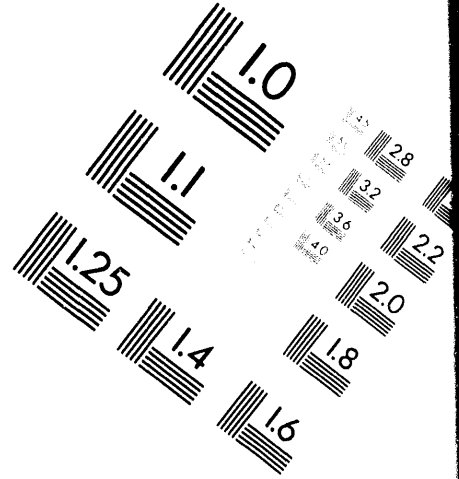
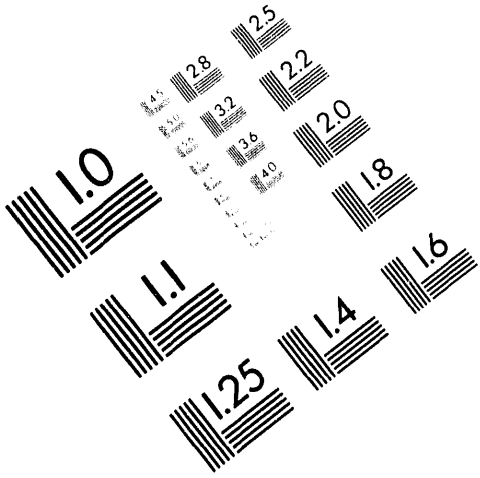




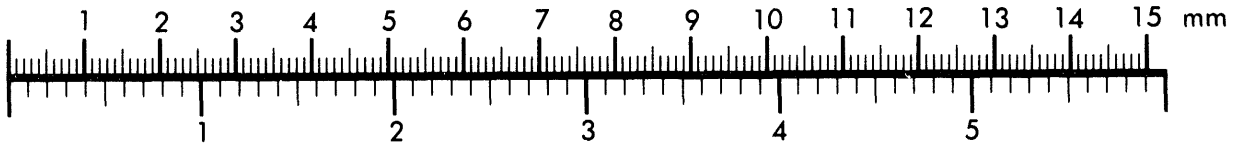
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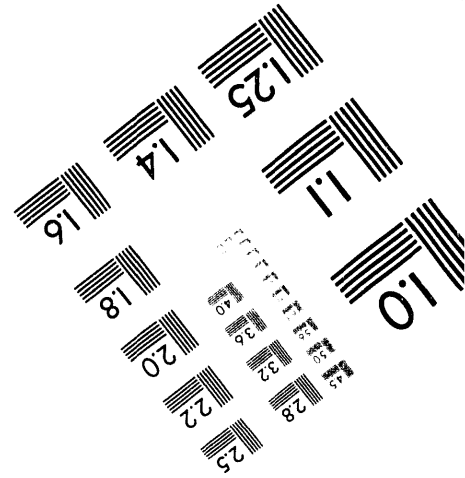
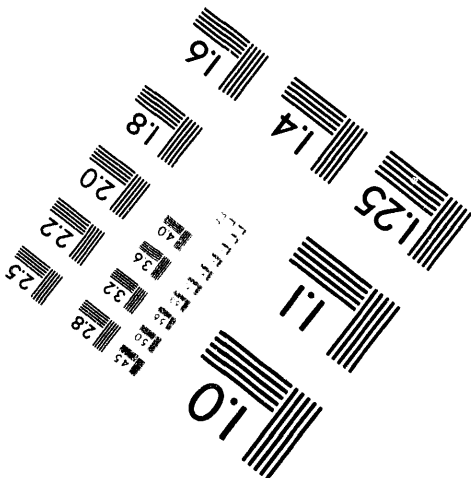
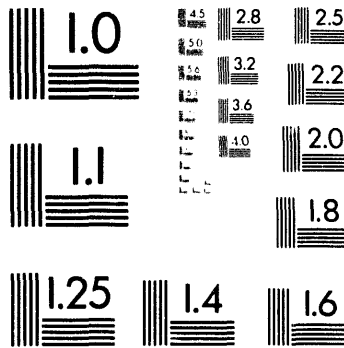
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**1 of 1**

**TA-59 NORTH PARKING LOT AND PAJARITO ROAD CORRIDOR  
ANALYSIS**

Prepared for:  
Los Alamos National Laboratory

Prepared By:  
Barton-Aschman Associates, Inc.

December 1993

**MASTER**

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## 1.

### INTRODUCTION

The purpose of this report is to provide traffic engineering services for the TA-59 North Parking Lot/Pajarito Road Corridor Analysis. Figure 1 provides the site location map. The following tasks were accomplished to assess the development of the north parking lot and Pajarito Road in the vicinity of TA-59:

- Conducted turning-movement counts from 7 AM to 9 AM and from 4 PM to 6 PM at the Pajarito Road/TA-59 intersection
- Conducted a parking supply and demand survey for all the parking lots within TA-59 on half-hour intervals between 0600-1800 (6 AM to 6 PM)
- Conducted mid-day directional speed study along Pajarito Road, just east or south of the TA-59/Pajarito Road intersection
- Conducted peak hour gap study on Pajarito Road in the vicinity of TA-59
- Reviewed the *TA-59 Parking Lot North of Pajarito Road, FY-94 Weapons GPP Short List Candidate #9* report and other documents pertaining to past transportation studies
- Reassigned current turning-movement volumes with a 100 space parking lot being built on the north side of Pajarito Road
- Prepared traffic projections for the Pajarito Road/TA-59 intersection according to the proposed development on the north side of Pajarito Road that would employ 246 people
- Assigned pedestrian crossing volumes between the northern lot/future development site and areas south of Pajarito Road

LOS ALAMOS  
TOWN SITE



JEMEZ ROAD

TA-3

DIAMOND DRIVE

PAJARITO ROAD

TA-59



# SITE LOCATION MAP

- Assessed geometric and signalization requirements at the intersection of TA-59 and Pajarito Road
- Assessed existing roadway geometry east of TA-59 entry with regards to existing and future development proposals
- Assess Pajarito Road speed limits, geometrics, and signage requirements
- Assess roadway geometry of, and interaction with, Pajarito/Diamond intersection with regards to the changes with the Pajarito/TA-59 intersection

2.

## **RECOMMENDATIONS**

Two scenarios were analyzed and based on the existing and future traffic volumes projected, both intersections of Pajarito Road/TA-59 Driveway and Pajarito Road/Diamond Drive may need to be signalized. From a level of service standpoint the two intersections operate acceptably except for the minor street left-turn movements.

### Recommendations:

1. Both intersections of TA-59/Pajarito Road and Diamond Drive/Pajarito Road currently meet Warrant 11, Peak Hour Volume for Traffic Signal Warrants. Both intersections need to be monitored in the future, as the current and future projected minor street movements operate at Level of Service F (LOS F) in both the AM and PM Peak Hours.
2. Once the 100 parking spaces are added to the north side of Pajarito Road across from TA-59, Pajarito Road needs to have a left-turn lane, a through lane, and a right-turn lane on both approaches to the TA-59 driveway. TA-59 needs a left-turn/through lane and a right-turn lane on both approaches. The north approach should provide a 100 foot left/through lane and a 50 foot right-turn lane. The east approach should provide a 75 foot storage left-turn lane, a continuous through lane, and a 50 foot storage right-turn lane. The south approach should provide a 100 foot long left-turn/through lane and a 50 foot storage right-turn lane. The west approach of Pajarito Road should provide a 125 foot storage left-turn lane, a continuous through lane, and a 75 foot storage right-turn lane.

3. If signalized, the intersections need to be interconnected and pedestrian/semi-actuated. TA-59/Pajarito Road should be signalized once the 100 parking spaces are installed.
4. Ideally all pedestrians would cross at the TA-59/Pajarito Road signalized intersection, but if a berm or fence are not installed along Pajarito Road there is not a way to enforce the crossing location. Pedestrian walkways and tunnels are expensive and people do not like to spend the extra time walking up/down them to cross narrow roadways. Adequate pedestrian warning signs, flashing lights, and pavement striping should be provided along Pajarito Road.
5. The speed limit should be to 25 mph in the TA-59/Pajarito corridor and enforced. Once 1,000 feet east of the TA-59 intersection the speed limit on Pajarito Road can be raised to 50 mph.
6. If a mid-block crosswalk is desired, it could be placed 500 to 600 feet east of the existing TA-59/Pajarito Road intersection and have good visibility. A raised median is desirable, but if not a 4-foot area should be provided in the center of Pajarito Road for people to stand in, out of the way of traffic, if they only cross half-way.

### 3.

#### **EXISTING CONDITIONS**

This chapter presents the existing conditions for the Pajarito Road area in the vicinity of TA-59. This includes the description of the roadway network, the results of the speed study, the results of the turning-movement counts and level of service for the intersections, the results of the parking supply and demand by hour, and the results of the gap study on Pajarito Road in the vicinity of TA-59.

##### Existing Roadway Network

**Pajarito Road** is a two lane roadway with turn lanes (acceleration and deceleration lanes) at intersections. Pajarito Road runs from TA-3 in the north to New Mexico 4 in the south. In the vicinity of TA-59, Pajarito Road is relatively flat at the intersection with TA-59, but east of TA-59 there is a horizontal and vertical curve. In the vicinity of the TA-59 driveway, Pajarito Road runs in an east-west direction. The speed limit is 35 miles per hour (mph) from Diamond Drive to past the TA-59 driveway and then the speed limit increases to 50 mph.

**TA-59 Driveway** is a two lane driveway that runs from Pajarito Road in the north to various parking lots and levels of TA-59. The intersection of the TA-59 Driveway with Pajarito Road has a left-turn lane and a through lane on the east approach of Pajarito Road. This left-turn lane on the east approach of Pajarito Road, becomes a westbound acceleration lane for the left-turn traffic from TA-59. The west approach of Pajarito Road at TA-59 has a through lane and a right-turn lane. The south approach of TA-59 at Pajarito Road has a left-turn lane and a right-turn lane. The left-turn lane has an acceleration lane; as mentioned above the left-turn lane from the east approach of Pajarito provides for an acceleration lane for northbound movements from TA-59.

The right-turn lane from TA-59 to Pajarito Road has an acceleration lane. The south approach of TA-59 is stop sign controlled at Pajarito Road.

### Speed Study

Spot speed studies are used to measure the speed of a vehicle at a specific location. These studies consist of observations of the individual speeds at which vehicles are passing a point on a roadway segment. These observations are used to estimate the speed characteristics of the entire traffic stream at the desired location. In order to get free-flow speeds, speed measurements normally will be taken during off-peak hours on weekdays. The minimum sample size for a speed check is generally 25 to 30 vehicles per direction. Normally, 50 to 100 or more vehicles are checked. Certain sampling procedures were followed according to the *Traffic Engineering Handbook*, by the Institute of Transportation Engineers. The recommendations for sampling procedures are, as follows:

1. Observe every  $n$ th vehicle (second, third, etc.) (Do not always observe the first vehicle in a platoon because the following vehicles may be restricted to travel at the speed of the lead vehicle.)
2. Select trucks for speed observation in proportion to their presence in the traffic stream.
3. Avoid sampling a large proportion of high-speed vehicles.
4. Measure only vehicles with a 4-second or greater headway."

Several measures of speed are commonly utilized in traffic engineering analysis, including time mean speed ("average"), the space mean speed, the median speed, the 85th percentile, and the 10-mph pace. The time mean speed is obtained by dividing the sum of all the speeds in the sample by the number of vehicles in the sample. The space mean speed is obtained by dividing the sum of all travel times in to the sum of all travel distances in the sample. The space mean speed is primarily used to

determine travel time accurately and is used in freeway metering calculations. The median speed is the speed below which one-half the vehicles in the sample travel and above which the other half travel. The median is a useful measure, because it is less affected by extreme values than is the time mean speed. The pace is the speed range within defined limits, usually 10 mph, which contain the largest number of observations.

The data collected on Pajarito Road were analyzed for the time mean speed, the median speed, the 85th percentile, and the 10-mph pace.

Spot speed data were collected on Pajarito Road just east of the TA-59 driveway in both directions on November 9 and 10, 1993 from 10:30 AM to 12:00 PM and from 2:30 PM to 3:30 PM. In these time frames 117 vehicles were monitored westbound and 103 vehicles were monitored eastbound. Of the 117 westbound Pajarito Road vehicles recorded, there were 108 automobiles and 9 trucks. Of the 103 eastbound Pajarito Road vehicles recorded, there were 94 automobiles and 9 trucks.

The westbound Pajarito Road automobiles time mean speed ("average") was 43.7 mph and the westbound Pajarito Road trucks averaged 40.3 mph. The median speed is between 43 mph to 44 mph for all the samples. The 85th-percentile speed of all the westbound Pajarito Road vehicles is 49 mph. The 10-mph pace is between 38 mph and 48 mph.

The eastbound Pajarito Road automobiles time mean speed ("average") was 40.0 mph and the eastbound Pajarito Road trucks averaged 38.8 mph. The median speed is between 43 mph to 44 mph for all the samples. The 85th-percentile speed of all the eastbound Pajarito Road vehicles is between 49 mph and 50 mph. The 10-mph pace is between 40 mph and 50 mph.

The speed limit is 35 mph on Pajarito Road in the vicinity of TA-59, but the speed limit is increased to 50 mph to the east of the TA-59 driveway. The westbound Pajarito Road vehicles are decelerating from the 50 mph zone to the 35 mph zone and the eastbound Pajarito Road vehicles are accelerating from the 35 mph zone to the 50

mph zone. The spot speed study appears to show that the average driver is operating between the two speed limits (between 35-50 mph) and the 85th-percentile driver is still operating at or has already achieved the 50 mph speed limit.

### Sight Distance

*A Policy on Geometric Design of Highways and Streets*, by the American Association of State Highway and Transportation Officials (AASHTO), was utilized for the sight distance evaluation. At-grade intersections are inherent points of potential vehicle-vehicle conflict. A driver approaching an intersection should have an unobstructed view of sufficient length to permit control of the vehicle to avoid a collision. The AASHTO guideline presents four cases for intersection control, which results in different intersection sight-distance requirements:

- I. No control, with vehicles adjusting speeds to avoid a collision
- II. Yield Control, with vehicles on the minor roadway yielding to the major roadway
- III. Stop control on the minor roadway
- IV. Signal control

Cases III and IV are the most common, with Case III representing the most critical conditions generally encountered. Within Case III are a range of possible operational assumptions regarding the stopped approach.

Sight distance is the distance along a roadway that an object of specified height is continuously visible to the driver. This distance is dependent on the height of the driver's eye above the road surface, the specified object height above the road surface, and the height of sight obstructions within the line of sight. The design height of the driver's eye is approximately 3.5 feet for measuring both stopping and passing sight distances. For stopping sight distance calculations, the height of object is assumed to be 6 inches above the road surface. For passing sight distance calculations, the height of object is considered to be 4.25 feet above the road surface.

Based on the horizontal and vertical curves on Pajarito Road with an assumed speed condition of 40 mph to 45 mph, the stopping sight distance for wet pavements, rounded for design, is 325 feet to 400 feet.

The sight distance to the west of TA-59 on Pajarito Road is approximately 1,000 feet. The sight distance to the east of TA-59 on Pajarito Road is approximately 500-800 feet, depending whether the pedestrian is on the north side of Pajarito Road or the south side of Pajarito. The north side of Pajarito has more sight distance than the south side of Pajarito at the TA-59 driveway, due to the horizontal and vertical curve to the east of TA-59. Based on the speed limit and the running speed of the vehicles there appears to be adequate stopping sight distance for traffic on Pajarito Road near TA-59.

#### Existing Level of Service

The operating level of an intersection can be described with the term "level of service" (LOS). Level of service is a qualitative description of an intersection's operation based on delay and maneuverability. Level of service can range from "A", representing free flow conditions, to "F", representing jammed conditions. The various levels of service and their descriptions are presented in Table 1.

Table 1

**LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS**

LEVEL OF SERVICE	RESERVE CAPACITY (Vehicles)	DESCRIPTION
A	> 400	Little or no delay
B	300 - 399	Short traffic delays
C	200 - 299	Average traffic delays
D	100 - 199	Long traffic delays
E	0 - 99	Very long traffic delays
F	< 0	Extreme traffic delays

There are several methods to calculate an intersection's level of service. The *1985 Highway Capacity Manual, Special Report 209*, by the Transportation Research Board, was utilized to analyze the unsignalized intersections. This method analyzes the level of service based on the reserve capacity of the minor street and major street turning-movements.

Manual turning-movement counts were conducted on November 9 and 10, 1993 at Pajarito Road/TA-59 Driveway from 7 AM to 9 AM and from 4 PM to 6 PM. The peak hours at the intersection are from 7:15 AM to 8:15 AM and 4:30 PM to 5:30 PM. Information was also collected at the intersection of Diamond Drive and Pajarito Road on September 23, 1992 for the PM peak hour for another traffic analysis. The PM peak hour at the Diamond Drive/Pajarito Road intersection is from 4:30 PM to 5:30 PM. Using the *1985 Highway Capacity Manual*, the levels of service for the two unsignalized intersections were calculated. At the intersection of TA-59/Pajarito Road, in both the AM and PM peak hours, the TA-59 westbound left-turn movements are operating at Level of Service E (LOS E), and the rest of the intersection is operating acceptably. At the intersection of Diamond Drive and Pajarito Road, the eastbound Pajarito Road

left-turns and through movements are operating at LOS E and LOS F, while the rest of the intersection operates at an acceptable level of service.

An intersection is usually considered to be operating at an acceptable level if it operates at LOS D or better during the peak hours. Both intersections currently have minor street movements operating at unacceptable levels of service in the peak hours of the day. Table 2 provides the intersection level of service by movement. Figure 2 shows the existing AM and PM peak hour traffic volumes.

Table 2  
**EXISTING UNSIGNALIZED INTERSECTION LEVELS OF SERVICE (AM & PM PEAK HOUR)**

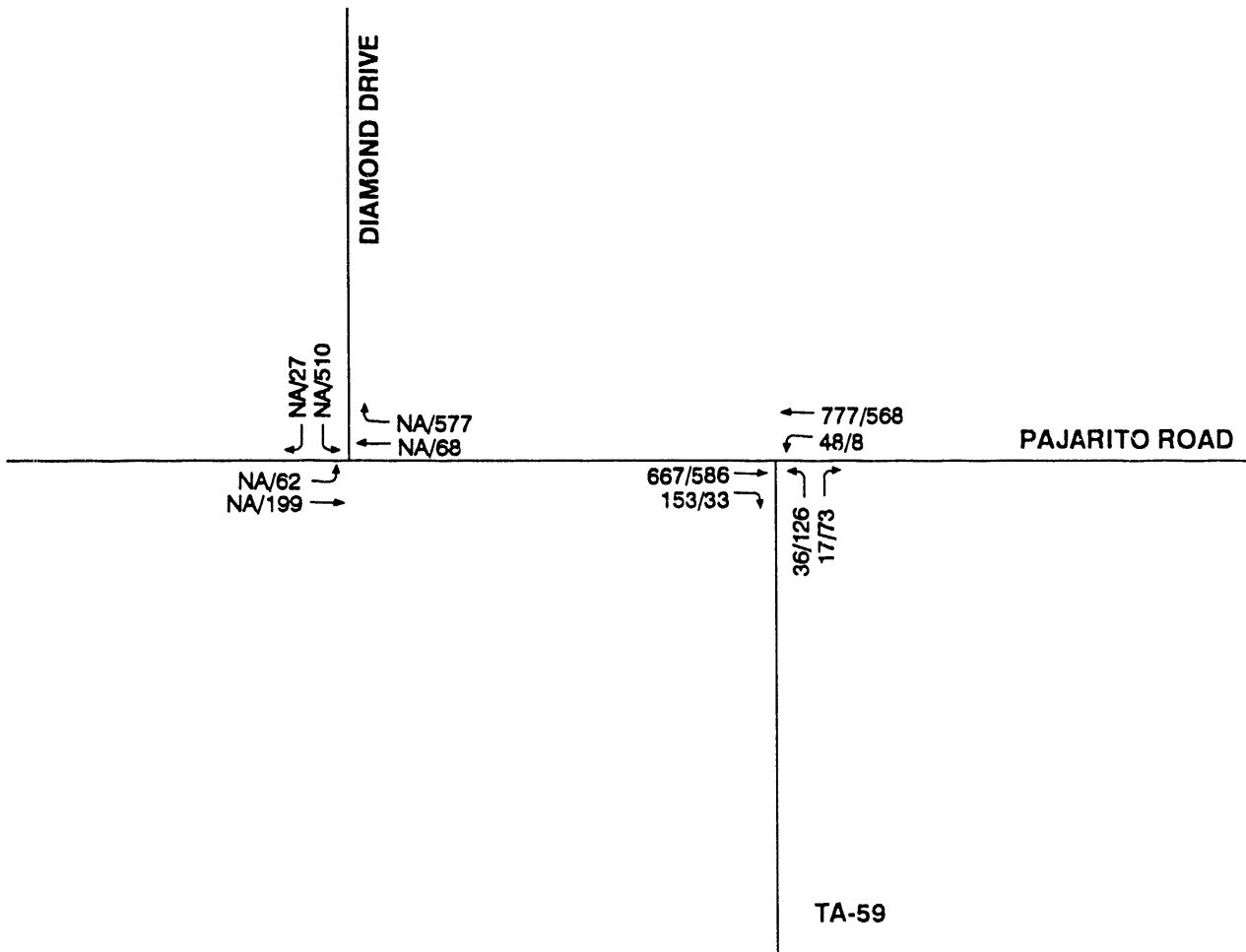
INTERSECTION	MOVEMENT (APPROACH)	RC*	LOS*
Pajarito Road/TA-59 Drive	NB Left	24/ -10	E/F
	NB Right	831/ 909	A/A
	WB Left	351/ 519	B/A
Pajarito Road/Diamond Drive	EB Left	NA/ -41	NA/F
	EB Through	NA/10	NA/E
	WB Through	NA/179	NA/D
	WB Right	NA/365	NA/B
	SB Left	NA/439	NA/A
	NB Left	NA/993	NA/A

RC = RC is reserved or unused capacity of the lane for unsignalized intersections in passenger cars per hour.

LOS= Level of service.

\* = AM/PM Peak Hour

NA = Not Available



**LEGEND:**

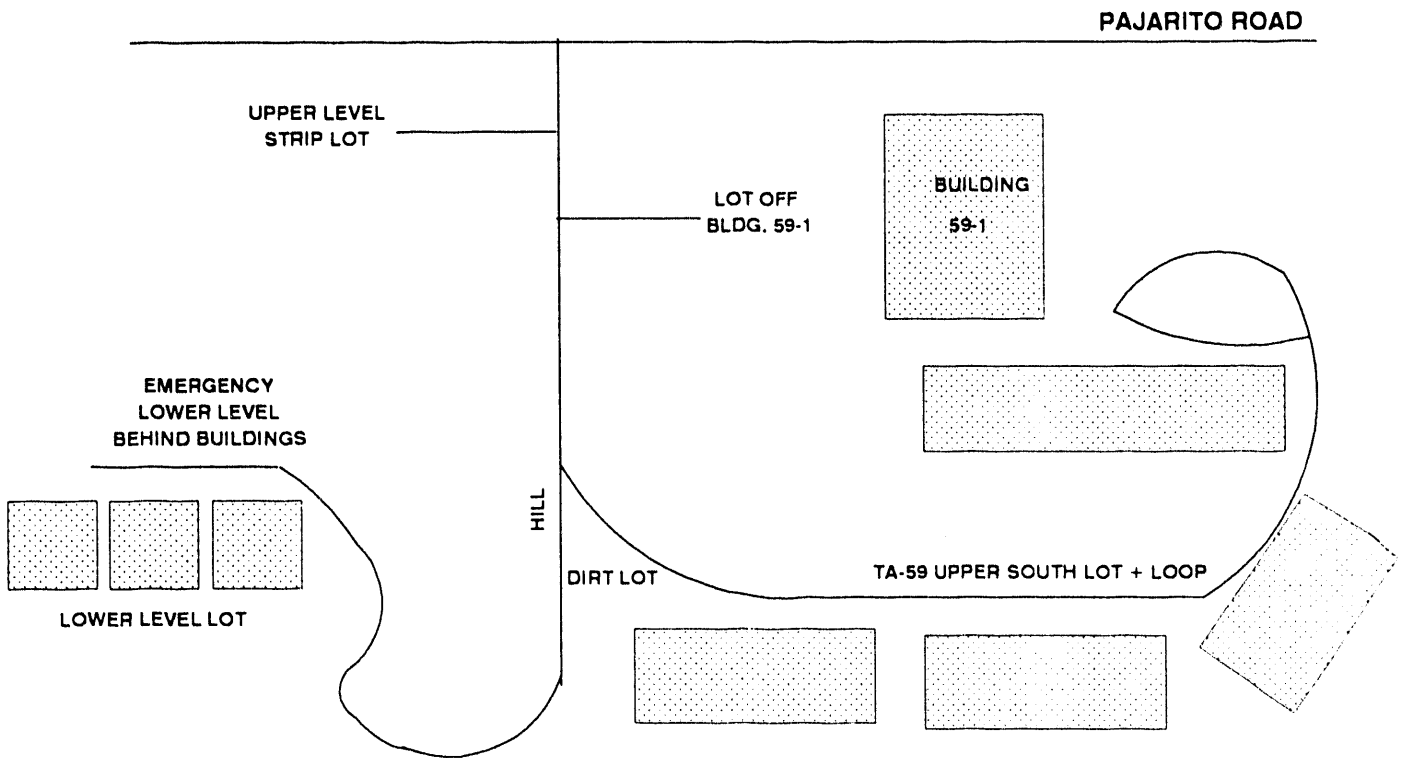
00/00 = A.M. PEAK HOUR/P.M. PEAK HOUR  
NA = NOT AVAILABLE



# EXISTING A.M. AND P.M. PEAK HOUR TRAFFIC VOLUMES

### Parking Supply and Demand

A parking supply and demand survey was performed for TA-59 from 6:00 AM to 6:00 PM on November 9 and 10, 1993. The TA-59 parking areas were surveyed once every half hour for the twelve hour survey. The TA-59 parking lots were divided into five areas. These areas were then inventoried for the type and quantity of the parking spaces. The five areas are shown on Figure 3 and are, as follows: Lot Off Building 59-1 (including the dirt lot and the hill); TA-59 Upper South Lot and Loop; Emergency Lower Level Parking (behind the buildings on the lower level); Lower Level Lot; and Upper Level Strip Lot. There are various types of parking spaces available in these parking areas. The types of parking available are handicap (HC), 2-Hour Visitor Parking, Reserved (Government), Loading zones or spaces, and unrestricted striped spaces. From a driver's perspective, if a parking lot has more than 85-percent of the parking spaces occupied it is perceived to be full. Due to various turn-over rates, the 85-percent utilization is used as a guide as to whether adequate parking is provided and whether or not the driver feels he/she is driving in circles in search of a parking space. Table 3 provides the parking lot supply and demand for TA-59.



# TA-59 PARKING LOT LOCATIONS

Table 3  
**TA-59 PARKING LOT SUPPLY AND DEMAND**

Begin Time	LOT OFF BLDG. 59-1 + DIRT + HILL					TA-59 UPPER SOUTH LOT/LOOP		
	HC(1)	2-Hour (4)	Reserved (4)	Regular (45)	Loading (1)	Reserved (29)	Loading (5)	Regular (33)
6:00	0	0	0	5	0	18	3	6
6:30	0	0	0	11	1	18	3	7
7:00	0	0	0	65	1	17	3	19
7:30	0	1	0	51	1	20	3	29
8:00	0	4	0	69	1	26	4	45
8:30	0	4	1	70	1	21	3	47
9:00	0	4	2	66	1	19	2	47
9:30	0	4	3	70	1	18	2	44
10:00	0	4	3	71	1	18	1	44
10:30	0	4	1	71	1	17	1	43
11:00	0	4	2	68	1	17	1	49
11:30	0	4	2	61	1	17	2	39
12:00	0	4	1	52	1	18	0	42
12:30	0	4	2	60	1	19	1	43
13:00	0	4	2	60	1	21	2	42
13:30	0	4	2	66	1	18	2	51
14:00	0	4	2	71	1	15	2	53
14:30	0	3	3	70	1	18	2	51
15:00	0	4	2	69	1	23	2	43
15:30	0	4	3	69	1	22	3	44
16:00	0	1	2	51	1	20	3	39
16:30	0	4	1	42	1	23	2	29
17:00	0	1	0	22	1	16	4	18
17:30	0	1	0	4	1	15	4	14
18:00	0	1	0	3	1	15	4	11

**Table 3  
TA-59 PARKING LOT SUPPLY AND DEMAND (Cont'd)**

Begin Time	EMERGENCY LOWER LEVEL BEHIND BUILDINGS			LOWER LEVEL LOT		
	HC(2)	Reserved (3)	Regular (3)	HC(1)	Reserved (12)	Regular (28)
6:00	0	0	0	0	11	3
6:30	0	0	1	0	11	3
7:00	0	0	1	0	11	7
7:30	0	0	1	0	11	18
8:00	0	0	1	0	11	27
8:30	0	0	1	0	10	29
9:00	0	1	1	0	9	31
9:30	0	1	0	0	6	32
10:00	0	1	0	0	5	30
10:30	0	1	1	0	8	31
11:00	0	1	2	0	7	30
11:30	0	1	0	0	8	26
12:00	0	1	1	0	9	23
12:30	0	1	2	0	8	28
13:00	0	1	1	0	8	33
13:30	1	2	3	0	10	26
14:00	1	2	3	0	8	28
14:30	1	2	3	0	5	29
15:00	1	2	3	0	8	27
15:30	1	2	2	0	9	27
16:00	1	2	2	0	10	26
16:30	0	1	1	0	11	20
17:00	0	0	0	0	11	16
17:30	0	0	0	0	11	4
18:00	0	0	0	0	10	2

**Table 3**  
**TA-59 PARKING LOT SUPPLY AND DEMAND (Cont'd)**

	UPPER LEVEL STRIP LOT		TA-59 TOTAL VEHICLES PARKED (283)
	Reserved (2)	Regular (110)	
6:00	2	3	51
6:30	2	4	61
7:00	2	12	118
7:30	2	23	160
8:00	2	65	255
8:30	2	85	274
9:00	1	92	276
9:30	1	103	285
10:00	1	104	283
10:30	1	100	280
11:00	1	98	281
11:30	1	88	250
12:00	1	71	224
12:30	1	59	229
13:00	1	71	247
13:30	1	86	273
14:00	1	89	280
14:30	1	92	281
15:00	0	90	273
15:30	0	88	275
16:00	1	77	236
16:30	1	69	205
17:00	2	45	136
17:30	2	7	63
18:00	2	3	52

HC = Handicap Space

(00)= Supply of Parking Spaces

Regular = No restriction on parking space and is a striped space.

2-Hour = Two-Hour time limit to parking space.

Reserved = Parking spaces reserved for certain vehicles only, i.e., Government.

Loading = Parking spaces that are loading zones.

Survey conducted on November 9 and 10, 1993.

The parking lot off of building 59-1, including the dirt lot and the hill area, has one handicap parking space, four 2-Hour Visitor spaces, four reserved spaces, one loading space, and 45 unrestricted parking spaces. During the 12 hours of the survey the handicap parking space was never utilized and the loading zone space was almost always occupied. The visitor spaces were almost always fully occupied from 8:00 AM to 4:30 PM. Of the four reserved spaces, they were never all fully occupied, but were 50-percent to 75-percent occupied from 9:00 AM to 4:00 PM. The regular or unrestricted parking were more than 100-percent utilized and people were parking on the hill, in the dirt, and illegally from 7:00 AM to 4:30 PM. There are 45 regular parking spaces provided and at the peak parking utilization for this area there were 71 vehicles parked from 10:00 AM to 11:00 AM and from 2:00 to 2:30 PM.

The parking lot for TA-59 Upper South Lot and the Loop, includes the parking areas behind Building 59-1. This area has 29 reserved spaces, five loading spaces, and 33 unrestricted parking spaces. During the 12 hours of the survey the loading zone spaces were never fully utilized, but were 50-percent to 80-percent occupied. Of the 29 reserved spaces, they were never all fully occupied, but were 50-percent to 90-percent occupied from 6:00 AM to 6:00 PM. The regular or unrestricted parking were more than 100-percent utilized and people were parking in the dirt or illegally from 8:00 AM to 4:30 PM. There are 33 regular parking spaces provided and at the peak parking utilization for this area there were 53 vehicles parked from 2:00 to 2:30 PM.

The parking area on the lower level behind the buildings, Emergency Vehicles Only, has two handicap parking spaces, three reserved spaces, and three unrestricted parking spaces. During the 12 hours of the survey the handicap parking spaces were never fully utilized Only one handicap space was used from 1:30 PM to 4:00 PM. The three reserved spaces were never all fully occupied, but were 33-percent to 66-percent occupied from 9:00 AM to 5:00 PM. The regular or unrestricted parking were 100-percent utilized from 1:30 PM to 3:30 PM.

The Lower Level Parking Lot has one handicap parking space, twelve reserved spaces, and 28 unrestricted parking spaces. During the 12 hours of the survey the handicap parking space was never utilized. Of the twelve reserved spaces, eleven were occupied early in the morning and again in the late afternoon. The reserved spaces were almost more than 50-percent occupied for the whole survey period. The regular or unrestricted parking spaces were more than 100-percent utilized from 8:30 AM to 11:30 AM, 12:30 PM to 1:30 PM, and 2:00 PM to 3:00 PM. There are 28 regular parking spaces provided and at 1:00 PM there were 33 vehicles parked in this area.

The Upper Level Strip Parking Lot has two reserved spaces and 110 unrestricted parking spaces. During the 12 hours of the survey the two reserved spaces were occupied early in the morning and again in the late afternoon. The reserved spaces almost always had at least one vehicle parked in one of the two spaces. The regular or unrestricted parking spaces were never 100-percent utilized, but were 85-percent utilized from 9:00 AM to 11:30 AM. There are 110 regular parking spaces provided, but the very western side of the parking area is quite a walk to some of the TA-59 buildings.

The adequacy of parking spaces is contingent on the restrictions placed on the striped parking spaces provided. Table 4 provides the percent utilization of the five parking areas with no distinction of parking space restrictions. Table 4 is based on the demand of the parking area compared to the striped parking spaces with no regards for the parking restrictions. Any parking areas over 85-percent utilized give the perception of being over-utilized. The parking area near Building 59-1 is extremely over-utilized from 7:00 AM to 5:00 PM. The Upper South Lot and Loop parking area is over-utilized from 8:00 AM to after 4:00 PM. The Emergency Lower Level Parking Area Behind the buildings is not over-utilized, but the roadway to access these parking spaces is one lane and narrow, plus there are only eight parking spaces in this area. The Lower Level Parking Area is over-utilized from 8:00 AM to Noon and again from

12:30 PM to approximately 4:30 PM. The Upper Level Strip Parking Lot is over-utilized from 9:30 AM to 11:30 AM. Table 4 provides a summary of the TA-59 parking percent utilization for the five areas as a whole. There appears to be shortage of regular/unrestricted spaces and possibly 2-Hour Visitor parking spaces. There appears to be an adequate number of handicap, loading, and reserved spaces.

**Table 4  
TA-59 PARKING PERCENT UTILIZATION**

TIME	LOT OFF BUILDING 59-1 + DIRT LOT + HILL	UPPER SOUTH LOT AND LOOP	EMERGENCY LOWER LEVEL BEHIND BUILDING	LOWER LEVEL LOT	UPPER LEVEL STRIP LOT
6:00	9%	40%	0%	34%	5%
6:30	22%	42%	13%	34%	5%
7:00	84%	58%	13%	44%	13%
7:30	96%	78%	13%	71%	22%
8:00	135%	112%	13%	93%	60%
8:30	138%	106%	13%	95%	78%
9:00	133%	102%	25%	98%	83%
8:30	142%	96%	13%	93%	93%
10:00	144%	94%	13%	85%	94%
10:30	140%	91%	25%	95%	90%
11:00	136%	100%	38%	90%	88%
11:30	124%	87%	13%	83%	80%
12:00	106%	90%	25%	78%	64%
12:30	122%	94%	38%	88%	54%
13:00	122%	97%	25%	100%	64%
13:30	133%	106%	75%	88%	78%
14:00	142%	105%	75%	88%	80%
14:30	140%	106%	75%	83%	83%
15:00	138%	102%	75%	85%	80%
15:30	140%	103%	63%	88%	79%
16:00	100%	93%	63%	88%	70%
16:30	87%	54%	25%	76%	63%
17:00	44%	57%	0%	66%	42%
17:30	11%	49%	0%	37%	8%
18:00	9%	45%	0%	29%	5%

### Gap Study

A gap study was performed on Pajarito Road to adequately address the needs of pedestrians to cross Pajarito Road from the parking lot on the north side to the buildings on the south side. The time in seconds was calculated for the gap between vehicles on Pajarito Road. A pedestrian would consider the gap in both directions before crossing a street. The gap study was conducted from 7:15 AM to 9:00 AM on November 10, 1993 and from 3:30 PM to 5:00 PM on November 9, 1993.

According to A Policy on Geometric Design on highways and Streets, 1990, by AASHTO, the average pedestrian walks at 4 feet per second to cross a street. For the two lane section, Pajarito Road is 28 feet wide, so it would require a 7 second gap. At the intersection of TA-59/Pajarito Road, the crossing width of Pajarito Road is currently 37 feet, so it would require a 9.25 second gap to cross a pedestrian safely. Based on the AM peak hour results the average gaps are 2.0 seconds to 4.8 seconds, which does not provide an adequate gap to safely cross Pajarito Road. In the PM peak hour, the average gaps are 2.6 seconds to 4.4 seconds, which also does not provide a sufficient gap to cross the road safely.

#### 4.

### **PROJECT CONDITIONS**

This chapter will present the trip generation, distribution, and assignment of the traffic volumes associated with the proposed two scenarios for TA-59. The first step, trip generation will assess the amount of traffic anticipated to travel to and from the site in the AM and PM peak hours of the day. The second step, trip distribution will utilize existing traffic patterns to assess the directions of approach and departure for the project traffic. The third and final step, trip assignment will assign the traffic volumes to the roadway network surrounding the site.

#### Future Scenarios

There are two scenarios proposed for TA-59 and they are as follows:

1. Add a 100 parking spaces to the north side of Pajarito Road
2. Add the original 100 parking spaces plus add an additional 246 employees to buildings that are proposed for the north side of Pajarito Road

#### Trip Generation

The AM and PM peak hour traffic volumes for each phase of the proposed TA-59 development were calculated based on the existing work habits of the TA-59 employees. In addition to the existing traffic volumes counted, the anticipated traffic volumes (33 westbound vehicles in the AM peak hour and 33 eastbound vehicles in the PM peak hour) for the new Material Science Laboratory (MSL) building in TA-3 were added to the existing volumes to reflect a more accurate future conditions scenario. The first scenario is to assess the impacts of adding a 100 parking spaces to the north side of Pajarito Road. A needs study was performed and according to the *FY-94 Weapons GPP Short List Candidate #9, TA-59 Parking Lot North of Pajarito Road*

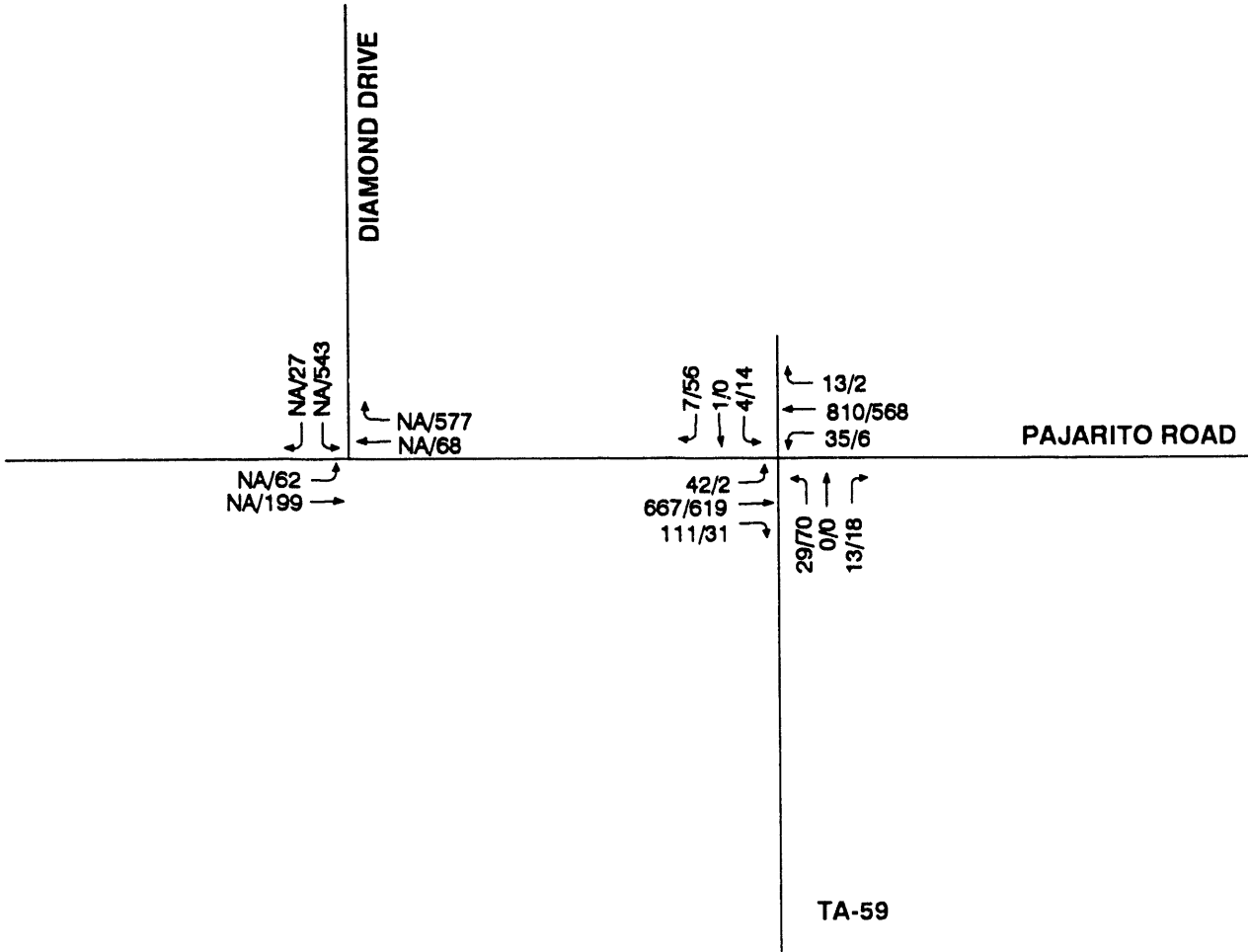
report a 100 parking spaces are to be provided to address the needs of TA-59. If the arrival and departure characteristics are the same as they are today, then approximately 55 vehicles will enter the proposed lot in the AM peak hour and 70 vehicles will depart from the lot in the PM peak hour. The second scenario is to assess not only having the 100 parking spaces, but to add 246 additional employees and their parking needs to the north side of Pajarito Road. The trip generation analysis for the additional 246 employees is based on the existing arrival and departure rates for the existing TA-59 employees. There are 135 vehicle trips anticipated inbound in the AM peak hour and 172 vehicle trips anticipated outbound in the PM peak hour.

#### Trip Distribution

The direction from which traffic will access the TA-59 site in the AM and PM peak hours is estimated to have 80-percent of the traffic come to/from the west and 20-percent of the traffic come to/from the east.

#### Trip Assignment

The site-generated traffic volumes by scenario were assigned to the area road system based on the trip distribution presented above. The site-generated traffic volumes by scenario were added to the existing plus MSL volumes for the AM and PM peak hours. The future traffic volumes for Scenario 1 and Scenario 2 are presented on Figures 4 and 5, respectively.

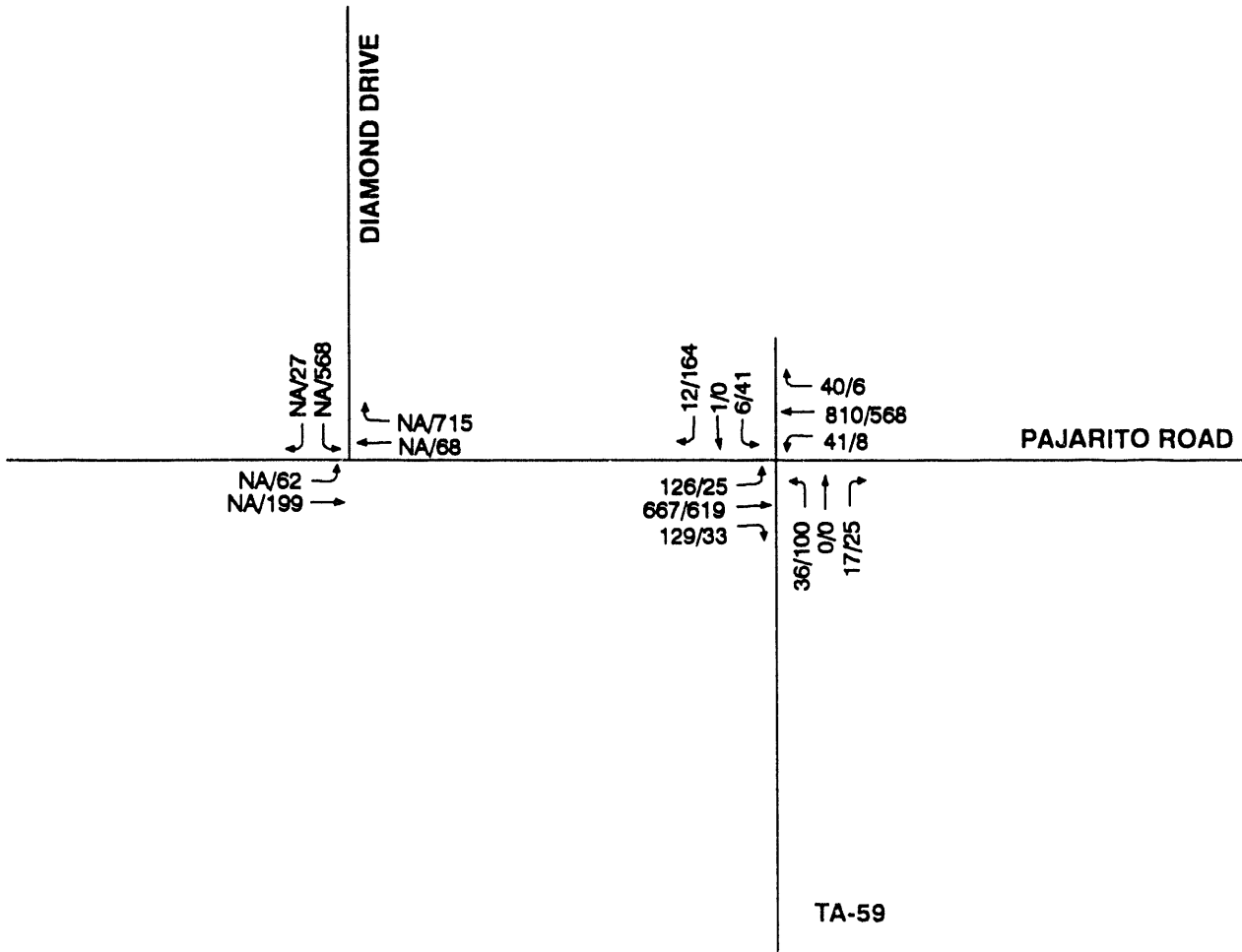


**LEGEND:**

00/00 = A.M. PEAK HOUR/P.M. PEAK HOUR  
 NA = NOT AVAILABLE

**TA-59 FUTURE TRAFFIC VOLUMES  
 WITH 100 PARKING SPACES ON  
 NORTH SIDE OF PAJARITO ROAD**





**LEGEND:**

00/00 = A.M. PEAK HOUR/P.M. PEAK HOUR  
 NA = NOT AVAILABLE

# TA-59 FUTURE TRAFFIC VOLUMES WITH 100 PARKING SPACES PLUS 246 ADDITIONAL EMPLOYEES



## 5.

### **FUTURE CONDITIONS**

This chapter provides the future traffic conditions for the parking lot and the potential increase in employees on the north side of Pajarito Road, across from TA-59. The trip generation, distribution, and reassignment/assignment of the traffic volumes associated with the proposed changes for TA-59 were added to the existing plus MSL traffic volumes to create two future conditions scenarios. The future conditions scenarios for the two phases will be analyzed with a level of service analysis. The first scenario for TA-59 is a proposed parking lot to be built on the north side of Pajarito Road and the second scenario is to provide accommodations for 246 employees on the north side of Pajarito Road, across from the existing TA-59.

#### Future Levels of Service

Based on the future traffic volumes for each scenario shown on Figures 4 and 5, the two unsignalized intersections were analyzed according to the *Highway Capacity Manual* for unsignalized intersections. Table 5 provides the results of the level of service analysis for the two unsignalized intersections in the AM and PM peak hours. Each scenario will be discussed individually.

Table 5

**FUTURE UNSIGNALIZED INTERSECTION LEVELS OF SERVICE BY SCENARIO FOR THE AM AND PM PEAK HOURS**

INTERSECTION	MOVEMENT APPROACH	SCENARIO 1		SCENARIO 2	
		RC*	LOS*	RC*	LOS*
Pajarito/TA-59 Drive	NB Left	25/31	E/E	4/-36	E/F
	NB Right	854/ 909	A/A	841/901	A/A
	SB Left	54/99	E/E	37/59	E/E
	SB Right	840/898	A/A	823/778	A/A
	EB Left	356/559	B/A	251/531	C/A
	WB Left	388/502	B/A	370/498	B/A
Pajarito/Diamond	EB Left	NA/44	NA/F	NA/58	NA/F
	EB Right	NA/16	NA/F	NA/35	NA/F
	WB Through	NA/151	NA/D	NA/130	NA/D
	WB Right	NA/365	NA/B	NA/214	NA/C
	NB Left	NA/993	NA/A	NA/993	NA/A
	SB Left	NA/402	NA/A	NA/375	NA/B

RC = Reserved or unused capacity of the lane for unsignalized intersections in passenger cars per hour.

LOS= Level of Service.

NA = Not Applicable.

\* = AM/PM Peak Hour.

Scenario 1 = Adding 100 Parking Spaces to North Side of Pajarito Road opposite TA-59.

Scenario 2 = Scenario 1 plus adding an additional 246 employees on north side of Pajarito Road.

### Scenario 1--Adding 100 Parking Spaces to North Side of Pajarito

Once the 100 parking spaces are added to the north side of Pajarito Road, opposite TA-59, the driveway to the proposed TA-59 parking lot will align with the existing TA-59 Driveway. Scenario 1 is anticipated to have both unsignalized intersections of Pajarito Road/TA-59 Drive and Pajarito Road/Diamond Drive minor street left-turn movements continue to operate at unacceptable levels of service, Level of Service E or F (LOS E/F). The major street left-turn movements are all anticipated to operate at acceptable levels of service (LOS D or better).

### Scenario 2--Adding an Additional 246 Employees to the North Side of Pajarito Road

Scenario 2 adds buildings and parking spaces for 246 new people at TA-59 on the north side of Pajarito Road. Scenario 2 is anticipated to have both unsignalized intersections of Pajarito Road/TA-59 Drive and Pajarito Road/Diamond Drive minor street left-turn movements continue to operate at unacceptable levels of service, Level of Service E or F (LOS E/F). The major street left-turn movements are all anticipated to continue to operate at acceptable levels of service (LOS D or better).

### Traffic Signal Warrants

To assess the traffic signal requirements the *Manual on Uniform Traffic Control Devices*, by the Federal Highway Administration, warrants for traffic signal installation were utilized. The traffic count data collected last year for the emergency evacuation plan analysis was used. The intersections of Pajarito Road/TA-59 Driveway and Pajarito Road/Diamond Drive currently both meet Warrant 11, Peak Hour Volume and are anticipated to continue to meet Warrant 11 traffic signal warrant once the 100 space parking lot is built in Scenario 1.

The intersections are not anticipated to meet Warrant 3, Minimum Pedestrian Volume since that requires that for eight hours on an average day that the major street carry 600 or more vehicles per hour and in the same eight hours 150 or more pedestrians per hour on the highest volume crosswalk cross the major street. A signal may be installed at non-intersection locations (mid-block) provided the requirements of Warrant 3 are met, and provided that the related crosswalk is not closer than 150 feet to another established crosswalk.

Both intersections are anticipated to meet or currently already do meet Warrant 11, Peak Hour Volume warrant and should continue to be monitored in the future. If the intersection of TA-59/Pajarito Road is signalized, it is anticipated to operate at LOS A or LOS B for both scenarios, and would provide a safe crossing point for pedestrians. If Diamond Drive/Pajarito Road were signalized it is anticipated to operate at LOS "B" for Scenario 1 and LOS D for Scenario 2 in the PM Peak Hour. The maximum queues are not estimated to be greater than 200 feet long and it is 800 to 1,000 feet from the TA-59 Driveway to Diamond Drive on Pajarito Road. The two intersections should be interconnected so no problems should occur between the two intersections if they are signalized.

#### Pedestrian Safety

The pedestrian volume in the peak hours is based on the number of vehicles parking in the lot and the vehicle occupancy of those vehicles. Based on studies conducted in the past, the Lab has a vehicle occupancy of 1.33. In Scenario 1, if 55 vehicles utilize the northern parking lot, then approximately 73 pedestrians will wish to cross Pajarito Road in the AM peak hour. In the PM peak hour, 70 vehicles are anticipated to leave the parking lot on the north side of Pajarito, so approximately 93 people will wish to cross Pajarito Road.

The intersections are anticipated to operate acceptably, except for the minor street left-turn movements in the peak hours, so it is not critical that the intersections be signalized. Although there are not enough pedestrians to warrant signalization, there is still a concern for pedestrian safety. The average existing vehicular gaps are not large enough for pedestrians to safely cross Pajarito Road all the way at one time. If the intersection continues to warrant signalization, a pedestrian actuated signal installation should be provided. This would have the signal operation maximize the time for vehicular movements, but when a pedestrian pushes the push-button then an adequate amount of time would be provided for the pedestrian to cross Pajarito Road.

Based on the stopping sight distance requirement of 400 feet, if the TA-59/Pajarito Road intersection is signalized there should not be any obstructions built that would cause a decrease in sight distance. There needs to be a minimum of 400 feet of visibility maintained, and it is recommended that the more visibility allowed the safer the conditions, due to the speed, the curvature of the road, and the pedestrians crossing.

Whether or not a traffic signal is installed, there will be some people who will wish to cross Pajarito Road east of the existing TA-59/Pajarito Road intersection. There are many expensive options to safely having people cross roadways, via pedestrian bridges or tunnels. Sometimes even when these expensive safety devices are utilized people will not use them. Based on the volume of people and the limited number of gaps in the peak hour there are a few pedestrian crossing techniques that could be utilized:

1. Build a berm or fence to make people cross only at the intersection.  
(This may not be deemed convenient to those parking in the lot and crossing to TA-59.)
2. Approximately 500 feet to 600 feet east from the existing TA-59/Pajarito Road intersection is a "Thru Traffic Keep Right" sign. A crosswalk could be striped with

a median center area striped so that there is a 4-foot area in the center for a pedestrian to stand if he could only cross Pajarito Road half way. A raised median would be more desirable, but raised medians are not utilized at the Lab due to snow removal concerns. This center area would only require a two foot shift from each side of the roadway to accommodate this "safety" area in the center of Pajarito Road. "Pedestrian warning" signs (W11A-2) should be placed approximately 375 feet for the westbound direction and 150 feet for the eastbound traffic on Pajarito. The speed limit should also be lowered to 25 mph in this area and enforced, to provide for a safer crossing. The pedestrian and vehicle visibility is good in this location, as there is over 1,000 feet in both directions.

#### Signing and Striping

The existing signage is adequate for the existing geometrics. If a signal is not installed there needs to be adequate signage to warn vehicles of the potential for pedestrians to cross Pajarito Road. The first sign that is recommended to be changed is the speed limit. As mentioned above, due to the pedestrians crossing Pajarito Road, it is recommended to reduce the speed limit to 25 mph until at least 1,000 feet east of the potential pedestrian crossing zone. A R2-5a (Reduced Speed Ahead) sign should be installed approximately 1,000 feet prior to the crosswalk location. Reducing the speed limit to 25 mph is an enforcement problem, but it is an important safety issue for pedestrians. Once 1,000 feet east of the crosswalk, then the speed limit can be posted for 50 mph for the eastbound traffic.

If a signal is not installed at the TA-59/Pajarito Road intersection a W11A-2 sign (Pedestrian Crossing Ahead) and a W14-4 sign (Limited Sight Distance), should be installed approximately 375 feet prior to the crosswalk for the westbound traffic on Pajarito Road and 150 feet prior to the crosswalk for the eastbound traffic. Crosswalk

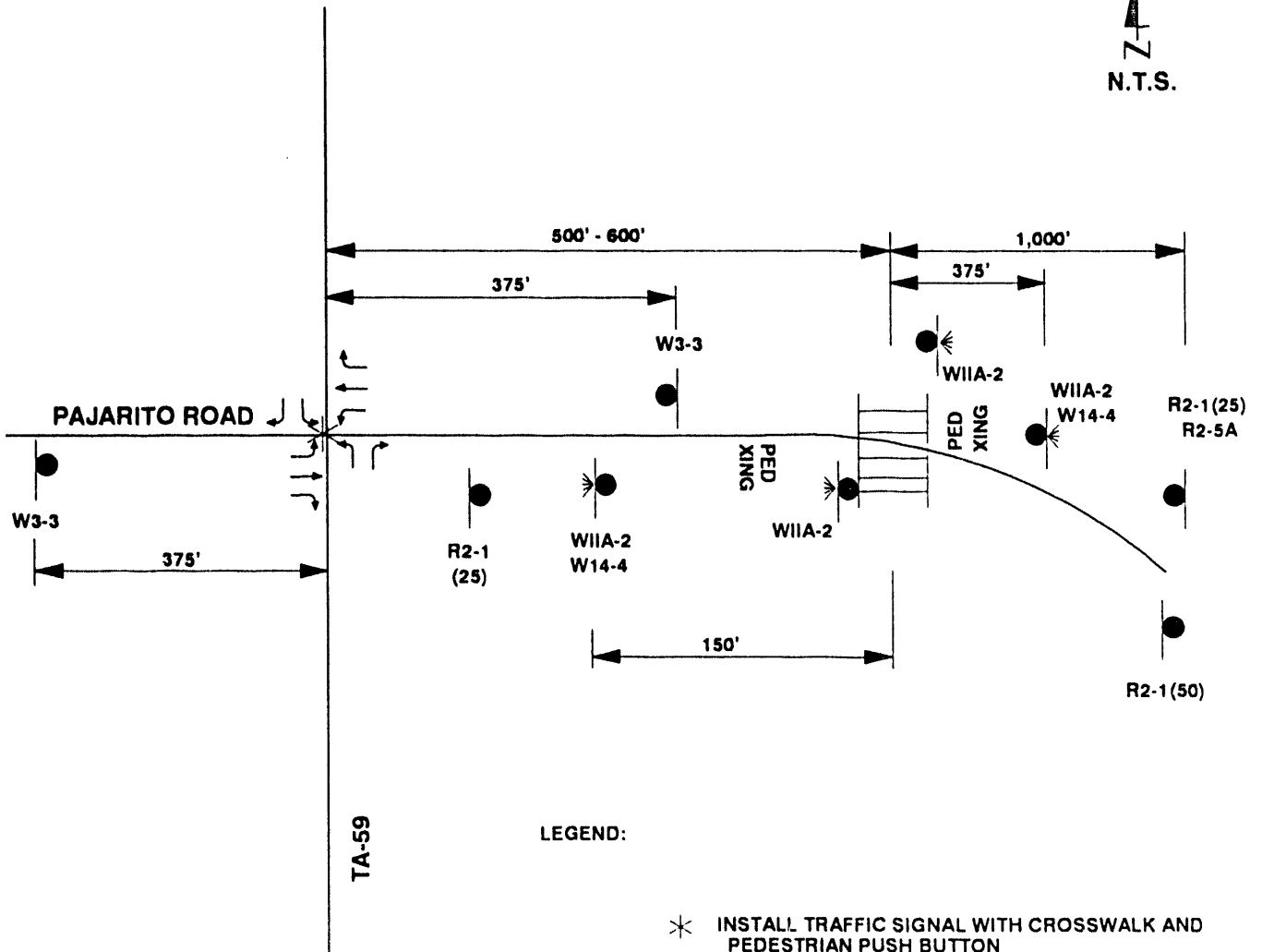
lines shall be solid white lines, marking both edges of the crosswalk. They shall be not less than 6 inches in width and should not be spaced less than 6 feet apart. Where vehicular speeds exceed 35 mph or where crosswalks are unexpected, it may be desirable to increase the width of the crosswalk line up to 24 inches in width. For added visibility, the area of the crosswalk may be marked with white diagonal lines at 45-degree angle or with white longitudinal lines at a 90-degree angle to the line of the crosswalk. These lines should be approximately 12 inches to 24 inches wide and spaced 12 inches to 24 inches apart.

If a signal is installed then a W3-3 sign (Signal Ahead Sign) should be placed in advance warning about 375 feet in advance of the intersection. The same crosswalk recommendations apply if the traffic signal is installed at the TA-59 Driveway/Pajarito Road intersection. The traffic signal, if installed, should be pedestrian actuated with a pedestrian push button.




The striping at the intersection of TA-59/Pajarito Road should provide for a 125 foot long left-turn lane and a 75 foot long right-turn lane for the Pajarito Road west approach. The east approach should have a 75 foot long left-turn lane and a 50 foot right-turn lane. The TA-59 driveway north approach should provide a driveway 75 foot long right-turn and a 75 foot long left-turn/through lane. The TA-59 south approach should provide a 100 foot long through/left-turn lane and a 50 foot right-turn lane.

A pedestrian crossing (PED XING) pavement marking should also be installed on the roadway prior to the unsignalized mid-block crossing location.

Figure 6 provides the TA-59/Pajarito Road Improvements.



**LEGEND:**

- \* INSTALL TRAFFIC SIGNAL WITH CROSSWALK AND PEDESTRIAN PUSH BUTTON
-  INSTALL CROSSWALK
-  SIGN
- W11A-2 PEDESTRIAN WARNING AHEAD
-  FLASHING YELLOW LIGHT
- R2-1(25) 25 MPH SPEED LIMIT SIGN
- R2-1(50) 50 MPH SPEED LIMIT SIGN
- R2-5A REDUCED SPEED AHEAD
- W14-4 LIMITED SIGHT DISTANCE
- W3-3 SIGNAL AHEAD SIGN
- PED XING PAVEMENT MARKING FOR PEDESTRIAN CROSSING



# PAJARITO ROAD/TA-59 PROPOSED SIGNING AND STRIPING IMPROVEMENTS

**DATE**

**FILMED**

9 / 7 / 94

**END**