7	87	6	104		
00:15	2	102	2	117	7	125	4	73	4	104		
00:30	1	88	5	117	4	106	7	104	4	104		
00:45	1	108	3	116	5	104	6	71	4	100		
01:00	3	101	0	119	8	86	5	83	4	97		
01:15	5	113	0	122	4	105	5	86	4	107		
01:30	0	84	3	103	3	101	3	76	2	91		
01:45	0	122	0	120	3	101	3	80	2	106		
02:00	2	99	0	108	1	106	2	82	1	99		
02:15	0	108	1	113	1	61	2	71	1	88		
02:30	1	102	1	98	5	84	2	76	2	90		
02:45	3	114	1	128	1	91	3	93	2	107		
03:00	3	103	2	126	1	88	0	94	2	103		
03:15	3	131	0	108	3	89	1	64	2	98		
03:30	5	123	1	120	0	104	0	80	2	107		
03:45	4	132	4	128	0	79	2	54	3	98		
04:00	4	130	5	129	1	81	1	93	3	108		
04:15	3	129	1	145	2	98	1	106	2	120		
04:30	8	156	7	132	3	85	2	79	5	113		
04:45	16	147	11	137	4	88	3	90	9	116		
05:00	27	146	17	153	9	93	3	72	14	116		
05:15	46	133	31	134	15	93	14	80	27	110		
05:30	28	192	31	134	25	97	18	70	26	123		
05:45	51	120	42	127	24	79	17	61	34	97		
06:00	43	122	49	137	22	85	12	71	32	104		
06:15	46	102	43	107	17	93	15	64	30	92		
06:30	62	110	59	101	28	75	22	72	43	90		
06:45	89	99	84	88	25	86	21	55	55	82		
07:00	91	101	93	74	35	74	19	39	60	72		
07:15	93	71	104	78	41	59	25	44	66	63		
07:30	99	77	74	73	52	54	38	50	66	64		
07:45	103	70	92	51	63	49	33	33	73	51		
08:00	114	53	112	71	60	61	44	37	83	56		
08:15	111	41	104	44	73	37	45	30	83	38		
08:30	91	37	98	39	62	33	38	17	72	32		
08:45	114	31	116	28	75	27	51	18	89	26		
09:00	99	33	110	28	64	29	53	29	82	30		
09:15	89	19	99	25	70	20	52	21	78	21		
09:30	100	20	80	19	86	30	60	15	82	21		
09:45	118	10	100	33	98	28	56	14	93	21		
10:00	93	11	84	24	107	21	68	16	88	18		
10:15	95	9	83	23	89	24	76	9	86	16		
10:30	78	12	92	25	80	16	69	11	80	16		
10:45	100	4	107	17	92	14	98	6	99	10		
11:00	109	9	108	10	118	13	67	9	101	10		
11:15	104	5	96	11	120	14	86	4	102	9		
11:30	127	2	112	10	87	6	76	3	101	5		
11:45	114	3	119	6	105	9	101	5	110	6		
Totals	2500	3931	2390	4055	1810	3234	1336	2597	0	0	2009	3454
Day Total	6431		6445		5044		3933		0		5463	
AM Pct	38.9%		37.1%		35.9%		34.0%				36.8%	
Peak Hour	11:00	16:45	11:45	16:15	11:45	12:00	11:45	16:00			11:45	16:45
Peak Volume	454	618	452	567	469	468	365	368			422	465

File Number: 2002059
Route: BELL RD
Location: Btwn N 91ST ST & N 94TH ST

Direction: WB
Latitude: 33.6401
Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	2	125	3	101	7	122	12	111			6	115
00:15	2	130	3	107	1	130	5	95			3	116
00:30	3	117	1	95	2	123	6	98			3	108
00:45	0	128	4	104	0	137	7	98			3	117
01:00	0	122	3	90	0	113	1	116			1	110
01:15	0	127	3	93	2	119	2	105			2	111
01:30	0	111	0	99	5	122	0	92			1	106
01:45	0	113	1	97	3	120	2	98			2	107
02:00	5	114	0	92	1	126	1	115			2	112
02:15	2	119	0	93	2	104	6	72			3	97
02:30	0	125	0	124	3	98	1	88			1	109
02:45	1	119	4	135	3	96	0	89			2	110
03:00	0	138	0	108	0	113	2	90			1	112
03:15	1	137	6	140	0	84	5	97			3	115
03:30	4	134	0	124	5	125	2	64			3	112
03:45	4	154	6	137	1	103	1	71			3	116
04:00	4	138	3	120	2	98	0	65			2	105
04:15	5	126	12	155	0	106	0	70			4	114
04:30	8	135	10	127	0	78	3	75			5	104
04:45	8	140	4	91	5	124	4	61			5	104
05:00	19	156	19	138	9	81	3	60			13	109
05:15	14	130	9	165	5	87	6	67			9	112
05:30	31	125	30	59	22	76	10	72			23	83
05:45	28	139	25	75	16	89	12	49			20	88
06:00	35	127	15	179	19	103	20	62			22	118
06:15	46	107	36	91	21	93	15	57			30	87
06:30	60	86	32	31	25	70	12	59			32	62
06:45	78	107	70	16	43	70	19	36			53	57
07:00	92	77	43	12	41	73	22	41			50	51
07:15	94	116	55	77	38	59	34	41			55	73
07:30	123	71	88	114	68	96	41	42			80	81
07:45	118	68	69	39	74	51	48	23			77	45
08:00	121	57	84	29	52	36	38	30			74	38
08:15	98	73	63	27	83	45	63	26			77	43
08:30	136	33	71	45	85	40	57	19			87	34
08:45	123	45	79	69	87	31	62	29			88	44
09:00	96	41	68	35	92	36	51	26			77	35
09:15	103	41	74	19	100	25	75	18			88	26
09:30	104	24	74	14	102	37	114	23			99	25
09:45	114	20	94	16	124	51	81	15			103	26
10:00	113	27	88	0	116	40	106	11			106	20
10:15	95	17	114	12	109	18	109	15			107	16
10:30	122	15	81	6	106	22	99	12			102	14
10:45	139	20	95	10	119	22	115	3			117	14
11:00	100	9	86	0	120	12	109	0			104	5
11:15	109	11	86	9	142	26	105	3			111	12
11:30	134	1	88	7	143	7	101	1			117	4
11:45	124	0	110	3	124	14	122	2			120	5
Totals	2618	4295	1909	3529	2127	3651	1709	2612	0	0	2091	3522
Day Total	6913		5438		5778		4321		0		5613	
AM Pct	37.9%		35.1%		36.8%		39.6%				37.3%	
Peak Hour	11:30	15:00	11:45	15:45	11:15	12:00	11:15	12:30			11:30	12:00
Peak Volume	513	563	413	539	531	512	439	417			467	455

File Number: 2002060
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: NB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	1	29	1	27	0	21			1	24
00:15	0	22	0	15	0	10	0	31			0	20
00:30	0	19	0	21	2	21	2	16			1	19
00:45	0	12	0	20	0	17	1	10			0	15
01:00	1	15	0	25	0	16	1	21			1	19
01:15	0	18	1	19	4	28	0	14			1	20
01:30	0	15	0	14	0	27	0	10			0	17
01:45	0	20	0	29	1	9	1	9			1	17
02:00	0	16	1	18	0	8	2	14			1	14
02:15	0	15	0	30	3	25	0	20			1	23
02:30	0	20	0	27	0	37	0	12			0	24
02:45	1	12	2	11	1	13	1	8			1	11
03:00	1	24	1	22	1	10	0	12			1	17
03:15	1	28	0	15	2	12	0	11			1	17
03:30	3	24	0	28	1	9	0	6			1	17
03:45	0	16	1	26	0	6	1	9			1	14
04:00	0	26	0	31	0	11	0	14			0	21
04:15	0	28	7	31	1	7	0	14			2	20
04:30	1	19	3	34	0	14	0	18			1	21
04:45	5	34	1	22	0	15	0	8			2	20
05:00	5	24	2	17	0	8	2	8			2	14
05:15	4	27	4	20	6	18	1	11			4	19
05:30	5	43	6	21	3	15	2	12			4	23
05:45	4	27	9	21	3	11	1	13			4	18
06:00	17	28	8	23	5	17	5	20			9	22
06:15	15	14	9	12	7	9	5	12			9	12
06:30	8	18	15	19	5	7	12	17			10	15
06:45	11	24	9	19	7	13	9	7			9	16
07:00	18	13	11	11	7	19	2	8			10	13
07:15	15	15	18	13	7	9	4	4			11	10
07:30	15	7	18	14	9	3	2	9			11	8
07:45	19	7	12	12	11	8	8	3			13	8
08:00	17	13	17	8	6	1	10	7			13	7
08:15	20	32	19	13	13	7	5	8			14	15
08:30	15	4	12	7	8	2	1	3			9	4
08:45	18	4	9	10	9	0	7	5			11	5
09:00	19	5	15	4	21	7	7	3			16	5
09:15	10	2	9	6	10	3	7	1			9	3
09:30	17	3	12	3	21	5	17	1			17	3
09:45	22	1	17	1	14	2	13	3			17	2
10:00	16	1	16	2	23	4	10	0			16	2
10:15	14	0	12	3	14	2	13	2			13	2
10:30	16	5	15	4	12	1	17	1			15	3
10:45	16	1	26	5	21	6	19	1			21	3
11:00	24	1	11	2	21	5	18	2			19	3
11:15	18	2	12	4	20	2	13	0			16	2
11:30	17	1	18	1	12	1	15	1			16	1
11:45	16	1	29	2	12	3	19	0			19	2
Totals	424	723	388	744	324	510	253	440	0	0	347	604
Day Total	1147		1132		834		693		0		952	
AM Pct	37.0%		34.3%		38.8%		36.5%				36.5%	
Peak Hour	10:45	16:45	11:45	15:45	10:30	12:45	11:45	12:00			11:45	17:15
Peak Volume	75	128	94	122	74	88	87	78			81	82

File Number: 2002061
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: SB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	0	23	2	18	1	23			1	20
00:15	2	15	0	16	2	21	3	14			2	17
00:30	0	19	0	18	2	26	5	20			2	21
00:45	0	10	2	15	0	26	0	24			1	19
01:00	0	16	0	13	1	20	1	12			1	15
01:15	0	16	0	17	1	24	0	9			0	17
01:30	0	19	0	20	0	12	0	8			0	15
01:45	0	27	1	24	4	16	1	13			2	20
02:00	0	13	1	9	2	8	1	32			1	16
02:15	0	20	0	17	2	19	0	5			1	15
02:30	0	17	2	23	0	15	0	5			1	15
02:45	0	18	0	21	1	8	1	9			1	14
03:00	3	26	1	27	0	12	3	18			2	21
03:15	3	37	4	26	2	8	0	14			2	21
03:30	4	24	0	15	0	9	1	9			1	14
03:45	0	20	1	20	0	14	1	13			1	17
04:00	4	13	6	30	1	8	1	15			3	17
04:15	2	28	2	18	0	11	0	14			1	18
04:30	2	24	1	20	0	11	0	10			1	16
04:45	6	19	8	13	0	19	0	14			4	16
05:00	8	23	4	13	1	14	3	11			4	15
05:15	14	28	13	18	0	17	2	12			7	19
05:30	10	30	5	26	3	16	0	10			5	21
05:45	19	44	16	32	12	20	10	14			14	28
06:00	16	14	16	17	7	13	3	9			11	13
06:15	8	15	10	14	9	12	2	10			7	13
06:30	14	15	16	11	6	13	7	8			11	12
06:45	21	20	23	18	7	9	1	7			13	14
07:00	23	12	14	13	6	7	3	10			12	11
07:15	19	9	24	7	9	10	5	8			14	9
07:30	17	16	23	8	12	6	11	7			16	9
07:45	26	11	34	8	19	8	11	8			23	9
08:00	20	13	20	13	4	8	4	4			12	10
08:15	22	9	23	7	6	10	3	6			14	8
08:30	18	5	17	8	9	3	8	5			13	5
08:45	25	6	27	4	14	10	5	3			18	6
09:00	19	8	16	2	16	7	3	6			14	6
09:15	20	2	14	8	11	4	11	5			14	5
09:30	5	2	19	9	21	4	11	3			14	5
09:45	23	4	20	4	14	3	12	1			17	3
10:00	16	2	16	8	12	3	15	0			15	3
10:15	19	1	14	2	14	4	23	3			18	3
10:30	21	2	21	2	19	5	12	3			18	3
10:45	14	1	19	4	19	3	17	2			17	3
11:00	22	0	17	5	12	2	12	1			16	2
11:15	15	2	28	1	13	3	18	0			19	2
11:30	13	0	16	1	24	4	14	1			17	2
11:45	17	0	19	2	32	1	16	0			21	1
Totals	510	692	533	650	351	524	261	438	0	0	414	576
Day Total	1202		1183		875		699		0		990	
AM Pct	42.4%		45.1%		40.1%		37.3%				41.8%	
Peak Hour	7:45	17:00	7:15	14:30	11:45	12:30	11:45	12:00			11:45	17:00
Peak Volume	86	125	101	97	97	96	73	81			79	82

APPENDIX B: CRASH DATA

IncidentID	IncidentDateTime	CollisionManner	LightCondition	TotalInjuries	TotalFatalities	TotalMotoristsInjuries	InjurySeverity	Onroad	CrossingFeature	Offset	Latitude	Longitude	IntersectionType	JunctionRelation	Weather	Offset Direction
3051751	1/16/2016 10:47	6	1	2	0	2	3	Bell Rd	94th St	-0.076	33.6400962	-111.87975	0	0	1	4
3054871	1/31/2016 15:54	1	1	0	0	0	1	Bell Rd	94th St	-0.095	33.6400963	-111.88008	0	0	2	0
3069271	3/26/2016 18:14	3	1	1	0	1	4	Bell Rd	94th St	-0.1	33.6400962	-111.88017	2	1	1	4
3087902	4/30/2016 16:45	4	1	0	0	0	1	Bell Rd	91st St	0.0379	33.6400921	-111.88428	0	0	2	2
3089519	5/12/2016 15:58	3	1	0	0	0	1	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095209	5/25/2016 13:49	3	1	1	0	1	3	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095227	5/26/2016 8:16	2	1	0	0	0	1	94th St	Bell Rd	0	33.6400951	-111.87844	1	1	1	0
3110396	7/16/2016 11:11	4	1	0	0	0	1	Bell Rd	91st St	-0.017	33.6400916	-111.88523	2	2	1	4
3198943	2/13/2017 11:37	2	1	1	0	1	2	Bell Rd	07 91ST ST C	-0.01	33.6400909	-111.88512	2	2	1	4
3206942	3/16/2017 13:37	3	1	2	0	2	3	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	1	1	0
3218839	4/14/2017 10:25	2	1	0	0	0	1	94th St	07 BELL RD	0	33.6400933	-111.87844	1	2	1	0
3243085	5/30/2017 17:45	2	1	0	0	0	1	Bell Rd	07 94TH ST	-0.028	33.6400938	-111.87893	0	0	1	4
3274865	9/9/2017 23:09	1	4	1	0	1	2	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	2	1	0
3278215	9/18/2017 10:29	1	1	1	0	1	3	Bell Rd	07 94TH ST	-0.002	33.6400934	-111.87847	1	2	1	4
3334984	1/8/2018 15:37	2	1	0	0	3	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3342524	2/2/2018 16:38	1	1	0	0	2	1	07 BELL RD	94th St	14	33.6400984	-111.8784	1	2	1	2
3349455	3/6/2018 6:47	3	1	2	0	2	3	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397725	7/22/2018 12:31	2	1	0	0	2	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397751	7/20/2018 8:22	2	1	0	0	2	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3408960	8/8/2018 19:53	3	4	0	0	3	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	4	0
3424614	9/24/2018 9:29	1	1	0	0	1	1	07 BELL RD	91st St	200	33.6400955	-111.88429	0	0	1	2
3460963	11/20/2018 7:22	4	1	0	0	5	1	07 BELL RD	94th St	-15	33.6400985	-111.8785	1	2	1	4

APPENDIX C: SYNCHRO ANALYSIS RESULTS

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	426	25	37	445	62	36
Future Vol, veh/h	426	25	37	445	62	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	463	27	40	484	67	39

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	490	0	799 245
Stage 1	-	-	-	-	477 -
Stage 2	-	-	-	-	322 -
Critical Hdwy	-	-	4.14	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.22	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	1297	-	*707 *934
Stage 1	-	-	-	-	*811 -
Stage 2	-	-	-	-	*849 -
Platoon blocked, %	-	-	1	-	1 1
Mov Cap-1 Maneuver	-	-	1297	-	*685 *934
Mov Cap-2 Maneuver	-	-	-	-	*685 -
Stage 1	-	-	-	-	*811 -
Stage 2	-	-	-	-	*822 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	685	934	-	-	1297	-
HCM Lane V/C Ratio	0.098	0.042	-	-	0.031	-
HCM Control Delay (s)	10.8	9	-	-	7.9	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	594	24	56	495	118	47
Future Vol, veh/h	594	24	56	495	118	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	646	26	61	538	128	51

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	672	0	1050
Stage 1	-	-	-	-	659
Stage 2	-	-	-	-	391
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1206	-	*642
Stage 1	-	-	-	-	*756
Stage 2	-	-	-	-	*849
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1206	-	*609
Mov Cap-2 Maneuver	-	-	-	-	*609
Stage 1	-	-	-	-	*756
Stage 2	-	-	-	-	*805

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	609	865	-	-	1206	-
HCM Lane V/C Ratio	0.211	0.059	-	-	0.05	-
HCM Control Delay (s)	12.5	9.4	-	-	8.1	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.8	0.2	-	-	0.2	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	450	18	42	470	89	35
Future Vol, veh/h	450	18	42	470	89	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	489	20	46	511	97	38

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	509	0	847 255
Stage 1	-	-	-	-	499 -
Stage 2	-	-	-	-	348 -
Critical Hdwy	-	-	4.14	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.22	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	1346	-	*675 *899
Stage 1	-	-	-	-	*849 -
Stage 2	-	-	-	-	*849 -
Platoon blocked, %	-	-	1	-	1 1
Mov Cap-1 Maneuver	-	-	1346	-	*652 *899
Mov Cap-2 Maneuver	-	-	-	-	*652 -
Stage 1	-	-	-	-	*849 -
Stage 2	-	-	-	-	*820 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	652	899	-	-	1346	-
HCM Lane V/C Ratio	0.148	0.042	-	-	0.034	-
HCM Control Delay (s)	11.5	9.2	-	-	7.8	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↶↷		↶	↶↷		↶	↷		↶	↷	
Traffic Vol, veh/h	5	426	25	37	445	0	62	0	36	1	0	4
Future Vol, veh/h	5	426	25	37	445	0	62	0	36	1	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	463	27	40	484	0	67	0	39	1	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	484	0	0	490	0	0	809	1051	245	806	1064	242
Stage 1	-	-	-	-	-	-	487	487	-	564	564	-
Stage 2	-	-	-	-	-	-	322	564	-	242	500	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	*1345	-	-	1297	-	-	*707	490	*934	*707	478	*899
Stage 1	-	-	-	-	-	-	*787	710	-	*777	697	-
Stage 2	-	-	-	-	-	-	*848	697	-	*881	699	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	*1345	-	-	1297	-	-	*685	473	*934	*660	461	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*685	473	-	*660	461	-
Stage 1	-	-	-	-	-	-	*783	707	-	*774	675	-
Stage 2	-	-	-	-	-	-	*818	675	-	*841	696	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.6	10.1	9.3
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	685	934	*1345	-	-	1297	-	-	660	899
HCM Lane V/C Ratio	0.098	0.042	0.004	-	-	0.031	-	-	0.002	0.005
HCM Control Delay (s)	10.8	9	7.7	-	-	7.9	-	-	10.5	9
HCM Lane LOS	B	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	0.1	0	-	-	0.1	-	-	0	0

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵↶		↵	↵↶		↵	↶		↵	↶	
Traffic Vol, veh/h	38	594	24	56	495	2	118	0	47	3	0	43
Future Vol, veh/h	38	594	24	56	495	2	118	0	47	3	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	41	646	26	61	538	2	128	0	51	3	0	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	540	0	0	672	0	0	1132	1403	336	1066	1415	270
Stage 1	-	-	-	-	-	-	741	741	-	661	661	-
Stage 2	-	-	-	-	-	-	391	662	-	405	754	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1305	-	-	1206	-	-	*614	312	*865	*642	304	*899
Stage 1	-	-	-	-	-	-	*651	604	-	*665	620	-
Stage 2	-	-	-	-	-	-	*848	619	-	*815	595	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	1305	-	-	1206	-	-	*547	287	*865	*567	280	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*547	287	-	*567	280	-
Stage 1	-	-	-	-	-	-	*630	586	-	*645	589	-
Stage 2	-	-	-	-	-	-	*763	588	-	*743	576	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.8			12.4			9.3		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	547	865	1305	-	-	1206	-	-	567	899
HCM Lane V/C Ratio	0.234	0.059	0.032	-	-	0.05	-	-	0.006	0.052
HCM Control Delay (s)	13.6	9.4	7.8	-	-	8.1	-	-	11.4	9.2
HCM Lane LOS	B	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.9	0.2	0.1	-	-	0.2	-	-	0	0.2

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

10/06/2020

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↗		↖	↗	
Traffic Vol, veh/h	92	450	24	56	470	6	118	0	47	6	0	100
Future Vol, veh/h	92	450	24	56	470	6	118	0	47	6	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	100	489	26	61	511	7	128	0	51	7	0	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	518	0	0	515	0	0	1080	1342	258	1082	1352	259
Stage 1	-	-	-	-	-	-	702	702	-	637	637	-
Stage 2	-	-	-	-	-	-	378	640	-	445	715	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1334	-	-	1339	-	-	*581	315	*899	*578	309	*899
Stage 1	-	-	-	-	-	-	*622	590	-	*691	639	-
Stage 2	-	-	-	-	-	-	*848	636	-	*848	581	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	1334	-	-	1339	-	-	*465	278	*899	*497	273	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*465	278	-	*497	273	-
Stage 1	-	-	-	-	-	-	*575	546	-	*639	609	-
Stage 2	-	-	-	-	-	-	*711	607	-	*740	538	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.3			0.8			13.8			9.8		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	465	899	1334	-	-	1339	-	-	497	899
HCM Lane V/C Ratio	0.276	0.057	0.075	-	-	0.045	-	-	0.013	0.121
HCM Control Delay (s)	15.7	9.2	7.9	-	-	7.8	-	-	12.3	9.6
HCM Lane LOS	C	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	1.1	0.2	0.2	-	-	0.1	-	-	0	0.4

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

94th Street and Bell Road Multi-Use Fields

Scottsdale, Arizona

Traffic Study

Lee Engineering Project No. 1079.06

October 2020

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering, LLC
3610 N. 44th Street
Suite 100
Phoenix, AZ 85018
(602) 955-7206

Gavan and Barker
3030 N. Central Ave., Suite 1530
Phoenix, AZ 85012



LEE ENGINEERING

**Northwest Corner, 94th Street and Bell Road
Multi-Use Fields**

Traffic Study

Prepared for:

City of Scottsdale, Arizona

Prepared by:

Lee Engineering

3610 N. 44th Street, Suite 100
Phoenix, Arizona, 85018
602-955-7206

Gavan and Barker

3030 N. Central Ave., Suite 1530
Phoenix, Arizona, 85012



October 2020

1079.06

CONTENTS

1.0	BACKGROUND	1
1.1	Scope	3
2.0	STUDY AREA CHARACTERISTICS.....	3
3.0	DATA COLLECTION	4
3.1	Traffic Volume.....	4
3.2	Ice Den Way Video	7
4.0	CRASH DATA	8
5.0	PROPOSED DEVELOPMENT	11
5.1	Development Description.....	11
5.2	Projected Traffic.....	11
5.3	Traffic Operations	18
5.4	Turn Lanes.....	22
5.5	Sight Distance	23
6.0	CONCLUSIONS AND RECOMMENDATIONS.....	24

APPENDIX A: TRAFFIC VOLUME DATA

APPENDIX B: CRASH DATA

APPENDIX C: SYNCHRO ANALYSIS RESULTS

LIST OF TABLES

Table 1. Existing Traffic Volume	5
Table 2. Site Trip Generation.....	12
Table 3. Site Trip Distribution	13
Table 4. Level of Service Criteria for Unsignalized Intersections.....	19
Table 5. Level of Service and Delay (seconds) at Bell Road and Ice Den Way	20

LIST OF FIGURES

Figure 1: Vicinity Map.....	1
Figure 2: Preliminary Site Plan.....	2
Figure 3: Existing Study-Area Peak-Hour Traffic Volumes	6
Figure 4: Existing Study-Area Daily Traffic Volumes.....	7
Figure 5: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way.....	9
Figure 6: Study Area Crashes	10
Figure 7: Study Area Site-Generated Peak Hour Traffic Volumes	13
Figure 8: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	14
Figure 9: Study Area Site-Generated Daily Traffic Volumes	15
Figure 10: Total Future Study Area Peak Hour Traffic Volumes	16
Figure 11: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way.....	17
Figure 12: Total Future Study Area Daily Traffic Volumes.....	18

1.0 BACKGROUND

A City of Scottsdale Capital Project proposes to construct a series of multi-use fields, suitable for soccer and other sports, on a parcel on the northwest corner of 94th Street and Bell Road in Scottsdale, Arizona. Lee Engineering was recently engaged to conduct a traffic analysis of the complex for the purposes of estimating its traffic impacts on the adjacent roadway network.

The location of the site is shown in Figure 1; a preliminary site plan is shown in Figure 2.

Figure 1: Vicinity Map

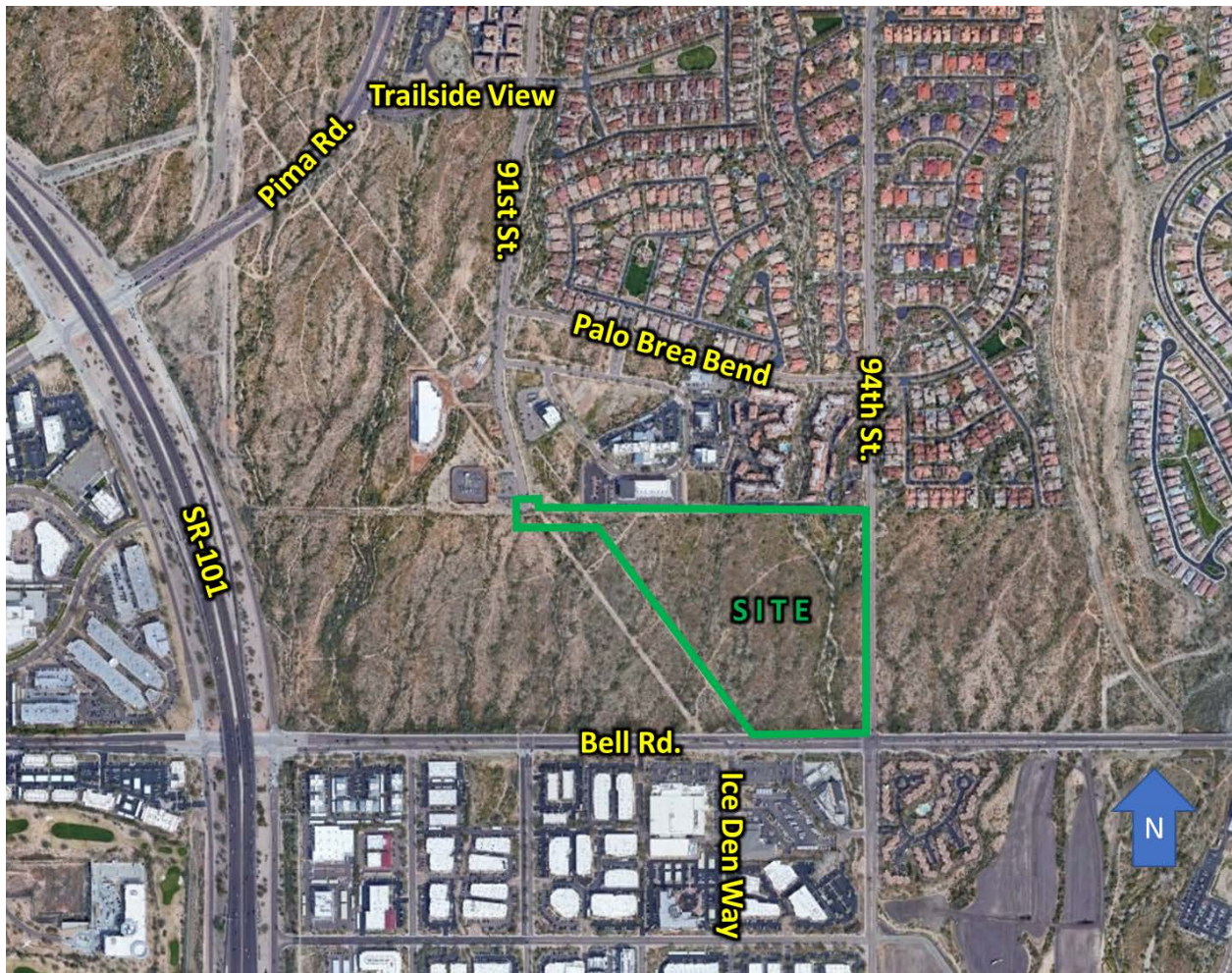
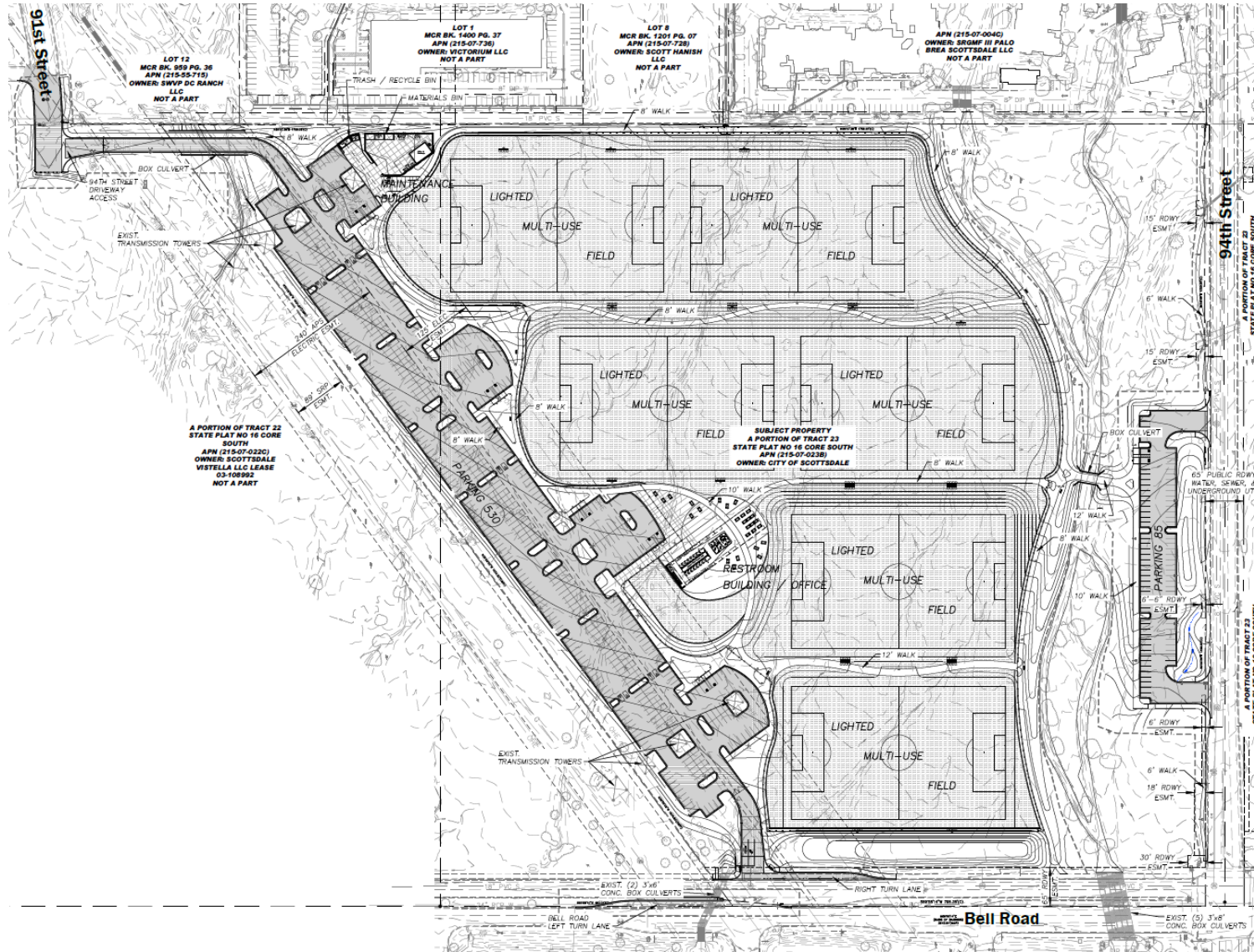


Figure 2: Preliminary Site Plan



1.1 Scope

In a conference call on August 13, 2020, the City of Scottsdale requested that this study include the following elements:

- Daily traffic volume data collection at these sites:
 - 91st Street between Trailside View and Palo Brea Bend
 - Bell Road between 91st and 94th Streets
 - 94th Street between Bell Road and Palo Brea Bend
- Video camera recording of the intersection of Bell Road and Ice Den Way
- Crash analysis for crashes adjacent to the site for a 3-year period
- Trip generation, distribution, and assignment for the proposed soccer complex
- Traffic analysis for the site's opening year at the site's primary access point, which will be the fourth (north) leg of the intersection of Bell Road and Ice Den Way. The analysis will include intersection operations, storage length requirements, and pavement marking or design improvements.

The remainder of this report will address these scope elements in turn.

2.0 STUDY AREA CHARACTERISTICS

According to the City of Scottsdale Street Classification map, Bell Road is classified as a “minor arterial – suburban” in the vicinity of the proposed development. Bell Road carries two vehicular lanes and one bicycle lane in each direction, separated by a raised median. It is also equipped with sidewalks on both north and south sides of the street. Eastbound right-turn lanes are provided at all driveways and intersections on the south side of Bell Road between 91st and 94th Streets. Breaks in the raised median exist at 91st Street, Ice Den Way, and 94th Street, and left-turn lanes are provided approaching each break. However, no eastbound left-turn lanes are provided approaching Ice Den Way or 91st Street because these intersections do not have a north leg. The speed limit on Bell Road is 45 mph.

Ice Den Way is a private street/driveway about 36 feet wide that has its northern terminus at Bell Road. Although it has the design characteristics of a driveway, rather than a street, it is equipped with a street name sign and a STOP sign at the Bell Road intersection. Ice Den Way is generally unmarked, although it does have designated right-turn and left-turn lanes marked for about 50 feet approaching Bell Road. (The markings do not comply with the *Manual on Uniform Traffic Control Devices*.) Ice Den Way has speed bumps that are more severe than the speed humps used on public streets, and in some segments it serves as access to adjacent perpendicular parking stalls. There are no sidewalks along either side of Ice Den Way.

South of Bell Road, 94th Street has a much different character than to the north. To the south, between Bell Road and Bahia Drive, it is a 4-lane roadway with bicycle lanes and sidewalks in both directions and a short segment of raised median. The street widens significantly approaching Bell Road, with two northbound left-turn lanes, one through lane, and one right-turn lane. North of Bell Road, the street narrows to about 44 feet wide, with one through lane and a bicycle lane in each direction separated by a two-way left-turn lane (TWLTL) without sidewalks. The southbound approach to Bell Road also widens, but not as much as in the northbound direction. The southbound lane configuration consists of one lane each for left turns, through traffic, and right turns. The street

is classified as a “minor collector – suburban” near Bell Road. The speed limit on 94th Street is posted 40 mph north of Bell Road and 35 mph south of Bell Road.

To the northwest of the proposed development, 91st Street has a similar cross-section as 94th Street north of Bell—one lane and a bicycle lane in each direction separated by a TWLTL. It also has a wide sidewalk on the east side of the street, separated from the street by a landscaped buffer. This street is not currently continuous north of Bell Road, and is not expected to be connected as part of the proposed development. The segment north of the proposed development is expected to have very low volume because it is a dead end, while the segment south of Bell Road is a four-lane divided roadway between Bell Road and Bahia Drive. Although 91st Street is not fully constructed, its entire length near the site, including the unconstructed portion, is classified as a “major collector – suburban.”

State Route 101 is slightly more than ½ mile west of the proposed development along Bell Road. This major freeway facility has an interchange with Bell Road that is likely to be used by much traffic approaching the soccer complex, but it also has an interchange with Princess Drive/Pima Road about ½ mile north of Bell Road that could be used by some site traffic. Not all traffic movements are provided directly at the two closely-spaced interchanges; some movements are served by a frontage road system that connects Bell and Pima Roads.

Traffic signals exist at both 91st Street and 94th Street intersections with Bell Road.

The intersection of Ice Den Way and Bell Road is minor-street stop-controlled. At this intersection, a merge lane is provided in the median for northbound Ice Den Way traffic turning left onto westbound Bell Road. The lane allows left-turning vehicles to cross the eastbound lanes of Bell Road, then wait in the merge lane for a gap in the westbound lanes. The merge lane was constructed in 2016, according to historical aerial photos. It is about 120 feet long, plus a taper, which is not long enough to be considered a full acceleration lane, but it can help facilitate two-stage left-turns onto Bell Road.

Overhead utility lines pass through the study area on a diagonal alignment to the west of the proposed development, constraining the western boundary of the site.

South of Bell Road, development is largely commercial, while north of the proposed site and east of 94th Street, existing development is residential.

3.0 DATA COLLECTION

3.1 Traffic Volume

Lee Engineering arranged for traffic volume data collection at the locations specified above for a four-day period, from Thursday, August 27, through Sunday, August 30, 2020. Traffic volume was collected in 15-minute intervals for the entire period, which allows calculation of weekday and weekend average daily traffic and peak-hour traffic volume on both weekdays and weekends. A summary of the collected traffic volume is shown in Table 1, and complete results are provided in Appendix A.

It should be noted that data collection occurred during a time when the global coronavirus pandemic has impacted some events and businesses. While some studies have shown that traffic reached (or was near) pre-pandemic levels by the end of August, the exact impact of the pandemic on the study-area traffic volume is unknown.

Table 1. Existing Traffic Volume

Route	Location	Direction	ADT	AM PkHr	AM PkVol	PM PkHr	PM PkVol
N 94TH ST	Btwn BELL RD & E PALO BREA BEND	NB	1883	11:15	155	16:30	180
		SB	1924	11:30	160	15:00	156
BELL RD	Btwn N 91ST ST & N 94TH ST	EB	5463	11:45	422	16:45	465
		WB	5612	11:30	467	12:00	455
N 91ST ST	Btwn E TRAILSIDE VIEW & E PALO BREA BEND	NB	952	11:45	81	17:15	82
		SB	990	11:45	78	17:00	82

Traffic volume on Bell Road averaged about 11,000 vehicles per day (vpd) during the four-day data collection period. Volume was notably higher on weekdays, with over 13,000 vpd on Thursday, dropping to about 8,000 vpd on Sunday. The morning peak on Bell Road actually occurred during the midday on each of the four days. A local peak did occur during typical commute time on Thursday, 7:30 to 8:30 a.m., but the volume during this time period was slightly lower than the midday peak that began at 11:30 a.m. that day. Midday peak volume on Saturday was higher than the midday volume on any other data collection day.

Volume on 94th Street averaged about 3,800 vpd, with patterns by day of week very similar to Bell Road. Daily traffic was its highest on Thursday, with about 4,400 vpd, and its lowest on Sunday, with about 2,800 vpd. Unlike Bell Road, however, 94th Street did see a morning peak at a conventional commute time on both Thursday and Friday, but only in the southbound direction. When considering both directions and all four days, the midday peak was higher than the morning peak.

As expected, 91st Street carries the lowest traffic of the three data collection sites: about 1,900 vpd. Daily volume ranged from 1,400 vpd on Sunday to 2,300 vpd on Thursday.

All the streets in the study area have volume that is appropriate for the cross-section and classification. According to the Maricopa County *Roadway Design Manual*, a four-lane divided urban minor arterial can support a traffic volume of about 31,000 vpd¹, suggesting ample reserve capacity on Bell Road, where weekday average daily traffic reaches about 13,000 vpd. Likewise, an urban minor collector can support a traffic volume of about 9,000 vpd, and an urban major collector can support about 10,000 vpd, both well above the actual volume on either 94th Street (4,400 vpd) or 91st Street (2,300 vpd). It should be noted that the future volume on 91st Street is likely to increase considerably if and when it is connected across Bell Road. This connection may draw traffic away

¹ Maricopa County *Roadway Design Manual*, 2019 Update, Table 2.1: Roadway Planning Level Traffic Volumes, p. 2-3.

from 94th Street, but future development may also generally increase traffic volume in the study area.

Peak-hour traffic volumes at the three data collection sites are shown in Figure 3, and daily traffic volumes at the sites on weekdays (average of Thursday and Friday) and Saturday are shown in Figure 4.

Figure 3: Existing Study-Area Peak-Hour Traffic Volumes



Figure 4: Existing Study-Area Daily Traffic Volumes



3.2 Ice Den Way Video

Video was collected on Thursday, August 27, 2020, showing the intersection of Ice Den Way and Bell Road from 6:00 a.m. to 7:00 p.m. The video was reviewed to understand patterns of traffic movement at the intersection, particularly related to left-turning traffic.

The four-day data collection indicated that the peak hours on Bell Road on August 27 were from 11:30 a.m. to 12:30 p.m. and from 4:45 to 5:45 p.m., and these hours were reviewed in detail on the video.

Initial impressions from the video show that Bell Road has relatively low volume compared with its capacity, and queues on Bell Road were never observed extending near Ice Den Way from the nearby traffic signals. Gaps exist in both directions, and they are artificially increased in size and frequency because of the two traffic signals on either side of Ice Den Way, each less than ¼ mile away.

The video also reveals that left-turn volume both into and out of Ice Den Way is generally low during peak hours. Some queues were observed both entering and exiting, but they tended to

dissipate quickly. Exiting (northbound) queues in the afternoon peak hour were notably longer than those during the midday peak.

Some outbound left-turning vehicles used the merge lane as designed and intended, and some vehicles were observed to wait at the stop bar even when a long gap was available in eastbound traffic, turning only when gaps were sufficient in both directions on Bell Road at the same time. However, the merge lane appears to provide a traffic operational benefit at the intersection. During the afternoon peak hour when exiting volume is highest, the merge lane helps to keep traffic from queueing exclusively at the stop bar. Anecdotally, a higher percentage of vehicles were observed to use the merge lane as designed during the higher-volume afternoon peak hour.

The following additional observations were made from the video:

- Several bike lane users were observed on Bell Road, including both bicyclists and travelers using other modes, such as scooters. A few pedestrians were observed, despite the August heat.
- During the two peak hours, 17 vehicles were observed making westbound U-turns. U-turners accounted for about 35 percent of traffic in the left-turn bay during the midday peak, dropping to less than 10 percent in the afternoon peak. Virtually all U-turning vehicles proceeded eastbound on Bell Road only as far as the next driveway, where no median break exists.
- One vehicle was observed to make an eastbound U-turn, despite the posted NO U-TURN regulatory sign and the complicated routing of this movement due to the presence of the island in the median.
- Two vehicles making northbound left turns did not use the merge lane, but rather turned on the right side of the island as though it were a roundabout. These vehicles did not cause conflicts with other vehicles because the westbound left-turn lane was unoccupied in both cases.

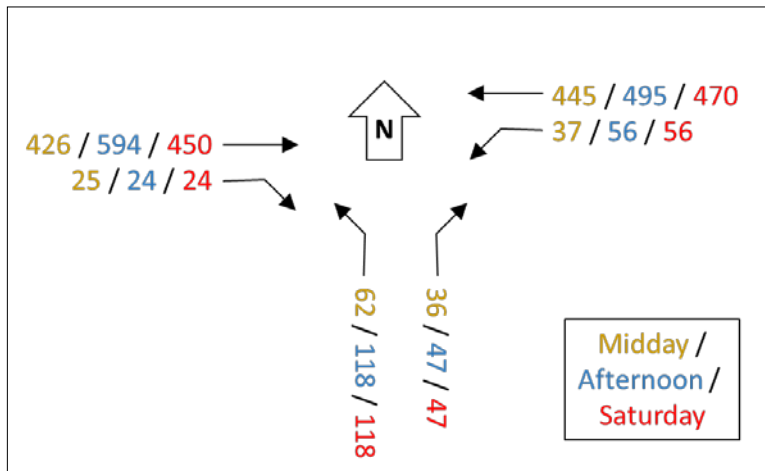
To facilitate traffic operational analysis, turning movement volumes were collected from the video data during the 11:30 a.m. and 4:45 p.m. peak hours. These volumes, along with the volume on Bell Road collected during the same time of the four-day count, provide an indication of existing traffic volume at this intersection. The midday and afternoon peak-hour volumes are shown in Figure 5.

Video was not recorded on Saturday, but because Saturday is critical for evaluating the proposed development, it is assumed that traffic entering and exiting Ice Den Way during the Saturday peak hour is equal to the weekday afternoon peak hour. Saturday peak-hour traffic on Bell Road is taken from the four-day count, which showed a peak hour beginning at 12:00 noon. Estimated Saturday volumes at the intersection are also shown in Figure 5.

4.0 CRASH DATA

Lee Engineering queried ADOT's Traffic Safety DataMart to identify crashes that occurred along the frontage of the site on Bell Road, 94th Street, and 91st Street. Crashes were queried that occurred in the three-year period from 2016 through 2018, the most recent three-year period for which data is available.

Figure 5: Existing Peak-Hour Traffic Volumes at Bell Road and Ice Den Way



As shown in Figure 6, a total of 22 crashes were identified in the vicinity of the proposed development, an average of about 7 crashes per year. All 22 crashes occurred along the Bell Road corridor, with 15 of the crashes (68 percent) at the 94th Street intersection. Only 2 crashes (9 percent) occurred at the Bell Road/91st Street intersection, and the remaining 5 crashes (23 percent) occurred between these two traffic signals. Notably, no crashes occurred at or within 250 feet of the Ice Den Way intersection.

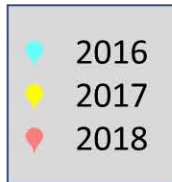
The crashes were distributed by year relatively uniformly. Eight crashes took place in both 2016 and 2018, and six crashes occurred in 2017. No crashes involved fatalities, and 8 of the 22 crashes (36 percent) involved at least one injury. The remaining 14 crashes (64 percent) involved property damage only. No crashes involved non-motorists.

Crashes in the study area overwhelmingly occurred during daylight hours. Only two crashes (9 percent) occurred after dark. Five crashes (23 percent) occurred between 6:00 and 10:00 a.m., the conventional morning peak period, and seven crashes (32 percent) occurred between 3:00 and 7:00 p.m. The remaining eight crashes (36 percent) occurred in the midday period between 10:00 a.m. and 3:00 p.m.

Three crashes occurred on Bell Road between Ice Den Way and 94th Street. Among these three crashes, one was a same-direction sideswipe, one was a single-vehicle run-off road crash, and one was coded as a left-turn crash, although the location where the crash is coded does not have any opportunity for left turns to be made.

Other than the crashes at the 94th Street and Bell Road intersection, no particular crash pattern was observed along the frontage of the proposed site. A more detailed summary of crashes can be found in Appendix B.

Figure 6: Study Area Crashes



5.0 PROPOSED DEVELOPMENT

5.1 Development Description

The proposed development is expected to consist of six rectangular multi-use athletic fields along with a restroom and office building near the center of the site and a maintenance building near the north site boundary.

Two parking lots are proposed. The larger of the two lots is proposed to consist of 530 parking spaces and is west of the athletic fields. It will have two access points: the main access point will add the fourth (north) leg to the intersection of Ice Den Way and Bell Road. This access point is proposed to be unsignalized, and it would require removal of the existing merge lane for northbound left turns to make room for an eastbound left-turn lane to enter the site. The second access point, also unsignalized, is near the cul-de-sac at the south end of 91st Street north of Bell Road.

The smaller of the two parking lots, with 85 parking spaces, is located east of the athletic fields. The access will be exclusively from 94th Street, with two access points about 450 feet apart. While the site is fully accessible on foot, no vehicular access will be provided to connect the two parking lots.

The large parking lot will provide new vehicular connectivity between 91st Street north of Bell Road and the Bell Road/Ice Den Way intersection. It is possible that this new connectivity may be on the shortest path for some existing or future vehicular trips that are unrelated to the soccer complex. The large parking lot is proposed to include traffic calming devices intended to discourage such “cut-through” traffic and to reduce vehicle speed and improve safety. The lot is also proposed to be gated during hours when the fields are not in operation. Because of these proposed measures, the amount of cut-through traffic is expected to be negligible and is not quantified as part of this study.

5.2 Projected Traffic

5.2.1 Trip Generation

The first step in estimating traffic to and from the proposed development is to calculate trip generation, which is the total vehicle trips to and from the site over a given time period. The Institute of Transportation Engineers *Trip Generation Manual*, 10th Edition, has been used to estimate site traffic. Based on the site plan provided, the ITE land use code (LUC) that best represents the site is LUC #488, Soccer Complex.

Trip Generation includes limited information about LUC #488 because of a small sample size of similar developments. The small sample size tends to limit confidence in the trip generation estimate. The City of Scottsdale Parks Department was contacted to determine if local information is available about trip generation for soccer field sites elsewhere in the city. However, Parks Department staff does not have information about local trip generation.

Trip Generation does include information for both weekday morning and afternoon peak hours both for the generator and for the adjacent street traffic. For both morning and afternoon periods, the peak hour of the generator was used. In both cases, the value is slightly higher than the peak of the adjacent street traffic, and it is recognized that the morning peak hour occurs at a non-traditional

time, which suggests that the peak hour of the generator may be a better representation of overall conditions.

Only one time period (Saturday peak hour) includes a fitted curve, but the average trip rate was used for all time periods evaluated. The difference between the fitted curve and the average rate for the Saturday peak hour is small, and the average rate shows a slightly higher (more conservative) number of trips.

Table 2 presents the trip generation data for the site. In total, the site is expected to generate about 430 trips on a typical weekday, with about 100 of those trips in the afternoon peak hour. Traffic is expected to be much higher on weekends than on weekdays. Expected daily traffic is more than 5 times greater on Saturday than on a weekday, and Saturday’s peak hour traffic is more than double the weekday afternoon peak hour. ITE does not provide a daily traffic estimate for Sunday, but Sunday peak hour traffic is expected to be about 70 percent greater than the weekday afternoon peak hour.

No trip reduction factors were applied to the ITE trip forecast, so all trips generated by the site are considered to be new trips added to the adjacent roadway network.

Table 2. Site Trip Generation

94th St & Bell Rd. Multi-Use Fields												
Land Use: (488) Soccer Complex												
# of Fields	Weekday Daily		Weekday AM Peak		Weekday PM Peak		Saturday Daily		Saturday Peak Hour		Sunday Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
6												
Dir. Dist.	50%	50%	53%	47%	47%	53%	50%	50%	48%	52%	46%	54%
ITE Trip Rate	71.33		1.77		16.9		404.88		40.1		28.78	
Trips	214	214	6	5	48	54	1215	1215	115	125	79	93
	428		11		101		2429		241		173	

5.2.2 Trip Distribution and Assignment

The site-generated trips have been distributed onto the adjacent roadway network based in part on existing traffic volume collected as a result of this study and in part on engineering judgment, considering traffic patterns in the nearby and broader area. The distribution percentages assumed for this study are presented in Table 3.

Of the traffic destined to and from the north on 91st Street, about half is expected to use Trailside View and Pima Road to SR 101 to and from the west. The other half is expected to use Legacy Boulevard or Trailside View to Pima Road to and from the north.

Traffic destined to and from the north on 91st Street is assumed to park in the large parking lot and use the north (91st Street) point of access to the lot. Traffic arriving via Bell Road in either direction is assumed to park in the large parking lot and use the south (Bell Road) access. Traffic destined to and from the north on 94th Street is assumed to park in the small lot, with access directly from 94th Street. The small lot, with a capacity of 85 spaces, is sufficient to support parking for the small percentage of traffic assumed to arrive at the site from 94th Street.

Table 3. Site Trip Distribution

To/from west on Bell Road (including access to SR 101 interchange at Bell Road):	80%
To/from east on Bell Road	5%
To/from north on 94th Street	5%
To/from north on 91st Street (including access to SR 101 interchange via Pima Road):	10%

Based on the trip generation values and distribution percentages above, the hourly site-generated traffic volumes in the study area are expected to be as shown in Figure 7. Hourly site-generated volumes at the Bell Road/Ice Den Way intersection are presented in Figure 8. Daily site-generated volumes in the study area are presented in Figure 9.

Figure 7: Study Area Site-Generated Peak Hour Traffic Volumes



Figure 8: Site-Generated Peak Hour Traffic Volumes at Bell Road and Ice Den Way

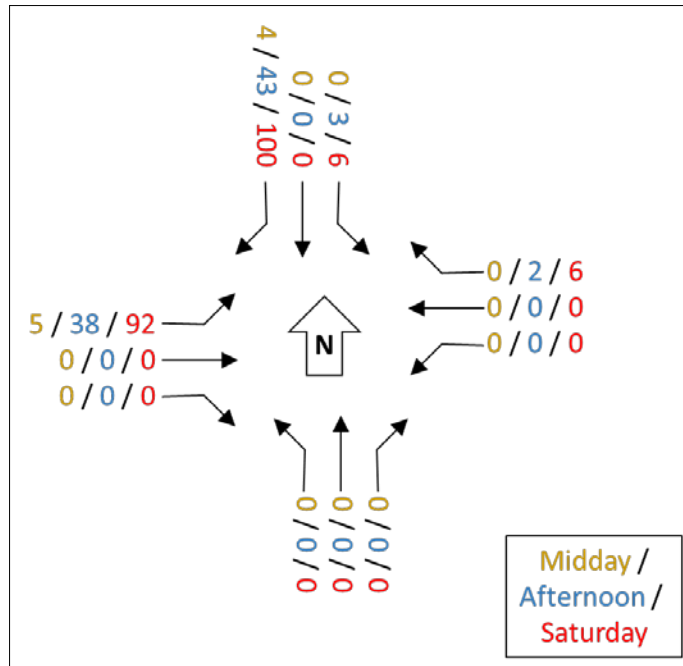


Figure 9: Study Area Site-Generated Daily Traffic Volumes



Total traffic volume, including existing plus predicted site traffic, are shown in the next series of figures. However, daily volumes in these figures are limited to the three locations where four-day data collection was conducted as part of this study. Hourly volumes are available at these three locations plus the Ice Den Way intersection, subject to the assumptions discussed earlier. Figure 10 presents expected total hourly traffic volumes in the study area, and Figure 11 presents hourly volumes at the Ice Den Way intersection. Figure 12 presents expected total daily traffic volume in the study area.

Figure 10: Total Future Study Area Peak Hour Traffic Volumes



Figure 11: Total Future Peak Hour Traffic Volumes at Bell Road and Ice Den Way

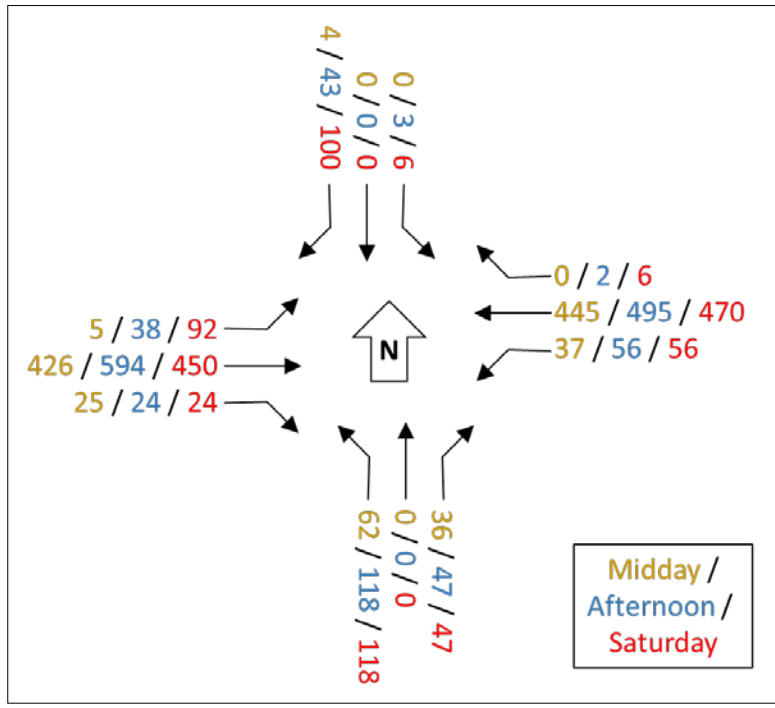


Figure 12: Total Future Study Area Daily Traffic Volumes



5.3 Traffic Operations

5.3.1 Bell Road/Ice Den Way

The traffic operational characteristics of the intersection of Bell Road and Ice Den Way were evaluated using Synchro software, version 10, which implements the methodologies of the *Highway Capacity Manual* (HCM), 6th edition. The analysis is based on the volumes presented above, along with existing and proposed lane configuration data.

To provide an indication of intersection performance, intersections are typically reported in terms of Levels of Service (LOS). Unsignalized two-way-stop-controlled (TWSC) intersection analysis is based on the minor street approach or critical movement, whichever is applicable. The capacity criteria for unsignalized intersection analysis are presented in Table 4.

Table 4. Level of Service Criteria for Unsignalized Intersections

Level of Service (LOS)	Average Control Delay (seconds)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operation. The HCM offers the following in Chapter 19:

“For a typical major street with two lanes in each direction and an average traffic volume in the range of 15,000 to 20,000 vehicles/day (roughly equivalent to a peak hour flow rate of 1,500 to 2,000 vehicles/hour), the delay equation will predict greater than 50s of delay (LOS F) for many urban two-way-stop-controlled (TWSC) intersections that allow minor-street left-turn movements. LOS F will be predicted regardless of the volume of minor-street left-turning traffic. Even with a LOS F estimate, most low-volume minor-street approaches would not meet any of the volume or delay warrants for signalization noted in the *Manual on Uniform Traffic Control Devices*. As a result, analysts who use the HCM LOS thresholds as the sole measure to determine the design accuracy of TWSC intersections should do so with caution. In evaluating the overall performance of TWSC intersections, it is important to consider measures of effectiveness such as volume-to-capacity ratios for individual movements, average queue lengths, and 95th percentile queue lengths in addition to considering delay. By focusing on a single measure of effectiveness for the worst movement only, such as delay for the minor-street left-turn, users may make less effective traffic control decisions.”

Considering the above guidance, for the purposes of this study, TWSC movements operating at LOS E or F with v/c ratios under 0.80 and acceptable queue lengths will be considered as operating at an acceptable level when the side street traffic volumes do not warrant a traffic signal.

The intersection was evaluated for both existing conditions, as a 3-leg intersection, and future conditions, as a 4-leg intersection with the north leg accessing the site. Traffic volume on Bell Road was assumed to be constant between the two scenarios. It is possible that traffic volume may increase on Bell Road in the future, but any increase is expected to be small in percentage terms in the relatively short time prior to construction of the subject site. Likewise, no changes were assumed in traffic turning to and from Ice Den Way.

Table 5 shows a summary of the traffic operational results of the two scenarios, and complete results can be found in Appendix C. Note that as a TWSC-controlled intersection, delay and level of service values are only provided for the stop-controlled movements, not the mainline movements, which are free-flow.

Table 5. Level of Service and Delay (seconds) at Bell Road and Ice Den Way

Movement	Existing			With Site		
	Weekday		Sat	Weekday		Sat
	Midday	PM		Midday	PM	
NBL	B (11)	B (13)	B (12)	B (11)	B (14)	C (16)
NBR	A (9)	A (9)	A (9)	A (9)	A (9)	A (9)
SBL	Not applicable			B (11)	B (11)	B (12)
SBR				A (9)	A (9)	A (10)

Table 5 shows that all movements appear to operate with low delay, LOS C conditions or better, in both existing and future scenarios during all three time periods evaluated. Attainment of this LOS and delay result relies on accounting for the gaps created by the adjacent traffic signals at 91st and 94th Street, a methodology permitted by the 6th edition of the HCM. Operational parameters at the intersection, including queue length and v/c ratio, are reasonable in all scenarios evaluated.

The volume of traffic at the intersection, including conflicting through and left-turn movements, is relatively high, particularly noting nearly 100 westbound left turns and over 100 northbound left turns during the peak hour on Saturday. The use of recreational fields can cause sharp traffic peaking patterns, in which traffic may arrive at an intersection in a crush rather than uniformly distributed throughout the peak hour. During these crush times, it is likely that delays may be greater than predicted by the Synchro analysis.

When delays are excessive, motorists may consider one of a few actions:

- Motorists may avoid making left turns, particularly outbound lefts. They may reroute to a right turn followed by a U-turn, or some other alternative route.
- Motorists may choose to use the 91st Street access point to the parking lot.
- Motorists may choose to use the 94th Street parking lot.
- Motorists may change their time or mode of travel.

It is not recommended that mitigation measures to address this potential conflict be incorporated into the project, noting the lack of confidence in the trip generation forecast and the potential for motorists to consider alternative actions if delays increase. Rather, the city may wish to monitor operations at the intersection after opening to confirm the operational characteristics.

5.3.2 94th Street

The predicted site volumes entering and exiting the 94th Street site parking lot are very low, reaching only as high as 6 vehicles per hour (vph) on Saturday, distributed between the two site access points. The small 85-space capacity of the parking lot also limits the traffic volume that will access the lot via 94th Street. Low site volumes and modest existing traffic on 94th Street suggest that the site access points will operate without excessive delay to traffic exiting the parking lot.

The city asked that this study consider whether the 94th Street parking lot should be configured with one-way operation to concentrate exiting and entering traffic at different points rather than introduce these conflicting movements at two points. A one-way configuration would likely operate satisfactorily, but two-way traffic is recommended. The low traffic volume, modest parking lot capacity, and adequate 450-foot separation between the two driveways suggest that conflicts will be manageable with a two-way configuration. One-way operation would introduce the following disadvantages:

- It is often difficult to enforce one-way operation in low-volume conditions. Drivers tend to take the shortest path to their destination even when the path conflicts with signs and pavement markings indicating a one-way route. Unenforced one-way operation can result in head-on conflicts.
- Additional signing and pavement marking would be required, introducing both capital and ongoing maintenance expense to ensure the traffic control devices remain highly visible.
- Drivers are most likely to comply with one-way parking aisles when angled parking, rather than perpendicular parking, is used. However, angled parking stalls would strongly discourage users from backing in to parking spaces, which is likely to be preferred by many users to load and unload athletic equipment from the rear of vehicles.

5.3.3 91st Street

The 91st Street access point is expected to operate with no conflicts, considering that 91st Street will end at the site access point immediately after opening.

Site traffic entering and exiting via 91st Street also will traverse additional nearby intersections. Traffic volumes were not collected at these intersections, so it is not possible to conduct detailed traffic operational analyses. However, the following qualitative observations are provided about each of the intersections with a potential to accommodate site traffic:

- *Trailside View and 91st Street.* This intersection is two-way stop controlled, with dedicated turn lanes for traffic destined to and from the site (northbound left and eastbound right). Anticipated site traffic volumes at the intersection are low, suggesting that it is not likely to require any site-related mitigation measures. However, the intersection may be a candidate for a roundabout or a mini-roundabout as traffic volumes increase.
- *Trailside View and Pima Road.* Pima Road is a 6-lane arterial that carries high volume, providing access to SR 101. Trailside View intersects Pima Road at a minor-street stop-controlled intersection, with dedicated left- and right-turn lanes on westbound Trailside View. According to the City of Scottsdale, a traffic signal has been requested at this intersection. The amount of traffic predicted to use the intersection is very low during peak hours, reaching no more than 6 vph, so it is unlikely that the site would cause the intersection to meet a traffic signal warrant. However, it is unknown whether the intersection already meets traffic signal warrants or if a traffic signal would be beneficial to overall operations. (The city did not request that this study include a traffic signal warrant study at the intersection.) The configuration of the intersection and the width of Pima Road suggest that a traffic signal is the most logical mitigation measure if delay is excessive under minor-street stop control.

- *91st Street and Legacy Boulevard.* This intersection is signalized, with double northbound left-turn lanes and ample capacity on Legacy Boulevard. The traffic signal control allows the intersection to respond to changes in traffic patterns, and it is not expected to experience major changes in operational performance due to the low volume of site traffic that may use the intersection.

5.4 Turn Lanes

This section evaluates the necessity and appropriateness of turn lanes for each approach at each site access point.

5.4.1 Bell Road/Ice Den Way Intersection

Eastbound Left-Turn Lane

Scottsdale requires left-turn lanes at all intersections on major collectors and arterials.² An eastbound left-turn lane approaching the site is shown on the site plan, in conformance with this requirement. In all three time periods evaluated, the eastbound left-turn movement has a 95th percentile queue length less than one vehicle length, suggesting that a minimum-length turn bay is acceptable for the site. The site plan shows a full-width left-turn bay about 175 feet long, which is suitable for site conditions.

Westbound Left-Turn Lane

The existing westbound left-turn lane is about 120 feet long, when measured along its full-width portion, plus a taper. The video data collection shows this turn bay to operate effectively at this length. Rarely is more than one car observed queued in the turn bay at the same time, even during peak hours, and vehicles that enter the bay tend to find a gap and turn quickly. The addition of the north leg to the intersection has little impact on the westbound left turn, because these vehicles must yield only to eastbound through traffic, which is not expected to change as a result of site development. The operational analysis results show that the westbound left-turn movement also has a 95th percentile queue less than one vehicle length, and as such, no changes to the westbound left-turn lane are necessary.

Eastbound Right-Turn Lane

The existing eastbound right-turn lane on Bell Road measures about 120 feet plus a short taper, which is acceptable for the modest right-turn volume entering Ice Den Way. The length complies with Scottsdale's minimum 100-foot length requirement for right-turn lanes,³ but it does not comply with the 150-foot "standard storage length." No changes to the existing turn lane are required, as this movement is not impacted by the proposed development.

Westbound Right-Turn Lane

The site plan proposes a right-turn lane with a 150-foot storage length plus a taper, in compliance with the city's "standard" length noted earlier. This design is sufficient to accommodate the volume of traffic making the movement.

² Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E2, p. 21.

³ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.118 - E1, p. 21.

5.4.2 94th Street

Northbound left turns into the small parking lot on 94th Street can be accommodated in the existing two-way left-turn lane.

The City of Scottsdale does not require right-turn lanes by policy on 94th Street since it is a minor collector street. Southbound right-turn lanes on collector streets are required when the following criteria are met:

- At least 5,000 vehicles per day are expected to use the street
- The 85th percentile speed on the street is at least 35 mph; or 45 mph for a two-lane (one lane each direction) roadway
- At least 30 vehicles will make right turns into the driveway during a one-hour period⁴

Traffic volume on 94th Street is somewhat less than the 5,000 vpd threshold, with average weekday volume collected at 4,400 vpd. Nevertheless, it is foreseeable that volume on 94th Street will increase above 5,000 vpd in the near term, so it is expected that this criterion will soon be met.

Actual travel speeds on 94th Street were not collected as part of this study. However, considering driver speed choice on other streets, it would not be surprising to find 85th percentile speeds of at least 45 mph on a street like 94th Street with a posted speed limit of 40 mph.

Southbound right-turn traffic volume entering the site from 94th Street is expected to be 5 percent of total traffic entering the site. The highest-volume peak hour (on Saturday) shows trip generation of 115 entering trips per hour, which suggests that about 6 vehicles per hour are likely to enter the small parking lot via a southbound right turn from 94th Street. Since this volume is forecast to be considerably below the 30-vph threshold, a right-turn deceleration lane on 94th Street is not recommended.

5.4.3 91st Street

Upon initial construction, the north site driveway to 91st Street will access the street at its southern terminus, so there will be no conflicting movements that require turn lanes. Additional review of site access should be conducted if 91st Street is extended south to Bell Road in the future.

5.5 Sight Distance

All site access points should be designed to accommodate sight distance recommendations in *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO). A review of the site reveals that the roadways near the proposed access points are generally on horizontal tangent alignments with little vertical profile, suggesting that roadway elements are not likely to constrain sight distance. Existing native desert landscaping may need to be ensure adequate sight distance.

⁴ Scottsdale Design Standards & Policies Manual, 2004 Update, Sec. 5-3.206, p. 34.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study has documented the following conclusions and recommendations:

- The proposed development consists of a set of six rectangular multi-use athletic fields on the northwest corner of Bell Road and 94th Street. A large parking lot, proposed to contain 530 parking spaces, is proposed to have access both from Bell Road and 91st Street west of the athletic fields. A smaller 85-space lot is proposed with two access points on 94th Street on the east side of the fields. The site's Bell Road access point would add a fourth (north) leg to the existing intersection of Ice Den Way, a private driveway.
- Traffic volume data collection shows that Bell Road, 91st Street, and 94th Street in the study area carry more traffic during the midday peak hour than the conventional morning commuter peak hour. Traffic conditions were evaluated for weekday midday and afternoon peak hours in addition to the Saturday peak hour.
- Crash data showed no notable pattern of crashes adjacent to the site. The intersection of 94th Street and Bell Road has experienced about 5 crashes per year, a level that is not unusual considering its traffic volume.
- Site trip generation was forecast using ITE Land Use Code #488 (Soccer Complex). The site is projected to generate the most trips on Saturday, with about 2,400 site vehicles per day and about 240 trips during the peak hour. Weekday trips are forecast at about 430 trips per day and 100 trips during the higher-volume afternoon peak hour. A daily trip forecast is not available for Sunday, but Sunday peak-hour volume is forecast at 170 trips.
- Site trip distribution assumes most trips (80 percent) will arrive and depart to and from the west on Bell Road, considering its ease of access to SR-101. Other routes approaching the site are likely mostly limited to local trips with origins no more than about two miles from the site.
- The traffic operational analysis of the Bell Road/Ice Den Way intersection shows that stop-controlled movements operate at LOS A and B conditions today, and all movements are expected to operate at LOS C or better with the athletic fields in place, overall very good operational performance.
- Two-way traffic flow is recommended in the small (94th Street) parking lot.
- It is unlikely that site-related traffic mitigation measures will be necessary at intersections north of Bell Road, including Trailside View intersections with 91st Street or Pima Road, and 91st Street and Legacy Boulevard, because of low site traffic assignment through these intersections. Traffic volume data was not collected at these intersections at the city's request. However, a traffic signal has been requested at the intersection of Pima Road at Trailside View. It is unknown whether the intersection currently meets any traffic signal warrants or if a traffic signal would improve the intersection's operations, but a traffic signal

is a logical mitigation measure for this intersection if delays become unacceptably high under minor-street stop control.

- An eastbound left-turn lane and a westbound right-turn lane are required approaching the site driveway on Bell Road. No changes to existing turn bays would be required. No turn bays are required at the 91st Street or 94th Street access points; the existing TWLTL on 94th Street can be used for northbound left-turn access.

APPENDIX A: TRAFFIC VOLUME DATA

File Number: 2002056
 Route: N 94TH ST
 Location: Btwn BELL RD & E PALO BREA BEND

Direction: NB
 Latitude: 33.6433
 Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	30	1	36	2	56	1	42			1	41
00:15	0	37	1	37	2	32	1	31			1	34
00:30	0	37	2	50	0	44	2	30			1	40
00:45	1	36	0	39	2	38	2	30			1	36
01:00	1	37	1	37	1	35	4	23			2	33
01:15	1	34	0	47	1	31	2	24			1	34
01:30	0	31	1	39	1	44	1	37			1	38
01:45	0	38	0	32	1	35	0	30			0	34
02:00	1	33	1	40	0	53	1	35			1	40
02:15	0	36	1	50	1	32	1	29			1	37
02:30	0	34	0	33	1	36	0	25			0	32
02:45	0	41	0	47	0	31	2	22			1	35
03:00	0	50	1	45	0	34	0	27			0	39
03:15	1	54	0	54	0	35	0	42			0	46
03:30	2	48	0	40	0	38	0	25			1	38
03:45	1	36	0	53	0	22	0	26			0	34
04:00	0	45	0	38	0	20	0	27			0	33
04:15	1	51	1	62	1	36	0	29			1	45
04:30	1	58	3	60	0	33	1	27			1	45
04:45	1	66	0	47	0	41	1	22			1	44
05:00	5	65	2	49	0	42	0	26			2	46
05:15	5	61	4	61	4	30	2	34			4	47
05:30	5	72	6	49	7	31	1	25			5	44
05:45	5	51	6	47	4	40	2	39			4	44
06:00	19	48	10	52	5	24	1	20			9	36
06:15	13	35	12	41	7	34	7	24			10	34
06:30	25	49	18	36	6	26	7	28			14	35
06:45	23	41	8	42	13	24	6	22			13	32
07:00	17	33	23	20	15	32	5	18			15	26
07:15	25	36	19	21	19	20	9	18			18	24
07:30	22	29	24	23	20	15	14	14			20	20
07:45	23	35	14	21	19	30	10	12			17	25
08:00	33	20	25	23	21	13	9	17			22	18
08:15	28	13	30	15	15	24	11	12			21	16
08:30	18	18	18	22	21	18	10	11			17	17
08:45	21	11	35	16	22	13	21	10			25	13
09:00	22	11	24	16	27	12	15	8			22	12
09:15	23	10	22	13	31	1	19	5			24	7
09:30	21	8	24	9	17	10	29	6			23	8
09:45	19	8	30	10	27	13	34	3			28	9
10:00	22	4	22	10	31	10	26	3			25	7
10:15	22	4	27	11	36	8	23	1			27	6
10:30	27	10	33	7	26	7	25	2			28	7
10:45	31	2	34	5	38	6	33	1			34	4
11:00	23	1	26	8	44	4	26	3			30	4
11:15	49	1	37	5	46	10	17	1			37	4
11:30	32	0	46	1	51	6	33	0			41	2
11:45	38	1	33	3	40	1	34	0			36	1
Totals	627	1509	625	1522	625	1230	448	946	0	0	581	1302
Day Total	2136		2147		1855		1394		0		1883	
AM Pct	29.4%		29.1%		33.7%		32.1%				30.9%	
Peak Hour	11:15	16:45	11:45	16:15	11:15	12:00	11:30	12:00			11:15	16:30
Peak Volume	149	264	156	218	193	170	140	133			155	181

File Number: 2002057
 Route: N 94TH ST
 Location: Btwn BELL RD & E PALO BREA BEND

Direction: SB
 Latitude: 33.6433
 Longitude: -111.8784

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	1	32	0	54	1	30	1	39			1	39
00:15	1	41	0	34	5	51	4	30			3	39
00:30	1	41	0	30	1	34	4	25			2	33
00:45	0	37	0	35	1	43	2	35			1	38
01:00	0	27	0	41	0	39	1	31			0	35
01:15	0	34	0	31	0	48	0	22			0	34
01:30	0	30	0	35	1	30	0	33			0	32
01:45	0	47	0	43	0	28	0	38			0	39
02:00	0	37	1	37	1	45	0	27			1	37
02:15	0	53	0	49	0	34	3	25			1	40
02:30	0	43	0	49	0	37	0	31			0	40
02:45	2	36	1	48	0	29	0	22			1	34
03:00	0	52	0	53	0	37	0	22			0	41
03:15	2	54	0	57	0	29	0	21			1	40
03:30	0	49	0	49	1	32	0	23			0	38
03:45	2	44	1	53	1	29	0	21			1	37
04:00	1	49	1	51	0	22	1	25			1	37
04:15	3	54	2	60	0	29	1	28			2	43
04:30	4	40	2	47	1	33	1	33			2	38
04:45	9	45	3	48	0	38	1	21			3	38
05:00	15	50	6	43	3	24	2	21			7	35
05:15	15	40	11	44	1	21	0	27			7	33
05:30	14	52	7	47	7	36	1	26			7	40
05:45	12	62	9	32	10	27	8	25			10	37
06:00	15	29	10	32	3	35	8	22			9	30
06:15	11	40	14	23	8	23	4	23			9	27
06:30	21	18	12	19	11	23	8	16			13	19
06:45	21	42	22	25	18	28	7	10			17	26
07:00	37	22	22	24	21	18	13	13			23	19
07:15	35	21	40	14	11	9	11	16			24	15
07:30	50	15	40	22	18	19	10	11			30	17
07:45	41	10	35	17	29	17	20	4			31	12
08:00	40	18	41	12	22	16	12	10			29	14
08:15	40	17	43	15	19	13	15	9			29	14
08:30	36	8	42	9	24	5	19	9			30	8
08:45	42	10	59	14	38	9	26	9			41	11
09:00	38	7	34	7	33	7	16	9			30	8
09:15	36	5	29	5	34	7	29	6			32	6
09:30	42	1	37	8	32	10	21	3			33	6
09:45	46	4	53	10	45	7	29	1			43	6
10:00	37	4	28	8	41	4	29	0			34	4
10:15	37	1	49	2	42	4	38	3			42	3
10:30	27	7	35	6	30	6	28	1			30	5
10:45	40	4	37	4	54	6	39	1			43	4
11:00	27	1	30	2	45	3	33	0			34	2
11:15	39	3	34	3	41	8	28	1			36	4
11:30	37	0	33	2	38	6	37	0			36	2
11:45	53	0	34	4	62	1	34	0			46	1
Totals	930	1336	857	1357	753	1089	544	828	0	0	771	1153
Day Total	2266		2214		1842		1372		0		1924	
AM Pct	41.0%		38.7%		40.9%		39.7%				40.1%	
Peak Hour	7:30	17:00	8:00	15:30	11:00	12:15	11:30	12:00			11:30	15:00
Peak Volume	171	204	185	213	186	167	140	129			160	156

File Number: 2002058
 Route: BELL RD
 Location: Btwn N 91ST ST & N 94TH ST

Direction: EB
 Latitude: 33.6401
 Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020		Average			
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
00:00	2	97	4	99	12	133	7	87	6	104		
00:15	2	102	2	117	7	125	4	73	4	104		
00:30	1	88	5	117	4	106	7	104	4	104		
00:45	1	108	3	116	5	104	6	71	4	100		
01:00	3	101	0	119	8	86	5	83	4	97		
01:15	5	113	0	122	4	105	5	86	4	107		
01:30	0	84	3	103	3	101	3	76	2	91		
01:45	0	122	0	120	3	101	3	80	2	106		
02:00	2	99	0	108	1	106	2	82	1	99		
02:15	0	108	1	113	1	61	2	71	1	88		
02:30	1	102	1	98	5	84	2	76	2	90		
02:45	3	114	1	128	1	91	3	93	2	107		
03:00	3	103	2	126	1	88	0	94	2	103		
03:15	3	131	0	108	3	89	1	64	2	98		
03:30	5	123	1	120	0	104	0	80	2	107		
03:45	4	132	4	128	0	79	2	54	3	98		
04:00	4	130	5	129	1	81	1	93	3	108		
04:15	3	129	1	145	2	98	1	106	2	120		
04:30	8	156	7	132	3	85	2	79	5	113		
04:45	16	147	11	137	4	88	3	90	9	116		
05:00	27	146	17	153	9	93	3	72	14	116		
05:15	46	133	31	134	15	93	14	80	27	110		
05:30	28	192	31	134	25	97	18	70	26	123		
05:45	51	120	42	127	24	79	17	61	34	97		
06:00	43	122	49	137	22	85	12	71	32	104		
06:15	46	102	43	107	17	93	15	64	30	92		
06:30	62	110	59	101	28	75	22	72	43	90		
06:45	89	99	84	88	25	86	21	55	55	82		
07:00	91	101	93	74	35	74	19	39	60	72		
07:15	93	71	104	78	41	59	25	44	66	63		
07:30	99	77	74	73	52	54	38	50	66	64		
07:45	103	70	92	51	63	49	33	33	73	51		
08:00	114	53	112	71	60	61	44	37	83	56		
08:15	111	41	104	44	73	37	45	30	83	38		
08:30	91	37	98	39	62	33	38	17	72	32		
08:45	114	31	116	28	75	27	51	18	89	26		
09:00	99	33	110	28	64	29	53	29	82	30		
09:15	89	19	99	25	70	20	52	21	78	21		
09:30	100	20	80	19	86	30	60	15	82	21		
09:45	118	10	100	33	98	28	56	14	93	21		
10:00	93	11	84	24	107	21	68	16	88	18		
10:15	95	9	83	23	89	24	76	9	86	16		
10:30	78	12	92	25	80	16	69	11	80	16		
10:45	100	4	107	17	92	14	98	6	99	10		
11:00	109	9	108	10	118	13	67	9	101	10		
11:15	104	5	96	11	120	14	86	4	102	9		
11:30	127	2	112	10	87	6	76	3	101	5		
11:45	114	3	119	6	105	9	101	5	110	6		
Totals	2500	3931	2390	4055	1810	3234	1336	2597	0	0	2009	3454
Day Total	6431		6445		5044		3933		0		5463	
AM Pct	38.9%		37.1%		35.9%		34.0%				36.8%	
Peak Hour	11:00	16:45	11:45	16:15	11:45	12:00	11:45	16:00			11:45	16:45
Peak Volume	454	618	452	567	469	468	365	368			422	465

File Number: 2002059
 Route: BELL RD
 Location: Btwn N 91ST ST & N 94TH ST

Direction: WB
 Latitude: 33.6401
 Longitude: -111.8823

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	2	125	3	101	7	122	12	111			6	115
00:15	2	130	3	107	1	130	5	95			3	116
00:30	3	117	1	95	2	123	6	98			3	108
00:45	0	128	4	104	0	137	7	98			3	117
01:00	0	122	3	90	0	113	1	116			1	110
01:15	0	127	3	93	2	119	2	105			2	111
01:30	0	111	0	99	5	122	0	92			1	106
01:45	0	113	1	97	3	120	2	98			2	107
02:00	5	114	0	92	1	126	1	115			2	112
02:15	2	119	0	93	2	104	6	72			3	97
02:30	0	125	0	124	3	98	1	88			1	109
02:45	1	119	4	135	3	96	0	89			2	110
03:00	0	138	0	108	0	113	2	90			1	112
03:15	1	137	6	140	0	84	5	97			3	115
03:30	4	134	0	124	5	125	2	64			3	112
03:45	4	154	6	137	1	103	1	71			3	116
04:00	4	138	3	120	2	98	0	65			2	105
04:15	5	126	12	155	0	106	0	70			4	114
04:30	8	135	10	127	0	78	3	75			5	104
04:45	8	140	4	91	5	124	4	61			5	104
05:00	19	156	19	138	9	81	3	60			13	109
05:15	14	130	9	165	5	87	6	67			9	112
05:30	31	125	30	59	22	76	10	72			23	83
05:45	28	139	25	75	16	89	12	49			20	88
06:00	35	127	15	179	19	103	20	62			22	118
06:15	46	107	36	91	21	93	15	57			30	87
06:30	60	86	32	31	25	70	12	59			32	62
06:45	78	107	70	16	43	70	19	36			53	57
07:00	92	77	43	12	41	73	22	41			50	51
07:15	94	116	55	77	38	59	34	41			55	73
07:30	123	71	88	114	68	96	41	42			80	81
07:45	118	68	69	39	74	51	48	23			77	45
08:00	121	57	84	29	52	36	38	30			74	38
08:15	98	73	63	27	83	45	63	26			77	43
08:30	136	33	71	45	85	40	57	19			87	34
08:45	123	45	79	69	87	31	62	29			88	44
09:00	96	41	68	35	92	36	51	26			77	35
09:15	103	41	74	19	100	25	75	18			88	26
09:30	104	24	74	14	102	37	114	23			99	25
09:45	114	20	94	16	124	51	81	15			103	26
10:00	113	27	88	0	116	40	106	11			106	20
10:15	95	17	114	12	109	18	109	15			107	16
10:30	122	15	81	6	106	22	99	12			102	14
10:45	139	20	95	10	119	22	115	3			117	14
11:00	100	9	86	0	120	12	109	0			104	5
11:15	109	11	86	9	142	26	105	3			111	12
11:30	134	1	88	7	143	7	101	1			117	4
11:45	124	0	110	3	124	14	122	2			120	5
Totals	2618	4295	1909	3529	2127	3651	1709	2612	0	0	2091	3522
Day Total	6913		5438		5778		4321		0		5613	
AM Pct	37.9%		35.1%		36.8%		39.6%				37.3%	
Peak Hour	11:30	15:00	11:45	15:45	11:15	12:00	11:15	12:30			11:30	12:00
Peak Volume	513	563	413	539	531	512	439	417			467	455

File Number: 2002060
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: NB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	1	29	1	27	0	21			1	24
00:15	0	22	0	15	0	10	0	31			0	20
00:30	0	19	0	21	2	21	2	16			1	19
00:45	0	12	0	20	0	17	1	10			0	15
01:00	1	15	0	25	0	16	1	21			1	19
01:15	0	18	1	19	4	28	0	14			1	20
01:30	0	15	0	14	0	27	0	10			0	17
01:45	0	20	0	29	1	9	1	9			1	17
02:00	0	16	1	18	0	8	2	14			1	14
02:15	0	15	0	30	3	25	0	20			1	23
02:30	0	20	0	27	0	37	0	12			0	24
02:45	1	12	2	11	1	13	1	8			1	11
03:00	1	24	1	22	1	10	0	12			1	17
03:15	1	28	0	15	2	12	0	11			1	17
03:30	3	24	0	28	1	9	0	6			1	17
03:45	0	16	1	26	0	6	1	9			1	14
04:00	0	26	0	31	0	11	0	14			0	21
04:15	0	28	7	31	1	7	0	14			2	20
04:30	1	19	3	34	0	14	0	18			1	21
04:45	5	34	1	22	0	15	0	8			2	20
05:00	5	24	2	17	0	8	2	8			2	14
05:15	4	27	4	20	6	18	1	11			4	19
05:30	5	43	6	21	3	15	2	12			4	23
05:45	4	27	9	21	3	11	1	13			4	18
06:00	17	28	8	23	5	17	5	20			9	22
06:15	15	14	9	12	7	9	5	12			9	12
06:30	8	18	15	19	5	7	12	17			10	15
06:45	11	24	9	19	7	13	9	7			9	16
07:00	18	13	11	11	7	19	2	8			10	13
07:15	15	15	18	13	7	9	4	4			11	10
07:30	15	7	18	14	9	3	2	9			11	8
07:45	19	7	12	12	11	8	8	3			13	8
08:00	17	13	17	8	6	1	10	7			13	7
08:15	20	32	19	13	13	7	5	8			14	15
08:30	15	4	12	7	8	2	1	3			9	4
08:45	18	4	9	10	9	0	7	5			11	5
09:00	19	5	15	4	21	7	7	3			16	5
09:15	10	2	9	6	10	3	7	1			9	3
09:30	17	3	12	3	21	5	17	1			17	3
09:45	22	1	17	1	14	2	13	3			17	2
10:00	16	1	16	2	23	4	10	0			16	2
10:15	14	0	12	3	14	2	13	2			13	2
10:30	16	5	15	4	12	1	17	1			15	3
10:45	16	1	26	5	21	6	19	1			21	3
11:00	24	1	11	2	21	5	18	2			19	3
11:15	18	2	12	4	20	2	13	0			16	2
11:30	17	1	18	1	12	1	15	1			16	1
11:45	16	1	29	2	12	3	19	0			19	2
Totals	424	723	388	744	324	510	253	440	0	0	347	604
Day Total	1147		1132		834		693		0		952	
AM Pct	37.0%		34.3%		38.8%		36.5%				36.5%	
Peak Hour	10:45	16:45	11:45	15:45	10:30	12:45	11:45	12:00			11:45	17:15
Peak Volume	75	128	94	122	74	88	87	78			81	82

File Number: 2002061
 Route: N 91ST ST
 Location: Btwn E TRAILSIDE VIEW & E PALO BREA BEND

Direction: SB
 Latitude: 33.6482
 Longitude: -111.8852

Count Date	8/27/2020		8/28/2020		8/29/2020		8/30/2020				Average	
Count Time	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
00:00	0	17	0	23	2	18	1	23			1	20
00:15	2	15	0	16	2	21	3	14			2	17
00:30	0	19	0	18	2	26	5	20			2	21
00:45	0	10	2	15	0	26	0	24			1	19
01:00	0	16	0	13	1	20	1	12			1	15
01:15	0	16	0	17	1	24	0	9			0	17
01:30	0	19	0	20	0	12	0	8			0	15
01:45	0	27	1	24	4	16	1	13			2	20
02:00	0	13	1	9	2	8	1	32			1	16
02:15	0	20	0	17	2	19	0	5			1	15
02:30	0	17	2	23	0	15	0	5			1	15
02:45	0	18	0	21	1	8	1	9			1	14
03:00	3	26	1	27	0	12	3	18			2	21
03:15	3	37	4	26	2	8	0	14			2	21
03:30	4	24	0	15	0	9	1	9			1	14
03:45	0	20	1	20	0	14	1	13			1	17
04:00	4	13	6	30	1	8	1	15			3	17
04:15	2	28	2	18	0	11	0	14			1	18
04:30	2	24	1	20	0	11	0	10			1	16
04:45	6	19	8	13	0	19	0	14			4	16
05:00	8	23	4	13	1	14	3	11			4	15
05:15	14	28	13	18	0	17	2	12			7	19
05:30	10	30	5	26	3	16	0	10			5	21
05:45	19	44	16	32	12	20	10	14			14	28
06:00	16	14	16	17	7	13	3	9			11	13
06:15	8	15	10	14	9	12	2	10			7	13
06:30	14	15	16	11	6	13	7	8			11	12
06:45	21	20	23	18	7	9	1	7			13	14
07:00	23	12	14	13	6	7	3	10			12	11
07:15	19	9	24	7	9	10	5	8			14	9
07:30	17	16	23	8	12	6	11	7			16	9
07:45	26	11	34	8	19	8	11	8			23	9
08:00	20	13	20	13	4	8	4	4			12	10
08:15	22	9	23	7	6	10	3	6			14	8
08:30	18	5	17	8	9	3	8	5			13	5
08:45	25	6	27	4	14	10	5	3			18	6
09:00	19	8	16	2	16	7	3	6			14	6
09:15	20	2	14	8	11	4	11	5			14	5
09:30	5	2	19	9	21	4	11	3			14	5
09:45	23	4	20	4	14	3	12	1			17	3
10:00	16	2	16	8	12	3	15	0			15	3
10:15	19	1	14	2	14	4	23	3			18	3
10:30	21	2	21	2	19	5	12	3			18	3
10:45	14	1	19	4	19	3	17	2			17	3
11:00	22	0	17	5	12	2	12	1			16	2
11:15	15	2	28	1	13	3	18	0			19	2
11:30	13	0	16	1	24	4	14	1			17	2
11:45	17	0	19	2	32	1	16	0			21	1
Totals	510	692	533	650	351	524	261	438	0	0	414	576
Day Total	1202		1183		875		699		0		990	
AM Pct	42.4%		45.1%		40.1%		37.3%				41.8%	
Peak Hour	7:45	17:00	7:15	14:30	11:45	12:30	11:45	12:00			11:45	17:00
Peak Volume	86	125	101	97	97	96	73	81			79	82

APPENDIX B: CRASH DATA

IncidentID	IncidentDateTime	CollisionManner	LightCondition	TotalInjuries	TotalFatalities	TotalMotoristsInjuries	InjurySeverity	Onroad	CrossingFeature	Offset	Latitude	Longitude	IntersectionType	JunctionRelation	Weather	Offset Direction
3051751	1/16/2016 10:47	6	1	2	0	2	3	Bell Rd	94th St	-0.076	33.6400962	-111.87975	0	0	1	4
3054871	1/31/2016 15:54	1	1	0	0	0	1	Bell Rd	94th St	-0.095	33.6400963	-111.88008	0	0	2	0
3069271	3/26/2016 18:14	3	1	1	0	1	4	Bell Rd	94th St	-0.1	33.6400962	-111.88017	2	1	1	4
3087902	4/30/2016 16:45	4	1	0	0	0	1	Bell Rd	91st St	0.0379	33.6400921	-111.88428	0	0	2	2
3089519	5/12/2016 15:58	3	1	0	0	0	1	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095209	5/25/2016 13:49	3	1	1	0	1	3	Bell Rd	94th St	0	33.6400951	-111.87844	1	1	1	0
3095227	5/26/2016 8:16	2	1	0	0	0	1	94th St	Bell Rd	0	33.6400951	-111.87844	1	1	1	0
3110396	7/16/2016 11:11	4	1	0	0	0	1	Bell Rd	91st St	-0.017	33.6400916	-111.88523	2	2	1	4
3198943	2/13/2017 11:37	2	1	1	0	1	2	Bell Rd	07 91ST ST C	-0.01	33.6400909	-111.88512	2	2	1	4
3206942	3/16/2017 13:37	3	1	2	0	2	3	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	1	1	0
3218839	4/14/2017 10:25	2	1	0	0	0	1	94th St	07 BELL RD	0	33.6400933	-111.87844	1	2	1	0
3243085	5/30/2017 17:45	2	1	0	0	0	1	Bell Rd	07 94TH ST	-0.028	33.6400938	-111.87893	0	0	1	4
3274865	9/9/2017 23:09	1	4	1	0	1	2	Bell Rd	07 94TH ST	0	33.6400933	-111.87844	1	2	1	0
3278215	9/18/2017 10:29	1	1	1	0	1	3	Bell Rd	07 94TH ST	-0.002	33.6400934	-111.87847	1	2	1	4
3334984	1/8/2018 15:37	2	1	0	0	3	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3342524	2/2/2018 16:38	1	1	0	0	2	1	07 BELL RD	94th St	14	33.6400984	-111.8784	1	2	1	2
3349455	3/6/2018 6:47	3	1	2	0	2	3	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397725	7/22/2018 12:31	2	1	0	0	2	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	1	0
3397751	7/20/2018 8:22	2	1	0	0	2	1	07 94TH ST	Bell Rd	0	33.6400985	-111.87845	1	1	1	0
3408960	8/8/2018 19:53	3	4	0	0	3	1	07 BELL RD	94th St	0	33.6400985	-111.87845	1	1	4	0
3424614	9/24/2018 9:29	1	1	0	0	1	1	07 BELL RD	91st St	200	33.6400955	-111.88429	0	0	1	2
3460963	11/20/2018 7:22	4	1	0	0	5	1	07 BELL RD	94th St	-15	33.6400985	-111.8785	1	2	1	4

APPENDIX C: SYNCHRO ANALYSIS RESULTS

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	426	25	37	445	62	36
Future Vol, veh/h	426	25	37	445	62	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	463	27	40	484	67	39

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	490	0	799
Stage 1	-	-	-	-	477
Stage 2	-	-	-	-	322
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1297	-	*707
Stage 1	-	-	-	-	*811
Stage 2	-	-	-	-	*849
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1297	-	*685
Mov Cap-2 Maneuver	-	-	-	-	*685
Stage 1	-	-	-	-	*811
Stage 2	-	-	-	-	*822

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	685	934	-	-	1297	-
HCM Lane V/C Ratio	0.098	0.042	-	-	0.031	-
HCM Control Delay (s)	10.8	9	-	-	7.9	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	594	24	56	495	118	47
Future Vol, veh/h	594	24	56	495	118	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	646	26	61	538	128	51

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	672	0	1050
Stage 1	-	-	-	-	659
Stage 2	-	-	-	-	391
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	1206	-	*642
Stage 1	-	-	-	-	*756
Stage 2	-	-	-	-	*849
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	1206	-	*609
Mov Cap-2 Maneuver	-	-	-	-	*609
Stage 1	-	-	-	-	*756
Stage 2	-	-	-	-	*805

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	609	865	-	-	1206	-
HCM Lane V/C Ratio	0.211	0.059	-	-	0.05	-
HCM Control Delay (s)	12.5	9.4	-	-	8.1	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.8	0.2	-	-	0.2	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↖	↖
Traffic Vol, veh/h	450	18	42	470	89	35
Future Vol, veh/h	450	18	42	470	89	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	60	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	489	20	46	511	97	38

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	509	0	847 255
Stage 1	-	-	-	-	499 -
Stage 2	-	-	-	-	348 -
Critical Hdwy	-	-	4.14	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.22	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	1346	-	*675 *899
Stage 1	-	-	-	-	*849 -
Stage 2	-	-	-	-	*849 -
Platoon blocked, %	-	-	1	-	1 1
Mov Cap-1 Maneuver	-	-	1346	-	*652 *899
Mov Cap-2 Maneuver	-	-	-	-	*652 -
Stage 1	-	-	-	-	*849 -
Stage 2	-	-	-	-	*820 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	652	899	-	-	1346	-
HCM Lane V/C Ratio	0.148	0.042	-	-	0.034	-
HCM Control Delay (s)	11.5	9.2	-	-	7.8	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↶↷		↶	↶↷		↶	↷		↶	↷	
Traffic Vol, veh/h	5	426	25	37	445	0	62	0	36	1	0	4
Future Vol, veh/h	5	426	25	37	445	0	62	0	36	1	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	463	27	40	484	0	67	0	39	1	0	4

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	484	0	0	490	0	0	809	1051	245	806	1064	242
Stage 1	-	-	-	-	-	-	487	487	-	564	564	-
Stage 2	-	-	-	-	-	-	322	564	-	242	500	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	*1345	-	-	1297	-	-	*707	490	*934	*707	478	*899
Stage 1	-	-	-	-	-	-	*787	710	-	*777	697	-
Stage 2	-	-	-	-	-	-	*848	697	-	*881	699	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	*1345	-	-	1297	-	-	*685	473	*934	*660	461	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*685	473	-	*660	461	-
Stage 1	-	-	-	-	-	-	*783	707	-	*774	675	-
Stage 2	-	-	-	-	-	-	*818	675	-	*841	696	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.6	10.1	9.3
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	685	934	*1345	-	-	1297	-	-	660	899
HCM Lane V/C Ratio	0.098	0.042	0.004	-	-	0.031	-	-	0.002	0.005
HCM Control Delay (s)	10.8	9	7.7	-	-	7.9	-	-	10.5	9
HCM Lane LOS	B	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.3	0.1	0	-	-	0.1	-	-	0	0

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

09/15/2020

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵↶		↵	↵↶		↵	↶		↵	↶	
Traffic Vol, veh/h	38	594	24	56	495	2	118	0	47	3	0	43
Future Vol, veh/h	38	594	24	56	495	2	118	0	47	3	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	41	646	26	61	538	2	128	0	51	3	0	47

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	540	0	0	672	0	0	1132	1403	336	1066	1415	270
Stage 1	-	-	-	-	-	-	741	741	-	661	661	-
Stage 2	-	-	-	-	-	-	391	662	-	405	754	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1305	-	-	1206	-	-	*614	312	*865	*642	304	*899
Stage 1	-	-	-	-	-	-	*651	604	-	*665	620	-
Stage 2	-	-	-	-	-	-	*848	619	-	*815	595	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	1305	-	-	1206	-	-	*547	287	*865	*567	280	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*547	287	-	*567	280	-
Stage 1	-	-	-	-	-	-	*630	586	-	*645	589	-
Stage 2	-	-	-	-	-	-	*763	588	-	*743	576	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.8			12.4			9.3		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	547	865	1305	-	-	1206	-	-	567	899
HCM Lane V/C Ratio	0.234	0.059	0.032	-	-	0.05	-	-	0.006	0.052
HCM Control Delay (s)	13.6	9.4	7.8	-	-	8.1	-	-	11.4	9.2
HCM Lane LOS	B	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0.9	0.2	0.1	-	-	0.2	-	-	0	0.2

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
3: Ice Den Way & Bell Rd

10/06/2020

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↗		↖	↗	
Traffic Vol, veh/h	92	450	24	56	470	6	118	0	47	6	0	100
Future Vol, veh/h	92	450	24	56	470	6	118	0	47	6	0	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	125	-	-	60	-	-	60	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	100	489	26	61	511	7	128	0	51	7	0	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	518	0	0	515	0	0	1080	1342	258	1082	1352	259
Stage 1	-	-	-	-	-	-	702	702	-	637	637	-
Stage 2	-	-	-	-	-	-	378	640	-	445	715	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1334	-	-	1339	-	-	*581	315	*899	*578	309	*899
Stage 1	-	-	-	-	-	-	*622	590	-	*691	639	-
Stage 2	-	-	-	-	-	-	*848	636	-	*848	581	-
Platoon blocked, %	1	-	-	1	-	-	1	1	1	1	1	1
Mov Cap-1 Maneuver	1334	-	-	1339	-	-	*465	278	*899	*497	273	*899
Mov Cap-2 Maneuver	-	-	-	-	-	-	*465	278	-	*497	273	-
Stage 1	-	-	-	-	-	-	*575	546	-	*639	609	-
Stage 2	-	-	-	-	-	-	*711	607	-	*740	538	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.3			0.8			13.8			9.8		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	465	899	1334	-	-	1339	-	-	497	899
HCM Lane V/C Ratio	0.276	0.057	0.075	-	-	0.045	-	-	0.013	0.121
HCM Control Delay (s)	15.7	9.2	7.9	-	-	7.8	-	-	12.3	9.6
HCM Lane LOS	C	A	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	1.1	0.2	0.2	-	-	0.1	-	-	0	0.4

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon



SCOTTSDALE AIRPORT VICINITY DEVELOPMENT SHORT FORM

For development projects within 20,000 feet of Scottsdale Airport NOT located on an Airpark taxilane or adjacent to airport property

The owner of developments within the Airport Influence Area shall complete forms required by the City and Scottsdale Airport to comply with the Scottsdale Revised Code, Chapter 5 – Aviation and the Airpark Rules and Regulations; and submit the completed forms with final plans to the assigned city project manager.

Project Name: Multi-Use Sports Fields	Plan#:
Site Address: 9390 East Bell Road, Scottsdale, AZ 85255	
Contact name: Joe Phillips	Phone: 480-312-2522

1. HEIGHT ANALYSIS, CH. 5, SEC. 5-354. GENERAL REQUIREMENTS

- Applicants must conduct a height analysis for all projects located within 20,000 feet of Scottsdale Airport.
 1. Complete a height analysis for all structures, appurtenances or construction equipment through the FAA at: <https://oeaaa.faa.gov/oeaaa/external/portal.jsp>, click on the Notice Criteria Tool (left side). If you do not exceed criteria, submit this FAA response from the website with your packet or you must complete step 2.

IF required by FAA, complete Step 2

 2. Submit an FAA form 7460-1 Notice of Proposed Construction or Alteration for review and determination. Please allow about 45 days for this process. A copy of the FAA's response will be required prior to final plan approval.

2. AIRCRAFT NOISE AND OVERFLIGHT DISCLOSURE, CH. 5, SEC. 5-356 & SECT. 5-357

- Incorporate the Airport Disclosure for Development around Scottsdale Airport language into the CC&Rs or other procedural documents and provide a copy. *Exhibit A*
- An aviation easement will need to be granted to the city. If not already recorded for property, submit a notarized Avigation Easement form with packet to your project manager. *Exhibit B*

For questions regarding this form or aviation-related requirements, contact Scottsdale Airport at 480-312-2321.



NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

§ 77.7 Form and time of notice.

(a) If you are required to file notice under §77.9, you must submit to the FAA a completed FAA Form 7460-1, Notice of Proposed Construction or Alteration. FAA Form 7460-1 is available at FAA regional offices and on the Internet.

(b) You must submit this form at least 45 days before the start date of the proposed construction or alteration or the date an application for a construction permit is filed, whichever is earliest.

(c) If you propose construction or alteration that is also subject to the licensing requirements of the Federal Communications Commission (FCC), you must submit notice to the FAA on or before the date that the application is filed with the FCC.

(d) If you propose construction or alteration to an existing structure that exceeds 2,000 ft. in height above ground level (AGL), the FAA presumes it to be a hazard to air navigation that results in an inefficient use of airspace. You must include details explaining both why the proposal would not constitute a hazard to air navigation and why it would not cause an inefficient use of airspace.

(e) The 45-day advance notice requirement is waived if immediate construction or alteration is required because of an emergency involving essential public services, public health, or public safety. You may provide notice to the FAA by any available, expeditious means. You must file a completed FAA Form 7460-1 within 5 days of the initial notice to the FAA. Outside normal business hours, the nearest flight service station will accept emergency notices.

§ 77.9 Construction or alteration requiring notice.

If requested by the FAA, or if you propose any of the following types of construction or alteration, you must file notice with the FAA of:

(a) Any construction or alteration that is more than 200 ft. AGL at its site.

(b) Any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:

(1) 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway more than 3,200 ft. in actual length, excluding heliports.

(2) 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway no more than 3,200 ft. in actual length, excluding heliports.

(3) 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in paragraph (d) of this section.

(c) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 15 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a) or (b) of this section.

(d) Any construction or alteration on any of the following airports and heliports:

(1) A public use airport listed in the Airport/Facility Directory, Alaska Supplement, or Pacific Chart Supplement of the U.S. Government Flight Information Publications;

(2) A military airport under construction, or an airport under construction that will be available for public use;

(3) An airport operated by a Federal agency or the DOD.

(4) An airport or heliport with at least one FAA-approved instrument approach procedure.

(e) You do not need to file notice for construction or alteration of:

(1) Any object that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation;

(2) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device meeting FAA-approved siting criteria or an appropriate military service siting criteria on military airports, the location and height of which are fixed by its functional purpose;

(3) Any construction or alteration for which notice is required by any other FAA regulation.

(4) Any antenna structure of 20 feet or less in height, except one that would increase the height of another antenna structure.

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177
Fax: (817) 222-5920

Website: <https://oeaaa.faa.gov>

INSTRUCTIONS FOR COMPLETING FAA FORM 7460-1

PLEASE TYPE or PRINT

ITEM #1. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #2. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #3. New Construction would be a structure that has not yet been built.

Alteration is a change to an existing structure such as the addition of a side mounted antenna, a change to the marking and lighting, a change to power and/or frequency, or a change to the height. The nature of the alteration shall be included in ITEM #21 "Complete Description of Proposal".

Existing would be a correction to the latitude and/or longitude, a correction to the height, or if filing on an existing structure which has never been studied by the FAA. The reason for the notice shall be included in ITEM #21 "Complete Description of Proposal".

ITEM #4. If Permanent, so indicate. If Temporary, such as a crane or drilling derrick, enters the estimated length of time the temporary structure will be up.

ITEM #5. Enter the date that construction is expected to start and the date that construction should be completed.

ITEM #6. Please indicate the type of structure. DO NOT LEAVE BLANK.

ITEM #7. In the event that obstruction marking and lighting is required, please indicate type desired. If no preference, check "other" and indicate "no preference" DO NOT LEAVE BLANK. NOTE: High Intensity lighting shall be used only for structures over 500' AGL. In the absence of high intensity lighting for structures over 500' AGL, marking is also required.

ITEM #8. If this is an existing tower that has been registered with the FCC, enter the FCC Antenna Structure Registration number here.

ITEM #9 and #10. Latitude and longitude must be geographic coordinates, accurate to within the nearest second or to the nearest hundredth of a second if known. Latitude and longitude derived solely from a hand-held G P S instrument is NOT acceptable. A hand-held GPS is only accurate to within 100 meters (328 feet) 95 percent of the time. This data, when plotted, should match the site depiction submitted under ITEM #20.

ITEM #11. NAD 83 is preferred; however, latitude and longitude may be submitted in NAD 27. Also, in some geographic areas where NAD 27 and NAD 83 are not available other datum may be used. It is important to know which datum is used. DO NOT LEAVE BLANK.

ITEM #12. Enter the name of the nearest city and state to the site. If the structure is or will be in a city, enter the name of that city and state.

ITEM #13. Enter the full name of the nearest public-use (not private-use) airport or heliport or military airport or heliport to the site.

ITEM #14. Enter the distance from the airport or heliport listed in #13 to the structure.

ITEM #15. Enter the direction from the airport or heliport listed in #13 to the structure.

ITEM #16. Enter the site elevation above mean sea level and expressed in whole feet rounded to the nearest foot (e.g. 17'3" rounds to 17', 17'6" rounds to 18'). This data should match the ground contour elevations for site depiction submitted under ITEM #20.

ITEM #17. Enter the total structure height above ground level in whole feet rounded to the next highest foot (e.g. 17'3" rounds to 18'). The total structure height shall include anything mounted on top of the structure, such as antennas, obstruction lights, lightning rods, etc.

ITEM #18. Enter the overall height above mean sea level and expressed in whole feet. This will be the total of ITEM #16 + ITEM #17.

ITEM #19. If an FAA aeronautical study was previously conducted, enter the previous study number.

ITEM #20. Enter the relationship of the structure to roads, airports, prominent terrain, existing structures, etc. Attach an 8-1/2" x 11" non-reduced copy of the appropriate 7.5 minute U.S. Geological Survey (USGS) Quadrangle Map MARKED WITH A PRECISE INDICATION OF THE SITE LOCATION. To obtain maps, contact USGS at 1-888-275-8747 or via internet at "<http://store.usgs.gov>". If available, attach a copy of a documented site survey with the surveyor's certification stating the amount of vertical and horizontal accuracy in feet.

ITEM #21.

- For transmitting stations, include maximum effective radiated power (ERP) and all frequencies.
- For antennas, include the type of antenna and center of radiation (Attach the antenna pattern, if available).
- For microwave, include azimuth relative to true north.
- For overhead wires or transmission lines, include size and configuration of wires and their supporting structures (Attach depiction).
- For each pole/support, include coordinates, site elevation, and structure height above ground level or water.
- For buildings, include site orientation, coordinates of each corner, dimensions, and construction materials.
- For alterations, explain the alteration thoroughly.
- For existing structures, thoroughly explain the reason for notifying the FAA (e.g. corrections, no record or previous study, etc.).

Filing this information with the FAA does not relieve the sponsor of this construction or alteration from complying with any other federal, state or local rules or regulations. If you are not sure what other rules or regulations apply to your proposal, contact local/state aviation's and zoning authorities.

Paperwork Reduction Work Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection displays a currently valid OMB Control Number. The OMB control number for this information collection is 2120-0001. Public reporting for this collection of information is estimated to be approximately 19 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. All responses to this collection of information are mandatory for anyone proposing construction or alteration that meets the criteria contained in 14 CFR 77. This information is collected to evaluate the effect of proposed construction or alteration on air navigation and is not confidential. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Federal Aviation Administration, 10101 Hillwood Parkway, Fort Worth, TX 76177-1524.

