

Pinnacle Peak Rd: 107th Ave to 83rd Ave

Final Design Concept Report

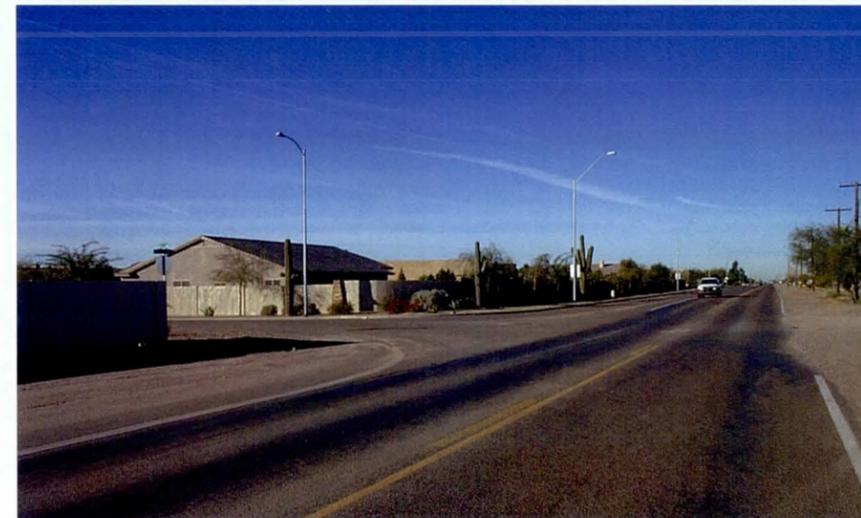
Contract No. 2006-15



Prepared For



Maricopa County
Department of Transportation



Prepared By



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TABLE OF CONTENTS

	<u>PAGE</u>
1.0 EXECUTIVE SUMMARY	1
1.1 Background.....	1
1.2 Purpose and Scope.....	2
1.3 Alternatives	2
1.4 Analysis.....	2
1.5 Recommendation	2
2.0 TRAFFIC INFORMATION	4
2.1 Existing Roadway Characteristics	4
2.2 Existing Traffic.....	4
2.3 Accident Data.....	4
2.4 Existing Levels of Service	4
2.5 Future Traffic.....	5
2.6 Future Intersection Levels of Service	5
2.7 Turn Lanes.....	6
3.0 MAJOR DESIGN FEATURES	7
3.1 Roadway Classification	7
3.2 Design Speed and Posted Speed.....	7
3.3 Design Criteria	7
3.4 Roadway Features	8
3.5 Crossroads	8
3.6 Access Control.....	10
3.7 Existing Drainage Facilities and Issues	10
3.7.1 Previous Drainage Studies.....	10
3.7.2 Proposed Drainage Improvements.....	11
4.0 ROADWAY DESIGN ALTERNATIVES	12
4.1 Alternative Description	12
4.2 Alternative Comparison	17
4.3 Recommended Alternative	21
5.0 RECOMMENDED DESIGN ALTERNATIVE	22
5.1 Roadway Design	22
5.2 Drainage Design	22
5.2.1 Proposed Off-site Drainage System	22
5.2.2 Proposed On-site Drainage System	22
5.3 Utilities	22
5.4 Right-of-Way.....	23
5.5 Future Development	23
6.0 ENVIRONMENTAL OVERVIEW	24
6.1 Introduction	24
6.2 Environmental Considerations	24
7.0 LAND USE PLANNING	27
8.0 APPENDIX MATERIALS	34

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
2.1	Existing Daily Traffic on Pinnacle Peak Rd (2005)	4
2.2	Accidents By Locations (2003-2005).....	4
2.3	Existing Intersection Level of Service.....	5
2.4	Pinnacle Peak Rd Daily Traffic Forecasts: 2030	5
2.5	Future Signalized Intersection LOS with Five Lane Section	
	on Pinnacle Peak Rd.....	5
2.6	Future Signalized Intersection LOS with Three Lane Section.....	
	on Pinnacle Peak Rd.....	6
3.1	Design Criteria	7
3.2	Crossroad Information	9
4.1	Alternative Evaluation Matrix.....	19
5.1	Utility Contacts.....	22
6.1	Population Characteristics	24
6.2	Employment Characteristics	25

LIST OF FIGURES

<u>FIGURE</u>		<u>PAGE</u>
1.1	Location Map	1
4.1	Alternative Typical Sections	12
4.2	Alternative 1	13
4.3	Alternative 1A	15
4.4	Alternative 2.....	16
4.5	Alternative 3.....	18
7.1	Existing Jurisdictions	28
7.2	Existing Land Use	29
7.3	Planned Land Use	30
7.4	Zoning	33

Douglas J. Hunt



1.0 EXECUTIVE SUMMARY

The Maricopa County Department of Transportation (MCDOT), in partnership with the Flood Control District of Maricopa County (FCDMC) and the City of Peoria, has prepared a Design Concept Report (DCR) for a section of Pinnacle Peak Rd, Contract No. 2006-15. The project is approximately 3 miles in length extending from 107th Ave to 83rd Ave (see Figure 1.1). This section of Pinnacle Peak Rd lies within the jurisdiction of unincorporated Maricopa County and the City of Peoria. After completion of the ultimate roadway construction, it is understood that the City of Peoria will own and operate Pinnacle Peak Rd from 107th Ave to 91st Ave and MCDOT will own and operate Pinnacle Peak Rd from 91st Ave to 83rd Ave.

1.1 BACKGROUND

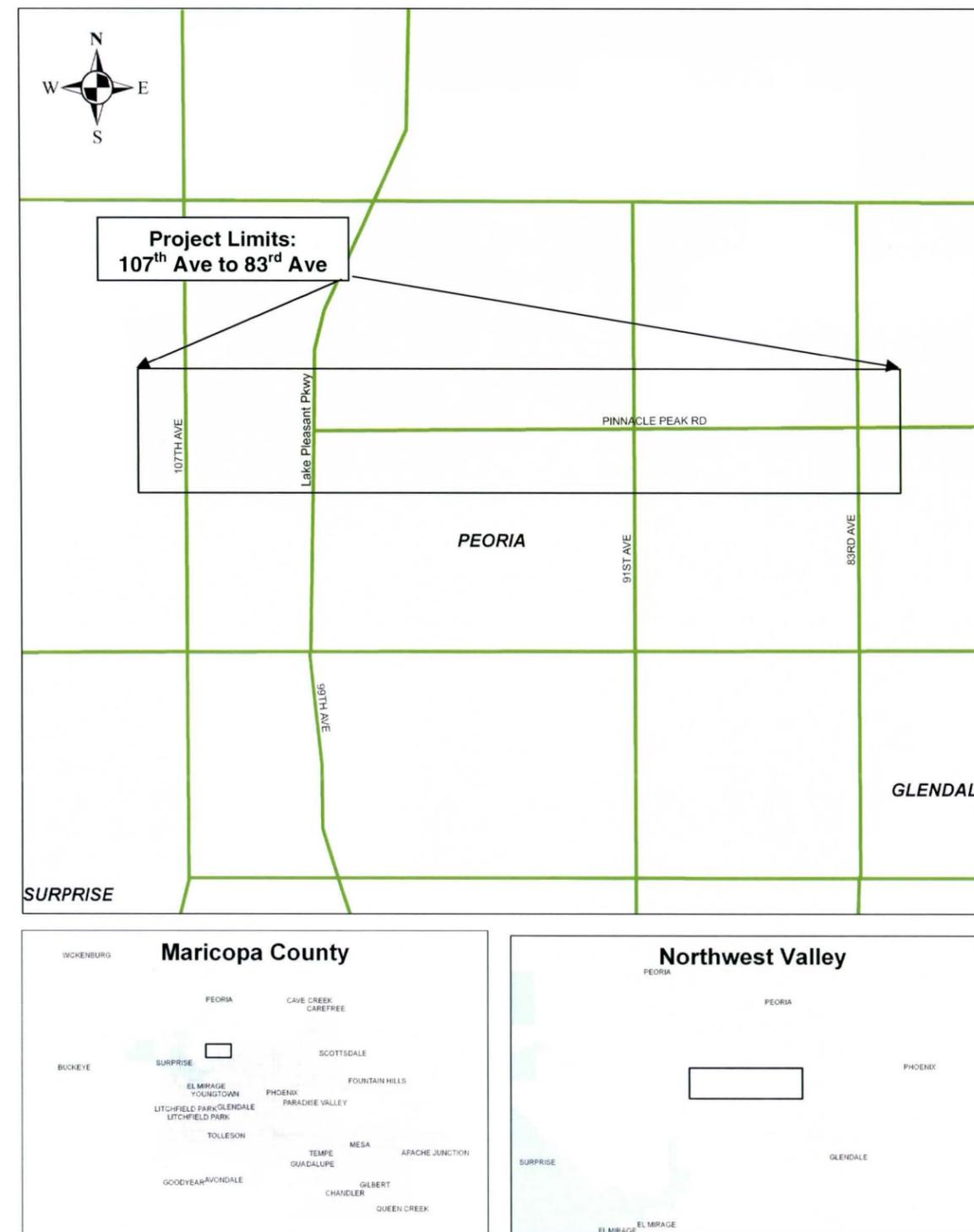
A Candidate Assessment Report (CAR) for Pinnacle Peak Rd, Lake Pleasant Pkwy to 83rd Ave, was prepared in October 1999 by Entranco. The study recommended that an urban five-lane section be constructed symmetrically about the existing centerline. Since the completion of the CAR, several projects have been initiated and/or completed that impact the CAR findings.

A significant impact results from the *Glendale/Peoria Area Drainage Master Plan Update (ADMP Update)*. The FCDMC partnered with the local jurisdictions to provide the update, which was prepared by Entellus in 2002. Within the *ADMP Update*, several major drainage features were recommended along Pinnacle Peak Rd that impact the existing roadway. These include a channel running parallel to Pinnacle Peak Rd from 103rd Ln to 91st Ave, a 2 - 8' x 4' reinforced concrete box culvert (RCBC) parallel to Pinnacle Peak Rd from 91st Ave to 89th Ave and 87th Ave to 83rd Ave and 2 - 36" pipe culverts parallel to Pinnacle Peak Rd from 89th Ave to 87th Ave. The *ADMP Update* indicates the improvements associated with the 83rd Ave corridor, including Pinnacle Peak Rd from 87th Ave to 83rd Ave, as top priority to implement. The proposed on-site drainage system presented in this DCR is based on the *ADMP Update* recommended off-site drainage system.

Another project occurring within the DCR limits is sponsored by the City of Peoria who contracted with Kirkham Michael to prepare a DCR for Lake Pleasant Pkwy between Williams Rd and SR 74. This project will be designed in four phases for funding purposes. The construction of Phases 1 and 2 is complete and the construction of Phase 3 is nearing completion. The improvements associated with the project include reducing the intersection skew of Pinnacle Peak Rd and Lake Pleasant Pkwy and reconstructing the Pinnacle Peak Rd approach (from the east). After construction of Phase 4, Lake Pleasant Pkwy will be upgraded to three lanes in each direction separated by a raised median.

Two interim signal projects on Pinnacle Peak Rd at 91st Ave and 83rd Ave have recently been designed by MCDOT within the project limits. The improvements include signalization and left turn lanes on all intersection approaches. The City of Peoria is administering construction of the 83rd Ave / Pinnacle Peak Rd intersection improvements. The anticipated construction completion date is March 2007. MCDOT will administer the construction of the 91st Ave / Pinnacle Peak Rd intersection improvements after right-of-way has been acquired. Construction is expected to start in the winter of 2007.

Figure 1.1: Location Map





1.2 PURPOSE AND SCOPE

The purpose of this project is to investigate the operational and capacity characteristics for the Pinnacle Peak Rd between 107th Ave and 83rd Ave. The DCR defines the project scope and identifies project issues. This information is then used to develop and evaluate improvement alternatives subject to review of environmental conditions. The resultant is a recommended design alternative that can be evaluated for inclusion in the MCDOT Transportation Improvement Program (TIP) and the City of Peoria Capital Improvement Program (CIP). An alternative must have a Benefit Cost (B/C) Ratio greater than 2.0 before it can be recommended and considered for inclusion in the TIP.

The scope of this project considered interim and ultimate improvements only. Spot improvements along Pinnacle Peak Rd will be addressed by MCDOT and the City of Peoria.

1.3 ALTERNATIVES

Four alternatives were developed and evaluated for this DCR in addition to the No-Build option. Alternatives 1, 2 and 3 provide an ultimate roadway improvement solution that meets the future traffic demand forecasts. These alternatives share the same urban typical section which is comprised of two through traffic lanes in each direction separated by a continuous left turn lane. Bike lanes, curb, gutter and sidewalk are also provided. The principal differences between the alternatives involve the horizontal alignment and right-of-way width. The sidewalk width also varies between alternatives. Alternative 1A provides an interim roadway solution that meets the traffic demands forecasted for the year 2030. The roadway consists of a three lane urban typical section with one through lane in each direction separated by a two-way left turn lane. Bike lanes, curb, gutter and sidewalk are also provided. All alternatives require right-of-way acquisition and utility relocation.

After the review of the April 2004 MCDOT Roadway Design Manual and the American Association of State and Highway Transportation Officials (AASHTO) criteria on design and posted speeds, this DCR recommends a speed study be performed along this corridor to potentially reduce the posted speed to 45 mph or less. All alternatives have been developed for a 55 mph minimum design speed, however, a lesser posted speed is recommended in MCDOT's design and operating policy for urban roadways.

Improvements to several crossroads are also a critical element of the studied alternatives. The north legs of the crossroads and the south leg of 83rd Ave fall within Maricopa County jurisdiction. The south legs of the crossroads between 107th Ave and 87th Ave fall within the City of Peoria jurisdiction. To accommodate the needed turn lane configurations at the intersections, widening along 91st Ave, 89th Ave, 87th Ave and 83rd Ave is necessary to connect new curb returns to the existing pavement. This DCR does not consider the improvements to the cross roads beyond the curb return. The respective agencies are responsible for crossroad improvements within their jurisdiction.

1.4 ANALYSIS

Included in this report is a detailed analysis of the existing traffic information and forecasted volumes for the year 2030. The existing traffic volumes, which range from 4,800 to 7,200 vehicles per day, will remain approximately the same in the year 2030 according to Maricopa Association of Governments (MAG) forecast travel model. The travel model assumed that Pinnacle Peak Rd extended to 67th Avenue. The traffic analysis examined the existing and projected level of service at the intersections of 107th Ave, Lake Pleasant Pkwy, 99th Ave, 97th Ave, 95th Ave, 93rd Ave, 91st Ave, 89th Ave, 87th Ave

and 83rd Ave. The intersections with Lake Pleasant Pkwy and 83rd Ave are presently signalized (with the completion of current construction). 91st Avenue will be improved as a signalized intersection in the winter of 2007. All other intersections may require signalization for the 2030 design year. Traffic signal warrant studies need to be completed periodically to check the need for traffic signals. Single left turn lanes are required for the intersection approaches. An eastbound right turn lane is required at 83rd Ave.

The DCR utilizes the findings of the *ADMP Update* for off-site drainage. A review of existing on-site drainage features indicates that on-site drainage ponds adjacent to the existing roadway since curb and gutter is not present. The ultimate on-site drainage improvements consist of designing catch basins and storm drains to discharge into the FCDMC off-site system.

Speedie and Associates published the Draft Geotechnical Investigation for this project on April 28, 2003, see Appendix D. The pavement and geotechnical recommendations made in the report were based on site reconnaissance, visual pavement condition assessment, subsurface exploration, laboratory testing and engineering analysis. A pavement design cost assessment was used to evaluate different pavement structural sections. The recommended section for reconstruction consists of 4 inches Asphaltic Concrete (AC) on 9 inches Aggregate Base Course (ABC) with 6 inches Lime Stabilized Subgrade. The Final Geotechnical Investigation will need to be completed to current MCDOT and City of Peoria standards when this project reaches final design.

Acquisition of new right-of-way is required for the studied alternatives. The right-of-way width required for the roadway varies between 40 feet to 65 feet from the centerline according to MCDOT and the City of Peoria typical sections. FCDMC improvements along Pinnacle Peak Rd between Lake Pleasant Pkwy and 91st Ave fall outside of the roadway right-of-way and are not included in the DCR acreage estimation. Temporary construction easements (TCEs) may be required to reconstruct access points.

Many utilities exist within the project limits. These include overhead power, underground electric, water, sewer, gas, cable and telephone. Underground utilities were not potholed as part of this DCR. MCDOT will allow the utilities to remain in their current locations if not in conflict with construction activities. However, City of Peoria may require new water and wastewater facilities as well as undergrounding overhead power and cable lines.

An Environmental Overview (EO) was prepared for this project and is provided in Section 6. The EO describes the social, economic and environmental character of the project area. No "fatal flaws" have been identified from an environmental perspective.

1.5 RECOMMENDATION

The recommended alternative is the No-Build option. All interim and ultimate alternatives studied in the DCR yielded a B/C Ratio of less than 2.0. MCDOT requires that recommendations need to have a B/C ratio greater than 2.0 if the project is to be considered for inclusion in the TIP. The driving factor for the low B/C Ratio was the low forecasted traffic volumes. It is recommended that this section of roadway be re-evaluated for improvement when projected traffic counts reach 10,000 to 15,000 vehicles per day.



Based on the traffic analysis conducted for this DCR, it is recommended that MCDOT and the City of Peoria evaluate the need for intersection improvements along Pinnacle Peak Rd. The traffic analysis showed that left and right turn lanes may be needed prior to interim or ultimate improvements.

The FCDMC has identified significant off-site drainage improvements along Pinnacle Peak Rd. The *ADMP Update* assumed that the existing Pinnacle Peak Rd would be upgraded to a five-lane urban arterial with the drainage improvements. The consequences of leaving the Pinnacle Peak Rd in the existing condition and installing the FCDMC improvements has not been considered as part of this DCR. Should the FCDMC project be designed before roadway improvements are needed on Pinnacle Peak Rd, the project partners will need to determine the appropriate roadway typical section.



2.0 TRAFFIC INFORMATION

This chapter presents existing and future traffic analysis of Pinnacle Peak Rd from 107th Ave to 83rd Ave. This section includes a summary of existing conditions, the results of the future conditions analysis, and recommendations for improvements.

2.1 EXISTING ROADWAY CHARACTERISTICS

Between Lake Pleasant Pkwy and 83rd Ave, Pinnacle Peak Rd is mostly a two-lane roadway without curb and gutter. The roadway widens and provides turn lanes at the intersections with Lake Pleasant Pkwy, 91st Ave and 83rd Ave. There is a signalized intersection at Pinnacle Peak Rd with Lake Pleasant Pkwy and traffic signals are warranted at 91st Ave and 83rd Ave. The construction plans for the interim traffic signals at the two locations are complete. The improvements recommended by this DCR will include reconstruction of the interim signals and place the signals in the ultimate location. Construction of the 83rd Ave improvements is underway while construction of 91st Ave will begin in winter 2007. There are six unsignalized intersections within this segment at 99th Ave, 97th Ave, 95th Ave, 93rd Ave, 89th Ave, and 87th Ave.

2.2 EXISTING TRAFFIC

Existing traffic data was obtained from the City of Peoria Annual Daily Traffic Map for 2005. The daily traffic information is summarized in Table 2.1. The data indicates that the existing traffic on Pinnacle Peak Rd ranges from 4,800 to 7,200 vehicles per day.

Table 2.1: Existing Daily Traffic on Pinnacle Peak Rd (2005)

Segment	Eastbound	Westbound	Total
Lake Pleasant Pkwy to 91 st Ave	2,321	2,540	4,861
91 st Ave to 83 rd Ave	3,626	3,556	7,182
East of 83 rd Ave	421	480	901

The AM and PM peak hour turning movement counts were collected in September 2006 at the six unsignalized intersections mentioned in Section 2.1. Turning movement counts were also collected in the AM and PM peak hour at the signalized intersection of Lake Pleasant Pkwy and Pinnacle Peak Rd. Turning movement counts were collected in October 2005 at the 91st Ave and 83rd Ave intersections with Pinnacle Peak Rd. These turning movement counts were utilized to estimate the existing levels of service at all the intersections on Pinnacle Peak Rd from 107th Ave to 83rd Ave.

2.3 ACCIDENT DATA

The accident data presented in this DCR was obtained from MCDOT. The 2003-2005 statistics indicate that 29 accidents occurred within the study segment of Pinnacle Peak Rd. The data indicates

that except for two accidents, all of the accidents were intersection accidents as summarized in the following table.

Table 2.2: Accidents by Locations (2003 – 2005)

INTERSECTION	NUMBER of ACCIDENTS
Pinnacle Peak Rd & Lake Pleasant Pkwy	10
Pinnacle Peak Rd & 97 th Ave, 95 th Ave, 93 rd Ave,	3 (one at each Intersection)
Pinnacle Peak Rd & 91 st Ave	8
Pinnacle Peak Rd & 83 rd Ave	6
TOTAL	27

The predominant types of accidents were angle, rear end and single vehicle accidents with 9, 6 and 4 accidents, respectively. A further review of the data indicates that 21 were non-injury accidents. Also, there were no fatalities reported. Seven of the accidents occurred during darkness or dawn/dusk conditions.

2.4 EXISTING LEVELS OF SERVICE

Intersection capacity analysis was conducted as part of the traffic analysis to determine the existing level of service. Level of service is a term used to describe the degree of traffic congestion. The various levels of service, which range from A to F, are generally defined as follows:

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

The intersections on Pinnacle Peak Rd were analyzed based on the Highway Capacity Manual methodology using Synchro 6 software package. The results for the AM and PM peak hour are summarized in Table 2.3. It should be noted that the intersections of Lake Pleasant Pkwy, 91st Ave and 83rd Ave with Pinnacle Peak Rd were analyzed with signal control.



Table 2.3: Existing Intersection Level of Service

INTERSECTION	AM (PM) PEAK HOUR LOS
Pinnacle Peak Rd & Lake Pleasant Pkwy**	A (A)
Pinnacle Peak Rd and 99 th Ave, 97 th Ave, 95 th Ave, 93 rd Ave*	B (B)
Pinnacle Peak Rd & 91 st Ave**	B (B)
Pinnacle Peak Rd and 89 th Ave, 87 th Ave*	C (C)
Pinnacle Peak Rd & 83 rd Ave**	B (B)

*unsignalized LOS listed is for the critical movement

**signalized

2.5 FUTURE TRAFFIC

Traffic forecasts for the year 2030 were obtained from Maricopa Association of Governments (MAG). Forecasts were developed by MAG for Average Daily Traffic volumes and AM and PM peak hour traffic volumes.

The daily traffic forecasts are shown in Table 2.4. The existing traffic is also shown for comparison. The percent growths between the existing volumes and the volumes in year 2030 are also shown.

Table 2.4: Pinnacle Peak Rd Daily Traffic Forecasts: 2030

Segment	Existing	2030	2030 vs. Existing (% increase or decrease)
107 th Ave to Lake Pleasant Pkwy		5,347	
Lake Pleasant Pkwy to 91 st Ave	4,861	6,212	28%
91 st Ave to 83 rd Ave	7,182	6,909	-4%

The daily traffic forecasts for Pinnacle Peak Rd between 107th Ave and 83rd Ave were analyzed using the arterial planning analysis in the *Highway Capacity Manual*. With two lanes in each direction separated by a two-way continuous left turn lane, the levels of service are expected to be LOS C in 2030.

Comparing the average daily traffic shown in Table 2.4 to *Table 2.1 Urban and Rural Roadway Planning Level Traffic Volumes* in the *MCDOT Roadway Design Manual*, Pinnacle Peak Rd is expected to be a minor arterial with two through lanes in each direction.

2.6 FUTURE INTERSECTION LEVELS OF SERVICE

The existing intersections were also analyzed for 2030 AM and PM peak hour volumes using Synchro 6 software. Taking the MAG provided AM and PM peak hour intersection approach volumes, and using the turning movement percentages obtained from 2005 and 2006 turning counts, turning movement volumes were developed for 2030 future year. The base ultimate condition that was analyzed assumed two through lanes each way on Pinnacle Peak Rd with a continuous left turn lane which becomes an exclusive left turn lane at the intersections. The intersections at 107th Avenue, Lake Pleasant Parkway, 91st Avenue and 83rd Avenue were assumed to be signalized. The rest of the intersections were analyzed as unsignalized intersections. All of the intersections were analyzed with four legs except for 99th Ave. It is expected that a fourth leg will be added as part of development at 97th, 95th and 93rd Aves.

Lake Pleasant Pkwy within City of Peoria is planned to be a seven lane (3-median-3) roadway and was analyzed as such. 107th Ave, 91st Ave and 83rd Ave were analyzed as minor arterials with two through lanes each way and a continuous left turn lane which becomes an exclusive left turn lane at the intersections. The minor streets of 99th Ave, 95th Ave, 93rd Ave, 89th, and 87th were analyzed as one lane each way with exclusive left turn lanes at their intersections with Pinnacle Peak Rd. Since AM and PM peak hour volumes were not available for these minor streets, 100 vehicles per hour per intersection approach were used for the capacity analysis. The westbound approach of Pinnacle Peak Rd at 107th Ave was analyzed with one left turn lane, one shared left/right turn lane and one right turn lane.

The results of the base future condition analysis are presented in Table 2.5 for 2030.

Table 2.5: Future Signalized Intersection LOS with Five Lane Section on Pinnacle Peak Rd

INTERSECTION	2030 AM (PM) PEAK HOUR LOS
Pinnacle Peak Rd & 107 th Ave	A (A)
Pinnacle Peak Rd & Lake Pleasant Pkwy	B (B)
Pinnacle Peak Rd & 91 st Ave	B (B)
Pinnacle Peak Rd & 83 rd Ave	B (C)

As shown in the table, the intersections are expected to operate at acceptable levels of service in 2030. When Lake Pleasant Pkwy is improved to three lanes in each direction, dual left turn lanes for the southbound to eastbound movement will be needed to serve the high left turn volumes.

The interim condition was analyzed with one through lane each way on Pinnacle Peak Rd with a continuous left turn lane which becomes an exclusive left turn lane at the intersections. The intersections at 107th Avenue, Lake Pleasant Parkway, 91st Avenue and 83rd Avenue were assumed to



be signalized. The remaining intersections were analyzed as unsignalized intersections. All of the intersections were analyzed with four legs except for 99th Ave. It is expected that a fourth leg will be added as part of development at 97th, 95th and 93rd Aves.

Lake Pleasant Pkwy within City of Peoria is planned to be a seven lane (3-median-3) roadway and was analyzed as such. 107th Ave, 91st Ave and 83rd Ave were analyzed as minor arterials with two through lanes each way and a continuous left turn lane which becomes an exclusive left turn lane at the intersections. The minor streets of 99th Ave, 95th Ave, 93rd Ave, 89th, and 87th were analyzed as one lane each way with exclusive left turn lanes at their intersections with Pinnacle Peak Rd. Since AM and PM peak hour volumes were not available for these minor streets, 100 vehicles per hour per intersection approach were used for the capacity analysis. The westbound approach of Pinnacle Peak Rd at 107th Ave was analyzed with one left turn lane, one shared left/right turn lane and one right turn lane.

The results of the base future condition analysis are presented in Table 2.6 for 2030 traffic volumes.

Table 2.6: Future Signalized Intersection LOS with Three Lane Section on Pinnacle Peak Rd

INTERSECTION	2030 AM (PM) PEAK HOUR LOS
Pinnacle Peak Rd & 107 th Ave	A(A)
Pinnacle Peak Rd & Lake Pleasant Pkwy	B (B)
Pinnacle Peak Rd & 91 st Ave	B (B)
Pinnacle Peak Rd & 83 rd Ave	B (C)

As shown in the table, the intersections are expected to operate at acceptable levels of service in 2030. When Lake Pleasant Pkwy is improved to three lanes in each direction, dual left turn lanes for the southbound to eastbound movement will be needed to serve the high left turn volumes.

2.7 TURN LANES

Based on the traffic forecasts obtained from MAG and signalized intersection capacity analyses, single left turn lanes will be needed on all the intersection approaches. Dual left turns will be needed southbound to eastbound at the Lake Pleasant Pkwy intersection. Right turn volumes were found to be accommodated satisfactorily without the need for an exclusive right turn lane at the intersections.

For the interim condition, dual left turns will be needed northbound to westbound at the 83rd Avenue intersection. To accommodate the dual left turns, Pinnacle Peak Road needs to be widened to two lanes westbound just past the intersection. The second through lane can be dropped after 300 feet. An exclusive right turn lane eastbound to southbound is also needed at this intersection.

3.0 MAJOR DESIGN FEATURES

Improvements to Pinnacle Peak Rd will be constructed by MCDOT. After construction of the ultimate roadway typical section, both MCDOT and the City of Peoria will own and operate different segments of the roadway. Therefore, design standards and guidelines from both agencies were considered during the development of the DCR.

3.1 ROADWAY CLASSIFICATION

Existing Pinnacle Peak Rd is primarily a two-lane roadway from Lake Pleasant Pkwy and 83rd Ave and is functionally classified as a Rural Minor Collector. Between 89th Ave and 87th Ave, the south side of the roadway has been improved by adjacent developers to Urban Minor Arterial standards. Pinnacle Peak Rd is not recognized as a declared road between 107th Ave and Lake Pleasant Pkwy.



Looking West Along Pinnacle Peak Rd

The ultimate Pinnacle Peak roadway is classified as a Minor Arterial and the interim roadway is classified as a Major Collector. The traffic study findings indicate that the Major Collector will accommodate the 2030 forecasted traffic between 107th Ave and 83rd Ave. In review of the City of Peoria Street Classification Map, Pinnacle Peak Rd is designated as a Minor Arterial west of Lake Pleasant Pkwy, a Major Arterial between Lake Pleasant Pkwy and 83rd Ave and a Major Collector east of 83rd Ave. Based on the traffic study findings of this DCR, it is recommended that the City of Peoria consider reclassifying Pinnacle Peak Rd to a Minor Arterial between Lake Pleasant Pkwy and 83rd Ave.

3.2 DESIGN SPEED AND POSTED SPEED

According to the MCDOT Roadway Design Manual, the design speed of the Urban Minor Arterial is 55 mph and the Urban Major Collector is 40 mph on level terrain. Due to the presence of vertical curb and gutter, AASHTO recommends that the speed be limited to 45 mph. While AASHTO states that the speed of a given road may be posted at the design speed, it is MCDOT's design and operating policy that where vertical curbs are installed, the posted speed limit shall only be 45 mph or less.

The existing posted speed is 50 mph between Lake Pleasant Pkwy and 91st Ave and 45 mph between 91st Ave and 83rd Ave. It is recommended that a speed study be performed and existing conditions

reviewed prior to final design to determine if the posted speed can be reduced. If the result of the speed study concludes that the posted speed remain 55 mph, then a phased implementation of the typical section is recommended as outlined in the MCDOT Policy/Procedure Manual "Median Policy for High Speed Roadways", dated 3/21/02.

3.3 DESIGN CRITERIA

The design criteria for this project was established using the MCDOT *Roadway Design Manual* (November 3, 1993) including updates through April 27, 2004, City of Peoria *Infrastructure Development Guidelines*, FCDMC *Drainage Design Manual, Volume I, Hydrology and Volume II, Hydraulics* and the AASHTO Policy on Geometric Design of Highways and Streets (2001).

Documents providing background information and a basis for design include the *ADMP Update* (May 2002), the City of Peoria Final Design Plans for Lake Pleasant Pkwy from Williams Rd to Carefree Hwy (Project No. P-9609D), 91st Ave and Pinnacle Peak Rd Intersection Improvements, 83rd Ave and Pinnacle Peak Rd Intersection Improvements and the MCDOT Candidate Assessment Report (CAR) Pinnacle Peak Rd from Lake Pleasant Pkwy to 83rd Ave (October 29, 1999).

Selective design criterion used for the DCR development is summarized in Table 3.1. The criterion is denoted as either MCDOT or Peoria if different values were provided by the respective design sources. The design for this study is based on the highlighted values.

Table 3.1: Design Criteria

Design Year	2020
2030 ADT	6,200 to 6,900 vpd (Forecasted by MAG)
Design Vehicle	WB-50 (MCDOT)
Design Speed	55 mph Min (MCDOT Urban Arterial) 40 mph Min (MCDOT Urban Collector)
Pavement Design Life	20 Years
Pavement Section	4 inches AC, 9 inches ABC, 6 inches Lime Stabilized Subgrade (To be reviewed against current MCDOT and City of Peoria standards during final design)
Horizontal Alignment	Curve Length 500 feet Min, e = 4% Max (MCDOT) Curve Length 500 feet Min, e = 6% Max (Peoria Arterial) Curve Length 150 feet Min, e = 6% Max (Peoria Collector)
Vertical Alignment	Vertical curve is required for algebraic grade difference equal to or greater than 0.5% (0.2% if Federally Funded) (MCDOT). Vertical curve is required for algebraic grade difference equal to or greater than 1.0% (Peoria). At major street/major street urban intersections, the maximum intersection ride through break-over at signalized intersections shall not exceed 2.5%.
Longitudinal Profile Grades	0.25% Min (MCDOT) 0.15% Absolute Min (MCDOT Special cases) 0.40% Min (Peoria) < 0.40% (Peoria City Engineer Approval)



Table 3.1: Design Criteria (continued)

Roadway Cross Slope	2%
Lane Widths	Travel Lanes: 12 feet Two-Way Left-Turn Lane: 14 feet
Curb Return Radii (Face of Curb)	45 feet (MCDOT Arterials and Major Collectors) 30 feet (MCDOT Minor Collectors and Local) 35 feet (Peoria Arterials) 30 feet (Peoria Collectors) 20 feet (Peoria Local)
Clear Zone	30 feet Desirable
Cut & Fill Slopes	4:1 Max
Curb and Gutter	MAG Standard Detail 220, Type A (Vert. Curb & Gutter)
Access, Driveway Design	Single Residential – Roadway Design Manual, Figure 7.1 (MCDOT) Commercial - Roadway Design Manual Figures 7.2 -7.4 (MCDOT) Single Residential – MAG Standard Detail 250 (Peoria) Commercial – Peoria Details 253 or 254 (Peoria)
Tapers	Design Speed: 1 Minimum
Flares	15:1 Minimum
Right-of-way	Desirable 130 feet total width (Urban Minor Arterial) Desirable 80 feet total width (Urban Major Collector)
Utilities	MCDOT and Peoria guidelines for relocations and the AUCC Public Improvement Project Guide
On-Site Drainage – Roadway	Storm drains associated with the on-site drainage system consist of short laterals due to the proximity of the proposed off-site drainage system. <ul style="list-style-type: none"> • Design on-site inlets, scuppers and storm drains using the 10-year storm. During the 10-year event one 12-foot driving lane must be free from flooding in each direction. This corresponds to an allowable spread width of 17.5 feet. • MAG 531 catch basins (5' – 6" curb opening) are used for on-grade inlets • At sags, flanking inlets are placed so that the ponding depth is 63 percent of the ponding depth at the sag inlet. • Inlets are also placed immediately upstream of curb returns and on the upstream end of superelevation transitions to minimize gutter flow crossing traveled lanes. • Storm drains associated with the on-site drainage system consist of short laterals due to the proximity of the proposed off-site drainage system. The storm drains are sized for the 10-year event. • On-site hydrology was computed for the proposed right-of-way limits using the Rational Method procedures outlined in the <i>Drainage Design Manual for Maricopa County, Hydrology</i>.

3.4 ROADWAY FEATURES

Two roadway typical sections were considered for the DCR, an ultimate section and an interim section. The ultimate section is classified as an Urban Minor Arterial consisting of two through lanes in each direction separated by a continuous left turn lane with curb, gutter and sidewalk. Bike lanes are provided in both directions. The total roadway width is 78 feet from face of curb to face of curb. The City of Peoria section is five feet wider than the equivalent MCDOT Urban Minor Arterial (see Figure 5.8 of the MCDOT Roadway Design Guidelines). City of Peoria standards were used for the Minor Arterial to ensure the widest typical section will fit within the recommended right-of-way. The interim section is classified as an Urban Major Collector. This section consists of one through lane and a bike lane in each direction separated by a two-way left turn. The total roadway width is 49 feet from face of curb. The City of Peoria Urban Major Collector section is 48 feet wide, therefore the MCDOT section (see Figure 5.9 of the MCDOT Roadway Design Guidelines) was used for DCR estimating purposes.

Two different horizontal alignments have been designed for the alternatives developed. They are described in Section 4 of the DCR. The existing horizontal alignment follows the section line within the project limits except on the east approach of the Lake Pleasant Pkwy intersection. This approach has been realigned by the City of Peoria Lake Pleasant Pkwy Project to provide an intersection skew that meets current design standards and provides for regional drainage improvements.

A new profile is required within the project limits due to significant horizontal realignment and substandard minimum grade for widening to an urban roadway. Preliminary profiles were designed to minimally impact underground utilities and provide a balanced earthwork condition when possible. The profile ties into the existing vertical alignment at 107th Ave and 83rd Ave. Between 89th Ave and 87th Ave, the south side has been completed by developers. The existing grade for this section is substandard at 0.01% and will require a design exception if this section is to remain in place.

During final design of Pinnacle Peak Rd, landscaping, irrigation, lighting, interconnect conduit, and future transit facilities will need to be addressed with the City of Peoria and the associated improvements agreed upon by Maricopa County.

3.5 CROSSROADS

The functionality and future use of crossroads were examined within this study. The major crossroads include 107th Ave, Lake Pleasant Pkwy, 91st Ave and 83rd Ave. Minor crossroads within the project limits are 99th Ave, 97th Ave, 95th Ave, 93rd Ave, 90th Ave, 89th Ave, 88th Dr, 88th Ave, 87th Ave and 86th Ave which serve as either collector or residential streets. The north legs of the crossroads and the south leg of 83rd Ave fall within Maricopa County jurisdiction. The south legs of the crossroads between 107th Ave and 87th Ave fall within Peoria jurisdiction.

Improvements to crossroads are primarily limited to constructing new curb returns, with the exception of 91st Ave and 83rd Ave which will require widening the existing roads to match the new curb return locations. Information regarding the crossroads is provided in Table 3.2.

Table 3.2: Crossroad Information

Intersection with Pinnacle Peak Rd	Existing Functional Classification	Existing Width	Proposed Width at Return
107 th Ave – North Leg	Major Collector	60 ft	Match Existing
107 th Ave – South Leg	Major Collector	60 ft	Match Existing
Lake Pleasant Pkwy – North Leg	Parkway	118 ft	Match Existing
Lake Pleasant Pkwy – South Leg	Parkway	130 ft	Match Existing
99 th Ave – North Leg	Residential Road (Half Street)	15 ft	30 ft
97 th Ave – North Leg	Residential Road	30 ft	Match Existing
95 th Ave – North Leg	Major Collector	48 ft	Match Existing
93 rd Ave – North Leg	Residential Road	25 ft	Match Existing
91 st Ave – North Leg	Major Collector	46 ft	92 ft
91 st Ave – South Leg	Minor Collector (Half Street)	30 ft	92 ft
90 th Ave – North Leg	Residential Road	23 ft	Match Existing
89 th Ave – North Leg	Residential Road	20 ft	40 ft
89 th Ave – South Leg	Minor Collector	38 ft	40 ft
88 th Dr – South Leg	Residential Road	30 ft	Match Existing
88 th Ave – South Leg	Residential Road	30 ft	Match Existing
87 th Ave – North Leg	Residential Road	20 ft	40 ft
87 th Ave – South Leg	Minor Collector	36 ft	40 ft
86 th Ave – South Leg	Residential Road	28 ft	Match Existing
83 rd Ave – North Leg	Minor Collector	25 ft	102 ft
83 rd Ave – South Leg	Minor Collector	37 ft	102 ft

107th Ave

Pinnacle Peak Rd does not presently intersect 107th Ave. However, in the vicinity of where the alignments will meet, existing 107th Ave is transitioning from a two-lane roadway to a four-lane roadway. The City of Peoria Street Classification Map designates the future 107th Ave as a Major Arterial.

Lake Pleasant Pkwy



Peak Rd/Lake Pleasant Pkwy Intersection

Improvements to Lake Pleasant Pkwy are nearing the end of Phase 3 construction by the City of Peoria. A four phased approach has been implemented which will ultimately construct a divided six-lane roadway. Phase 3, advertised in early 2004, involves constructing the new northbound lanes and obliterating existing Lake Pleasant Pkwy between Williams Rd and Dynamite Blvd. The FCDMC box culvert immediately north of the Lake Pleasant Pkwy and Pinnacle Peak Rd intersection was constructed as part of this project. This establishes a fixed point for the future FCDMC open channel to cross Lake Pleasant Pkwy. The east leg of the intersection was reconstructed to provide a temporary transition to the existing road. The transition will need to be removed to implement the recommended design of Pinnacle Peak Rd.

91st Ave

MCDOT has recently designed an interim signal project at 91st Ave intersection. Construction will begin in Winter 2007. Improvements include signalization and left turn lanes. The intersection will continue to operate with one-through lane in all directions. The future classification of 91st Ave is a Major Arterial consisting of three through lanes in each direction. The existing 91st Ave roadway cross section north and south of Pinnacle Peak Rd does not presently align since the south leg was built as a half street east of the section line. The interim signal plans provide a new centerline to improve the alignment prior to upgrading 91st Ave to a Major Arterial. The intersection will need to be reconstructed and the signal will need to be relocated at that time.

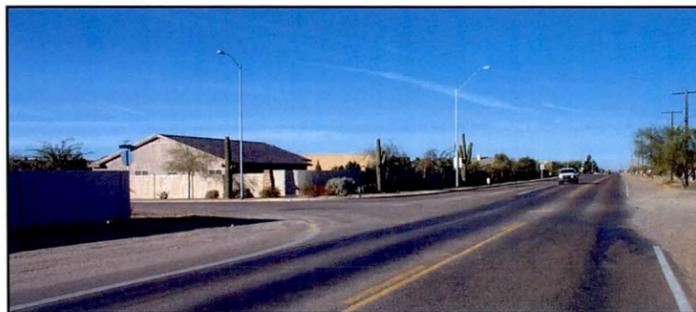


Pinnacle Peak Rd/91st Ave Intersection

89th Ave

The traffic analysis in Section 2 concludes left turn lanes are required in the future for all legs of this intersection, with 160 feet storage length on Pinnacle Peak and 75 feet storage length on 89th Ave. The existing roadway width is 20 feet on the north leg and 37 feet on the south leg. A minimum of width of 40 feet is recommended for an urban three-lane section, 14 feet through lanes adjacent to the curb and a 12-foot left turn lane. This width should be held for at least 75 feet to accommodate the needed left turn lane storage length. The roadway can then be tapered at the appropriate rate to match the existing roadway width.

87th Ave



Looking East Along Pinnacle Peak Rd at 87th Ave

87th Ave requires the same treatment as 89th Ave. On the north leg, the existing roadway width is 20 feet. The width is 34 feet on the south leg. The three-lane section, 40 feet in width, should be held for 75 feet to meet the 2020 design criteria, then tapered to match the existing roadway width.

83rd Ave

The 83rd Ave intersection is presently under construction through March 2007. The project is being administered by the City of Peoria. Improvements include signalization and left turn lanes. The City of Peoria future classification of 83rd Ave is a Major Arterial consisting of three through lanes in each direction. The signal will need to be relocated to accommodate the wider roadway.



Looking Northwest at 83rd Ave Intersection

3.6 ACCESS CONTROL

Pinnacle Peak Rd is not access controlled within the project limits. No direct access points currently exist between Lake Pleasant Pkwy and 91st Ave. However, between 91st Ave and 83rd Ave there are 33 driveways. Campbell's Mercantile is located on the northeast corner of Pinnacle Peak Rd and 91st Ave. This property has two driveways east of 91st Ave. St. Alban's Episcopal Church is located on the southeast corner of Pinnacle Peak Rd and 86th Ave. The remaining driveways access residential properties. All driveways should be reviewed during final design to ensure valid MCDOT or City of Peoria permits have been obtained. The number of access points should be minimized where possible. Due to the closeness of homes both north and south of Pinnacle Peak Rd, frontage roads are not feasible. Property owners or businesses will be reconnected to the roadway with curb cuts. The driveway treatment beyond the Standard Detail limits shall match the existing driveway surface to the MCDOT right-of-way line.

3.7 EXISTING DRAINAGE FACILITIES AND ISSUES

The majority of Pinnacle Peak Rd does not have curb and gutter; only a short segment between 89th Ave and 87th Ave on the south side of the road has existing curb and gutter which was installed with an adjacent development. Both within the curb and gutter segment and elsewhere, on-site runoff collects in shallow roadside ditches or flows towards the south as sheet flow over land and down residential streets.

Off-site runoff approaches Pinnacle Peak Rd from the north and crosses Pinnacle Peak Rd in minor dip crossings. In some cases, this flow coincides with north-south residential streets. Most natural washes that used to cross Pinnacle Peak Rd have been obliterated by residential subdivision construction, with the exception of a small wash just west of the extension of 103rd Ave.

Longitudinal grades along Pinnacle Peak Rd range from nearly flat to 0.5 percent immediately east of Lake Pleasant Pkwy.

3.7.1 Previous Drainage Studies

The Flood Control District of Maricopa County prepared the *Glendale-Peoria Area Drainage Master Plan (ADMP)* for the region in 1987 and an *ADMP Update* in 2002; the study area extends the entire Pinnacle Peak Rd project limits covered in this DCR. The *ADMP Update* study contains the recommended alternative from the original *ADMP* study, and presents an off-site drainage system along the north side of Pinnacle Peak Rd. That off-site drainage system consists of open channels, closed conduits in the form of box culverts and storm drain pipe, and a detention basin. The proposed on-site drainage system presented in this DCR is based on the recommended off-site drainage system presented in the *ADMP Update*, with the Happy Valley Drain to be installed by Peoria in FY 08 and FY 09. The drainage requirements shown in the *ADMP Update* will be revised by FCDMC and Peoria as part of the final design.



3.7.2 Proposed Drainage Improvements

A FCDMC final design project was completed in August 2006 and will involve improvements to the 83rd Ave intersection. With the designed improvements, drainage will be captured in the area north of Pinnacle Peak Rd between 83rd Ave and 91st Ave then conveyed to the existing drainage infrastructure at Deer Valley Estates and then to the New River. The scope of the project includes constructing two large detention basins on the northwest quadrant of the intersection and installing the storm drain system along the north side of Pinnacle Peak Rd between 87th Ave and 83rd Ave. Construction is expected to begin in April 2007. The roadway improvements on Pinnacle Peak Rd are not included in the FCDMC project.

4.0 ROADWAY DESIGN ALTERNATIVES

This section of the DCR describes the alternatives studied, evaluates the alternatives according to various criteria and provides a recommendation. Four alternatives were developed and evaluated for this project in addition to the No-Build option. Three alternatives provide ultimate improvement solutions and one alternative provides an interim solution. Each interim and ultimate alternative involves reconstructing Pinnacle Peak Rd, increasing capacity, improving access and installing curb, gutter, sidewalk and bike lanes, see Figure 4.1 for the roadway typical sections. An evaluation matrix considering impacts to adjacent features, along with other critical project criteria, is used to compare the alternatives.

The Peoria Community played a key role in the development of alternatives. A public meeting was held on December 4, 2006 to illicit input and share findings. The three ultimate alternatives were presented at the meeting. As a result of the input received, an interim alternative was developed and included in the DCR. A summary of the Public Involvement Information is provided in Appendix E.

4.1 ALTERNATIVE DESCRIPTION

No Build Alternative (Recommended Alternative)

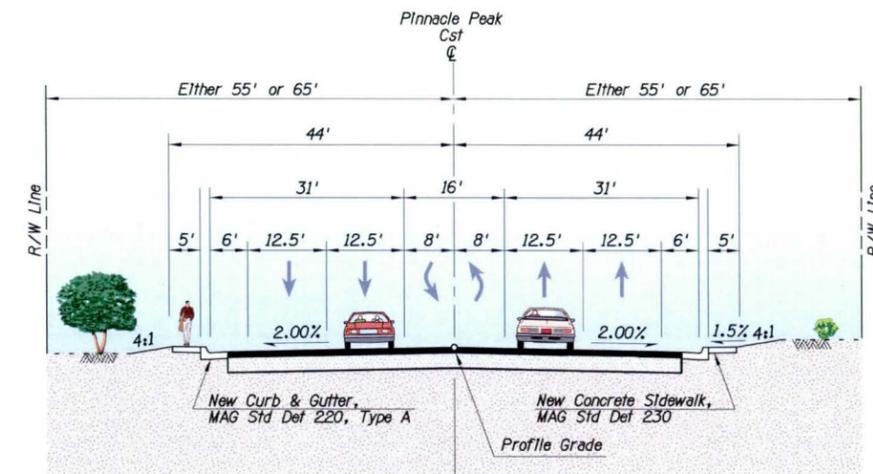
The No-Build alternative does not consider any improvements to the existing Pinnacle Peak roadway or intersections within the project limits. With this option, Pinnacle Peak Rd will remain as a two-lane roadway from Lake Pleasant Pkwy and 83rd Ave (south side has been improved 89th Ave and 87th Ave) and will remain as a wildcat road between 107th Ave and Lake Pleasant Pkwy.

Alternative 1

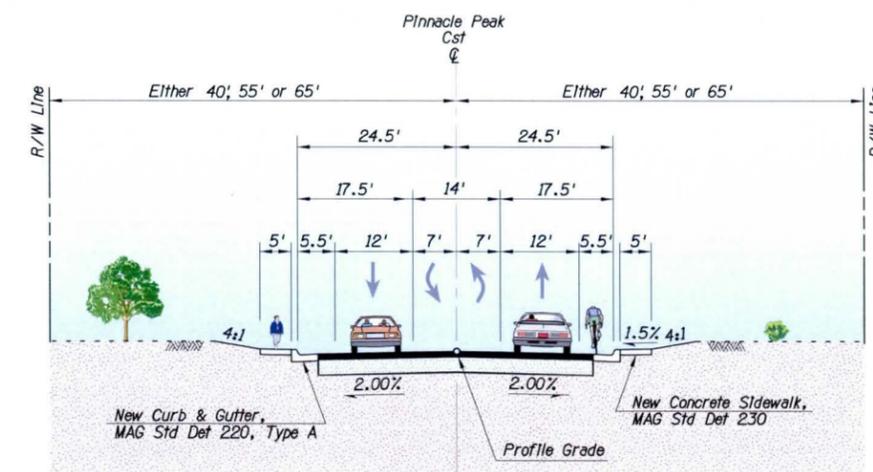
Alternative 1 is based on the roadway concept developed in the *ADMP Update* to accommodate a future off-site drainage channel on the north side of Pinnacle Peak Rd between 103rd Ln and 91st Ave. The roadway typical section is a four-lane Minor Arterial with curb, gutter, sidewalk and bike lanes as shown in Figure 4.1. The sidewalk width is five-feet for this alternative. This is the ultimate typical section recommended for Pinnacle Peak Rd.

The horizontal alignment consists of seven horizontal curves and matches the recent improvements constructed at Lake Pleasant Pkwy to reduce the intersection skew to 10 degrees. The alignment then runs parallel to the section line at a southern offset of 145 feet between 99th Ave and 97th Ave and 80 feet between 97th Ave and 93rd Ave. The offset was determined by holding the existing right-of-way line on the north side of Pinnacle Peak Rd, laying out the proposed channel as noted in the FCDMC Master Plan Update then providing a buffer from the top of channel to the face of curb. Although curb and gutter is recommended for this project, AASHTO recommends providing for clear zone on arterials where possible. A buffer will also allow for future westbound right turn lanes if necessary. Offsetting the alignment between Lake Pleasant Pkwy and 91st Ave is achieved by a series of 10,000 foot radius reverse curves. Curves with a 10,000 foot minimum radius can be constructed with a normal crown. The curves west of 91st Ave require a smaller radius due to existing constraints. Sufficient distance has been provided for cross slope transition beyond the intersections. The alignment ties back into the existing horizontal alignment just west of 91st Ave and remains on tangent for the rest of the project limits.

Figure 4.1: Alternative Typical Sections



ALTERNATIVE 1



ALTERNATIVE 1A

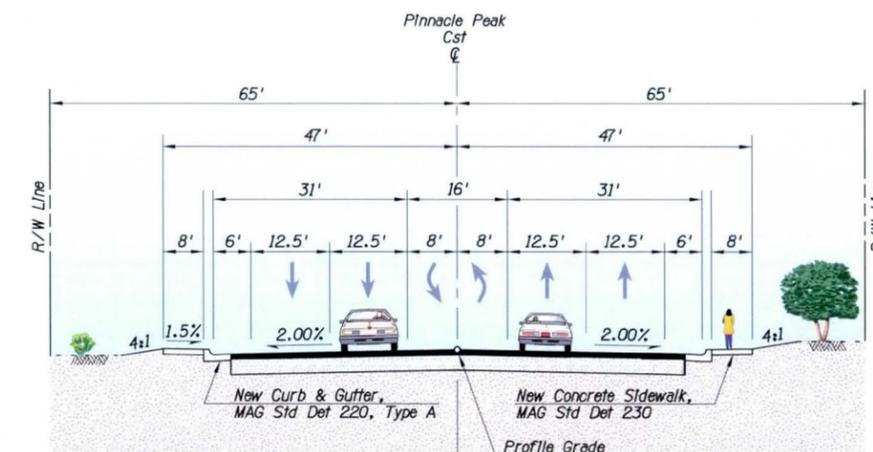
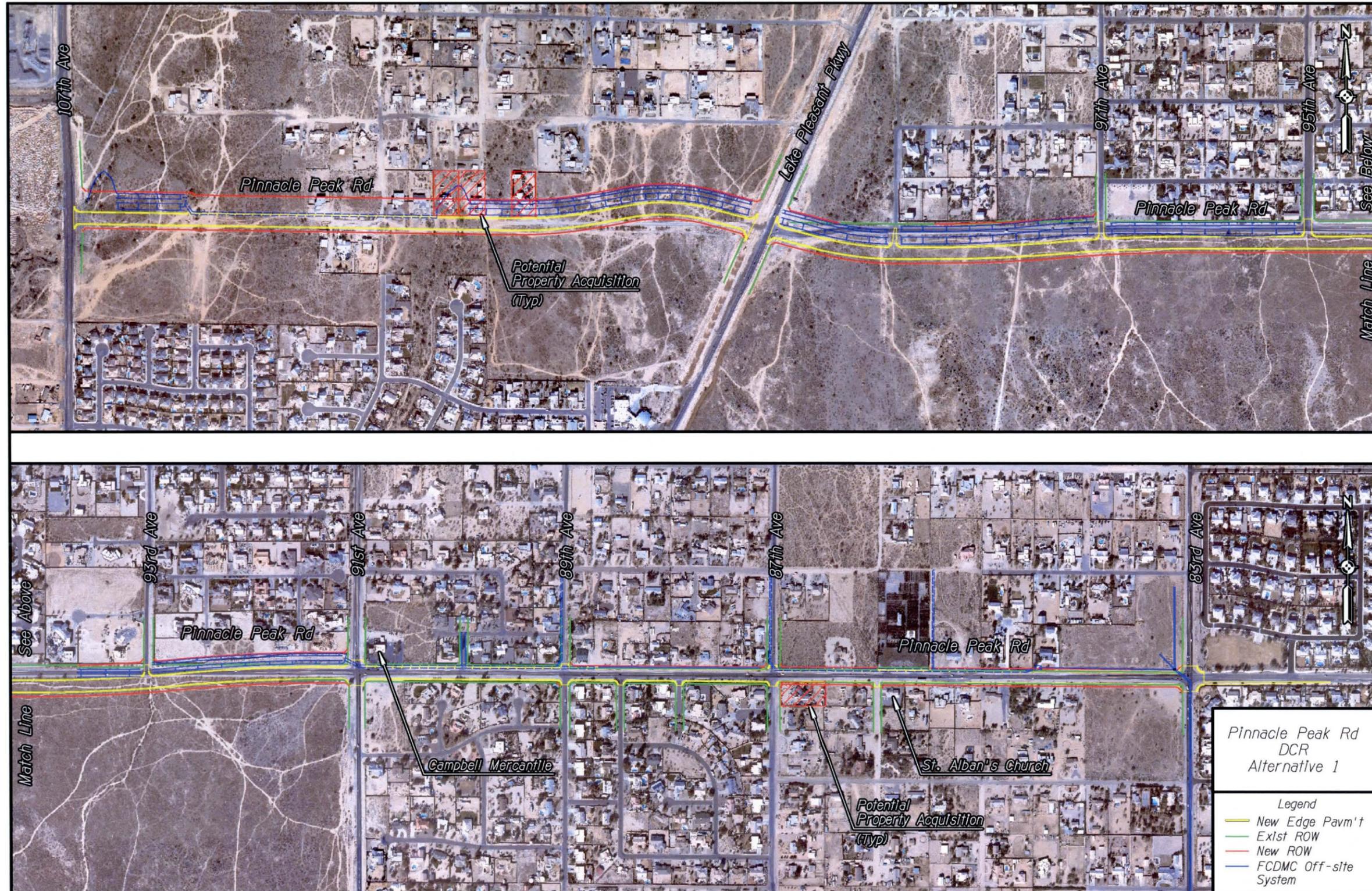


Figure 4.2: Alternative 1





The profile is rolling with 0.25% grades between Lake Pleasant Pkwy and 83rd Ave. West of Lake Pleasant Pkwy, the profile matches the existing ground at a 4% grade (maximum). The profile is designed to balance earthwork and minimize impact to utilities.

Along Pinnacle Peak Rd between 103rd Ln and 83rd Ave, the *ADMP Update* calls for a proposed off-site drainage system, consisting of both open channels and closed conduits, into which the on-site runoff will drain. On-site drainage will be collected in catch basins then conveyed to the proposed *ADMP* storm drain system. Approximately 83 curb inlets and 5,300 lineal feet of pipe are required for Alternative 1.

Alternative 1 utilizes new and existing right-of-way. Both the City of Peoria and MCDOT typical sections indicate a desired right-of-way width of 130 feet for a Minor Arterial (55-feet from the centerline). However, many residential properties adjacent to the roadway provide an existing right-of-way width of 55-feet from the centerline, the previous standard offset. Therefore, Alternative 1 proposes using a 55-foot right-of-way half width where the roadway is immediately adjacent to residential properties and a 65-foot half width where the roadway is adjacent to open land. This approach results in 22.4 acres of new right-of-way and acquisition of 4 residential properties. Three of the properties can be avoided if the FCDMC open channel near 103rd Ln is converted to a box culvert. Between 91st Ave and 83rd Ave, the Campbell Mercantile, the St. Alban's Episcopal Church and several residences access their property directly from Pinnacle Peak Rd. Access to existing permitted properties will be reconnected with standard driveways.

Existing utilities within the construction limits of Alternative 1 include overhead power, underground electric, water, sewer, gas, cable and telephone. According to maps obtained from the utilities companies, conflicts with overhead power are anticipated. An underground investigation has not been performed for this study. Final determination is dependent on pothole information.

Alternative 1A

Alternative 1A was developed to address local community input received at the December 4, 2006 public meeting. This alternative is an interim approach to Alternative 1. The purpose of this alternative is to minimize right of way acquisition while providing capacity to meet the year 2030 traffic demands and improving roadway operations. The roadway typical section is a three-lane Major Collector with curb, gutter, sidewalk and bike lanes as shown in Figure 4.1. The sidewalk width is five-feet. On the west leg of the Pinnacle Peak Rd and 83rd Ave intersection, the roadway width is widened to accommodate an eastbound right turn lane and northbound dual left turn lanes. Two westbound through lanes are provided on Pinnacle Peak Rd to receive the northbound dual left turn lanes from 83rd Ave. The outside through lane is dropped west of the intersection.

The horizontal alignment for Alternative 1A is the same as Alternative 1. The alignment consists of seven horizontal curves and matches the recent improvements constructed at Lake Pleasant Pkwy to reduce the intersection skew to 10 degrees. The alignment then runs parallel to the section line at a southern offset of 145 feet between 99th Ave and 97th Ave and 80 feet between 97th Ave and 93rd Ave. West of 91st Ave, the alignment remains on the section line for the rest of the project limits.

The profile is rolling with 0.25% grades between Lake Pleasant Pkwy and 83rd Ave. West of Lake Pleasant Pkwy, the profile matches the existing ground at a 4% (maximum) grade. The profile is designed to balance earthwork and minimize impact to utilities.

Along Pinnacle Peak Rd between 103rd Ln and 83rd Ave, the *ADMP Update* calls for a proposed off-site drainage system, consisting of both open channels and closed conduits, into which the on-site runoff will drain. On-site drainage will be collected in catch basins then conveyed to the proposed *ADMP* storm drain system. Approximately 106 curb inlets and 5,100 lineal feet of pipe are required for Alternative 1A.

Alternative 1A utilizes new and existing right-of-way. Both the City of Peoria and MCDOT typical sections indicate a desired right-of-way width of 80 feet for a Major Collector (40-feet from the centerline). However, where the roadway is immediately adjacent to open land, this DCR recommends acquiring the 65 foot width from the centerline to accommodate the ultimate roadway typical section. This approach results in 20.5 acres of new right-of-way and acquisition of 3 residential properties. The three properties can be avoided if the FCDMC open channel near 103rd Ln is converted to a box culvert.

Between 91st Ave and 83rd Ave, the Campbell Mercantile, the St. Alban's Episcopal Church and several residences access their property directly from Pinnacle Peak Rd. Access to existing permitted properties will be reconnected with standard driveways.

Existing utilities within the construction limits of Alternative 1A include overhead power, underground electric, water, sewer, gas, cable, and telephone. According to maps obtained from the utilities companies, conflicts with overhead power are anticipated. An underground investigation has not been performed for this study. Final determination is dependent on pothole information.

Alternative 2

Alternative 2 is similar to Alternative 1 with the exception of the proposed right-of-way width and sidewalk width. As with Alternative 1, Alternative 2 provides the ultimate section, a four-lane Minor Arterial typical section with curb, gutter, sidewalk and bike lanes. However, the sidewalk width is eight-feet for this alternative instead of five-feet.

The horizontal alignment for Alternative 2 is the same as Alternative 1. The alignment consists of seven horizontal curves and matches the recent improvements constructed at Lake Pleasant Pkwy to reduce the intersection skew to 10 degrees. The alignment then runs parallel to the section line at a southern offset of 145 feet between 99th Ave and 97th Ave and 80 feet between 97th Ave and 93rd Ave. West of 91st Ave, the alignment remains on the section line for the rest of the project limits.

The profile is rolling with 0.25% grades between Lake Pleasant Pkwy and 83rd Ave. West of Lake Pleasant Pkwy, the profile matches the existing ground at a 4% (maximum) grade. The profile is designed to balance earthwork and minimize impact to utilities.

Between 103rd Ln and 83rd Ave, the *ADMP Update* recommends a proposed off-site drainage system, consisting of both open channels and closed conduits, into which the on-site runoff will drain. On-site drainage will be collected in catch basins then conveyed to the proposed *ADMP Update* storm drain system. Approximately 83 curb inlets and 5,300 lineal feet of pipe are also required for Alternative 2.

Alternative 2 utilizes a right-of-way width of 65-feet within the project limits. This is the minimum right-of-way width designated on the City of Peoria and MCDOT typical sections for an arterial roadway. To attain this width, approximately 24.8 acres of new right-of-way and 12 residential properties must be

Figure 4.3: Alternative 1A

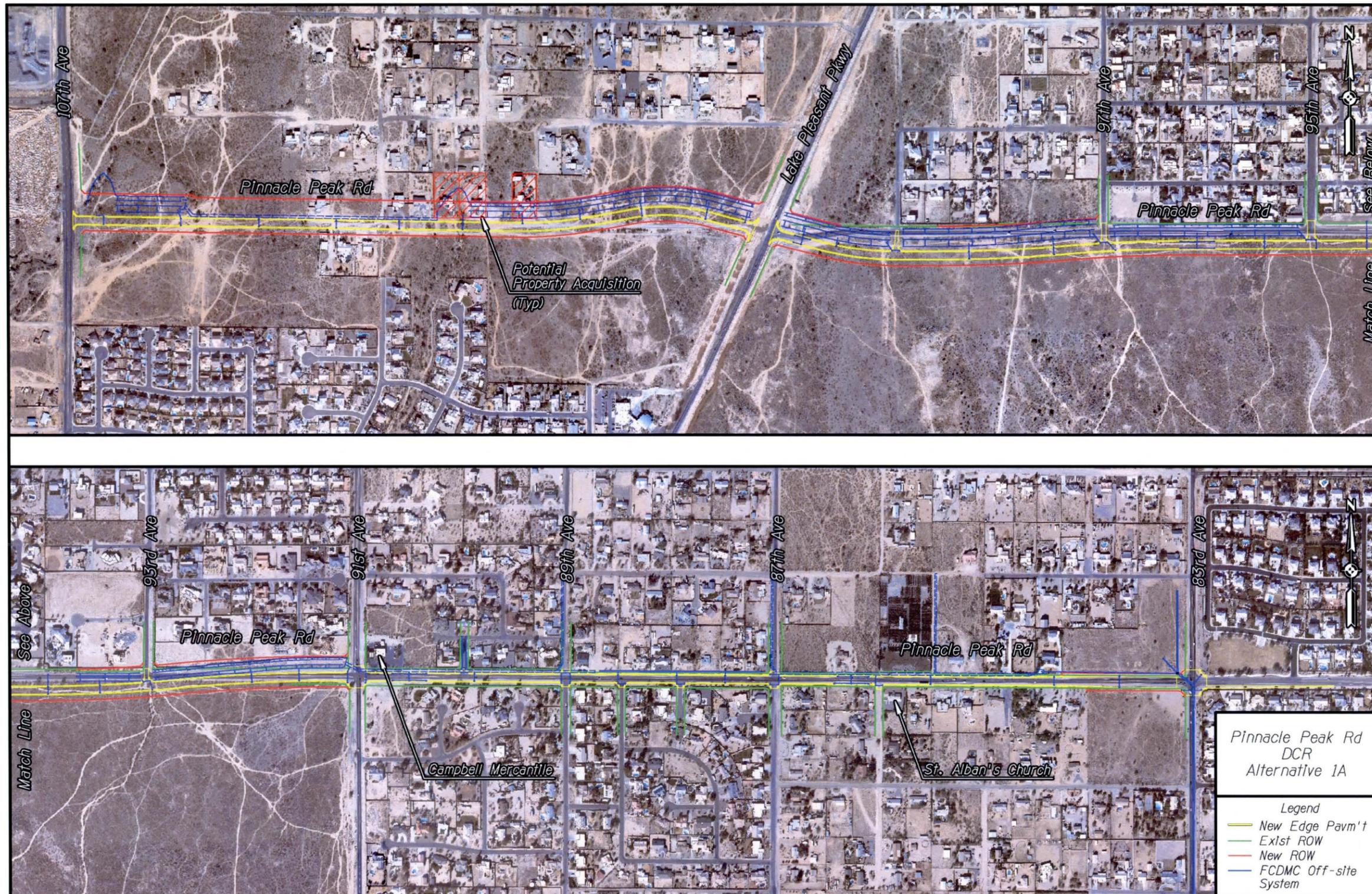
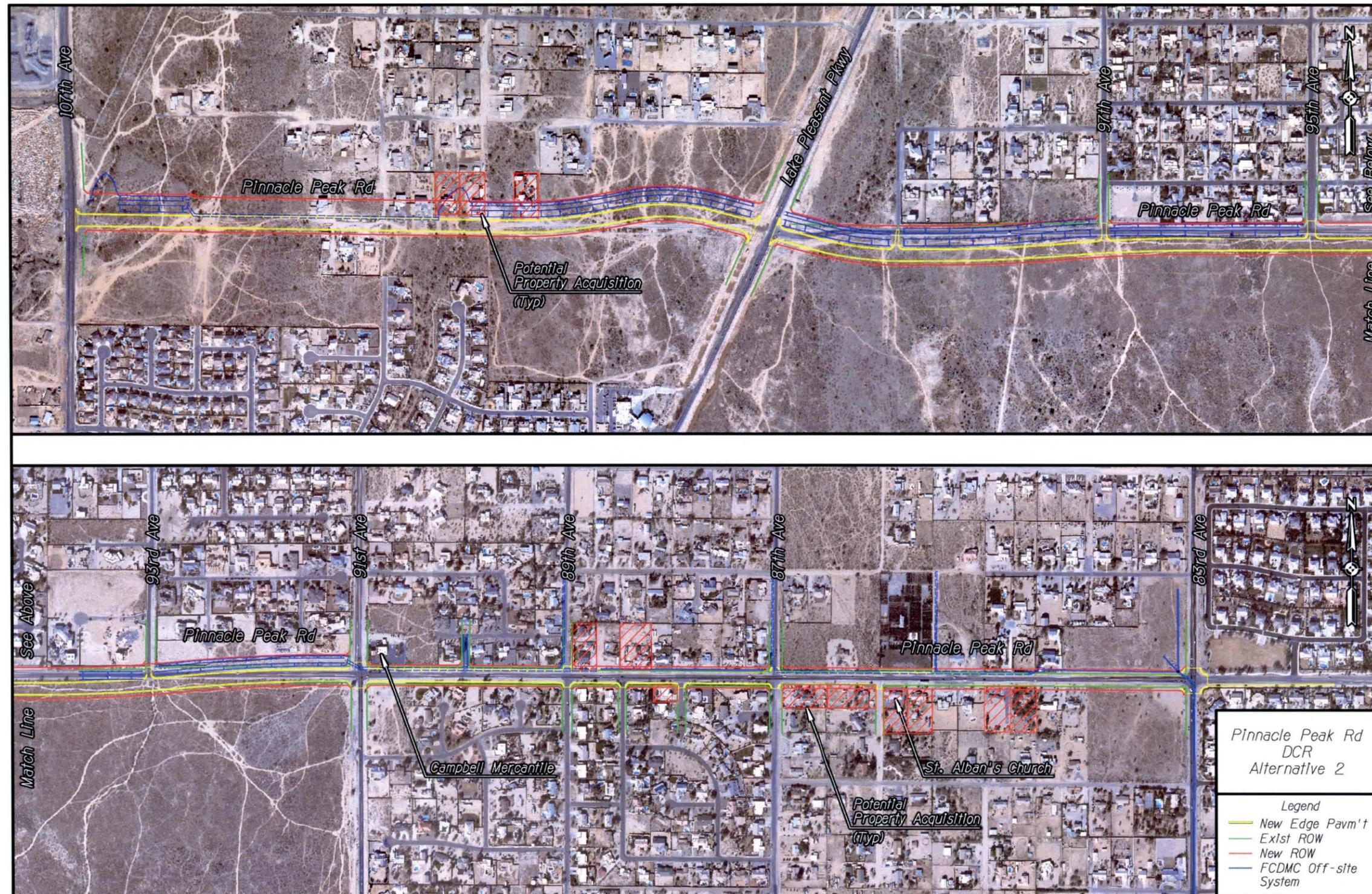


Figure 4.4: Alternative 2





acquired. Three of the properties will not be impacted if the FCDMC open channel near 103rd Ln is converted to a closed system.

Between 91st Ave and 83rd Ave, Campbell Mercantile, St. Alban's Episcopal Church and several residences access their property directly from Pinnacle Peak Rd. Access to existing permitted properties will be reconnected with standard driveways

Existing utilities within the construction limits of Alternative 2 include overhead power, underground electric, water, sewer, gas, cable and telephone. According to maps obtained from the utilities companies, conflicts with overhead power are anticipated. An underground investigation has not been performed for this study. Final determination is dependent on pothole information

Alternative 3

Alternative 3 was developed to allow the off-site drainage system to be constructed on the north side of Pinnacle Peak Rd for the entire project limits. Similar to Alternative 2, the typical section consists of a four-lane Minor Arterial with curb, gutter, sidewalk and bike lanes. The sidewalk width is eight-feet for this alternative. This alternative provides the ultimate roadway typical section.

The horizontal alignment consists of seven horizontal curves and matches the recent improvements constructed at Lake Pleasant Pkwy to reduce the intersection skew to 10 degrees. The alignment then runs parallel to the section line at a southern offset of 145 feet between 99th Ave and 97th Ave and 80 feet between 97th Ave and 83rd Ave. Immediately west of 83rd Ave, the alignment ties back into the section line with 10,000-foot radius reverse curves.

The profile is similar to the previous alternatives where a rolling 0.25% grade is proposed between Lake Pleasant Pkwy and 83rd Ave. West of Lake Pleasant Pkwy, the profile matches the existing ground with a 4% (maximum) grade. The profile is designed to balance earthwork and minimize impact to utilities.

Off-site drainage will be collected in an open channel north of Pinnacle Peak Rd between 103rd Ln and 83rd Ave with this concept. This proposition differs from the recommendations of the *ADMP Update*, but will provide a cost savings by eliminating the 1 mile closed system. On-site drainage will be collected in catch basins then conveyed to the open channel. Approximately 77 curb inlets and 5,260 lineal feet of pipe are required for Alternative 2.

Alternative 3 utilizes a right-of-way width of 65-feet within the project limits like Alternative 2. Approximately 28.8 acres of new right-of-way and 22 private properties will need to be acquired, including St. Alban's Episcopal Church. Like the other alternatives, three residential properties can be avoided if the FCDMC open channel near 103rd Ln is converted to a closed system.

As previously mentioned, Campbell Mercantile, St. Alban's Episcopal Church and several homes directly access Pinnacle Peak Rd between 91st Ave and 83rd Ave. Because the off-site drainage system is open channel within these limits, additional drainage structures will be required to maintain access to permitted properties on the north side of the roadway.

Existing utilities within the construction limits of Alternative 3 include overhead electric, water, sewer, gas, cable and telephone. According to maps obtained from the utilities companies, no conflicts are

anticipated. An underground investigation has not been performed for this study. Final determination is dependent on pothole information.

4.2 ALTERNATIVE COMPARISON

The four alternatives are evaluated using the matrix shown in Table 4.1.

Alternatives 1, 1A, 2 and 3 achieve the objectives of improving the capacity and operational characteristics of Pinnacle Peak Rd. Alternatives 1, 2 and 3 provide the ultimate recommended roadway typical section (Minor Arterial) and improved geometry that meets 55mph design criteria. The alternatives differ according to sidewalk width that can be provided within the right-of-way limits. Alternative 1 will only allow a five-foot sidewalk where Alternatives 2 and 3 can accommodate an eight-foot sidewalk as desired by the City of Peoria. Alternative 1A provides an interim typical section (Major Collector) that meets the forecasted traffic demands for the year 2030.

The on-site drainage approach is the same for all alternatives while the off-site drainage approach is different for Alternative 3. With Alternatives 1, 1A and 2, the FCDMC off-site drainage culvert (2-8'x4' RCBC), between 91st Ave and 83rd Ave, may be located beneath the roadway since right-of-way widths were kept to a minimum. Because of the culvert length, manholes will be required every 650 feet and located in the pavement for future maintenance purposes.

Maintenance of traffic during construction is an important project issue. Alternatives 1, 1A and 2 require a phased construction sequence since the new and existing roadway centerlines are coincident between 91st Ave and 83rd Ave. Temporary pavement widening will be required to accommodate two-way traffic while the existing pavement is reconstructed. Alternative 3 would allow the new roadway improvements to be constructed south of the existing roadway so that traffic could be maintained on the existing roadway.

The new right-of-way and number of residential properties impacted vary between alternatives. Alternative 1A requires the least area of new right-of-way and the fewest number of displaced homes due to the interim typical section. Alternative 1 utilizes a right-of-way width designated is less than the minimum right-of-way required by the City of Peoria and MCDOT for portions of Pinnacle Peak Rd and provides the minimum right-of-way impact for the ultimate roadway typical section. Alternatives 2 and 3 both provide the minimum right-of-way corridor desired by the City of Peoria and MCDOT. Alternative 3 results in the greatest right-of-way acquisition and residential property impact.

Utility relocations are necessary in all of the alternatives. According to preliminary utility information, Alternative 3 impacts the fewest number of existing utilities and Alternatives 1, 1A and 2 would require relocation of the overhead power lines.

All of the alternatives have very little environmental impact to the surrounding area. The impacts to water and air quality are the same among the four alternatives. Sound walls were not recommended for any alternative since the 2030 forecast volumes are less than 10,000 AADT.

The costs of the alternatives range from \$20,300,000 for Alternative 1A, \$24,100,000 for Alternative 1, \$30,400,000 for Alternative 2 and \$37,500,000 for Alternative 3. Detailed cost estimates are provided in Appendix B.

Figure 4.5: Alternative 3

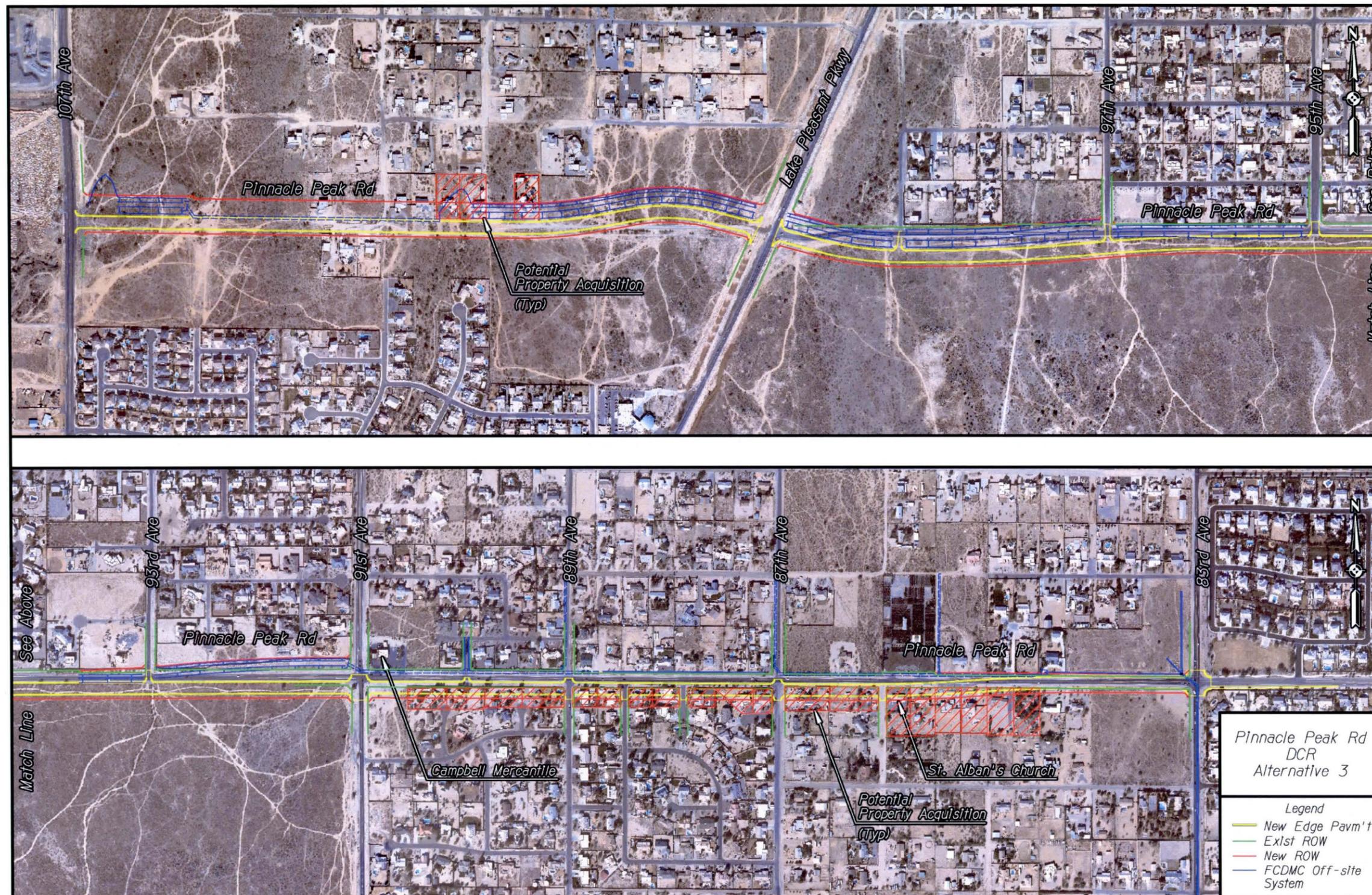




Table 4.1: Alternative Evaluation Matrix

	NO-BUILD	ALTERNATIVE 1	ALTERNATIVE 1A	ALTERNATIVE 2	ALTERNATIVE 3
Description	<ul style="list-style-type: none"> No improvements to the existing Pinnacle Peak roadway or intersections Pinnacle Peak Rd is not extended west to 107th Ave. 	<ul style="list-style-type: none"> Alignment is on section line with the exception of the Lake Pleasant Pkwy intersection and between Lake Pleasant Pkwy and 91st Ave. At the intersection, the roadway consists of reverse curves west and east of the intersection to cross with a skew that meets current design standards. This alignment matches the newly constructed intersection. 5-lane City of Peoria Typical Section with bike lanes between 107th Ave and 83rd Ave 65 ft ROW south of centerline between 107th Ave and 91st Ave. 120 feet to 140 feet ROW north of centerline between 107th Ave and 91st Ave to accommodate FCDMC open channel. 55 ft ROW south of centerline between 91st Ave and 83rd Ave. 55 foot ROW north of centerline between 91st Ave and 83rd Ave due to FCDMC closed facility. 	<ul style="list-style-type: none"> Alignment is on section line with the exception of the Lake Pleasant Pkwy intersection and between Lake Pleasant Pkwy and 91st Ave. At the intersection, the roadway consists of reverse curves west and east of the intersection to cross with a skew that meets current design standards. This alignment matches the newly constructed intersection. 3-lane MCDOT Typical Section with bike lanes between 107th Ave and 83rd Ave 65 ft ROW south of centerline between 107th Ave and 91st Ave. 120 feet to 140 feet ROW north of centerline between 107th Ave and 91st Ave to accommodate FCDMC open channel. 40 ft ROW south of centerline between 91st Ave and 83rd Ave. 55 foot ROW north of centerline between 91st Ave and 83rd Ave due to FCDMC closed facility. 	<ul style="list-style-type: none"> Alignment is on section line with the exception of the Lake Pleasant Pkwy intersection and between Lake Pleasant Pkwy and 91st Ave. At the intersection, the roadway consists of reverse curves west and east of the intersection to cross with a skew that meets current design standards. This alignment matches the newly constructed intersection (City of Peoria project). 5-lane City of Peoria Typical Section with bike lanes between 107th Ave and 83rd Ave. 65 ft ROW south of centerline between 107th Ave and 91st Ave. 120 feet to 140 feet ROW north of centerline between 107th Ave and 91st Ave to accommodate FCDMC open channel. 65 ft ROW south of centerline between 91st Ave and 83rd Ave. 65 foot ROW north of centerline between 91st Ave and 83rd Ave due to FCDMC closed facility. 	<ul style="list-style-type: none"> Alignment is on section line between 107th Ave and approaching the Lake Pleasant Pkwy intersection. At the intersection, the roadway utilizes reverse curves to cross LPP with a skew that meets current design standards. East of LPP, the alignment remains south of the section line too 83rd Ave. Reverse curves bring the alignment back on section line immediately west of the Pinnacle Peak Rd and 83rd Ave intersection. The alignment matches the newly constructed intersection (City of Peoria project) at LPP. 5-lane City of Peoria Typical Section with bike lanes between 107th Ave and 83rd Ave. 65 ft ROW south of centerline between 107th Ave and 83rd Ave. 120 feet to 140 feet ROW north of centerline between 107th Ave and 83rd Ave to accommodate FCDMC open channel.
Advantages	<ul style="list-style-type: none"> No cost. No right-of-way impact to adjacent residents. 	<ul style="list-style-type: none"> Allows room for future FCDMC open channel to be constructed without disruption to homes north of Pinnacle Peak Rd between 103rd Ave and 91st Ave. Provides the ultimate roadway typical section. 	<ul style="list-style-type: none"> Allows room for future FCDMC open channel to be constructed without disruption to homes north of Pinnacle Peak Rd between 103rd Ave and 91st Ave. Least number of residential properties impacted. Favored by the public. 	<ul style="list-style-type: none"> Allows room for future FCDMC open channel to be constructed without disruption to homes north of Pinnacle Peak Rd between 103rd Ave and 91st Ave. Provides minimum right-of-way requirement per MCDOT and City of Peoria Typical Sections Allows space for a continuous 8 foot sidewalk throughout project limits. Sidewalk can be detached if desired. Provides the ultimate roadway typical section. 	<ul style="list-style-type: none"> Allows room for future FCDMC open channel to be constructed without disruption to homes north of Pinnacle Peak Rd between Lake Pleasant Pkwy and 83rd Ave therefore less cost. Pinnacle Peak Rd can be constructed with the least disruption to traffic since the existing roadway can be utilized. Provides minimum right-of-way requirement per MCDOT and City of Peoria Typical Sections Allows space for a continuous 8 foot sidewalk throughout project limits. Sidewalk can be detached if desired.



Table 4.1: Alternative Evaluation Matrix (Continued)

	NO-BUILD	ALTERNATIVE 1	ALTERNATIVE 1A	ALTERNATIVE 2	ALTERNATIVE 3
Disadvantages	<ul style="list-style-type: none"> ▪ Possesses potential political ramifications from the project partners. ▪ Does not provide guidance for future development along Pinnacle Peak Rd. ▪ The existing roadway configuration is not consistent with the roadway configuration shown in the FCDMC ADMP Update. ▪ Does not provide auxiliary lanes at all intersections. ▪ Possesses potential negative reaction from the public. 	<ul style="list-style-type: none"> ▪ Flows must be contained in a box culvert between 91st Ave and 83rd Ave to avoid disruption to home owners north of Pinnacle Peak Rd. If a 5 ft buffer is provided at the right-of-way line, the box culvert is approximately 4 ft from the back of curb. ▪ Additional right-of-way is required from homeowners north and south of Pinnacle Peak Rd. Privacy walls must be reconstructed. ▪ Must reconnect driveways adjacent to Pinnacle Peak Rd ▪ Does not provide minimum right-of-way recommended by MCDOT and City of Peoria Typical Sections. 	<ul style="list-style-type: none"> ▪ Flows must be contained in a box culvert between 91st Ave and 83rd Ave to avoid disruption to home owners north of Pinnacle Peak Rd. If a 5 ft buffer is provided at the right-of-way line, the box culvert is approximately 4 ft from the back of curb. ▪ Additional right-of-way is required from homeowners north of Pinnacle Peak Rd to build the FCDMC improvements in the ultimate location. Privacy walls must be reconstructed. ▪ Must reconnect driveways adjacent to Pinnacle Peak Rd. 	<ul style="list-style-type: none"> ▪ Flows must be contained in a box culvert between 91st Ave and 83rd Ave to avoid disruption to home owners north of Pinnacle Peak Rd. If a 5 ft buffer is provided at the right-of-way line, the box culvert is approximately 14 ft from the back of curb. ▪ Additional right-of-way is required from homeowners north and south of Pinnacle Peak. Privacy walls must be reconstructed. ▪ Irregular pattern of impact to residences. 	<ul style="list-style-type: none"> ▪ Additional right-of-way is required from homeowners south of Pinnacle Peak Rd. Privacy walls must be reconstructed. ▪ Box culverts must be provided for driveways to cross open channel. ▪ Greatest number of residential properties impacted.
New Right-of-Way Required	None Required	22.4 Acres	20.5 Acres	24.8 Acres	28.8 Acres
Impacted Properties	None Impacted	4 Residential Properties 0 Businesses	3 Residential Properties 0 Businesses	11 Residential Properties 1 Church (Potentially)	21 Residential Properties 1 Church
Costs	N/A	\$24,100,000	\$20,300,000	\$30,400,000	\$37,500,000
B/C Ratio	N/A	1.44	0.33	1.15	0.98
Gross Benefits	N/A	\$27,809,500	\$5,293,400	\$27,809,500	\$27,809,500
Net Benefits	N/A	\$8,521,700	-\$10,953,100	\$3,628,800	-\$528,000
Assumptions	1) According to MCDOT policy, an alternative possessing a B/C Ratio less than 2.0 cannot be recommended for inclusion in the MCDOT TIP. 2) The cost for residential land is \$6/square foot and the cost for home relocation is \$500,000/home. For estimating purposes, the church was counted as a home.				
Recommendation	NO-BUILD ALTERNATIVE				



The B/C Ratio for all alternatives is less than 2.0. The B/C Ratio is provided by the MCDOT Planning Department using the Stratbencost software. Software input factors for each alternative were provided to MCDOT, see Appendix A for worksheets. The factors that influence the B/C Ratio include capacity, existing volumes, forecasted volumes, intersection delay, accident information, right-of-way required, existing pavement condition and project cost. For this study, the low forecasted traffic volumes heavily influenced the B/C Ratio.

4.3 RECOMMENDED ALTERNATIVE

As mentioned previously, alternatives with a B/C Ratio less than 2.0 can not be recommended for inclusion in the MCDOT TIP. Therefore, this DCR recommends the No-Build Alternative. It is recommended that this section of roadway be re-evaluated for improvement when projected traffic volumes reach 10,000 to 15,000 vehicles per day.

The traffic analysis detailed in Section 2 indicates that left turn lanes at all intersections and a right turn lane at 83rd Ave are required for the forecasted traffic volumes for the year 2030. Spot improvements at the intersections will need to be evaluated by MCDOT and the City of Peoria.

The No-Build recommendation of the DCR may impact the improvements identified in the FCDMC *ADMP Update*. The *ADMP Update* shows the existing Pinnacle Peak Rd upgraded to a five-lane urban arterial with the drainage improvements. The consequences of leaving the Pinnacle Peak Rd in the existing condition and installing the FCDMC improvements has not been considered as part of the DCR.

The No-Build recommendation needs to be further discussed between the project partners, MCDOT, FCDMC and the City of Peoria. Recommending that Pinnacle Peak Rd remain a two-lane roadway for the design year 2030 may impact regional drainage improvements and the local General Plan.



5.0 RECOMMENDED DESIGN ALTERNATIVE

This study recommends the No-Build option as detailed in Section 4.3.

5.1 ROADWAY DESIGN

Pinnacle Peak Rd is predominantly a two-lane roadway without curb, gutter and sidewalk. The roadway widens and provides turn lanes at the intersections with Lake Pleasant Pkwy, 91st Ave and 83rd Ave. Between 89th Ave and 87th Ave, the south side of the roadway has been improved by adjacent developers to Urban Minor Arterial standards. Pinnacle Peak Rd is not recognized as a declared road between 107th Ave and Lake Pleasant Pkwy.

5.2 DRAINAGE DESIGN

5.2.1 Proposed Off-Site Drainage System

The proposed off-site drainage system for Pinnacle Peak Rd is divided into three main systems. The first system drains from 87th Ave east to 83rd Ave, the second system drains toward 93rd Ave from 87th Ave on the east and from 94th Ave (alignment) on the west, and the third system drains from 87th Ave west to the Agua Fria River. These three off-site drainage systems are described briefly as follows:

System 1, 87th Ave to 83rd Ave

The off-site drainage system along Pinnacle Peak Rd is a continuation of the proposed off-site drainage system in 87th Ave referred to as the "Northwest System" in the *ADMP Update*. A 10' x 4' reinforced concrete box culvert (RCBC) in 87th Ave changes to a 2-8' x 4' RCBC on the north side of Pinnacle Peak Rd. This double barrel box culvert continues east to a proposed detention basin on the northwest corner of Pinnacle Peak Rd and 83rd Ave.

System 2, 94th Ave to 87th Ave

Beginning at the northwest corner of Pinnacle Peak Rd and 87th Ave, this off-site drainage system consists of two 36" diameter reinforced concrete pipes (RCP) on the north side of Pinnacle Peak Rd. Approximately 200 ft east of 89th Ave, the 2-36" diameter pipes change to a single 10' x 4' RCBC. The box culvert continues west along Pinnacle Peak Rd, discharging to an open trapezoidal channel on the west side of 91st Ave. The open channel continues west to an outlet structure that discharges under Pinnacle Peak Rd through a 2-10' x 5' RCBC to a wash on the south side of the street. The other part of this off-site drainage system consists of an open trapezoidal channel between 94th Ave (alignment) and 93rd Ave. Flow in this open channel crosses under 93rd Ave in a 2-4' x 3' RCBC to the junction structure previously described.

System 3, 94th Ave to Agua Fria River

This system starts on the west side of the 94th Ave alignment as an existing detention basin on the north side of Pinnacle Peak Rd that extends to 95th Ave. A new 44" x 27" concrete arch pipe will discharge the contents of this detention basin under 95th Ave to a new trapezoidal channel on the

north side of the road. The channel will continue west along the north side of Pinnacle Peak Rd, with 3-8' x 4' box culverts crossing under the intersecting streets of 97th Ave, 99th Ave, and Lake Pleasant Pkwy. West of Lake Pleasant Pkwy, the open channel continues west along the Pinnacle Peak Rd alignment for approximately 1,500 ft at which point it terminates at a large junction structure that intercepts off-site flow from a wash. The junction structure discharges to a 2-8' x 6' RCBC that continues west approximately 1,600 ft to an open trapezoidal channel. The open channel continues west approximately 600 ft to another junction structure that intercepts flow from a small wash. The junction structure discharges to a 3-8' x 5' RCBC under the Pinnacle Peak Rd alignment to a short segment of open channel. From the open channel, the flow passes through another 3-8' x 5' RCBC under the alignment of 107th Ave and thence to the Agua Fria River.

5.2.2 Proposed On-Site Drainage System

This DCR did not consider spot drainage improvements. The No-Build recommendation maintains the existing drainage patterns.

5.3 UTILITIES

A summary of the utility information for Pinnacle Peak Rd is provided in Table 5.1.

Table 5.1: Utility Contacts

Utility	Contact	Address	Phone
APS	Bobby Garza	2121 W. Cheryl Drive Phoenix, AZ 85021	602-316-9825
Cox	Suzanne Holzer	1550 W. Deer Valley Rd Phoenix, AZ 85027	623-328-3522
El Paso Natural Gas	Ed Kemmerer	Two North Nevada Avenue, Room 782 Colorado Springs, CO 80903	719-520-4392
City of Peoria Water, Wastewater	Shawn Kreuzwiesner	8401 West Monroe Street Peoria, AZ 85345	623-773-7286
Qwest	Matt Phillips	6350 S. Maple Ave Room 125 Tempe, AZ 85283	480-234-2032
Sunrise Water	Marvin Collins	9098 West Pinnacle Peak Rd Peoria, AZ 85383	623-972-6133
Southwest Gas	Jesse Gonzales	PO Box 52075 Phoenix, AZ 85072	602-484-5650

5.4 RIGHT-OF-WAY

New right-of-way is not required for the No-Build option.



5.5 FUTURE DEVELOPMENT

Opportunity for future development exists along Pinnacle Peak Rd within the project limits. The City of Peoria has received plans for a Circle K convenience store to be located in the southwest quadrant of Pinnacle Peak Rd and Lake Pleasant Pkwy. Also, State Land will sell the parcel on the south side of Pinnacle Peak Rd between Lake Pleasant Pkwy and 91st Ave, Camino a Lago North, in July 2007. This parcel will become a residential development according to the Peoria 2006 Masterplan. Other smaller residential developments are anticipated between 107th Ave and Lake Pleasant Pkwy. The City of Peoria will need to use their General Plan and Street Classification Map to guide future development along Pinnacle Peak Rd.



6.0 ENVIRONMENTAL OVERVIEW

6.1 INTRODUCTION

The purpose of the Environmental Overview (EO) is to generally describe the social, economic, and environmental character of the area in the vicinity of the Pinnacle Peak Rd widening project. This description can then be used to identify any "fatal flaws" and associated issues that pertain to the project and to assist in the evaluation of alternatives for the future roadway improvements. This general description of environmental conditions and potential impacts is not intended to meet the requirements of the National Environmental Policy Act (NEPA). Additional environmental study and documentation will be required at future stages of project development.

6.2 ENVIRONMENTAL CONSIDERATIONS

Population and Employment

As a basis for describing population characteristics and employment conditions, data from the 2000 U.S. Census were compiled for Maricopa County, the City of Peoria, and a study area in the immediate vicinity of the project corridor.

The study area was defined by using data from census tracts in the immediate vicinity of the Pinnacle Peak Rd corridor. Total population and sex, age, and race characteristics were described using data from these census blocks. In some cases, the blocks extend some distance from the project corridor. Thus, this study area is representative of the demographic conditions along the roadway, but does not describe the exact composition of the persons directly affected.

Poverty status and employment data are not reported by the U.S. Census at the block level. Thus, block group data were compiled for these characteristics. The area covered by these block groups is somewhat larger than that defined by the use of block data. Again, these data provide the basis for a description of general conditions in the study area compared to Maricopa County and the City of Peoria.

Population characteristics for Maricopa County, the City of Peoria, and the study area as defined by the census block data are shown in Table 6.1. The numbers for poverty status are derived from block group data.

The male/female split in all three areas is roughly equal; the City of Peoria has the greatest discrepancy between the sexes, with a 48%/52% male/female split. In the study area, only 4% of the population is over age 65, which is much lower than in either Maricopa County or City of Peoria (14% and 12% respectively).

Racial composition in the study area is less diverse than in the City of Peoria and even less so than Maricopa County. Nonetheless, a substantial majority of the population in all three areas is white: 94% in the study area; 84.9% in the City of Peoria; and 77% in Maricopa County. The largest minority group in the three areas is Hispanic (any race); Hispanics make up 25% of the population of Maricopa

County, 15.4% of the City of Peoria's, and 7.5% of the study area population. The study area seems relatively better off financially than the City of Peoria or Maricopa County; the percentage of individuals and families living in poverty is less than in Peoria and Maricopa County.

Table 6.1: Population Characteristics

Subject	Maricopa County		City of Peoria		Study Area	
	Number	%	Number	%	Number	%
Total Population	3,072,149	100%	108,364	100.0%	5,568	100.0%
Sex and Age						
Male	1,536,473	50%	52,306	48%	2,807	50%
Female	1,535,676	50%	56,306	52%	2,761	50%
65+	358,979	12%	15,652	14%	236	4%
Race						
White alone	2,376,359	77%	92,050	84.9%	5,236	94.0%
Black/African American	114,551	4%	3,012	2.8%	45	0.8%
American Indian	56,706	2%	734	0.7%	32	0.6%
Asian	66,445	2%	2,077	1.9%	45	0.8%
Native Hawaiian/Pacific Islander	4,406	0%	12	0.1%	2	0.0%
Other	364,213	12%	7,686	7.1%	135	2.4%
Two or more races	89,469	3%	2,685	2.5%	73	1.3%
Hispanic (any race)	763,341	25%	16,699	15.4%	420	7.5%
Poverty Status						
Families	61,519	8%	968	3.3%	81	2.2%
Individuals	355,668	12%	5,627	5.3%	340	2.6%

Employment characteristics, as derived from the 2000 U.S. Census, are shown in Table 6.2. These data indicate that the unemployment rate is low in all three areas; it is lowest in the study area (at 3.2%) and highest in Maricopa County (at 5.1%).



Table 6.2: Employment Characteristics

Subject	Maricopa County		City of Peoria		Study Area	
	Number	%	Number	%	Number	%
Civilian Labor Force	1,504,252	100%	52,336	100%	6,869	100%
Employed	1,427,292	94.9%	49,793	95.1%	6,647	96.8%
Unemployed	76,960	5.1%	2,543	4.9%	222	3.2%

Title VI / Environmental Justice

Title VI of the Civil Rights Act of 1964 and related statutes seeks to assure that individuals are not subjected to discrimination on the basis of race, color, national origin, age, sex, or disability. Executive Order 12898, entitled Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations.

The U.S. Department of Transportation issued its final order to implement the provisions of Executive Order 12898 on April 15, 1997. This final order requires that information be obtained concerning the race, color or national origin, and income level of populations served or affected by the proposed action. It further requires that steps be taken to avoid disproportionately high and adverse effects on these populations.

Minority, low-income, and elderly populations are present in the area, although in very low numbers. The most prominent ethnic minority in the study area is Hispanic/Latino, with 7.5% of the population. This proportion is only about one-half of the Hispanic/Latino population of the City of Peoria (at 15.4%) and less than one-third of the Hispanic/Latino population of Maricopa County (25.4%). Maricopa County has the highest total proportion of all ethnic minority groups, and City of Peoria the next highest.

The study area seems relatively better off financially than the City of Peoria or Maricopa County. The percentage of individuals and families living in poverty is less than in Peoria and Maricopa County: 2.3% of families in the study area live in poverty versus 3.3% in the City and 8% in the County; and 2.7% of the individuals in the study area meet poverty status versus 5.3% in the City and 12% in the County. In the study area, only 4% of the population is over age 65, which is much lower than in either Maricopa County or City of Peoria (14% and 12% respectively).

The percentages of minority, low-income, elderly, and female populations are below the threshold of 50 percent of the affected area, which is a general guideline for the definition of a substantial population. Initial evaluation of potential impacts would indicate that disproportionate impacts on these groups are not likely to occur. In many respects, the implementation of the project will have positive impacts on the immediate vicinity. However, judgment should be used in the future definition

and evaluation of impacts to clearly document the potential effects on these groups. These efforts should include an evaluation of the distribution of these groups compared to the overall population of the study area. Care should also be taken to ensure their participation in future public involvement activities

Water Resources

Federal Emergency Management Administration (FEMA) flood maps were reviewed to determine the relationship of the project area to existing floodplains. FEMA Map No. 04013C1160H shows that the majority of the project lies in Zone X of the Agua Fria River floodplain and has a 0.2% chance of being flooded.

Additional evaluation was conducted to determine potential water quality issues the need for a permit under Section 404 of the Water Quality Act. This evaluation included a review of available topographic maps, aerial photography of the area surrounding the project corridor, and a site visit.

Drainage flow in the project area is generally from north to south-southwest across Pinnacle Peak Rd and parallel to the Agua Fria River. Several drainages cross Pinnacle Peak Rd within the project corridor between 83rd Ave and 107th Ave. Although the drainages between 83rd Ave and Lake Pleasant Pkwy exhibit some physical characteristics associated with defining the Ordinary High Water Mark (OHWM) (vegetation differences, changes in soil characteristics, shelving and cut banks), historically these drainages terminate prior to joining larger tributaries and do not flow to the Agua Fria River. Additionally, these drainages have been further impacted by recent urbanization and now appear completely cut off from other drainages.

The drainage that crosses the undeveloped portion of the Pinnacle Peak Rd alignment just east of 107th Ave appears to exhibit certain physical characteristics associated with the OHWM and appears to flow into the Agua Fria River. This drainage flows south-southwest along the fringe of the Agua Fria's floodplain terrace and is likely a Water of the U.S. A Clean Water Act Section 404/401 Permit will most likely be required to construct within the drainage. Given the type of project, Nationwide Permit (NWP) 14, Linear Transportation Projects, may be applicable to the project depending on the total permanent loss of waters of the U.S. A jurisdictional delineation for the project area is recommended, with an estimate of the total potential acres of permanent loss. Further consultation with the U.S. Army Corps of Engineers will likely be needed prior to construction of the project.

Biological Resources

The project area lies within the Basin and Range physiographic province and the Lower Colorado River subdivision of the Sonoran desert scrub biotic community type. The project limits are within a landscaped urban area surrounded by commercial and residential development, with isolated areas of degraded desert scrub. Little native vegetation remains within the project area. Creosote bush is common in undeveloped areas, primarily west of Lake Pleasant Pkwy. However, this area is dissected by numerous off-road vehicle tracks. Saguaros, ironwood, mesquite, and palo verde are rare throughout the project area.

Archaeological Consulting Services Ltd. (ACS) performed a biological review to evaluate the potential effects of the proposed project on endangered, threatened, proposed, and candidate species. For



this review, a list of species was developed using the current federally listed species within Maricopa County as provided by the United States Fish and Wildlife Service (USFWS) Arizona Ecological Services website and information from the Arizona Game and Fish Department (AGFD) Heritage Data Management System. In addition to the use of these data sources, a field visit was conducted on September 8, 2006 by Johnida S. Martin, Wildlife Biologist (ACS).

The biological review concluded that the proposed project would not affect any endangered, threatened, proposed, or candidate species. In addition, no designated critical habitat occurs within the project area.

A letter was sent to the AGFD requesting any specific concerns or recommendations that the agency may have concerning the project, as well as the identification of any state and federally listed species that may occur in the project vicinity. The AGFD response identified several state sensitive bat species that are associated with the Sunrise Relief Mine, which is located approximately one mile north of the project area near Happy Valley Road and 91st Ave. However, suitable roost sites for these species do not exist within the project area and existing potential foraging habitat within the area is highly degraded. Therefore, no accommodations for sensitive species are necessary.

Hazardous Materials

A preliminary investigation was conducted by Archaeological Consulting Services, Ltd. (ACS) to identify sites in the project area that may contain hazardous wastes and substances. This investigation consisted of a review of available federal and state environmental databases and the performance of site visit to confirm information from the databases and to note additional field observations.

The Campbell Mercantile at the northeast corner of 91st Ave and Pinnacle Peak Rd. has three underground storage tanks (USTs) in use. This business had a false alarm on a suspected release (LUST) in 1994. There are dry wells located at the corners of 83rd Ave and Pinnacle Peak Rd. and at 95th Ave and Pinnacle Peak Rd.

No other hazardous materials concerns were identified by either the database search or the field visit. The study concluded that no further hazardous materials investigation is required for this project at this time. If suspected hazardous materials are encountered during construction, work should cease and the Project Engineer notified so arrangements can be made to properly assess the material.

Cultural Resources

A cultural resources survey was completed for the project corridor in November, 2006. Two sites were identified: a historic trash scatter and a historic road, and both have been recommended as not eligible for National Register of Historic Places. The report and recommendation will be forwarded to the State Historic Preservation Office for review. No further cultural resources investigations are anticipated.

Air Quality

This project is located in the Phoenix Metropolitan Non-Attainment Area, meaning that air quality in the region does not meet National Ambient Air Quality Standards for ozone and particulates (O₃, and PM₁₀). The project as proposed will replace a two lane road with a three lane road, and create a new 0.8 miles of arterial roadway. Through travel lanes of greater than ½ mile will be added to the existing roadway. Therefore this project will require conformity analysis by the Maricopa Association of Governments to ensure that the additional roadway does not cause or contribute to new violations of the air quality standards, and conforms to the existing air quality improvement plans.

Roadway construction activities may result in some deterioration of the existing air quality on a temporary basis. Such impacts are expected to be localized and temporary. Dust generated by construction activities will be controlled in accordance with County Air Pollution Regulations and as stipulated in the required County Earthmoving Permit.

Noise

MCDOT adopted a Noise Abatement Policy in April 2001 to set guidelines to determine the need, feasibility, and reasonableness of noise abatement measures for all roadway projects. For all construction projects, MCDOT is committed to identifying any potential noise receptors, ascertain existing conditions, identify the nature of the project and its potential to impact those potential noise receptors.

If it is likely that the predicted noise level will approach or exceed the noise abatement criterion, or cause a substantial (15dBA) increase over the existing traffic noise level, MCDOT will evaluate the impacted properties for possible abatement. Noise abatement measures must be reasonable and feasible. Feasibility deals primarily with engineering considerations (e.g., can a barrier be built given the topography of the location; can a substantial noise reduction be achieved given certain access, drainage, safety, or maintenance requirements; are other noise sources present in the area, etc.) The reasonableness of any noise abatement measure will be discussed with the affected property owner and mutual agreement is required for construction of a barrier.

For estimating DCR construction costs, budgeting for noise wall mitigation at this phase of project development is not recommended. When the project goes into the design phase, a more detailed noise analysis will need to be conducted to determine if noise abatement is recommended.



7.0 LAND USE PLANNING

Land Jurisdiction and Ownership

The Pinnacle Peak Roadway corridor lies in an area of rapid change and development within Maricopa County. The entire study area was once completely within the jurisdiction of Maricopa County. Subsequent annexations have brought part of the area into the City of Peoria. The remaining unincorporated Maricopa County areas are located on the north side of Pinnacle Peak Rd between 83rd Ave and 107th Ave and in the southeast portion of the study area between 83rd Ave and 91st Ave. The incorporated City of Peoria portions occupy the remainder of the study area south of Pinnacle Peak Rd and the area on the north along Happy Valley Rd between 83rd Ave and Lake Pleasant Pkwy. A small portion of land at the northeast corner of 91st Ave and Pinnacle Peak Rd is currently under annexation by City of Peoria. These jurisdictional areas are illustrated on Figure 7.1.

Land ownership is generally private, with the exception of two parcels on the northwest corner of 83rd Ave and Pinnacle Peak Rd, which are owned by the City, and a large area of State Trust land south of Pinnacle Peak Rd between 91st and 99th Aves.

Existing Land Use

In general, the land in the study area is in transition from vacant land to residential and commercial uses. The existing land uses are illustrated in Figure 7.2 and briefly described below. The descriptions are provided for each of the six sections of Township 4 North, Range 1 East.

Section 8

Section 8 is in the northwest corner of the study area. It is bounded roughly by West Happy Valley Rod on the north, North Lake Pleasant Pkwy on the east, West Pinnacle Peak Rd on the south, and North 107th Ave on the west. Almost 70 percent of the area is vacant, with a region of residential use in the northern portion of Section 8, north of Hatfield Rd, and another area of residential in the central-southern area of Section 8.

Section 9

Section 9, which is east of Section 8, is bounded by West Happy Valley Rd, North 91st Ave, West Pinnacle Peak Rd, and North Lake Pleasant Pkwy. The southern half of Section 9 is residential use. There is another portion of residential use on the eastern side of the section between North 93rd Ave and North 91st Ave. The remaining portion of land, in the northwest area of Section 9 is vacant land.

Section 10

Section 10, east of Section 9, is bounded by West Happy Valley Rd, North 83rd Ave, West Pinnacle Peak Rd, and North 91st Ave. There is a small portion of commercial land use in the southwest corner of Section 10, at the intersection of West Pinnacle Peak Rd and North 91st Ave. The southern half of Section 10 is almost entirely residential, with two small pockets of open space. The upper-third portion of Section 10 is vacant.

Section 15

Section 15 is in the southeast corner of the study area, south of Section 10. Section 15 is bounded by West Pinnacle Peak Rd, North 83rd Ave, West Deer Valley Rd, and North 91st Ave. Almost 95 percent of Section 15 is residential use, with small portions of open space dispersed throughout.

Sections 16 and 17

Sections 16 and 17 are in the southwest corner of the study area, west of Section 15. This area is bounded by West Pinnacle Peak Rd, North 91st Ave, West Deer Valley Rd, and North 107th Ave. The area east of North Lake Pleasant Pkwy is State Trust land and is therefore vacant. West of North Lake Pleasant Pkwy is residential use.

The approximate percentages of existing land uses in the study area are:

- Vacant/Open Space – 51.7%
- Residential – 48.2%
- Commercial – 0.1%

Planned Land Use

Five different planning documents provide information about the planned land use in this area. Information on planned land use are illustrated on Figure 7.3 and briefly summarized below.

Maricopa County

A comprehensive plan, the Maricopa County 2020 Eye to the Future, was adopted in 1997 and amended in 2000 and 2002. This plan is a statement of the County's plans for development, growth, and land use on county lands. The goal of the plan's land use element is to "promote efficient land development that is compatible with adjacent land uses, is well integrated with the transportation system, and is sensitive to the natural environment."

The Maricopa County 2020 comprehensive plan classifies the county-controlled island in the project area as a General Plan Development Area (GPDA), which is "an unincorporated area that is likely to be annexed by a city or town in the future and is included in an adopted municipal general plan." Although no additional information about land use on these county islands is provided in the comprehensive plan, the County has developed several area-specific plans as amendments to the comprehensive plans. One of these area plans, the White Tanks/Grand Ave Area Plan, addresses the portion of the project study area west of 91st Ave. The area is planned for small-lot residential development.



Figure 7.1 – Existing Jurisdictions

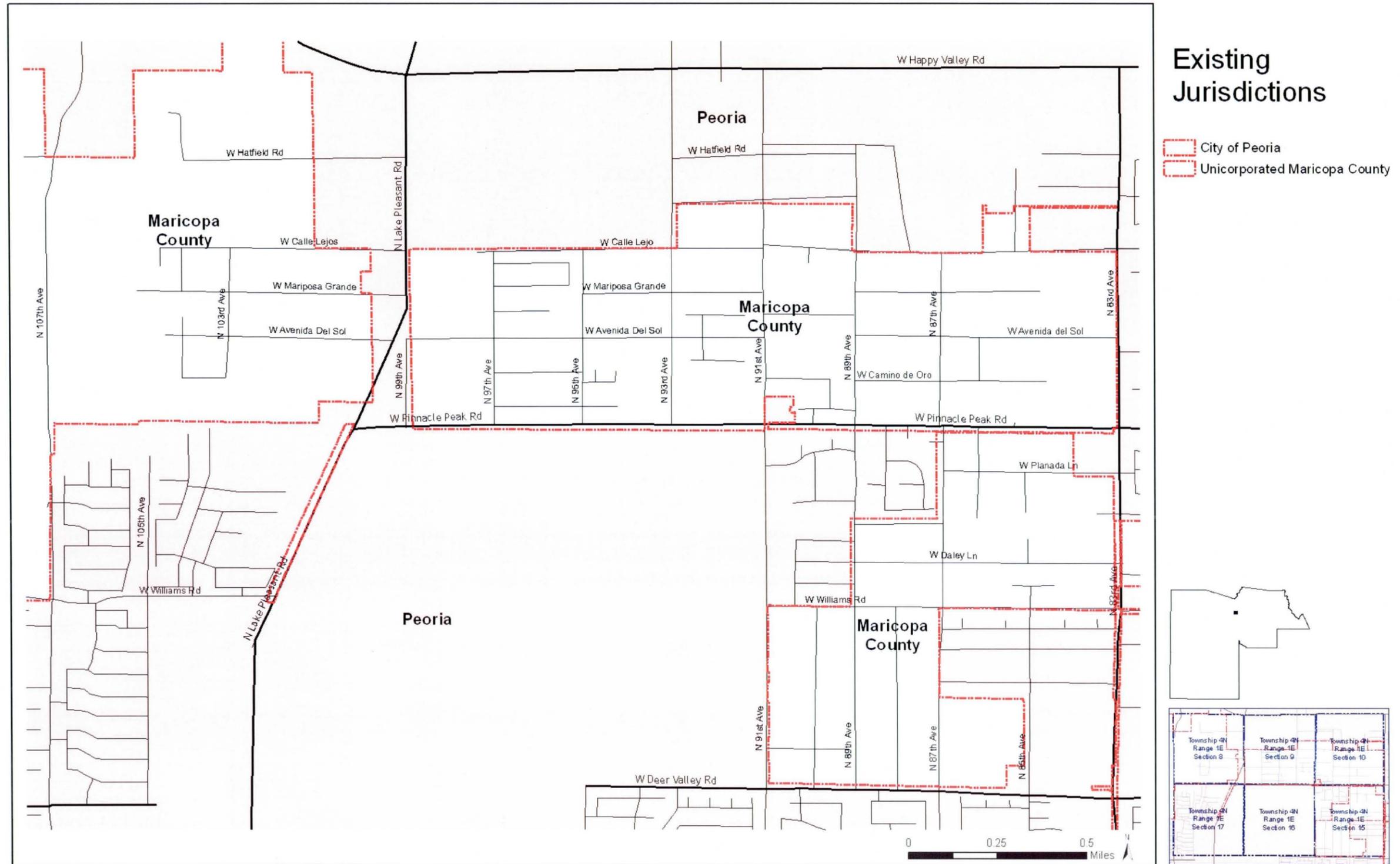
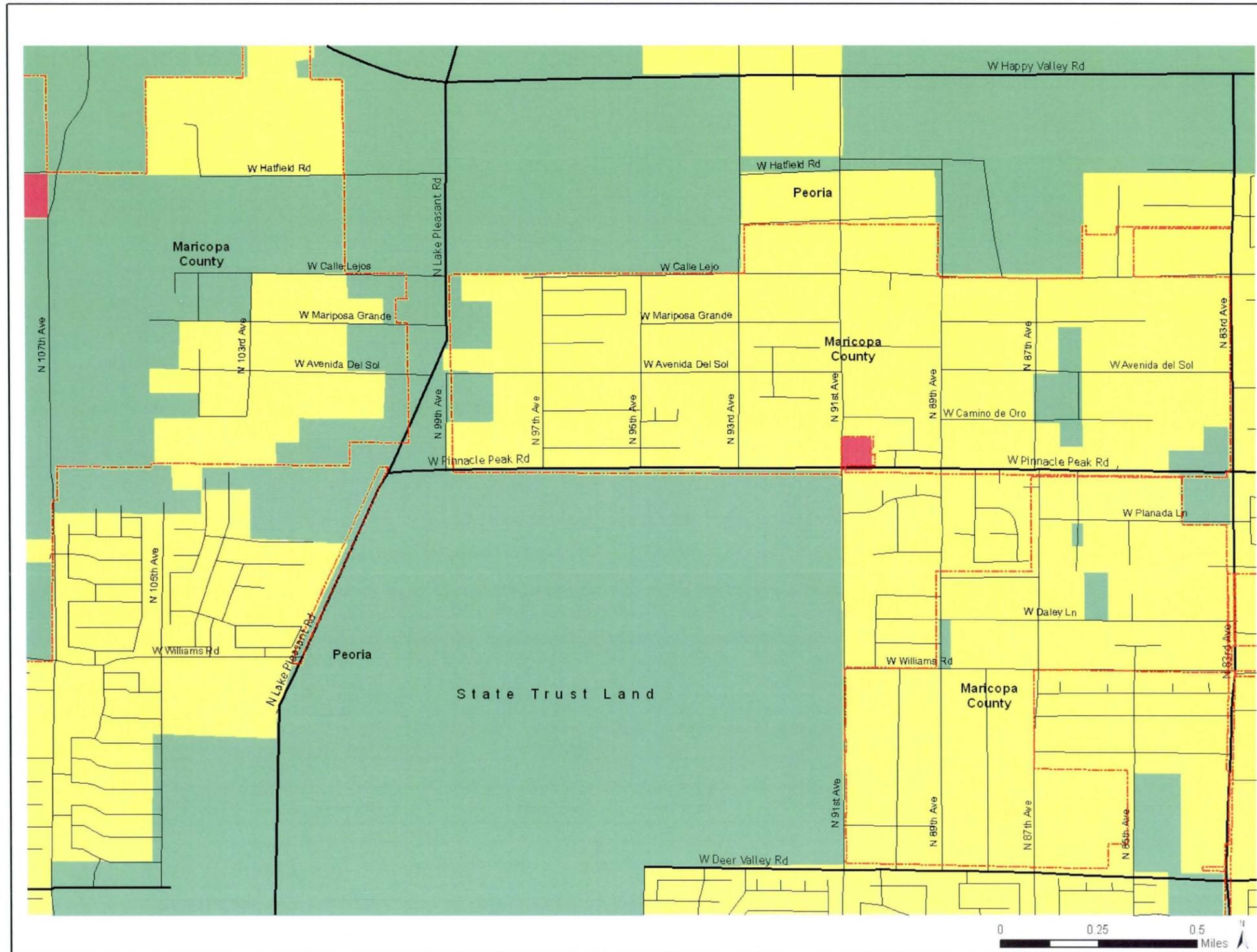




Figure 7.2 – Existing Land Use



Existing Land Use

- Peoria City Limits
- Roads
- Existing Land Use**
- Vacant/Open Space
- Residential
- Commercial

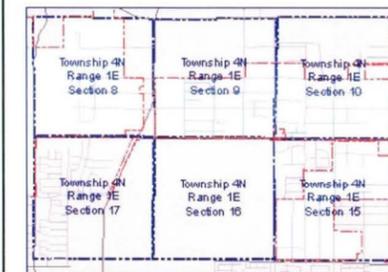
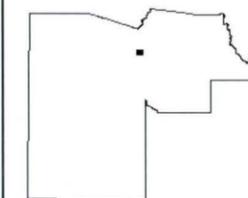
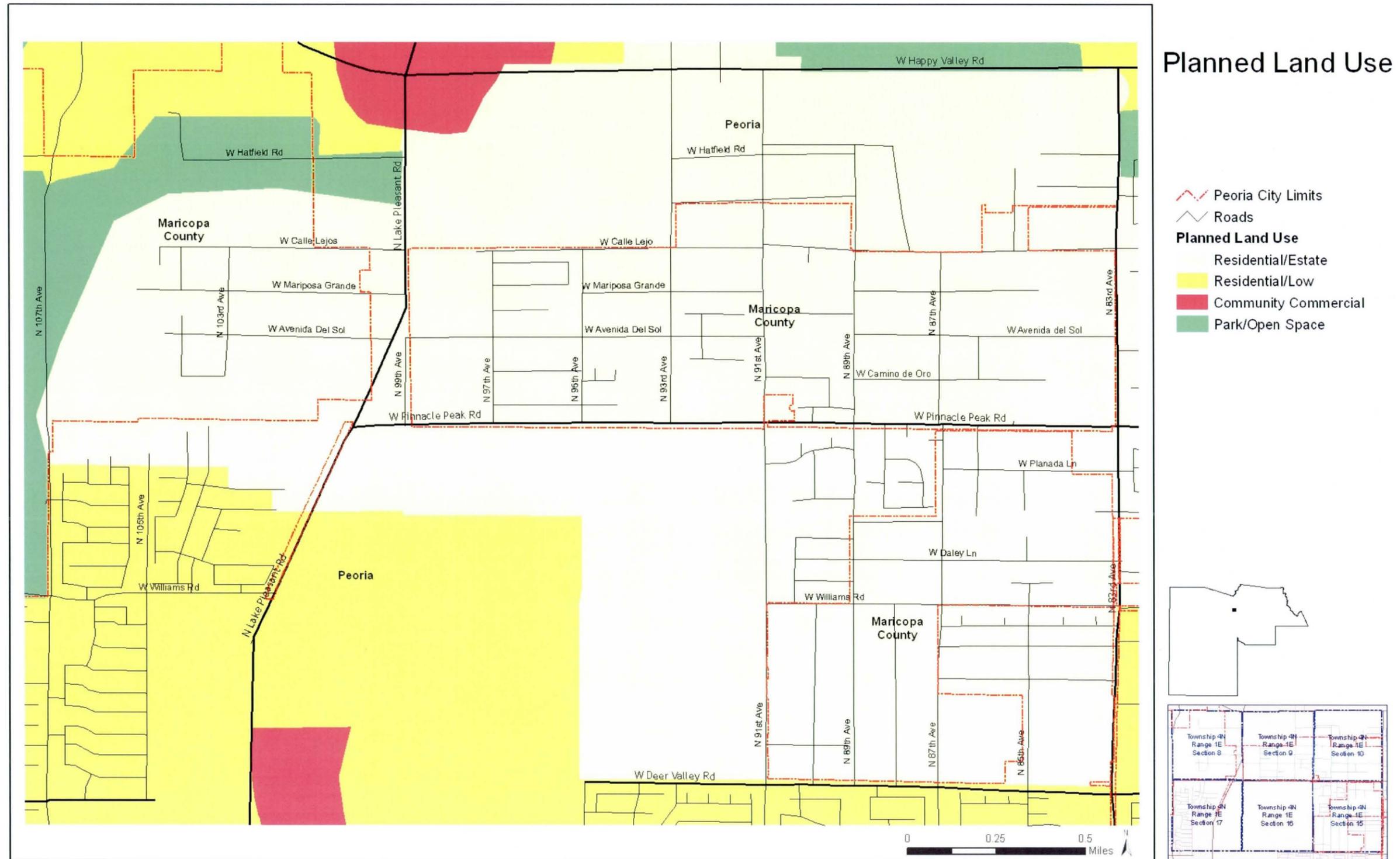


Figure 7.3 – Planned Land Use





City of Peoria

The City of Peoria's General Plan provides fundamental policy direction and guidance for growth and development and is intended to be updated periodically to reflect changing conditions in the community. Land use goals from the General Plan include providing a balance of land uses to preserve and enhance neighborhoods; promoting economic development; encouraging redevelopment at appropriate locations; and protecting environmentally sensitive areas.

Following the State's Grower Smarter Plus initiative, the City's General Plan identifies several growth areas that can "efficiently and logically accommodate growth resulting in a diverse concentration of land uses, multi-modal opportunities and natural resources." The goal of creating growth areas is to promote efficient development with a mix of land uses. The southern tip of the North Central Peoria Growth Area extends into the study area, just south of Happy Valley Road at Lake Pleasant Pkwy Parkway.

Another relevant plan is the Lake Pleasant Pkwy Corridor Specific Area Plan (SAP). Developed in 2000, this SAP addresses a one-mile buffer of the Lake Pleasant Pkwy between 99th Ave and the Carefree Highway. The SAP designates areas of the corridor as rural, suburban, or urban. In the portion of the corridor that intersects with the study area, anticipated land uses are suburban and urban. Specifically, land to the northeast of the intersection of Pinnacle Peak Rd. and Lake Pleasant Pkwy is designated suburban; land southwest of this intersection is designated urban. The General Plan Land Use element further specifies that this area is designated as residential/estate type land uses with densities from one to three dwelling units per acre.

The Camino a Lago SAP provides information on portion of the study area south of Pinnacle Peak Rd roughly between 95th and 107th Aves. The SAP envisions residential development of approximately 3800 homes and two neighborhood parks. The City's General Plan specifically mentions the challenge of integrating "older, approved Specific Area Plans such Camino a Lago into the land use pattern." This integration is to be achieved by buffering the areas with less-intensive land uses and coordinating new development with the existing development in terms of density and intensity of land uses. The Camino a Lago development is expected to be fully built by 2010.

Zoning

Various zoning districts are used in the study area by the City of Peoria and Maricopa County. These districts are summarized below for each jurisdiction and illustrated on Figure 7.4.

City of Peoria

- SR-43 and SR-35: Suburban Ranch District. The principal purpose of this zoning is to provide for and conserve existing rural and low-density residential uses in their present or desired character fostering orderly growth in rural areas. Provides for rural and low-density residential uses, raising of soil crops, public parks, group homes, churches and places of worship, and public utility facilities.

- R1-35 and R1-18: Residential Estate District. Provides for large-lot single-family dwellings, public parks and recreation areas, group homes, public/charter and private schools, churches and places of worship, and public utility facilities.
- R1-12, R1-8, R1-6: Single-Family Residential. Provides for detached single-family dwellings, parks and recreation areas, group homes, public/charter and private schools, churches and places of worship, and public utility facilities.
- RM-1: Multi-Family Residential District. Provides for multi-family residences and attached single-family residences, group homes, public/charter and private schools, churches places of worship, and public utility facilities.
- O-1: Office Commercial District. This zoning is intended to provide an environment conducive to the establishment of professional offices, medical and legal services, and ancillary retail uses.
- C-2: Intermediate Commercial District. This zoning is intended to provide a shopping center for the sale of convenience goods and personal services.
- AG: General Agricultural District. This district serves two purposes. It is intended to comprise lands devoted to agriculture related activities and other open field uses, and is intended to constitute a 'holding' district to retain land in less intensive use until the time is appropriate for more intensive development. Provides for agricultural uses; general uses, which include guest ranches, veterinary clinics, or single-family dwellings; public and quasi-public uses, which include water pumping plants and storage tanks, places of worship, public recreational uses, and golf courses; group homes; and public/charter and private schools.
- PAD: Planned Area Development District. This is an alternative zoning district which provides for a compatible selection of uses and groupings of buildings, parking areas, circulation and open spaces, and is designed as an integrated unit, in such manner as to constitute a safe, efficient, and convenient urban area development.

Maricopa County

- Rural-43: Rural District. The principal purpose of this zoning district is to conserve and protect farms and other open land uses, foster orderly growth in rural and agricultural areas, and prevent urban agricultural conflicts. But when governmental facilities and services, public utilities and street access are available, or can reasonably be made available, applications for change of this zoning district to any single-family residential zoning district will be given favorable consideration. Principal uses permitted include both farm and non-farm residential uses and recreational and institutional uses.
- R1-35 and R-18: Single-Family Residential District. This zoning district is intended to conserve and protect single-family residential development. Provides for single-family dwellings, churches, schools, parks, playgrounds, and other community facilities.

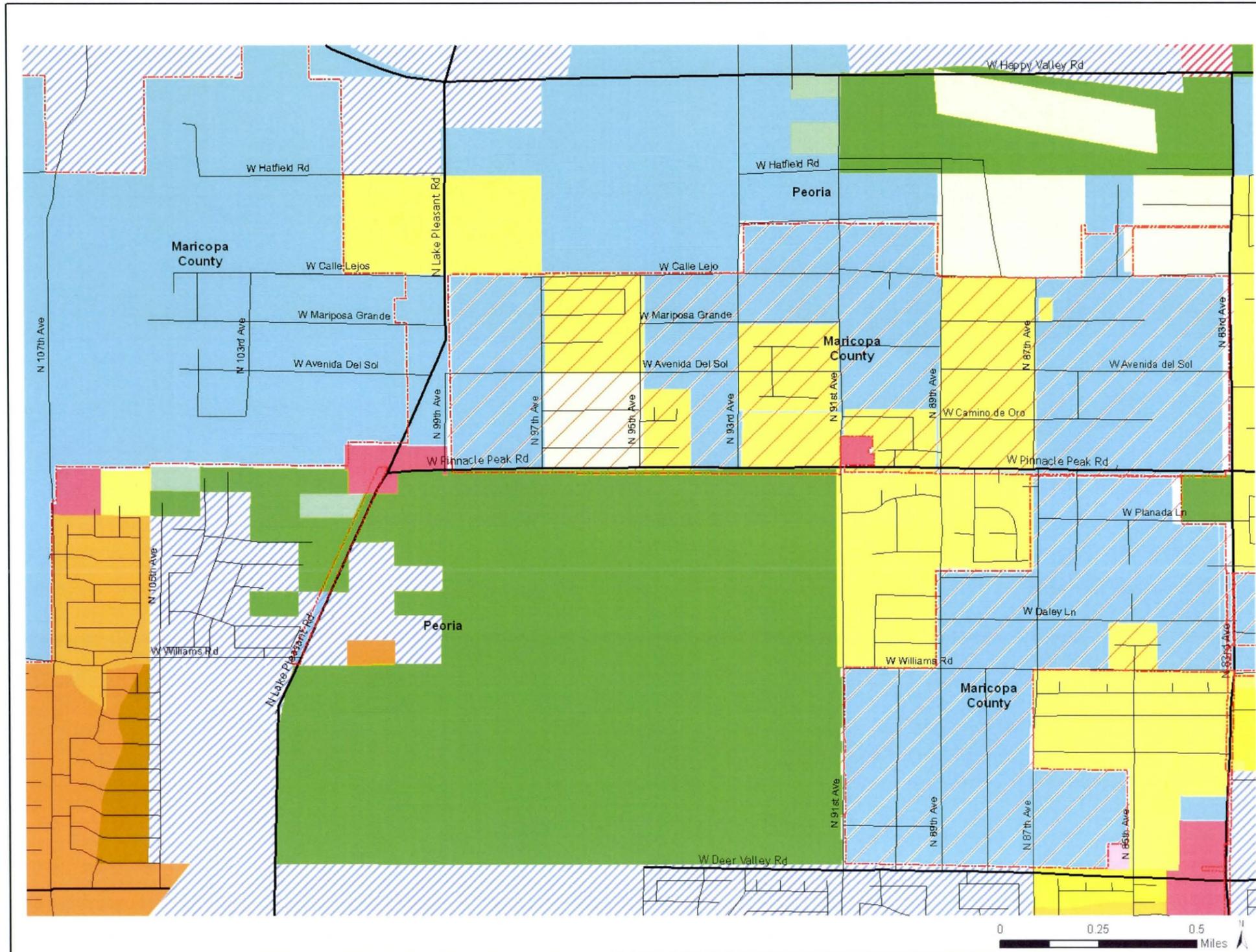


- SU: Special Use. This zoning permits any of numerous uses in a zoning district which otherwise prohibits that use. Special use requires the approval of the Board of Supervisors. Examples of special uses include agriculturally oriented operations and facilities, airports, cemeteries, group care facilities, mobile home parks, race tracks, resort hotels, recreation vehicle parks, and zoos.

The approximate percentages of zoning in the study area are:

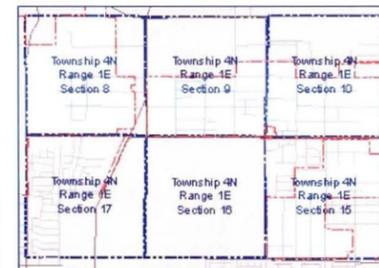
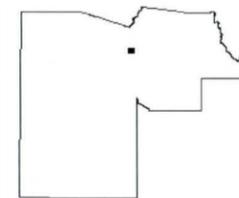
- SR-43/Rural-43 – 41.0%
- AG – 25.7%
- R1-18 – 14.1%
- PAD – 8.9%
- R1-35 – 4.8%
- Other – 5.5%

Figure 7.4 – Zoning



Zoning

- Peoria City Limits
- Roads
- City/County Zoning**
- AG/AG
- SR-43/Rural-43
- SR-35/R1-35
- R1-35/R1-35
- R1-18/R1-18
- R1-12/R1-12
- R1-8/R1-8
- R1-6/R1-6
- RM-1/R-3
- O-1/C-O
- C-2/C-2
- SU/SU
- PAD/PAD





8.0 APPENDIX MATERIALS

Appendix A: Benefit Cost Worksheets

Appendix B: Cost Estimates

Appendix C: Traffic Information

Appendix D: Geotechnical Information

Appendix E: Public Involvement Information



APPENDIX A

BENEFIT COST RATIO WORKSHEETS

Melita, Joy

From: Ed Fritz - MCDOTX [EdFritz@mail.maricopa.gov]
Sent: Thursday, February 15, 2007 2:04 PM
To: LaMont, Doug
Cc: Melita, Joy; Tom Larson - MCDOTX
Subject: RE: Pinnacle Peak Rd DCR: 107th Ave to 83rd Ave

Doug,

The table below contains the benefit-cost analysis results for Pinnacle Peak Road using 2030 as the forecast year and the revised forecast volumes.

Benefit Cost Results Using Consultant 2030 ADT (MAG Provided)

Alternative	Gross Benefits	Net Benefits	B/C Ratio
Pinnacle Peak Rd (107th Av to 83rd Av) - Alt 1	27,809,500	8,521,700	1.44
Pinnacle Peak Rd (107th Av to 83rd Av) - Alt 2	27,809,500	3,628,800	1.15
Pinnacle Peak Rd (107th Av to 83rd Av) - Alt 3	27,809,500	(528,000)	0.98
Pinnacle Peak Rd (107th Av to 83rd Av) - Alt 4	5,293,400	(10,953,100)	0.33

* Year 2030 ADT are 5347, 6212 and 6909 traveling from west to east

Thanks,

Ed Fritz
Senior Transportation Planner
Maricopa County Department of Transportation
2901 W Durango St
Phoenix, AZ 85009

Ph: (602) 506-8139
Fax: (602) 506-4882

From: LaMont, Doug [mailto:LaMont@pbworld.com]
Sent: Thursday, February 15, 2007 11:26 AM
To: Ed Fritz - MCDOTX
Cc: Tom Larson - MCDOTX; Anantuni, Krishna; Melita, Joy
Subject: FW: Pinnacle Peak Rd DCR: 107th Ave to 83rd Ave

Ed,

I don't know if this will make a difference or not but can you re-run the B/C with the data provided below. We used 2030 numbers not 2026.

Thanks for you help with this.

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 1 (107th Ave to Lake Pleasant Pkwy)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 1
From Termini	107th Ave
To Termini	Lake Pleasant Pkwy
Segment Length (mi)	1
Current Surface (Dirt or Paved)	None
Current Year ADT	None
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	0
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	None
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 107th Ave	-
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Improved Road at 107th Ave	A-4.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
20-Year Intersection Delay for Unimproved Road at 107th Ave	-
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Improved Road at 107th Ave	A-4.3sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
Current Traffic Control Device at 107th Ave	None
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 107th Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 107th Ave	0
Current Number of R-Turn Lanes at 107th Ave	0
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	0
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 107th Ave	1
Proposed Number of R-Turn Lanes at 107th Ave	1
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	\$1,403,609 (for entire project)
Admin Costs	\$1,169,675 (for entire project)
Utility Relocation Cost	\$233,935 (for entire project)
Construction Cost	\$11,696,745 (for entire project)
Construction Management Cost	\$1,754,512 (for entire project)
Right-of-Way Cost	\$7,840,370 (for entire project)

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 1 (Lake Pleasant Pkwy to 91st Ave)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 1
From Termini	Lake Pleasant Pkwy
To Termini	91st Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	4861
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	2
Non-incapacitating Accidents**	3
Possible Injury Accidents**	3
No Injury Accidents**	13
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	1
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 1 (91st Ave to 83rd Ave)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 1
From Termini	91st Ave
To Termini	83rd Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	7182
20-Year ADT*	6909
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	8
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Unimproved Road at 83rd Ave	C-15.8sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Intersection Delay for Improved Road at 83rd Ave	C-21.0sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Unimproved Road at 83rd Ave	F-496.6sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-8.2sec
20-Year Intersection Delay for Improved Road at 83rd Ave	E-42.6sec
Current Traffic Control Device at 91st Ave	Signal
Current Traffic Control Device at 83rd Ave	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at 83rd Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	0
Current Number of L-Turn Lanes at 83rd Ave	1
Current Number of R-Turn Lanes at 83rd Ave	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Proposed Number of L-Turn Lanes at 83rd Ave	1
Proposed Number of R-Turn Lanes at 83rd Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 2 (107th Ave to Lake Pleasant Pkwy)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 2
From Termini	107th Ave
To Termini	Lake Pleasant Pkwy
Segment Length (mi)	1
Current Surface (Dirt or Paved)	None
Current Year ADT	None
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	0
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	None
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 107th Ave	-
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Improved Road at 107th Ave	A-4.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
20-Year Intersection Delay for Unimproved Road at 107th Ave	-
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Improved Road at 107th Ave	A-4.3sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
Current Traffic Control Device at 107th Ave	None
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 107th Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 107th Ave	0
Current Number of R-Turn Lanes at 107th Ave	0
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	0
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 107th Ave	1
Proposed Number of R-Turn Lanes at 107th Ave	1
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	\$1,546,712 (for entire project)
Admin Costs	\$1,288,926 (for entire project)
Utility Relocation Cost	\$257,785 (for entire project)
Construction Cost	\$12,889,264 (for entire project)
Construction Management Cost	\$1,933,390 (for entire project)
Right-of-Way Cost	\$12,473,9700 (for entire project)

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 2 (Lake Pleasant Pkwy to 91st Ave)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 2
From Termini	Lake Pleasant Pkwy
To Termini	91st Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	4861
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	2
Non-incapacitating Accidents**	3
Possible Injury Accidents**	3
No Injury Accidents**	13
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	1
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 2 (91st Ave to 83rd Ave)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 2
From Termini	91st Ave
To Termini	83rd Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	7182
20-Year ADT*	6909
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	8
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Unimproved Road at 83rd Ave	C-15.8sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Intersection Delay for Improved Road at 83rd Ave	C-21.0sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Unimproved Road at 83rd Ave	F-496.6sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-8.2sec
20-Year Intersection Delay for Improved Road at 83rd Ave	E-42.6sec
Current Traffic Control Device at 91st Ave	Signal
Current Traffic Control Device at 83rd Ave	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at 83rd Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	0
Current Number of L-Turn Lanes at 83rd Ave	1
Current Number of R-Turn Lanes at 83rd Ave	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Proposed Number of L-Turn Lanes at 83rd Ave	1
Proposed Number of R-Turn Lanes at 83rd Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 3 (107th Ave to Lake Pleasant Pkwy)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 3
From Termini	107th Ave
To Termini	Lake Pleasant Pkwy
Segment Length (mi)	1
Current Surface (Dirt or Paved)	None
Current Year ADT	None
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	0
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	None
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 107th Ave	-
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Improved Road at 107th Ave	A-4.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
20-Year Intersection Delay for Unimproved Road at 107th Ave	-
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Improved Road at 107th Ave	A-4.3sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
Current Traffic Control Device at 107th Ave	None
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 107th Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 107th Ave	0
Current Number of R-Turn Lanes at 107th Ave	0
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	0
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 107th Ave	1
Proposed Number of R-Turn Lanes at 107th Ave	1
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	\$1,631,389 (for entire project)
Admin Costs	\$1,359,491 (for entire project)
Utility Relocation Cost	\$271,898 (for entire project)
Construction Cost	\$13,594,911 (for entire project)
Construction Management Cost	\$2,039,237 (for entire project)
Right-of-Way Cost	\$16,873,430 (for entire project)

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 3 (Lake Pleasant Pkwy to 91st Ave)	
ITEM	VALUE
Road	Pinnacle Peak Road Alt 3
From Termini	Lake Pleasant Pkwy
To Termini	91st Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	4861
20-Year ADT*	5347
Fatal Accidents**	0
Incapacitating Accidents**	2
Non-incapacitating Accidents**	3
Possible Injury Accidents**	3
No Injury Accidents**	13
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	B-8.8sec
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Improved Road at Lake Pleasant Pkwy	B-8.5sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
20-Year Intersection Delay for Unimproved Road at Lake Pleasant Pkwy	E-59.3sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Improved Road at Lake Pleasant Pkwy	E-57.1sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Traffic Control Device at Lake Pleasant Pkwy	Signal
Current Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at Lake Pleasant Pkwy	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	1
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of R-Turn Lanes at Lake Pleasant Pkwy	1
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT

Fill out one sheet for each road segment (typically one-mile segments)

Scoring and B/C Data Sheet for Pinnacle Peak Road Alt 3 (91st Ave to 83rd Ave)

ITEM	VALUE
Road	Pinnacle Peak Road Alt 3
From Termini	91st Ave
To Termini	83rd Ave
Segment Length (mi)	1
Current Surface (Dirt or Paved)	Paved
Current Year ADT	7182
20-Year ADT*	6909
Fatal Accidents**	0
Incapacitating Accidents**	0
Non-incapacitating Accidents**	0
Possible Injury Accidents**	0
No Injury Accidents**	8
Sufficiency Rating**	
Pavement Condition Rating**	
International Roughness Index**	
Current Facility Type (Urban or Rural)	Rural
Proposed Facility Type (Urban or Rural)	Urban
Current Intersection Delay for Unimproved Road at 91st Ave	C-21.0sec
Current Intersection Delay for Unimproved Road at 83rd Ave	C-15.8sec
Current Intersection Delay for Improved Road at 91st Ave	B-11.9sec
Current Intersection Delay for Improved Road at 83rd Ave	C-21.0sec
20-Year Intersection Delay for Unimproved Road at 91st Ave	F-168.1sec
20-Year Intersection Delay for Unimproved Road at 83rd Ave	F-496.6sec
20-Year Intersection Delay for Improved Road at 91st Ave	B-8.2sec
20-Year Intersection Delay for Improved Road at 83rd Ave	E-42.6sec
Current Traffic Control Device at 91st Ave	Signal
Current Traffic Control Device at 83rd Ave	Signal
Proposed Traffic Control Device at 91st Ave	Signal
Proposed Traffic Control Device at 83rd Ave	Signal
Current Number of Through Lanes	1 (each direction)
Current Number of L-Turn Lanes at 91st Ave	1
Current Number of R-Turn Lanes at 91st Ave	0
Current Number of L-Turn Lanes at 83rd Ave	1
Current Number of R-Turn Lanes at 83rd Ave	0
Proposed Number of Through Lanes	2 (each direction)
Proposed Number of L-Turn Lanes at 91st Ave	1
Proposed Number of R-Turn Lanes at 91st Ave	0
Proposed Number of L-Turn Lanes at 83rd Ave	1
Proposed Number of R-Turn Lanes at 83rd Ave	0
Is Project in Another Agency's CIP?	Yes
Will Traffic Signals Be Interconnected?	Yes
Does Proposed Project Include Sidewalks?	Yes
Does Proposed Project Include Landscaping?	No
Does Proposed Project Include Bus Pull Outs?	No
Current Facility - Is There an Existing Curb?	No
Proposed Facility - Is Curb Proposed?	Yes
Current Facility - Is There an Existing Raised Median?	No
Proposed Facility - Is a Raised Median Proposed?	No
Design Costs	
Admin Costs	
Utility Relocation Cost	
Construction Cost	
Construction Management Cost	
Right-of-Way Cost	

*20-year traffic volumes supplied by MCDOT if available

**Accident and pavement condition information supplied by MCDOT



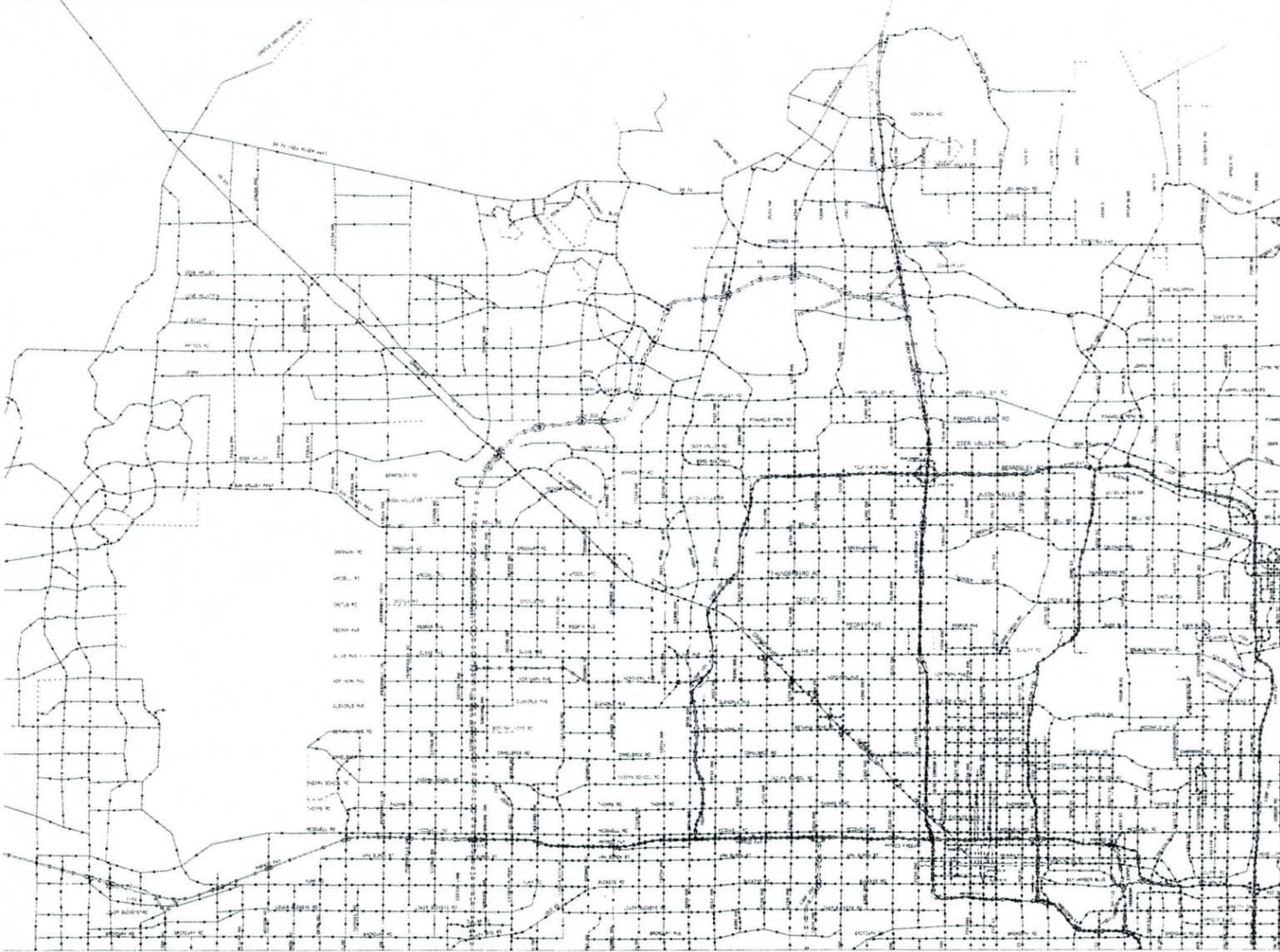
APPENDIX B

ALTERNATIVE COST ESTIMATES

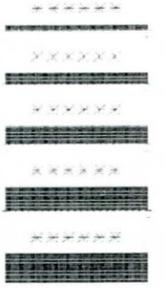


APPENDIX C

TRAFFIC INFORMATION



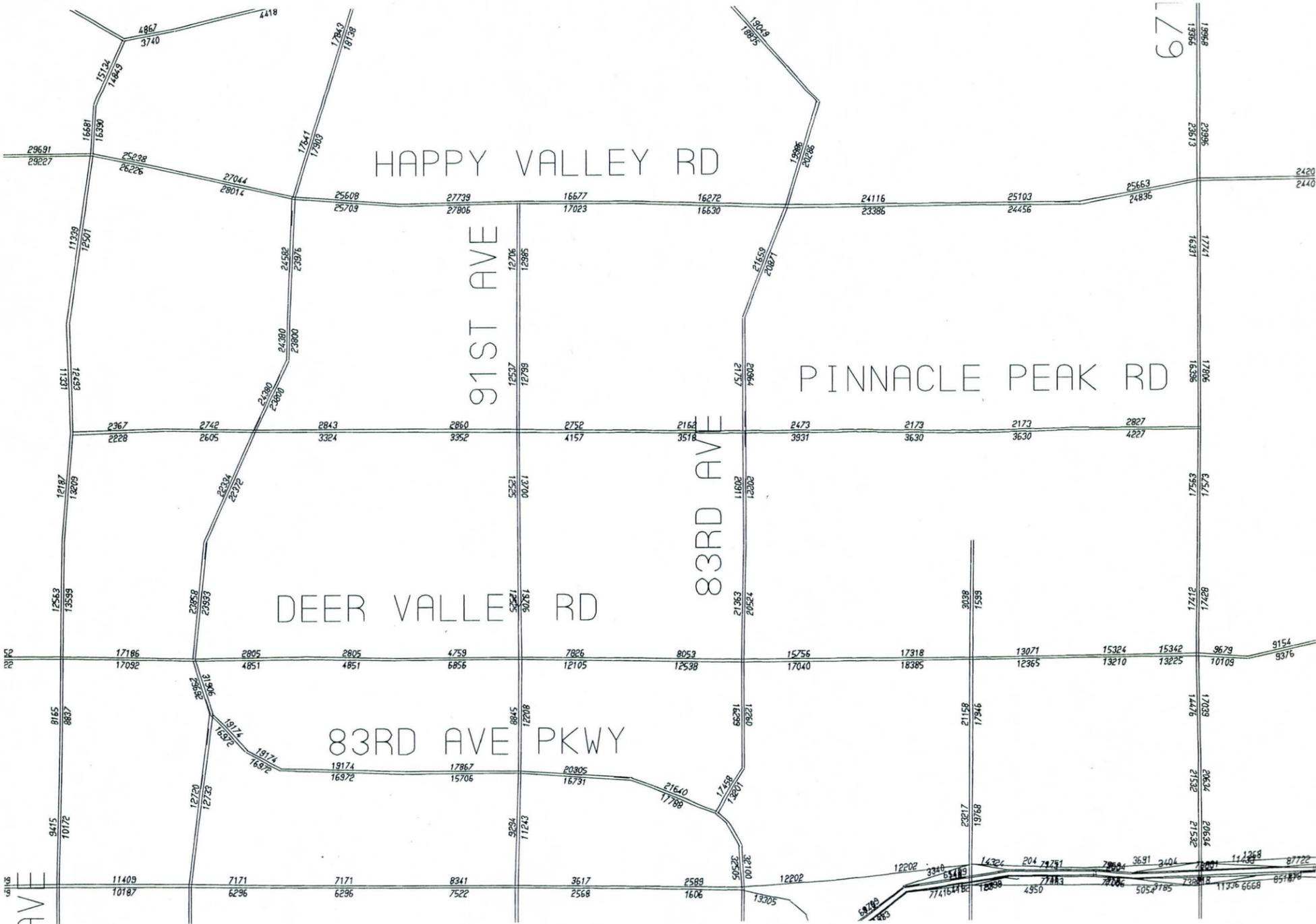
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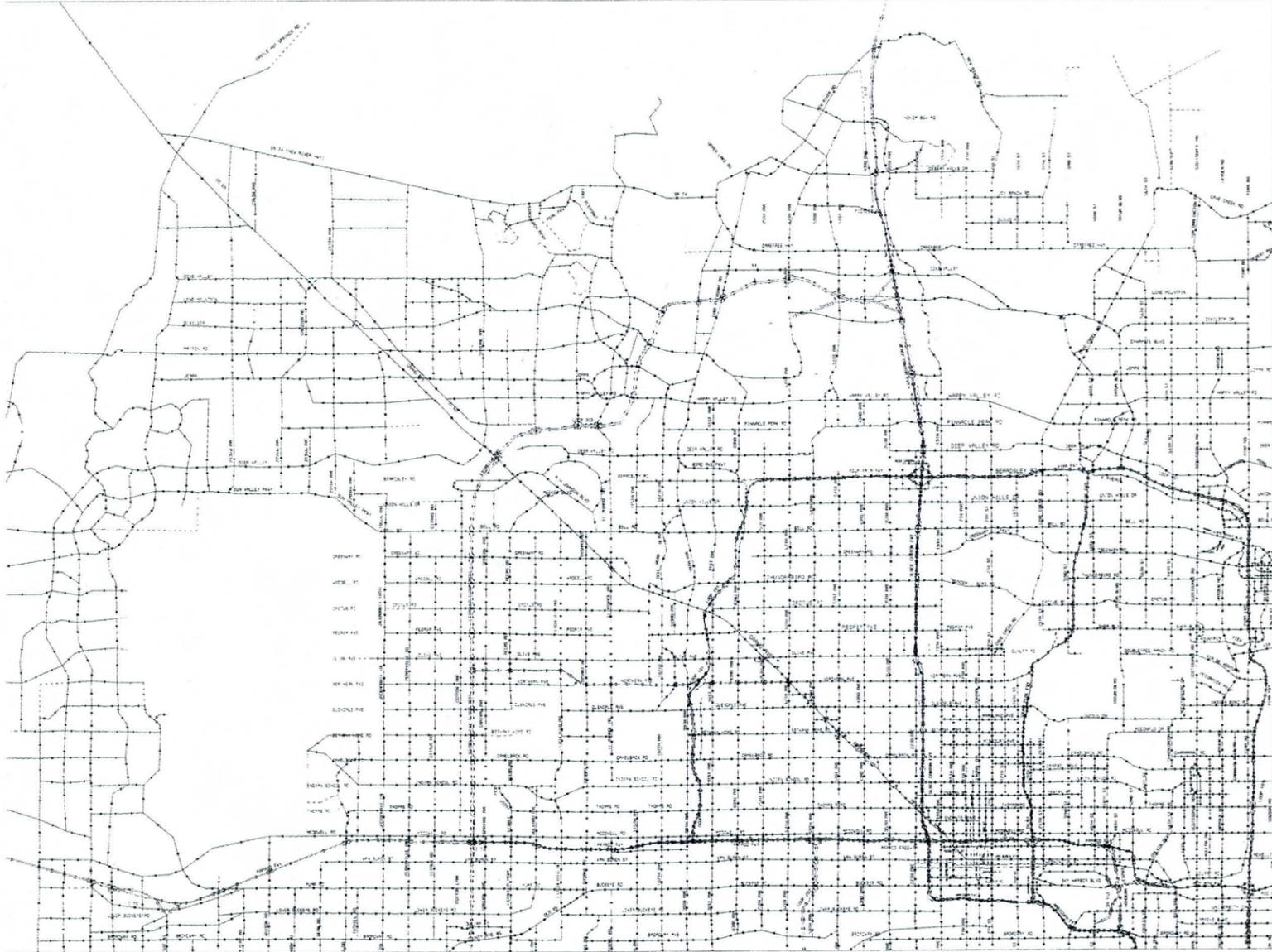


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713132/1070087

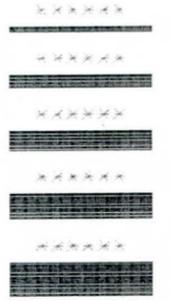
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SCENARIO 7: 24-HR Hwy Assignment (validation)

05-01-24 11:56
MODULE: 6.12
MAG.....VL





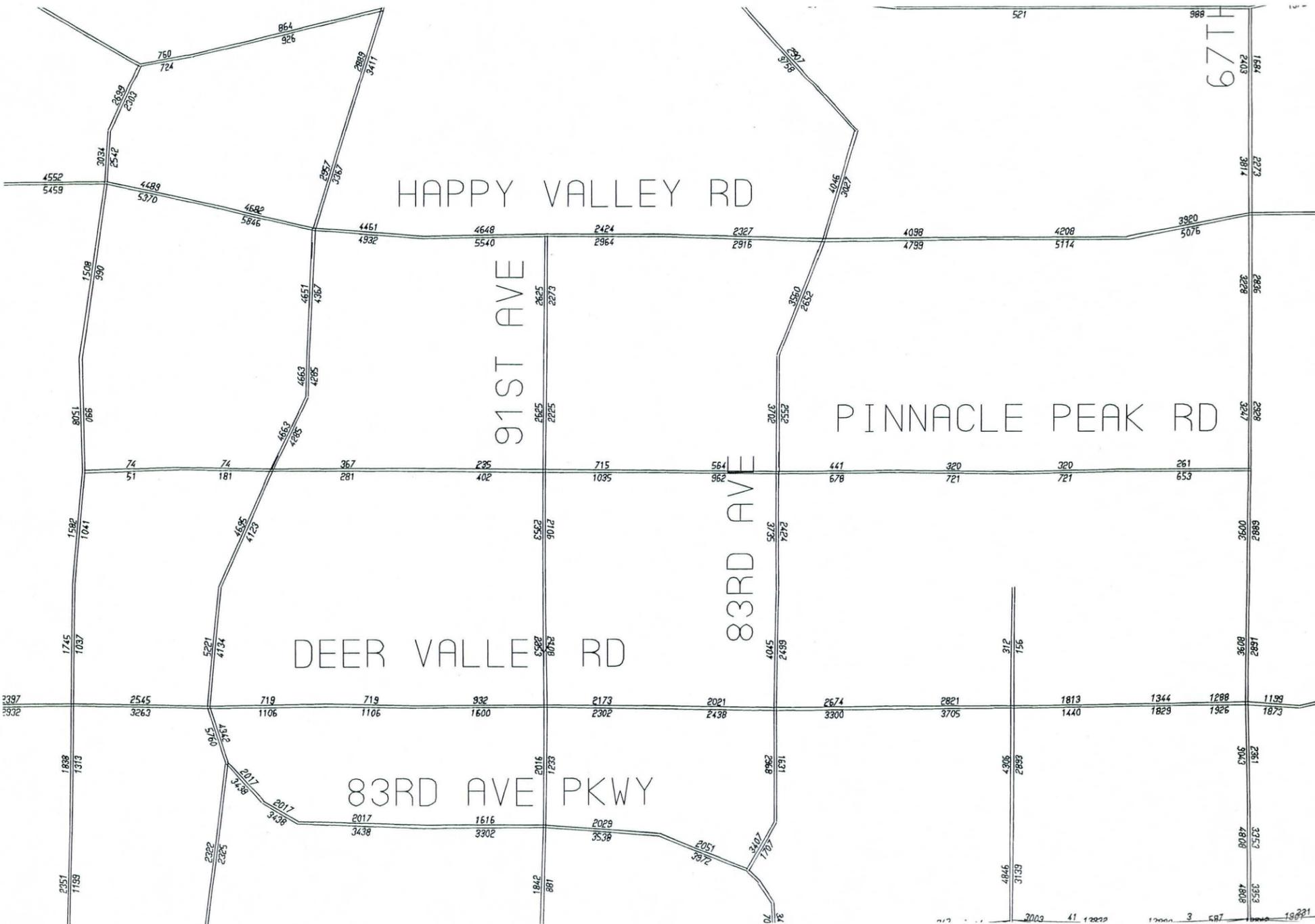
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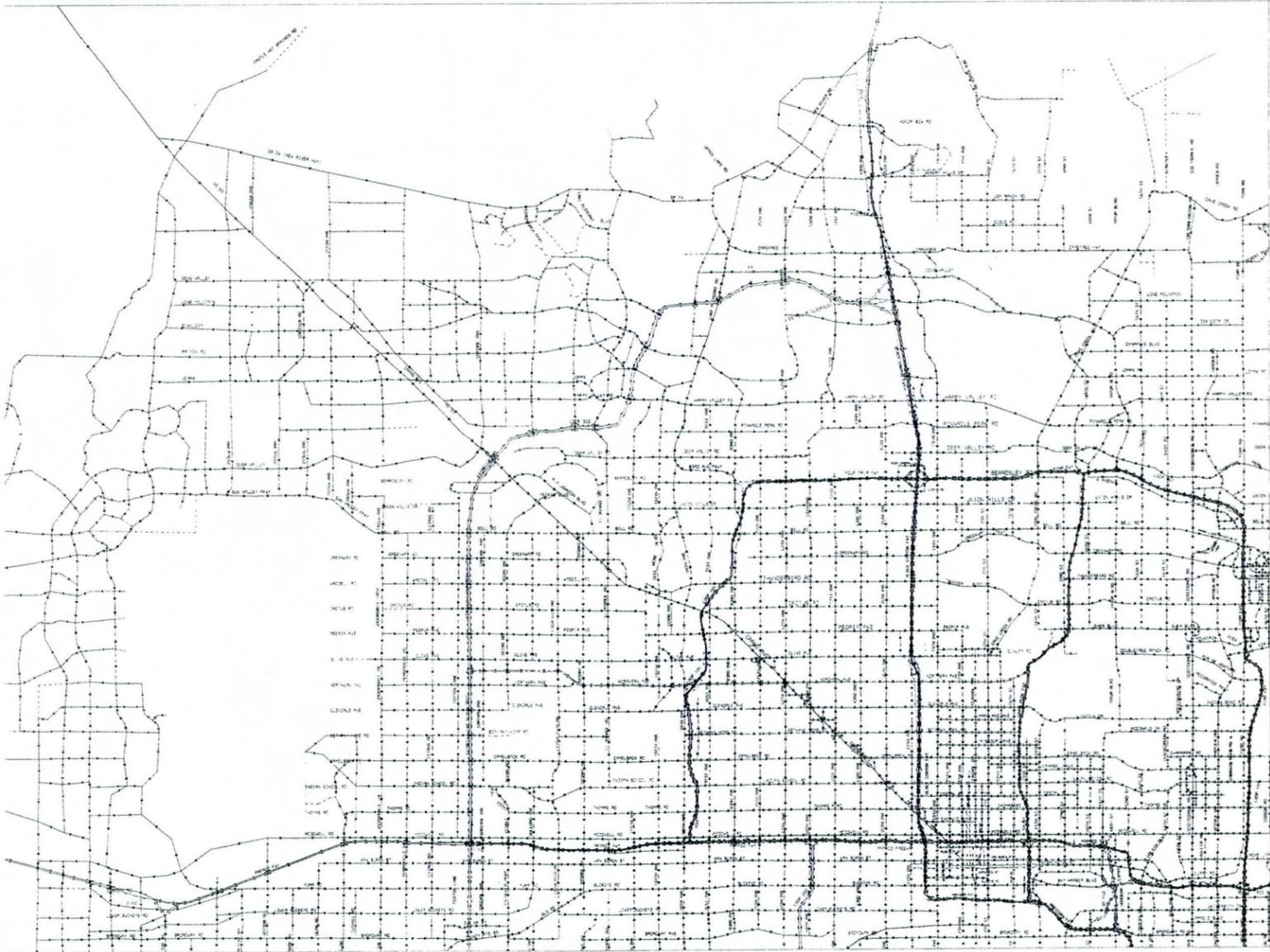


WINDOW:
450656/ 873230
713132/1070087

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05-01-24 12:08
MODULE: 6.12
MAG.....VL





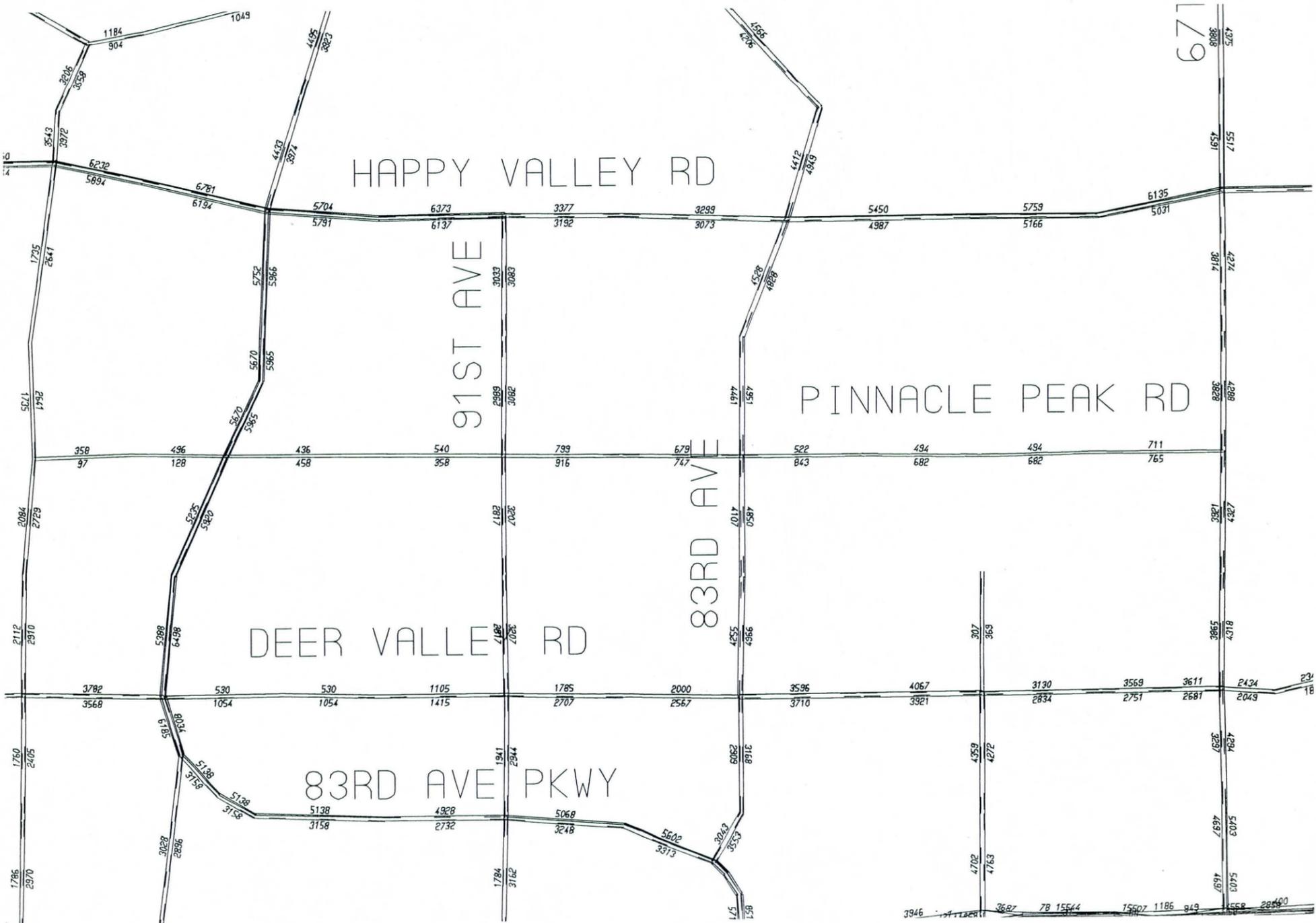
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WINDOW:
 450656/ 873230
 713132/1070087

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 SCENARIO 600: PM PEAK PERIOD MULTICLASS ASGMT

05-01-24 12:11
 MODULE: 6.12
 MAG.....VL



Phone: Fax:
 E-Mail:

PLANNING ANALYSIS

Analyst: KA
 Agency/Co.: PB
 Date Performed: 10/18/2006
 Analysis Time Period: Peak Hour
 Urban Street: Pinnacle Peak Rd
 Direction of Travel:
 Jurisdiction: Peoria
 Analysis Year: 2030
 Project ID: Pinnacle Peak Rd - Lake Pleasant to 91st

Traffic Characteristics

Annual average daily traffic, AADT 6212 vpd
 Planning analysis hour factor, K 0.080
 Directional distribution factor, D 0.550
 Peak-hour factor, PHF 0.900
 Adjusted saturation flow rate 1800 pcphgpl
 Percent turns from exclusive lanes 75 %

Roadway Characteristics

Number of through lanes one direction, N 2
 Free flow speed, FFS 45 mph
 Urban class 2
 Section length 1.00 miles
 Median Yes
 Left-turn bays Yes

Signal Characteristics

Signalized intersections 4
 Arrival type, AT 4
 Signal type (k = 0.5 for planning) Actuated
 Cycle length, C 90.0 sec
 Effective green ratio, g/C 0.500

Results

Annual average daily traffic, AADT 6212 vpd
 Two-way hourly volume 496 vph
 Hourly directional volume 272 vph
 Through-volume 15-min. flow rate 75 v
 Running time 104.0 sec
 v/c ratio 0.04
 Through capacity 1800 vph
 Progression factor, PF 0.767
 Uniform delay 11.5 sec
 Filtering/metering factor, I 1.000
 Incremental delay 0.0 sec
 Control delay 8.9 sec/v

Phone: Fax:
E-Mail:

 PLANNING ANALYSIS

Analyst: KA
 Agency/Co.: PB
 Date Performed: 10/18/2006
 Analysis Time Period: Peak Hour
 Urban Street: Pinnacle Peak Rd
 Direction of Travel:
 Jurisdiction: Peoria
 Analysis Year: 2030
 Project ID: Pinnacle Peak Rd - 91st to 83rd

 Traffic Characteristics

Annual average daily traffic, AADT 6909 vpd
 Planning analysis hour factor, K 0.080
 Directional distribution factor, D 0.550
 Peak-hour factor, PHF 0.900
 Adjusted saturation flow rate 1800 pcphgpl
 Percent turns from exclusive lanes 75 %

 Roadway Characteristics

Number of through lanes one direction, N 2
 Free flow speed, FFS 45 mph
 Urban class 2
 Section length 1.00 miles
 Median Yes
 Left-turn bays Yes

 Signal Characteristics

Signalized intersections 4
 Arrival type, AT 4
 Signal type (k = 0.5 for planning) Actuated
 Cycle length, C 90.0 sec
 Effective green ratio, g/C 0.500

 Results

Annual average daily traffic, AADT 6909 vpd
 Two-way hourly volume 552 vph
 Hourly directional volume 303 vph
 Through-volume 15-min. flow rate 84 v
 Running time 104.0 sec
 v/c ratio 0.05
 Through capacity 1800 vph
 Progression factor, PF 0.767
 Uniform delay 11.5 sec
 Filtering/metering factor, I 1.000
 Incremental delay 0.0 sec
 Control delay 8.9 sec/v

Phone: Fax:
E-Mail:

 PLANNING ANALYSIS

Analyst: KA
 Agency/Co.: PB
 Date Performed: 10/18/2006
 Analysis Time Period: Peak Hour
 Urban Street: Pinnacle Peak Rd
 Direction of Travel:
 Jurisdiction: Peoria
 Analysis Year: 2030
 Project ID: Pinnacle Peak Rd - 107th Avenue to Lake Pleasant

 Traffic Characteristics

Annual average daily traffic, AADT 5347 vpd
 Planning analysis hour factor, K 0.080
 Directional distribution factor, D 0.550
 Peak-hour factor, PHF 0.900
 Adjusted saturation flow rate 1800 pcphgpl
 Percent turns from exclusive lanes 75 %

 Roadway Characteristics

Number of through lanes one direction, N 2
 Free flow speed, FFS 45 mph
 Urban class 2
 Section length 0.50 miles
 Median Yes
 Left-turn bays Yes

 Signal Characteristics

Signalized intersections 2
 Arrival type, AT 4
 Signal type (k = 0.5 for planning) Actuated
 Cycle length, C 90.0 sec
 Effective green ratio, g/C 0.405

 Results

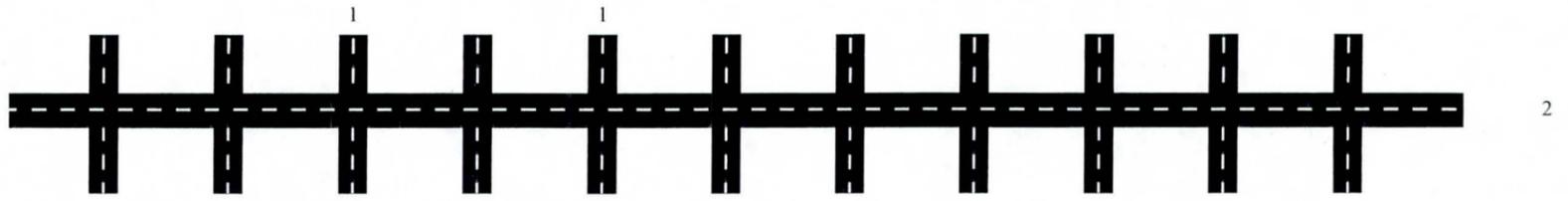
Annual average daily traffic, AADT 5347 vpd
 Two-way hourly volume 427 vph
 Hourly directional volume 234 vph
 Through-volume 15-min. flow rate 65 v
 Running time 52.0 sec
 v/c ratio 0.04
 Through capacity 1458 vph
 Progression factor, PF 0.889
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 Incremental delay 0.1 sec
 Control delay 14.5 sec/v

Accidents by Injury Severity - 2003 through 2005

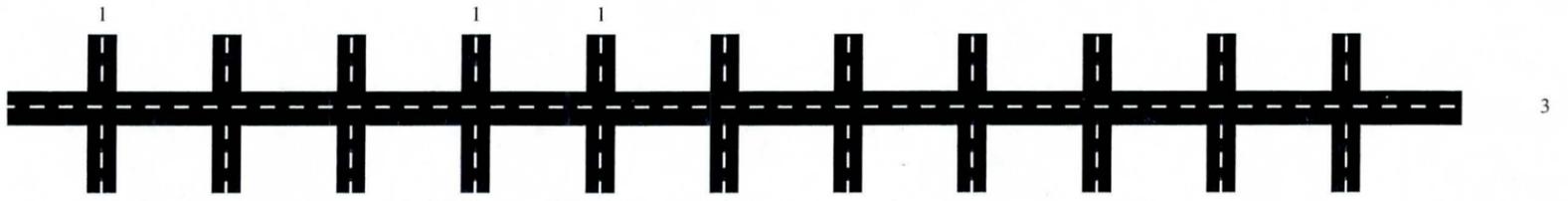
Road: Pinnacle Peak Rd

Lake Pleasant Rd 95th Av 91st Av 89th Av 87th Av 83rd Av
 97th Av 93rd Av 90th Av 88th Dr 86th Av Total

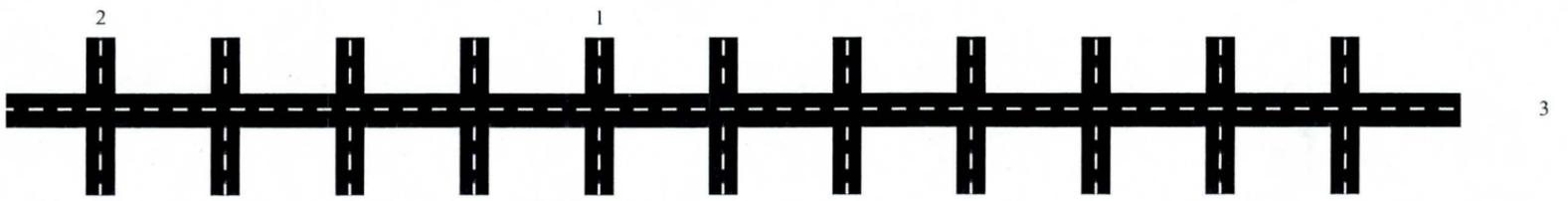
Incapacitating Injury



Non-Incapacitating Injury



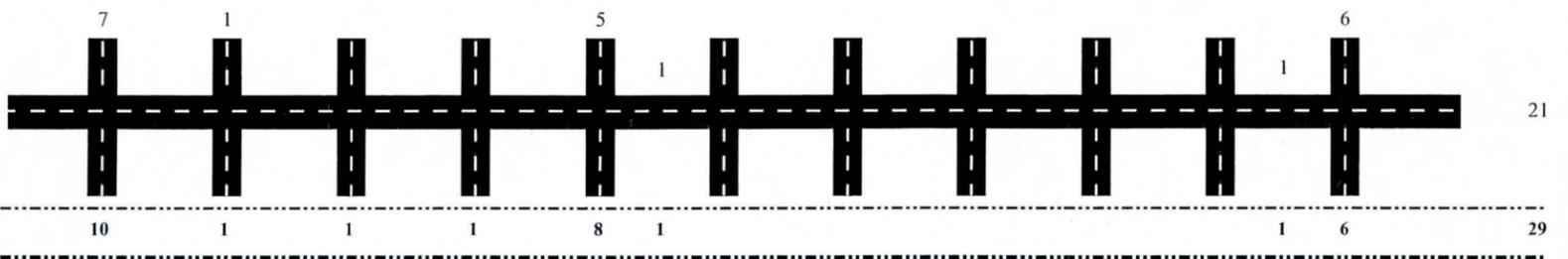
Possible Injury



Road: Pinnacle Peak Rd

Lake Pleasant Rd 95th Av 91st Av 89th Av 87th Av 83rd Av
 97th Av 93rd Av 90th Av 88th Dr 86th Av Total

No Injury



Intersection Method: Distance From Intersection

Intersection Radius: 100 feet

Distance From First Intersection: -100 feet

Distance From Last Intersection: 100 feet

Incidents

MICROFILM	ROADNAME	LOCATION	DISTANCE	MONTH	YR	TIME	FIRST_HARM	TOTAL_UNI	TOTAL_INJ	TOTAL_FAT	COLLISION_MANNER	DAYLIGHT	WEATHER	TRAFFIC_WAY	N_OFF_RD	INJURY_SEVERITY
11141696	Lake Pleasant Rd	Pinnacle Peak Rd	91	1	2003	10:20:00 PM	Overtuning	1	1	0	0 Single Vehicle	Darkness	Clear	Roadside	-1	Non-Incapacitating Injury
11141705	Pinnacle Peak Rd	Lake Pleasant Rd	4	1	2003	12:58:00 PM	Collision with other Motor Vehicle	2	0	0	0 Sideswipe (same)	Daylight	Clear	Roadway/Alley	0	No Injury
11192603	Pinnacle Peak Rd	91st Av	0	2	2003	5:51:00 PM	Collision with other Motor Vehicle	2	0	0	0 Angle	Dawn or Dusk	Clear	Roadway/Alley	0	No Injury
11260107	83rd Av	Pinnacle Peak Rd	0	2	2003	1:45:00 PM	Collision with other Motor Vehicle	2	0	0	0 Left Turn	Daylight	Cloudy	Roadway/Alley	0	No Injury
11261657	Pinnacle Peak Rd	91st Av	0	2	2003	8:38:00 AM	Collision with other Motor Vehicle	2	2	0	0 Angle	Daylight	Clear	Roadway/Alley	0	Possible Injury
11322321	Pinnacle Peak Rd	91st Av	-3	3	2003	3:38:00 PM	Collision with other Motor Vehicle	2	0	0	0 Other	Daylight	Clear	Roadway/Alley	0	No Injury
11540720	Lake Pleasant Rd	Pinnacle Peak Rd	27	5	2003	2:13:00 PM	Collision with other Motor Vehicle	4	3	0	0 Rear-End	Daylight	Clear	Roadway/Alley	0	Possible Injury
11742257	Pinnacle Peak Rd	Lake Pleasant Rd	0	7	2003	9:23:00 AM	Collision with other Motor Vehicle	2	0	0	0 Sideswipe (same)	Daylight	Clear	Roadway/Alley	0	No Injury
11780554	Pinnacle Peak Rd	97th Av	-21	6	2003	6:40:00 PM	Collision with other Motor Vehicle	2	0	0	0 Rear-End	Daylight	Clear	Roadway/Alley	0	No Injury
11792701	Pinnacle Peak Rd	91st Av	160	8	2003	8:59:00 PM	Collision with Utility Pole	1	0	0	0 Single Vehicle	Darkness	Clear	Roadside	-1	No Injury
11962358	Pinnacle Peak Rd	91st Av	0	9	2003	1:47:00 PM	Collision with other Motor Vehicle	2	0	0	0 Angle	Daylight	Clear	Roadway/Alley	0	No Injury
12242242	83rd Av	Pinnacle Peak Rd	-61	11	2003	4:19:00 PM	Collision with other Motor Vehicle	2	0	0	0 Rear-End	Daylight	Rain	Roadway/Alley	0	No Injury
12421893	Pinnacle Peak Rd	91st Av	61	9	2003	2:31:00 PM	Collision with Curb	1	0	0	0 Single Vehicle	Daylight	Clear	Roadside	-1	No Injury
12492772	Pinnacle Peak Rd	83rd Av	-10	1	2004	7:33:00 AM	Collision with other Motor Vehicle	2	0	0	0 Rear-End	Daylight	Clear	Roadway/Alley	0	No Injury
12622619	Pinnacle Peak Rd	Lake Pleasant Rd	0	3	2004	5:08:00 PM	Collision with other Motor Vehicle	2	0	0	0 Angle	Daylight	Clear	Roadway/Alley	0	No Injury
12631320	Pinnacle Peak Rd	83rd Av	-400	3	2004	3:34:00 PM	Collision with other Motor Vehicle	2	0	0	0 U-Turn	Daylight	Clear	Roadway/Alley	0	No Injury
13100575	Pinnacle Peak Rd	95th Av	-39	3	2004	7:41:00 PM	Collision with other Motor Vehicle	2	2	0	0 Rear-End	Darkness	Clear	Roadway/Alley	0	Incapacitating Injury
13150762	Pinnacle Peak Rd	93rd Av	72	7	2004	5:45:00 PM	Collision with Utility Pole	1	1	0	0 Single Vehicle	Dawn or Dusk	Clear	Roadside	-1	Non-Incapacitating Injury
13280894	Pinnacle Peak Rd	91st Av	0	5	2004	11:27:00 AM	Collision with other Motor Vehicle	2	4	0	0 Angle	Daylight	Clear	Roadway/Alley	0	Non-Incapacitating Injury
13282022	Lake Pleasant Rd	Pinnacle Peak Rd	0	8	2004	6:50:00 AM	Collision with other Motor Vehicle	2	1	0	0 Angle	Daylight	Clear	Roadway/Alley	0	Possible Injury
13672292	Pinnacle Peak Rd	91st Av	0	3	2004	7:56:00 PM	Collision with other Motor Vehicle	2	1	0	0 Rear-End	Darkness	Clear	Roadway/Alley	0	Incapacitating Injury
13872417	Pinnacle Peak Rd	Lake Pleasant Rd	75	1	2005	11:45:00 AM	Collision with other Motor Vehicle	2	0	0	0 Backing	Daylight	Clear	Roadway/Alley	0	No Injury
14021158	Lake Pleasant Rd	Pinnacle Peak Rd	0	2	2005	12:33:00 AM	Collision with Other Fixed Object	1	0	0	0 Single Vehicle	Darkness	Clear	Roadside	-1	No Injury
14031137	83rd Av	Pinnacle Peak Rd	0	2	2005	3:09:00 PM	Collision with other Motor Vehicle	2	0	0	0 Angle	Daylight	Raining	Roadway/Alley	0	No Injury
14332191	83rd Av	Pinnacle Peak Rd	0	5	2005	6:36:00 PM	Collision with other Motor Vehicle	2	0	0	0 Angle	Daylight	Clear	Roadway/Alley	0	No Injury
14461940	Pinnacle Peak Rd	Lake Pleasant Rd	75	6	2005	7:42:00 AM	Collision with other Motor Vehicle	2	0	0	0 Angle	Daylight	Clear	Roadway/Alley	0	No Injury
14881830	83rd Av	Pinnacle Peak Rd	0	9	2005	8:31:00 PM	Collision with other Motor Vehicle	2	0	0	0 Left Turn	Darkness	Clear	Roadway/Alley	0	No Injury
15122118	91st Av	Pinnacle Peak Rd	0	11	2005	6:05:00 AM	Collision with other Motor Vehicle	2	0	0	0 Left Turn	Dawn or Dusk	Clear	Roadway/Alley	0	No Injury
15160496	Lake Pleasant Rd	Pinnacle Peak Rd	0	12	2005	11:10:00 AM	Collision with other Motor Vehicle	2	0	0	0 Sideswipe (same)	Daylight	Clear	Roadway/Alley	0	No Injury

HCM Signalized Intersection Capacity Analysis
5: Pinnacle Peak Road & Lake Pleasant Road

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↖	↗		↖	↗	↖	↗	↔	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frt		0.98		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1776		1770	1591		1770	3539	1583	1770	3536	
Flt Permitted		0.93		0.75	1.00		0.54	1.00	1.00	0.58	1.00	
Satd. Flow (perm)		1697		1404	1591		998	3539	1583	1089	3536	
Volume (vph)	3	2	1	53	2	65	4	249	122	211	331	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	2	1	58	2	71	4	271	133	229	360	2
RTOR Reduction (vph)	0	1	0	0	43	0	0	0	80	0	1	0
Lane Group Flow (vph)	0	5	0	58	30	0	4	271	53	229	361	0
Turn Type	Perm			Perm			Perm		Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		16.0		16.0	16.0		16.0	16.0	16.0	16.0	16.0	
Effective Green, g (s)		16.0		16.0	16.0		16.0	16.0	16.0	16.0	16.0	
Actuated g/C Ratio		0.40		0.40	0.40		0.40	0.40	0.40	0.40	0.40	
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		679		562	636		399	1416	633	436	1414	
v/s Ratio Prot					0.02			0.08			0.10	
v/s Ratio Perm		0.00		c0.04			0.00		0.03	c0.21		
v/c Ratio		0.01		0.10	0.05		0.01	0.19	0.08	0.53	0.26	
Uniform Delay, d1		7.2		7.5	7.3		7.2	7.8	7.5	9.1	8.0	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.0		0.4	0.1		0.0	0.3	0.3	4.5	0.4	
Delay (s)		7.2		7.9	7.5		7.3	8.1	7.7	13.6	8.5	
Level of Service		A		A	A		A	A	A	B	A	
Approach Delay (s)		7.2			7.7			8.0			10.4	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗	↖	↗	↔	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00						1.00	
Frt	1.00	1.00		1.00	1.00						1.00	
Flt Protected	0.95	1.00		0.95	1.00						0.99	
Satd. Flow (prot)	1770	1863		1770	1863						1857	
Flt Permitted	0.50	1.00		0.31	1.00						0.95	
Satd. Flow (perm)	938	1863		578	1863						1778	
Volume (vph)	7	356	0	26	238	0	19	305	0	173	468	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	387	0	28	259	0	21	332	0	188	509	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	8	387	0	28	259	0	0	353	0	0	697	0
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	16.0	16.0		16.0	16.0			31.0			31.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0			31.0			31.0	
Actuated g/C Ratio	0.29	0.29		0.29	0.29			0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	273	542		168	542			1002			857	
v/s Ratio Prot		c0.21			0.14							
v/s Ratio Perm	0.01			0.05				0.20			c0.46	
v/c Ratio	0.03	0.71		0.17	0.48			0.35			0.81	
Uniform Delay, d1	13.9	17.5		14.5	16.1			6.5			9.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	7.8		2.1	3.0			1.0			8.3	
Delay (s)	14.1	25.3		16.7	19.1			7.5			18.0	
Level of Service	B	C		B	B			A			B	
Approach Delay (s)		25.0			18.8			7.5			18.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

31: Pinnacle Peak Road & 83rd Avenue

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flt	1.00	0.85		1.00	1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1590		1770	1863	1583	1770	1829		1770	1850	
Flt Permitted	0.75	1.00		0.50	1.00	1.00	0.31	1.00		0.61	1.00	
Satd. Flow (perm)	1400	1590		940	1863	1583	586	1829		1132	1850	
Volume (vph)	17	7	303	66	8	4	169	197	27	3	446	21
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	8	329	72	9	4	184	214	29	3	485	23
RTOR Reduction (vph)	0	134	0	0	0	2	0	12	0	0	4	0
Lane Group Flow (vph)	18	203	0	72	9	2	184	231	0	3	504	0
Turn Type	Perm			Perm			Perm	Perm			Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40	0.40	0.40		0.40	0.40	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	560	636		376	745	633	234	732		453	740	
v/s Ratio Prot		c0.13			0.00			0.13			0.27	
v/s Ratio Perm	0.01			0.08		0.00	c0.31			0.00		
v/c Ratio	0.03	0.32		0.19	0.01	0.00	0.79	0.32		0.01	0.68	
Uniform Delay, d1	7.3	8.3		7.8	7.2	7.2	10.5	8.2		7.2	9.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.3		1.1	0.0	0.0	22.9	1.1		0.0	5.0	
Delay (s)	7.4	9.6		8.9	7.3	7.2	33.4	9.4		7.2	14.9	
Level of Service	A	A		A	A	A	C	A		A	B	
Approach Delay (s)		9.5			8.7			19.7			14.9	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

5: Pinnacle Peak Road & Lake Pleasant Road

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Flt		0.98		1.00	0.85		1.00	0.85		1.00	0.85	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1776		1770	1591		1770	3539		1770	3536	
Flt Permitted		0.93		0.75	1.00		0.54	1.00		0.58	1.00	
Satd. Flow (perm)		1697		1404	1591		998	3539		1089	3536	
Volume (vph)	3	2	1	53	2	65	4	249	122	211	331	2
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	2	1	58	2	71	4	271	133	229	360	2
RTOR Reduction (vph)	0	1	0	0	43	0	0	80	0	0	1	0
Lane Group Flow (vph)	0	5	0	58	30	0	4	271	53	229	361	0
Turn Type	Perm			Perm			Perm	Perm		Perm		
Protected Phases		4			8			2		2		6
Permitted Phases	4			8		8	2			2		6
Actuated Green, G (s)		16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	16.0
Effective Green, g (s)		16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	16.0
Actuated g/C Ratio		0.40		0.40	0.40	0.40	0.40	0.40		0.40	0.40	0.40
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)		679		562	636		399	1416	633	436	1414	
v/s Ratio Prot					0.02			0.08			0.10	
v/s Ratio Perm		0.00		c0.04		0.00		0.03		c0.21		
v/c Ratio		0.01		0.10	0.05	0.01	0.19	0.08		0.53	0.26	
Uniform Delay, d1		7.2		7.5	7.3	7.2	7.8	7.5		9.1	8.0	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0		0.4	0.1	0.0	0.3	0.3		4.5	0.4	
Delay (s)		7.2		7.9	7.5	7.3	8.1	7.7		13.6	8.5	
Level of Service		A		A	A	A	A	A		B	A	
Approach Delay (s)		7.2			7.7		8.0				10.4	
Approach LOS		A			A		A				B	

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↕	↕		↖	↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flt	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flt Protected	0.95	1.00		0.95	1.00		1.00	1.00		0.99	0.99	0.99
Satd. Flow (prot)	1770	1863		1770	1863		1857	1857		1838	1838	1838
Flt Permitted	0.50	1.00		0.31	1.00		0.95	0.95		0.82	0.82	0.82
Satd. Flow (perm)	938	1863		578	1863		1778	1778		1520	1520	1520
Volume (vph)	7	356	0	26	238	0	19	305	0	173	468	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	387	0	28	259	0	21	332	0	188	509	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	8	387	0	28	259	0	0	353	0	0	697	0
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	16.0	16.0		16.0	16.0			31.0			31.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0			31.0			31.0	
Actuated g/C Ratio	0.29	0.29		0.29	0.29			0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	273	542		168	542			1002			857	
v/s Ratio Prot		c0.21			0.14							
v/s Ratio Perm	0.01			0.05				0.20			c0.46	
v/c Ratio	0.03	0.71		0.17	0.48			0.35			0.81	
Uniform Delay, d1	13.9	17.5		14.5	16.1			6.5			9.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	7.8		2.1	3.0			1.0			8.3	
Delay (s)	14.1	25.3		16.7	19.1			7.5			18.0	
Level of Service	B	C		B	B			A			B	
Approach Delay (s)		25.0			18.8			7.5			18.0	
Approach LOS		C			B			A			B	

Intersection Summary

HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
31: Pinnacle Peak Road & 83rd Avenue

11/9/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↕	↕		↖	↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flt	1.00	0.85		1.00	1.00	0.85	1.00	0.98		1.00	0.99	1.00
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1590		1770	1863	1583	1770	1829		1770	1850	1850
Flt Permitted	0.75	1.00		0.50	1.00	1.00	0.31	1.00		0.61	1.00	1.00
Satd. Flow (perm)	1400	1590		940	1863	1583	586	1829		1132	1850	1850
Volume (vph)	17	7	303	66	8	4	169	197	27	3	446	21
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	8	329	72	9	4	184	214	29	3	485	23
RTOR Reduction (vph)	0	134	0	0	0	2	0	12	0	0	4	0
Lane Group Flow (vph)	18	203	0	72	9	2	184	231	0	3	504	0
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	16.0
Effective Green, g (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0		16.0	16.0	16.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40	0.40	0.40	0.40		0.40	0.40	0.40
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	560	636		376	745	633	234	732		453	740	740
v/s Ratio Prot		c0.13			0.00			0.13			0.27	
v/s Ratio Perm	0.01			0.08		0.00	c0.31			0.00		
v/c Ratio	0.03	0.32		0.19	0.01	0.00	0.79	0.32		0.01	0.68	
Uniform Delay, d1	7.3	8.3		7.8	7.2	7.2	10.5	8.2		7.2	9.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.3		1.1	0.0	0.0	22.9	1.1		0.0	5.0	
Delay (s)	7.4	9.6		8.9	7.3	7.2	33.4	9.4		7.2	14.9	
Level of Service	A	A		A	A	A	C	A		A	B	
Approach Delay (s)		9.5			8.7			19.7			14.9	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Pinnacle Peak Road & 107th Avenue

2/13/2007

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↗	↑	↖	↖	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	1.00	1.00
Frt	0.96	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.97	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3338	1441	1863	1583	1770	1863
Flt Permitted	0.97	1.00	1.00	1.00	0.56	1.00
Satd. Flow (perm)	3338	1441	1863	1583	1050	1863
Volume (vph)	25	25	300	50	50	500
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	27	326	54	54	543
RTOR Reduction (vph)	11	15	0	10	0	0
Lane Group Flow (vph)	27	1	326	44	54	543
Turn Type	Perm		Perm		Perm	
Protected Phases	8		2		6	
Permitted Phases	8		2		6	
Actuated Green, G (s)	2.6	2.6	49.4	49.4	49.4	49.4
Effective Green, g (s)	2.6	2.6	49.4	49.4	49.4	49.4
Actuated g/C Ratio	0.04	0.04	0.82	0.82	0.82	0.82
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	145	62	1534	1303	865	1534
v/s Ratio Prot	c0.01		0.18		c0.29	
v/s Ratio Perm	0.00		0.03		0.05	
v/c Ratio	0.19	0.01	0.21	0.03	0.06	0.35
Uniform Delay, d1	27.7	27.5	1.1	1.0	1.0	1.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.3	0.0	0.1	0.6
Delay (s)	28.3	27.5	1.5	1.0	1.1	2.0
Level of Service	C	C	A	A	A	A
Approach Delay (s)	28.1		1.4		1.9	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay	3.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Pinnacle Peak Road & Lake Pleasant Road

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕	↗	↖	↕	↗	↖	↕	↗	↖	↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.91	1.00	0.97	0.91	
Frt	1.00	0.95		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3362		1770	3080		1770	5085	1583	3433	5080	
Flt Permitted	0.70	1.00		0.73	1.00		0.26	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1306	3362		1368	3080		493	5085	1583	3433	5080	
Volume (vph)	31	20	10	55	10	65	15	913	447	603	946	6
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	22	11	60	11	71	16	992	486	655	1028	7
RTOR Reduction (vph)	0	10	0	0	65	0	0	0	205	0	0	0
Lane Group Flow (vph)	34	23	0	60	17	0	16	992	281	655	1035	0
Turn Type	Perm			Perm			Perm		Perm		Prot	
Protected Phases	4			8			2		2		1 6	
Permitted Phases	4			8			2		2		1 6	
Actuated Green, G (s)	8.0	8.0		8.0	8.0		48.0	48.0	48.0	22.0	74.0	
Effective Green, g (s)	8.0	8.0		8.0	8.0		48.0	48.0	48.0	22.0	74.0	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.53	0.53	0.53	0.24	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	116	299		122	274		263	2712	844	839	4177	
v/s Ratio Prot	0.01			0.01			c0.20		c0.19		0.20	
v/s Ratio Perm	0.03			c0.04			0.03		0.18			
v/c Ratio	0.29	0.08		0.49	0.06		0.06	0.37	0.33	0.78	0.25	
Uniform Delay, d1	38.4	37.6		39.1	37.6		10.1	12.2	11.9	31.7	1.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.4	0.1		3.1	0.1		0.4	0.4	1.1	4.8	0.1	
Delay (s)	39.8	37.7		42.2	37.7		10.6	12.6	13.0	36.5	1.9	
Level of Service	D	D		D	D		B	B	B	D	A	
Approach Delay (s)	38.8			39.6			12.7				15.3	
Approach LOS	D			D			B				B	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Flt	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3524		1770	3517		1770	3522		1770	3529	
Flt Permitted	0.65	1.00		0.66	1.00		0.39	1.00		0.38	1.00	
Satd. Flow (perm)	1202	3524		1232	3517		719	3522		704	3529	
Volume (vph)	3	128	4	23	208	9	40	641	21	233	629	13
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	139	4	25	226	10	43	697	23	253	684	14
RTOR Reduction (vph)	0	4	0	0	6	0	0	2	0	0	1	0
Lane Group Flow (vph)	3	139	0	25	230	0	43	718	0	253	697	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		2		6		6		6	
Permitted Phases	4		8		2		6		6		6	
Actuated Green, G (s)	6.2	6.2		6.2	6.2		45.8	45.8		45.8	45.8	
Effective Green, g (s)	6.2	6.2		6.2	6.2		45.8	45.8		45.8	45.8	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.76	0.76		0.76	0.76	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	124	364		127	363		549	2688		537	2694	
v/s Ratio Prot		0.04			c0.07			0.20			0.20	
v/s Ratio Perm	0.00			0.02			0.06			c0.36		
v/c Ratio	0.02	0.38		0.20	0.63		0.08	0.27		0.47	0.26	
Uniform Delay, d1	24.2	25.1		24.6	25.8		1.8	2.1		2.6	2.1	
Progression Factor	1.20	1.19		1.76	1.74		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6		0.7	3.5		0.3	0.2		2.9	0.2	
Delay (s)	29.0	30.4		44.0	48.2		2.1	2.4		5.6	2.3	
Level of Service	C	C		D	D		A	A		A	A	
Approach Delay (s)		30.4			47.8			2.3			3.2	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
31: Pinnacle Peak Road & 83rd Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖↗	↖↗		↖	↖↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.95		1.00	0.95	
Flt	1.00	0.85		1.00	0.95		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3021		1770	3348		3433	3475		1770	3515	
Flt Permitted	0.74	1.00		0.50	1.00		0.95	1.00		0.47	1.00	
Satd. Flow (perm)	1379	3021		935	3348		3433	3475		872	3515	
Volume (vph)	17	7	297	124	15	8	347	405	56	8	1171	55
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	8	323	135	16	9	377	440	61	9	1273	60
RTOR Reduction (vph)	0	200	0	0	7	0	0	15	0	0	6	0
Lane Group Flow (vph)	18	131	0	135	18	0	377	486	0	9	1327	0
Turn Type	Perm		Perm		Prot		Perm		Perm		Perm	
Protected Phases	4		8		5		2		6		6	
Permitted Phases	4		8		5		2		6		6	
Actuated Green, G (s)	12.3	12.3		12.3	12.3		9.4	39.7		26.3	26.3	
Effective Green, g (s)	12.3	12.3		12.3	12.3		9.4	39.7		26.3	26.3	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.16	0.66		0.44	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	283	619		192	686		538	2299		382	1541	
v/s Ratio Prot		0.04			0.01		c0.11	0.14			c0.38	
v/s Ratio Perm	0.01			c0.14						0.01		
v/c Ratio	0.06	0.21		0.70	0.03		0.70	0.21		0.02	0.86	
Uniform Delay, d1	19.2	19.8		22.2	19.1		24.0	4.0		9.6	15.2	
Progression Factor	0.89	1.97		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		11.1	0.0		4.1	0.2		0.1	6.6	
Delay (s)	17.3	39.3		33.2	19.1		28.1	4.2		9.7	21.8	
Level of Service	B	D		C	B		C	A		A	C	
Approach Delay (s)		38.1			31.0			14.5			21.7	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Pinnacle Peak Road & 107th Ave

2/13/2007

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↗	↑	↖	↖	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	1.00	1.00	1.00
Frt	0.96	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.97	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3342	1441	1863	1583	1770	1863
Flt Permitted	0.97	1.00	1.00	1.00	0.24	1.00
Satd. Flow (perm)	3342	1441	1863	1583	448	1863
Volume (vph)	50	50	900	25	50	575
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	54	978	27	54	625
RTOR Reduction (vph)	20	31	0	5	0	0
Lane Group Flow (vph)	55	2	978	22	54	625
Turn Type	Perm		Perm		Perm	
Protected Phases	8		2		6	
Permitted Phases	8		2		6	
Actuated Green, G (s)	4.1	4.1	47.9	47.9	47.9	47.9
Effective Green, g (s)	4.1	4.1	47.9	47.9	47.9	47.9
Actuated g/C Ratio	0.07	0.07	0.80	0.80	0.80	0.80
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	228	98	1487	1264	358	1487
v/s Ratio Prot	c0.02		c0.53		0.34	
v/s Ratio Perm	0.00		0.01		0.12	
v/c Ratio	0.24	0.02	0.66	0.02	0.15	0.42
Uniform Delay, d1	26.5	26.1	2.6	1.2	1.4	1.8
Progression Factor	1.04	1.07	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	2.3	0.0	0.9	0.9
Delay (s)	28.1	28.0	4.9	1.3	2.3	2.7
Level of Service	C	C	A	A	A	A
Approach Delay (s)	28.0		4.8		2.7	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Pinnacle Peak Road & Lake Pleasant Road

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.91	1.00	0.97	0.91	
Frt	1.00	0.92		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3274		1770	3078		1770	5085	1583	3433	5081	
Flt Permitted	0.70	1.00		0.74	1.00		0.15	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1303	3274		1380	3078		277	5085	1583	3433	5081	
Volume (vph)	22	11	11	79	10	67	6	1425	543	427	1454	8
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	12	12	86	11	73	7	1549	590	464	1580	9
RTOR Reduction (vph)	0	10	0	0	63	0	0	0	325	0	1	0
Lane Group Flow (vph)	24	14	0	86	21	0	7	1549	265	464	1588	0
Turn Type	Perm			Perm			Perm			Perm	Prot	
Protected Phases	4			8			2			2	1	6
Permitted Phases	4			8			2			2		
Actuated Green, G (s)	8.1	8.1		8.1	8.1		26.9	26.9	26.9	13.0	43.9	
Effective Green, g (s)	8.1	8.1		8.1	8.1		26.9	26.9	26.9	13.0	43.9	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.45	0.45	0.45	0.22	0.73	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	176	442		186	416		124	2280	710	744	3718	
v/s Ratio Prot	0.00			0.01			c0.30			c0.14	0.31	
v/s Ratio Perm	0.02			c0.06			0.03			0.17		
v/c Ratio	0.14	0.03		0.46	0.05		0.06	0.68	0.37	0.62	0.43	
Uniform Delay, d1	22.9	22.5		23.9	22.6		9.4	13.1	11.0	21.3	3.1	
Progression Factor	0.85	0.79		1.76	3.40		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.0		1.5	0.0		0.9	1.7	1.5	1.6	0.4	
Delay (s)	19.8	17.8		43.6	76.8		10.2	14.8	12.5	22.9	3.5	
Level of Service	B	B		D	E		B	B	B	C	A	
Approach Delay (s)	18.8			60.0			14.1			7.9		
Approach LOS	B			E			B			A		

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖↗		↖	↖↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3517		1770	3525		1770	3528		1770	3526	
Flt Permitted	0.56	1.00		0.68	1.00		0.33	1.00		0.28	1.00	
Satd. Flow (perm)	1035	3517		1259	3525		611	3528		525	3526	
Volume (vph)	9	106	5	21	240	6	187	867	19	227	751	19
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	115	5	23	261	7	203	942	21	247	816	21
RTOR Reduction (vph)	0	4	0	0	3	0	0	2	0	0	2	0
Lane Group Flow (vph)	10	116	0	23	265	0	203	961	0	247	835	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.0	8.0		8.0	8.0		44.0	44.0		44.0	44.0	
Effective Green, g (s)	8.0	8.0		8.0	8.0		44.0	44.0		44.0	44.0	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.73	0.73		0.73	0.73	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	138	469		168	470		448	2587		385	2586	
v/s Ratio Prot		0.03			c0.08			0.27			0.24	
v/s Ratio Perm	0.01			0.02			0.33			c0.47		
v/c Ratio	0.07	0.25		0.14	0.56		0.45	0.37		0.64	0.32	
Uniform Delay, d1	22.8	23.3		23.0	24.4		3.2	2.9		4.0	2.8	
Progression Factor	1.16	1.18		1.55	1.56		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.4	1.5		3.3	0.4		8.0	0.3	
Delay (s)	26.6	27.7		36.0	39.4		6.5	3.3		12.0	3.1	
Level of Service	C	C		D	D		A	A		B	A	
Approach Delay (s)		27.6			39.1			3.9			5.1	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
31: Pinnacle Peak Road & 83rd Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖↗	↖↗	↖	↖	↖↗	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	0.95		1.00	0.95	1.00
Frt	1.00	0.86		1.00	0.94		1.00	1.00		0.85	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3037		1770	3334		3433	3539		1583	1770	3539
Flt Permitted	0.73	1.00		0.54	1.00		0.95	1.00		1.00	0.32	1.00
Satd. Flow (perm)	1354	3037		1006	3334		3433	3539		1583	590	3539
Volume (vph)	26	12	211	143	25	16	661	827	129	4	1405	77
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	13	229	155	27	17	718	899	140	4	1527	84
RTOR Reduction (vph)	0	188	0	0	14	0	0	0	37	0	0	45
Lane Group Flow (vph)	28	54	0	155	30	0	718	899	103	4	1527	39
Turn Type	Perm			Perm			Prot		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8					2	6		6
Actuated Green, G (s)	16.0	16.0		16.0	16.0		20.1	66.0	66.0	41.9	41.9	41.9
Effective Green, g (s)	16.0	16.0		16.0	16.0		20.1	66.0	66.0	41.9	41.9	41.9
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.22	0.73	0.73	0.47	0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	241	540		179	593		767	2595	1161	275	1648	737
v/s Ratio Prot		0.02			0.01		c0.21	0.25			c0.43	
v/s Ratio Perm	0.02			c0.15					0.06	0.01		0.02
v/c Ratio	0.12	0.10		0.87	0.05		0.94	0.35	0.09	0.01	0.93	0.05
Uniform Delay, d1	31.1	31.0		36.0	30.7		34.3	4.3	3.4	12.9	22.6	13.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		32.7	0.0		18.6	0.4	0.2	0.1	10.5	0.1
Delay (s)	31.3	31.1		68.6	30.7		52.9	4.7	3.6	13.0	33.1	13.3
Level of Service	C	C		E	C		D	A	A	B	C	B
Approach Delay (s)		31.1			60.3			24.3			32.0	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Pinnacle Peak Road & 107th Avenue

2/13/2007

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑↑	↖	↗	↑↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Flt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.55	1.00
Satd. Flow (perm)	1770	1583	3539	1583	1033	3539
Volume (vph)	25	25	300	50	50	500
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	27	326	54	54	543
RTOR Reduction (vph)	0	26	0	10	0	0
Lane Group Flow (vph)	27	1	326	44	54	543
Turn Type	Perm		Perm		Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	2.9	2.9	49.1	49.1	49.1	49.1
Effective Green, g (s)	2.9	2.9	49.1	49.1	49.1	49.1
Actuated g/C Ratio	0.05	0.05	0.82	0.82	0.82	0.82
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	86	77	2896	1295	845	2896
v/s Ratio Prot	c0.02		0.09			c0.15
v/s Ratio Perm		0.00		0.03	0.05	
v/c Ratio	0.31	0.02	0.11	0.03	0.06	0.19
Uniform Delay, d1	27.6	27.2	1.1	1.0	1.0	1.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	0.1	0.1	0.0	0.1	0.1
Delay (s)	29.7	27.3	1.2	1.1	1.2	1.3
Level of Service	C	C	A	A	A	A
Approach Delay (s)	28.5		1.2			1.3
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	2.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Pinnacle Peak Road & Lake Pleasant Road

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑↑	↖	↗	↑↑↑	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.91	1.00	1.00	0.91	
Flt	1.00	0.95		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1770		1770	1621		1770	5085	1583	1770	5080	
Flt Permitted	0.70	1.00		0.74	1.00		0.26	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1311	1770		1370	1621		493	5085	1583	1770	5080	
Volume (vph)	31	20	10	55	10	65	15	913	447	603	946	6
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	22	11	60	11	71	16	992	486	655	1028	7
RTOR Reduction (vph)	0	10	0	0	65	0	0	0	243	0	1	0
Lane Group Flow (vph)	34	23	0	60	17	0	16	992	243	655	1034	0
Turn Type	Perm			Perm			Perm		Perm	Perm	Prot	
Protected Phases		4			8			2	2	1	6	
Permitted Phases	4			8			2		2			
Actuated Green, G (s)	8.1	8.1		8.1	8.1		32.3	32.3	32.3	37.6	73.9	
Effective Green, g (s)	8.1	8.1		8.1	8.1		32.3	32.3	32.3	37.6	73.9	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.36	0.36	0.36	0.42	0.82	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	118	159		123	146		177	1825	568	739	4171	
v/s Ratio Prot		0.01			0.01			c0.20		c0.37	0.20	
v/s Ratio Perm	0.03			c0.04			0.03		0.15			
v/c Ratio	0.29	0.14		0.49	0.12		0.09	0.54	0.43	0.89	0.25	
Uniform Delay, d1	38.3	37.8		39.0	37.7		19.1	23.0	21.9	24.2	1.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.4	0.4		3.0	0.4		1.0	1.2	2.3	12.4	0.1	
Delay (s)	39.6	38.2		42.0	38.0		20.1	24.1	24.2	36.6	2.0	
Level of Service	D	D		D	D		C	C	C	D	A	
Approach Delay (s)		38.9			39.7			24.1			15.4	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Flt	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1855		1770	1851		1770	3522		1770	3529	
Flt Permitted	0.45	1.00		0.66	1.00		0.38	1.00		0.37	1.00	
Satd. Flow (perm)	836	1855		1227	1851		699	3522		680	3529	
Volume (vph)	3	128	4	23	208	9	40	641	21	233	629	13
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	139	4	25	226	10	43	697	23	253	684	14
RTOR Reduction (vph)	0	2	0	0	3	0	0	3	0	0	2	0
Lane Group Flow (vph)	3	141	0	25	233	0	43	717	0	253	696	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.1	12.1		12.1	12.1		39.9	39.9		39.9	39.9	
Effective Green, g (s)	12.1	12.1		12.1	12.1		39.9	39.9		39.9	39.9	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.66	0.66		0.66	0.66	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	169	374		247	373		465	2342		452	2347	
v/s Ratio Prot		0.08			c0.13			0.20			0.20	
v/s Ratio Perm	0.00			0.02			0.06			c0.37		
v/c Ratio	0.02	0.38		0.10	0.62		0.09	0.31		0.56	0.30	
Uniform Delay, d1	19.2	20.7		19.5	21.9		3.6	4.2		5.4	4.2	
Progression Factor	1.36	1.31		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.5		0.2	3.2		0.4	0.3		4.9	0.3	
Delay (s)	26.2	27.6		19.7	25.1		4.0	4.6		10.3	4.5	
Level of Service	C	C		B	C		A	A		B	A	
Approach Delay (s)		27.6			24.6			4.5			6.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
31: Pinnacle Peak Road & 83rd Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	0.95		1.00	0.95	
Flt	1.00	1.00	0.85	1.00	0.95		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1762		3433	3475		1770	3515	
Flt Permitted	0.74	1.00	1.00	0.75	1.00		0.95	1.00		0.47	1.00	
Satd. Flow (perm)	1380	1863	1583	1402	1762		3433	3475		872	3515	
Volume (vph)	17	7	297	124	15	8	347	405	56	8	1171	55
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	8	323	135	16	9	377	440	61	9	1273	60
RTOR Reduction (vph)	0	0	232	0	7	0	0	13	0	0	5	0
Lane Group Flow (vph)	18	8	91	135	18	0	377	488	0	9	1328	0
Turn Type	Perm		Perm	Perm			Prot			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8						6		
Actuated Green, G (s)	11.1	11.1	11.1	11.1	11.1		11.0	45.9		30.9	30.9	
Effective Green, g (s)	11.1	11.1	11.1	11.1	11.1		11.0	45.9		30.9	30.9	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17		0.17	0.71		0.48	0.48	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	236	318	270	239	301		581	2454		415	1671	
v/s Ratio Prot		0.00			0.01		c0.11	0.14			c0.38	
v/s Ratio Perm	0.01		0.06	c0.10						0.01		
v/c Ratio	0.08	0.03	0.34	0.56	0.06		0.65	0.20		0.02	0.79	
Uniform Delay, d1	22.6	22.4	23.7	24.7	22.6		25.2	3.3		9.0	14.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.0	0.7	3.0	0.1		2.5	0.2		0.1	4.0	
Delay (s)	22.8	22.5	24.5	27.8	22.7		27.7	3.4		9.1	18.4	
Level of Service	C	C	C	C	C		C	A		A	B	
Approach Delay (s)		24.3			27.0			13.9			18.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Pinnacle Peak Road & 107th Avenue

2/13/2007

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↕	↗	↖	↕
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.30	1.00
Satd. Flow (perm)	1770	1583	3539	1583	557	3539
Volume (vph)	175	100	818	100	95	600
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	109	889	109	103	652
RTOR Reduction (vph)	0	45	0	43	0	0
Lane Group Flow (vph)	190	64	889	66	103	652
Turn Type	Perm		Perm		Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	7.9	7.9	24.1	24.1	24.1	24.1
Effective Green, g (s)	7.9	7.9	24.1	24.1	24.1	24.1
Actuated g/C Ratio	0.20	0.20	0.60	0.60	0.60	0.60
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	350	313	2132	954	336	2132
v/s Ratio Prot	c0.11		c0.25			0.18
v/s Ratio Perm		0.04		0.04	0.18	
v/c Ratio	0.54	0.20	0.42	0.07	0.31	0.31
Uniform Delay, d1	14.4	13.4	4.2	3.3	3.9	3.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.3	0.6	0.1	2.4	0.4
Delay (s)	16.1	13.7	4.8	3.4	6.2	4.2
Level of Service	B	B	A	A	A	A
Approach Delay (s)	15.3		4.7			4.5
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Pinnacle Peak Road & Lake Pleasant Road

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.91	1.00	1.00	0.91	
Frt	1.00	0.92		1.00	0.86		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1723		1770	1606		1770	5085	1583	1770	5081	
Flt Permitted	0.56	1.00		0.72	1.00		0.14	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1052	1723		1349	1606		260	5085	1583	1770	5081	
Volume (vph)	46	23	23	132	10	112	6	1364	519	440	1499	9
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	25	25	143	11	122	7	1483	564	478	1629	10
RTOR Reduction (vph)	0	21	0	0	104	0	0	0	267	0	1	0
Lane Group Flow (vph)	50	29	0	143	29	0	7	1483	297	478	1638	0
Turn Type	Perm			Perm			Perm		Perm		Prot	
Protected Phases		4			8			2		2	1	6
Permitted Phases	4			8			2		2			
Actuated Green, G (s)	13.3	13.3		13.3	13.3		36.9	36.9	36.9	27.8	68.7	
Effective Green, g (s)	13.3	13.3		13.3	13.3		36.9	36.9	36.9	27.8	68.7	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.41	0.41	0.41	0.31	0.76	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	155	255		199	237		107	2085	649	547	3878	
v/s Ratio Prot		0.02			0.02			c0.29		c0.27	0.32	
v/s Ratio Perm	0.05			c0.11			0.03		0.19			
v/c Ratio	0.32	0.11		0.72	0.12		0.07	0.71	0.46	0.87	0.42	
Uniform Delay, d1	34.3	33.2		36.6	33.3		16.1	22.1	19.3	29.4	3.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	0.2		11.7	0.2		1.2	2.1	2.3	14.4	0.3	
Delay (s)	35.5	33.4		48.3	33.5		17.3	24.2	21.6	43.8	4.1	
Level of Service	D	C		D	C		B	C	C	D	A	
Approach Delay (s)		34.5			41.2			23.5			13.0	
Approach LOS		C			D			C			B	

Intersection Summary

HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Pinnacle Peak Road & 91st Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1849		1770	1856		1770	3530		1770	3526	
Flt Permitted	0.26	1.00		0.63	1.00		0.31	1.00		0.27	1.00	
Satd. Flow (perm)	490	1849		1167	1856		578	3530		504	3526	
Volume (vph)	12	146	7	31	354	9	180	835	15	223	739	18
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	159	8	34	385	10	196	908	16	242	803	20
RTOR Reduction (vph)	0	3	0	0	1	0	0	2	0	0	3	0
Lane Group Flow (vph)	13	164	0	34	394	0	196	922	0	242	820	0
Turn Type	Perm		Perm		Perm		Perm		Perm			
Protected Phases	4		8		2		6		6			
Permitted Phases	4		8		2		6		6			
Actuated Green, G (s)	15.2	15.2		15.2	15.2		36.8	36.8		36.8	36.8	
Effective Green, g (s)	15.2	15.2		15.2	15.2		36.8	36.8		36.8	36.8	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.61	0.61		0.61	0.61	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	124	468		296	470		355	2165		309	2163	
v/s Ratio Prot		0.09			c0.21			0.26			0.23	
v/s Ratio Perm	0.03			0.03			0.34			c0.48		
v/c Ratio	0.10	0.35		0.11	0.84		0.55	0.43		0.78	0.38	
Uniform Delay, d1	17.2	18.4		17.2	21.2		6.8	6.1		8.6	5.8	
Progression Factor	1.32	1.10		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.4		0.2	12.3		6.1	0.6		17.8	0.5	
Delay (s)	23.0	20.6		17.4	33.5		12.8	6.7		26.4	6.4	
Level of Service	C		B		C		B		A		C	
Approach Delay (s)	20.8		32.2		7.8		10.9					
Approach LOS	C		C		A		B					

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
31: Pinnacle Peak Road & 83rd Avenue

2/13/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00		0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87	0.85	1.00	0.94		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1532	1504	1770	1756		3433	3539	1583	1770	3539	1583
Flt Permitted	0.70	1.00	1.00	0.58	1.00		0.95	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	1299	1532	1504	1081	1756		3433	3539	1583	644	3539	1583
Volume (vph)	33	16	269	292	52	32	595	745	116	4	1216	67
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	17	292	317	57	35	647	810	126	4	1322	73
RTOR Reduction (vph)	0	104	104	0	25	0	0	0	48	0	0	45
Lane Group Flow (vph)	36	59	42	317	67	0	647	810	78	4	1322	28
Turn Type	Perm		Perm		Perm		Prot		Perm		Perm	
Protected Phases	4		8		8		5		2		6	
Permitted Phases	4		4		8		2		6		6	
Actuated Green, G (s)	26.0	26.0	26.0	26.0	26.0		17.0	56.0	56.0	35.0	35.0	35.0
Effective Green, g (s)	26.0	26.0	26.0	26.0	26.0		17.0	56.0	56.0	35.0	35.0	35.0
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.19	0.62	0.62	0.39	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	375	443	434	312	507		648	2202	985	250	1376	616
v/s Ratio Prot		0.04			0.04		c0.19	0.23			c0.37	
v/s Ratio Perm	0.03		0.03	c0.29					0.05	0.01		0.02
v/c Ratio	0.10	0.13	0.10	1.02	0.13		1.00	0.37	0.08	0.02	0.96	0.05
Uniform Delay, d1	23.4	23.7	23.4	32.0	23.7		36.5	8.3	6.8	16.9	26.8	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.1	55.1	0.1		34.7	0.5	0.2	0.1	16.5	0.1
Delay (s)	23.5	23.8	23.5	87.1	23.8		71.2	8.8	6.9	17.0	43.4	17.3
Level of Service	C		C		F		E		A		B	
Approach Delay (s)	23.7		72.9		34.1		41.9					
Approach LOS	C		E		C		D					

Intersection Summary			
HCM Average Control Delay	40.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



APPENDIX D

GEOTECHNICAL INFORMATION



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February 7, 2007

Mr. Doug LaMont P.E.
 Parson Brinkerhoff
 1501 W. Fountainhead Parkway, Suite 400
 Tempe, AZ 85282-1853

**RE: Project No. 030210SA
 Pinnacle Peak Rd.: Lake Pleasant
 Rd. to 83rd Ave
 Peoria, AZ
 Pavement Design**

Dear Doug:

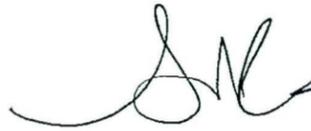
We understand that an additional one mile segment (Lake Pleasant Road to 107th Avenue) will be added to the west of the project limits along Pinnacle Peak Road. We have reviewed the project file, and adjacent projects to estimate pavement design for the additional segment. Based on our information, the soils in this area are expected to become more granular as the alignment approaches the Agua Fria River (1/2 mile west of 107th Avenue). For preliminary design purposes, the pavement thicknesses for the Pinnacle Peak Road section recommended in the draft report dated April 28, 2003 can conservatively be used.

Please note, that the "Estimated Cost per Square yard of Pavement" in the draft report is estimated using 2003 costs. Current costs should be appropriately revised.

Respectfully Submitted,
 SPEEDIE & ASSOCIATES, INC.


 Timothy J. Rheinschmidt, R.G.




 Gregg A. Creaser, P.E.



**SPEEDIE
AND ASSOCIATES**

**REPORT ON GEOTECHNICAL
INVESTIGATION**

DESIGNATION: Pinnacle Peak Road

LOCATION: Pinnacle Peak Rd,
Lake Pleasant Rd to 83rd Avenue
Peoria, Arizona

CLIENT: Division Maricopa County
Department of Transportation Planning

PROJECT NO: 030210SA

DRAFT DATE: April 28, 2003

DRAFT

1.0	INTRODUCTION.....	1
2.0	GENERAL SITE AND SOIL CONDITIONS.....	1
2.1	Site Conditions	1
2.2	Regional Geology	1
2.3	Local Geology	1
2.4	General Subsurface Conditions	2
2.5	Regional Groundwater Elevation	2
2.6	Aerial Photographs	2
3.0	ANALYSIS AND RECOMMENDATIONS.....	3
3.1	Analysis	3
3.2	Site Preparation.....	3
3.3	Excavation and Compaction Factors	3
3.4	Fill And Backfill.....	4
3.5	Utilities Installation	4
3.6	Asphalt Pavement.....	5
3.7	Pavement Design Parameters	6
3.8	Soil Corrosion.....	7
4.0	GENERAL.....	8

DRAFT

1.0 INTRODUCTION

This report presents the results of a subsoil investigation for the purpose of roadway widening and pavement design for the proposed site. Design information calls for the construction of approximately 2 miles of new roadways and/or improved roadway. Allowable traffic capacities for pavement thicknesses have been calculated based on soil conditions for a Urban Minor Arterial with bike lanes. Some grading to improve drainage is anticipated. The designs presented herein are for all new and reconditioned structural sections. It is not known if or where the roadways will have drainage crossings requiring box culverts.

2.0 GENERAL SITE AND SOIL CONDITIONS

2.1 Site Conditions

The Pinnacle Peak Road configuration generally has two lanes with unpaved shoulders. Some curb and gutter improvements have been made but roadside ditches generally collect the stormwater. Surrounding land usage appears to be primarily residential. The general alignment will not be changed.

2.2 Regional Geology

The Phoenix valley area, is located within the Salt River Valley Basin, which is part of the Basin and Range physiographic province as described by Fenneman (1931). The Salt River Valley Basin is a structural depression formed in Cenozoic crustal extension and characterized by broad sloping valleys bounded by generally northwesterly trending mountain ranges, including the McDowell, Superstition, Sierra Estrella, and White Tank Mountains.

The Salt River Valley Basin lies within a broad alluvial valley composed of Cenozoic (Oligocene to Recent) sedimentary deposits. The alluvial basin extends to maximum projected depths of approximately 10,000 feet (Oppenheimer, 1980) and predominantly consists of consolidated to unconsolidated sands and gravels, with local discontinuous clays and silts. Valley floor elevations range from a minimum of 800 feet in the southwest portion of the basin to a maximum of 2,000 feet in the northeast. These sedimentary deposits are underlain by crystalline and volcanic bedrock formations of late Cretaceous to early Tertiary age.

2.3 Local Geology

Similar to the Phoenix area as a whole, the subject site area is underlain by a thick sequence of Cenozoic sedimentary deposits that form the major aquifer units of the Salt River Valley Basin. The

sedimentary deposits primarily consist of unconsolidated to semi-consolidated silts, sands and gravels that yield substantial quantities of groundwater. No shallow bedrock is anticipated along this alignment.

2.4 General Subsurface Conditions

Subsoil conditions at the site consist mainly of sandy clay and clayey sand. Borings along the alignment also indicate varying degrees of calcareous cementation and subordinate amounts of gravel. No groundwater was encountered during this investigation. Soils are described as being in a moist to dry state at the time of investigation based on visual and tactile evaluation.

Soil samples submitted for laboratory testing indicates that Liquid limits range from 33 to 101 percent with plasticity indices that range from 1 to 70 percent. The percent finer than the #200 sieve ranges from 18 to 66 percent.

2.5 Regional Groundwater Elevation

Regional groundwater maps developed by the Arizona Department of Water Resources (ADWR) revealed two wells located within a one mile radius of the Property, with groundwater elevations ranging from 810 to 960 feet above mean sea level (350 to 484 feet below ground surface) and a southerly groundwater flow direction. However, groundwater flow resulting from local groundwater gradients may vary considerably in the area due to surface recharge, groundwater pumping and local subsurface geology (Hammett).

2.6 Aerial Photographs

A cursory review of the 1973 aerial photography from the US Department of Agriculture and 2001-2003 Maricopa county assessors aerial photography was conducted to identify past uses and characteristics of the lands adjoining Pinnacle Peak Road, as well as to determine and evaluate the nature of previous activities existing on adjoining lands.

In 1973, all of the land adjoining Pinnacle Peak Road appeared to be native desert land except for an area north of Pinnacle Peak Road between 87th Avenue and 91st Avenue. This area appears to have been occupied by ranch style homes and possibly a convenience store. This facility, Campbells Mercantile Inc, located at 9098 W. Pinnacle Peak Road is listed as having underground storage tanks and has had a leaking underground storage tank that was closed in 1994. Further information on this site can be reviewed at the Arizona Department of Environmental Quality.

Since 1973 the area has continued to add residential growth except for the area on the south side of Pinnacle Peak Road between 91st Avenue and Lake Pleasant Road. This area remains native desert land.

3.0 ANALYSIS AND RECOMMENDATIONS

3.1 Analysis

Analysis of the field and laboratory data indicates that subsoils at the site are generally favorable for the support of pavements. There was one anomaly at boring B-5. The plasticity was very high. This is likely the result of the cementation. Groundwater is not expected to be a factor in the design or construction of the roadway. Shallow excavation operations should be relatively straight forward using conventional equipment. The soils generally become harder with depth and very dense and/or cemented conditions may require more aggressive (rock like soil) removal techniques. Adequate drainage will be critical for long-term performance of the roadway. Attention must be paid to provide proper drainage to limit the potential for water infiltrating under pavement systems.

The swell potential of the fine portion of the upper clayey soils is a concern. The measured swell potential is moderate to high along with the presence of some high plastic clay. It is recommended that the roadway be placed on lime stabilized subgrade to reduce the potential for road damage due to swelling clays.

3.2 Site Preparation

The entire area to be occupied by the proposed construction should be stripped of all vegetation, debris, rubble and obviously loose surface soils. Any existing asphaltic concrete may be cold-milled in-place to a gradation similar to that of an ABC and it, along with the existing aggregate base, stockpiled for reuse under new paving as subbase. Care must be taken not to contaminate it with the native subgrade soils, as the plasticity requirements must also be met.

Prior to placing subgrade and/or subbase fill under new paving, the exposed grade should first be scarified to a depth of 8-inches, moisture conditioned to optimum (± 2 percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698.

3.3 Excavation and Compaction Factors

Earthwork shrinkage is expected to be on the order of 15 percent outside of the roadway prism. Earthwork factors within the roadway prism are expected to be nil.

3.4 Fill And Backfill

Native soils are considered suitable for use in general grading fills. If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of equal or better value than the existing subgrade soils. This import must exhibit an R-value of at least 25.

Fill should be placed on subgrade, which has been properly prepared and approved by a Soils Engineer. Fill must be wetted and thoroughly mixed to achieve optimum moisture content, ± 2 percent. Fill should be placed in horizontal lifts of 8-inch thickness (or as dictated by compaction equipment) and compacted to the percent of maximum dry density per ASTM D-698 set forth as follows:

A.	Pavement Subgrade or Fill	95
B.	Utility Trench Backfill	
1.	More than 2.0' below finish S/G	95
2.	Within 2.0' of finish S/G	95
C.	Aggregate Base Course	
1.	Below asphalt paving	100
D.	Landscape Areas	
1.	Miscellaneous fill	90
2.	Utility trench - more than 1.0' below F/G	85
3.	Utility trench - within 1.0' of F/G	90

3.5 Utilities Installation

If required, shallow trench excavations for utilities can be accomplished by conventional trenching equipment. Deeper trench excavations may encounter dense calcified soils that may require more aggressive removal techniques. Trench walls should stand near-vertical for the short periods of time required to install utilities although some sloughing may occur in looser and/or sandier soils requiring laying back of side slopes and/or temporary shoring. Adequate precautions must be taken to protect workmen in accordance with all current governmental regulations.

Backfill of trenches may be carried out with native excavated material. This material should be moisture-conditioned, placed in 8-inch lifts and mechanically compacted. Water settling is not recommended. Compaction requirements are summarized in the "Fill and Backfill" section of this report.

For trench loading conditions, it is recommended to use a wet soil weight of 120 pcf. The soil conditions do not present any specific requirements for pipe material selection. The fine-grained soils will

not be suitable for pipe bedding purposes. Metal pipe selection and protection should be based on the minimum resistivity and pH results presented in the Appendix.

3.6 Asphalt Pavement

If earthwork in paved areas is carried out to finish subgrade elevation as set forth herein, the subgrade will provide adequate support for pavements. Recommendations are provided for a structural section made up of asphaltic concrete, aggregate base and unstabilized and lime stabilized subgrade.

TABLE 3.6.1- Recommended Pavement Thicknesses for Pinnacle Peak Rd

AC (.42) in(mm)	ABC (.12) in(mm)	Lime Stabilized Subgrade (.16) in(mm)	Total 18-kip ESALs	Estimated Cost per Sq Yd of Pavement	Structural Number	
					Required	Calculated
Pavement Section With No Lime Stabilized Subgrade						
4(100)	17(430)	-	5,242,483	\$13.74	3.66	3.72
5(125)	13(330)	-	5,828,876	\$14.42		3.78
6(150)	10(255)	-	5,242,483	\$14.72		3.72
Pavement Section With 6" Lime Stabilized Subgrade						
4(100)	9(230)	6(150)	5,242,483	\$12.92	3.66	3.72
5(125)	6(150)	6(150)	5,828,876	\$13.60		3.78
6(150)	2(50)	6(150)	5,242,483	\$13.90		3.72
Pavement Section With 12" Lime Stabilized Subgrade						
4(100)	1(25)	12(305)	5,242,483	\$12.10	3.66	3.72
5(125)	-	12(305)	8,802,434	\$13.54		4.02
6(150)	-	12(305)	17,412,290	\$15.36		4.44
Notes:						
1. All thicknesses are in inches with metric in parentheses.						

3.7 Pavement Design Parameters

Design Lane Traffic:

- Assume: 1.2 18 kip Equivalent Single Axle Load (ESAL)/Truck
- 0.0008 18 kip Equivalent Single Axle Load (ESAL)/Car
- 9.2% Trucks
- 2003 VPD of 6,508 two-way (MAG Data)
- 2020 VPD of 24,000 two-way (MAG Projections)
- 6.7% growth rate
- 39.9 Growth Factor
- Use Design Average ADT of 723
- 50% Design Direction Traffic
- 90% Design Lane Traffic
- Life: 20 years
- Resultant: 4,738,300 ESALs
- Rural Arterial with 2,001-10,000 ADT & >2,500,000 ESALs
- Minimum SN=2.75 (per ADOT)
- Minimum Pavement Section=4" AC + 10" ABC (per MCDOT)

Pavement Design Parameters:

- Life: 20 years
- Assume:
- Reliability: 95%
- Overall Std. Deviation: 0.45
- Structural Coefficient: AC 0.42
- Aggregate Base 0.12
- LSS 0.16
- Initial Serviceability: 4.5
- Terminal Serviceability: 2.5
- Estimated Material Prices (MCDOT Pavement Design Guide)
- AC \$1.82 per sq yd-in
- Aggregate Base \$0.38 per sq yd-in
- LSS \$0.37 per sq yd-in

Subgrade Soil Profile:

- Avg. R value: 23 (per R value tests and MCDOT correlated R values)
- M_R: 13,685 (per AASHTO formula)

This assumes that all subgrades are prepared in accordance with the recommendations contained in the "Site Preparation" and "Fill and Backfill" sections of this report, and paving operations carried out in a proper manner. If pavement subgrade preparation is not carried out immediately prior to paving, the entire area should be proof-rolled at that time with a heavy pneumatic-tired roller to identify locally unstable areas for repair.

Pavement base course material should be A.B.C. per Maricopa Association of Governments Uniform Standard Specifications for Public Works (M.A.G.) Section 702. Asphalt concrete materials and mix design should conform to M.A.G. 710 using PG70-10 asphalt and the requirements for heavy volume traffic. It is recommended that mix designation A-12.5 and A-19 be used for the pavements. Pavement installation should be carried out under applicable portions of M.A.G. Section 321 with any MCDOT and municipality standard supplements.

Due to the swell potential of the upper clayey soil it is recommended that the road be placed on 12 inches (305mm) of lime stabilized subgrade. The lime stabilization can be eliminated or reduced to 6 inches (150mm) in areas where the subgrade soils are less clayey and/or expansive. Table 1 gives design sections with no lime stabilization, 6 inches (150mm) of lime stabilization and 12 inches (305mm) of lime stabilization for comparison reasons. As seen in Table 1, there can be a substantial reduction in aggregate base thickness (up to full replacement) for a given traffic volume when the subgrade is stabilized. Correspondingly, the capacity can be greatly increased. All stabilization work should be carried out in accordance with M.A.G. Section 309 Specifications. It is recommended that several trial mixes be tested using the native, subgrade soils and varying amounts of lime to determine an optimum amount. Typically, lime on the order of 4½ to 6 percent by weight can be used, depending on strength requirements, for preliminary estimating purposes. A minimum 5-day lab cured compressive strength of 150 psi is recommended.

Soil stabilization should be carried out by a contractor experienced in this type of work. Consideration may be given to use of a slurry rather than dry application since dusting is a concern. Use of a slurry will also reduce the amount of loss, provide consistent coverage and ensure proper hydration.

3.8 Soil Corrosion

Laboratory minimum resistivity test results ranged from 797 ohm-cm to 2,666 ohm-cm and soil pH from 8.0 to 8.6 indicating a moderate to severe degree of corrosiveness. This is a laboratory value based on saturated soils. In the field, saturation of the soils should not be expected which would thereby increase the resistivity. These low values are likely the result of the cemented soils which increase the salt

content. Accordingly, suitable pipe wall thickness and corrosion protection should be selected per the trench/traffic load and lifetime requirements of the project.

4.0 GENERAL

The scope of this investigation and report does not include regional considerations such as seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal, nor any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a representative of the Soils Engineer observe and test the earthwork and foundation portions of this project to ensure compliance to project specifications and the field applicability of subsurface conditions which are the basis of the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,
SPEEDIE & ASSOCIATES, INC.

Jeramy B. Decker, E.I.T.

DRAFT

Timothy J. Rheinschmidt, R.G.

DRAFT

Gregg A. Creaser, P.E.

APPENDIX

FIELD AND LABORATORY INVESTIGATION

SOIL BORING LOCATION PLAN

SOIL LEGEND

LOG OF TEST BORINGS

TABULATION OF TEST DATA

MOISTURE-DENSITY RELATIONS

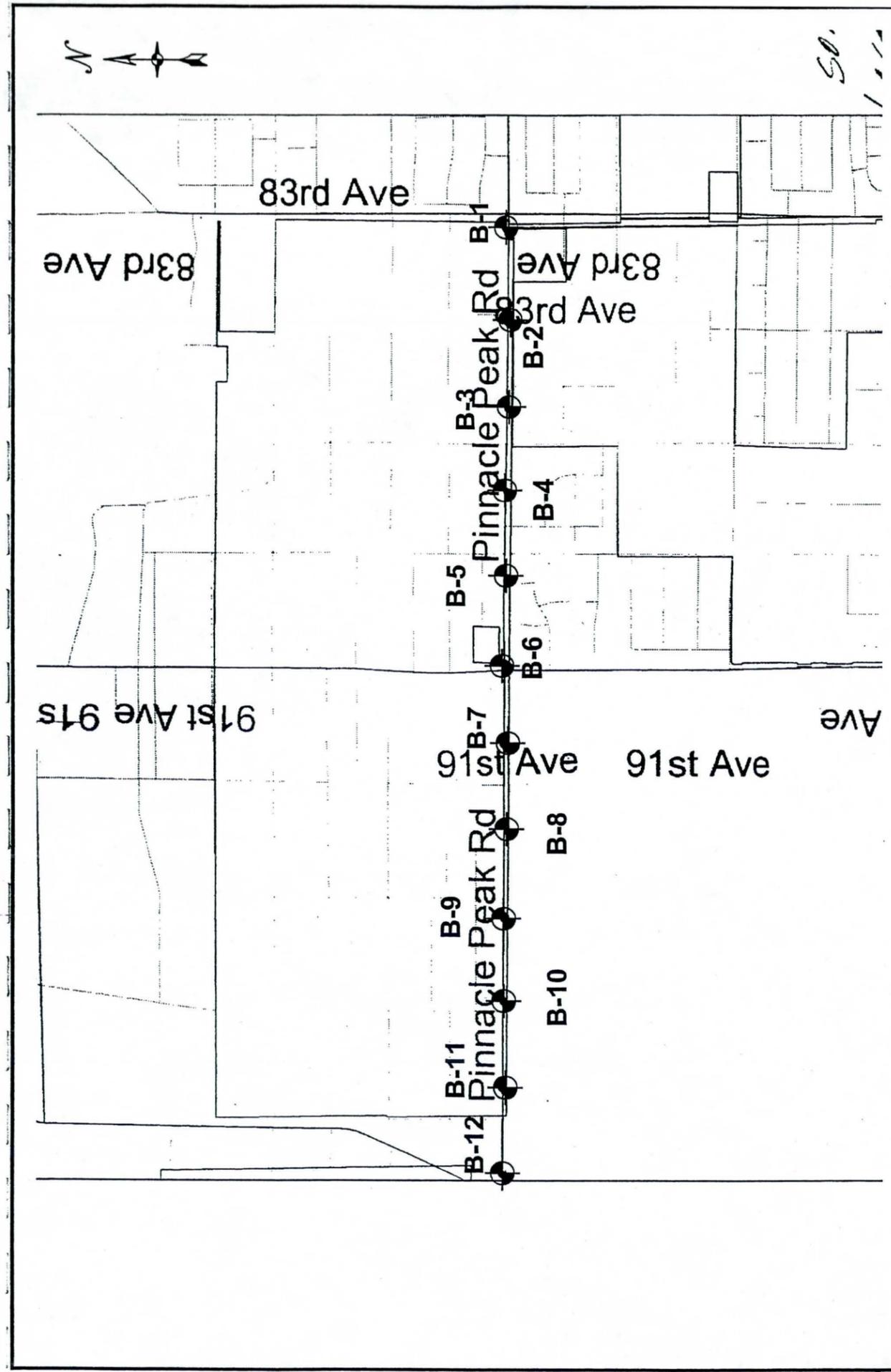
SWELL TEST DATA

DRAFT

FIELD AND LABORATORY INVESTIGATION

On March 31, 2003, soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan. All exploration work was carried out under the full-time supervision of our staff geologist, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a CME-75 truck-mounted drill rig utilizing 8-inch diameter hollow stem flight augers. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location.

Laboratory testing consisted of pH, resistivity, grain-size distribution, plasticity (Atterberg Limits) and R-value tests for classification and pavement design parameters. All field and laboratory data is presented in this appendix.



● - APPROXIMATE SOIL BORING LOCATIONS

SOIL BORING LOCATION PLAN

PINNACLE PEAK RD.
LAKE PLEASANT RD. TO 83RD AVE.
PEORIA, ARIZONA

DR: CMW CHK: GC REV: DATE: 04/15/03 PROJECT NO. 030210SA

**SPREEDIE
AND ASSOCIATES**
GEOTECHNICAL/ENVIRONMENTAL/MATERIALS ENGINEERS
3333 E. WOOD ST. PHOENIX, ARIZONA 85040 (602) 997-6391

SOIL LEGEND

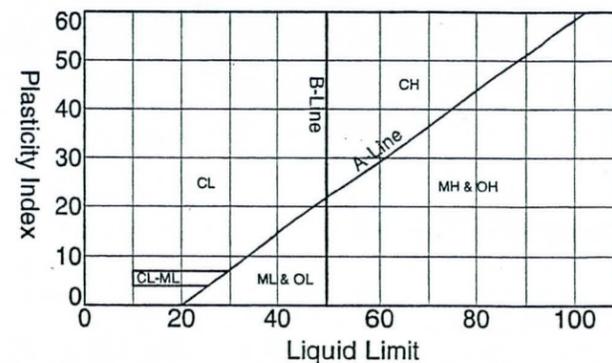
SAMPLE DESIGNATION	DESCRIPTION	
AS	Auger Sample	A grab sample taken directly from auger flights.
BS	Large Bulk Sample	A grab sample taken from auger spoils or from bucket of backhoe.
S	Spoon Sample	Standard Penetration Test (ASTM D-1586) Driving a 2.0 inch outside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the final 12 inches of penetration is the Standard Penetration Resistance.
RS	Ring Sample	Driving a 3.0 inch outside diameter spoon equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by the same means of the Spoon Sample. The blows required for the 12 inches of penetration are recorded.
LS	Liner Sample	Standard Penetration Test driving a 2.0-inch outside diameter split spoon equipped with two 3-inch long, 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil by the same means of the Spoon Sample.
ST	Shelby Tube	A 3.0-inch outside diameter thin-walled tube continuously pushed into the undisturbed soil by a rapid motion, without impact or twisting (ASTM D-1587).
--	Continuous Penetration Resistance	Driving a 2.0-inch outside diameter "Bullnose Penetrometer" continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12-inch increment are recorded.

CONSISTENCY			RELATIVE DENSITY	
Clays & Silts	Blows/Foot	Strength (tons/sq ft)	Sands & Gravels	Blows/Foot
Very Soft	0 - 2	0 - 0.25	Very Loose	0 - 4
Soft	2 - 4	0.25 - 0.5	Loose	5 - 10
Firm	5 - 8	0.5 - 1.0	Medium Dense	11 - 30
Stiff	9 - 15	1 - 2	Dense	31 - 50
Very Stiff	16 - 30	2 - 4	Very Dense	> 50
Hard	> 30	> 4		

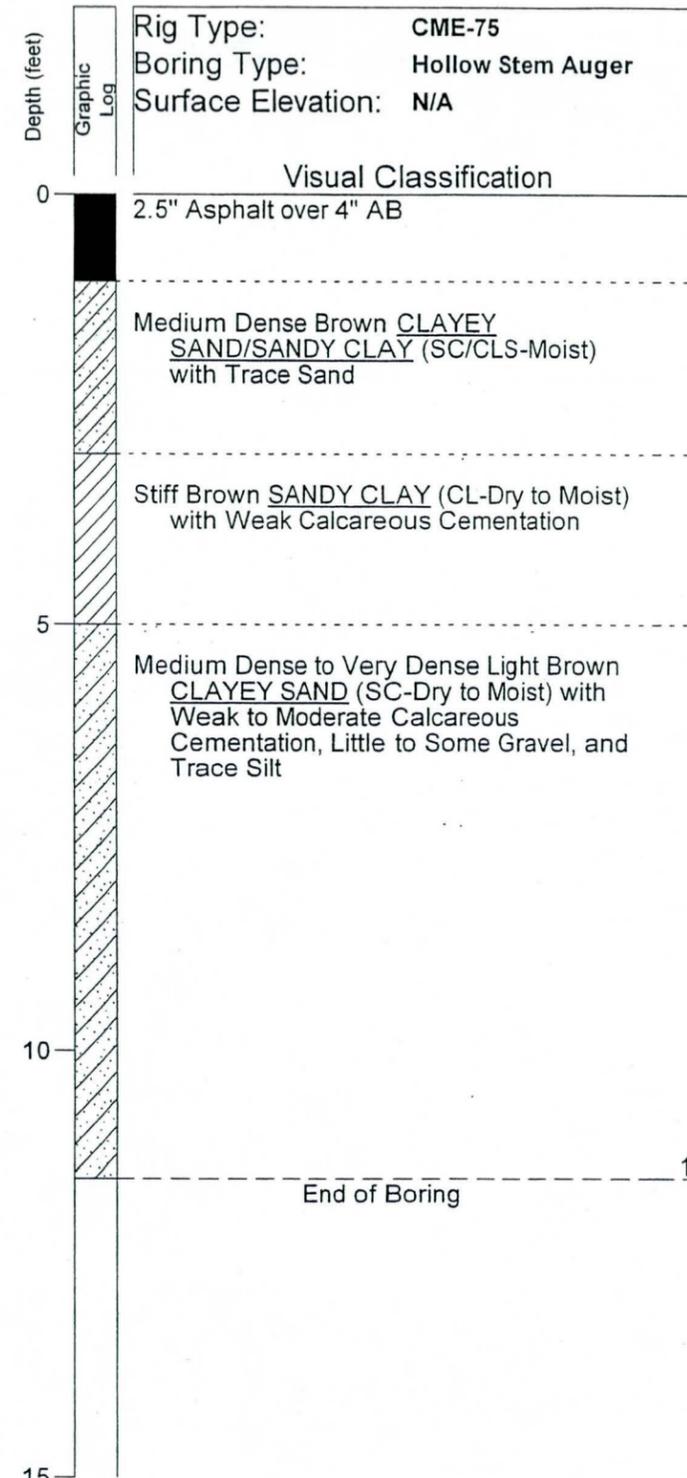
MAJOR DIVISIONS		SYMBOLS		TYPICAL DESCRIPTIONS	
		GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
			GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
				SM	SILTY SANDS, SAND-SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

MATERIAL SIZE	PARTICLE SIZE				
	Lower Limit		Upper Limit		
	mm	Sieve Size ♦	mm	Sieve Size ♦	
SANDS	Fine	0.075	#200	0.42	#40
	Medium	0.420	#40	2.00	#10
	Coarse	2.000	#10	4.75	#4
GRAVELS	Fine	4.75	#4	19	0.75" x
	Coarse	19	0.75" x	75	3" x
COBBLES	75	3" x	300	12" x	
BOULDERS	300	12" x	900	36" x	

♦U.S. Standard xClear Square Openings



NOTE: DUAL OR MODIFIED SYMBOLS MAY BE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS OR TO PROVIDE A BETTER GRAPHICAL PRESENTATION OF THE SOIL



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	
S-2	6.5	NT	NT	
S-3	11.5	NT	NT	

Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

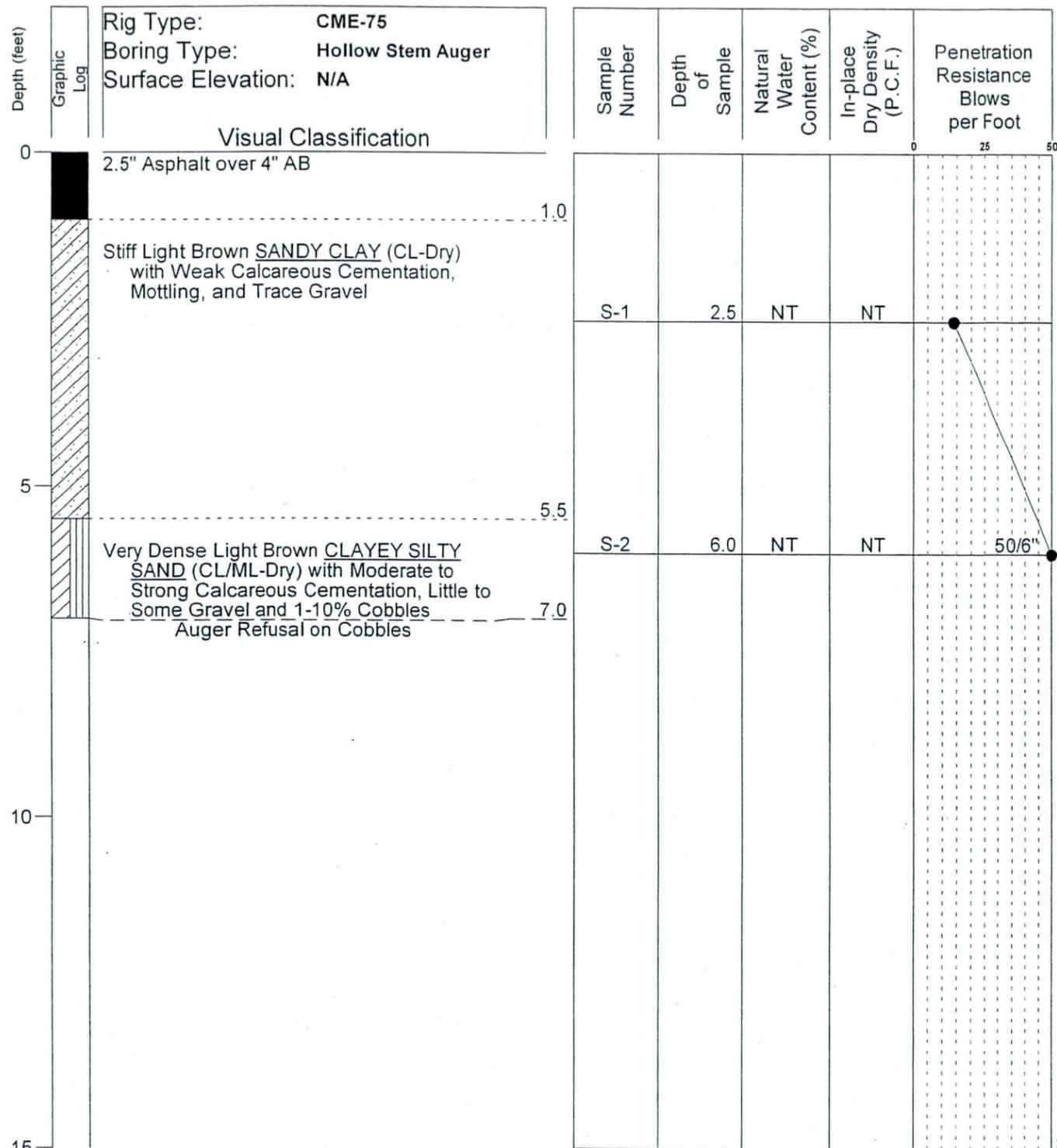
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-1**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA GPJ_GENGE0.GDT 4/28/03



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	
S-2	6.0	NT	NT	50/6"

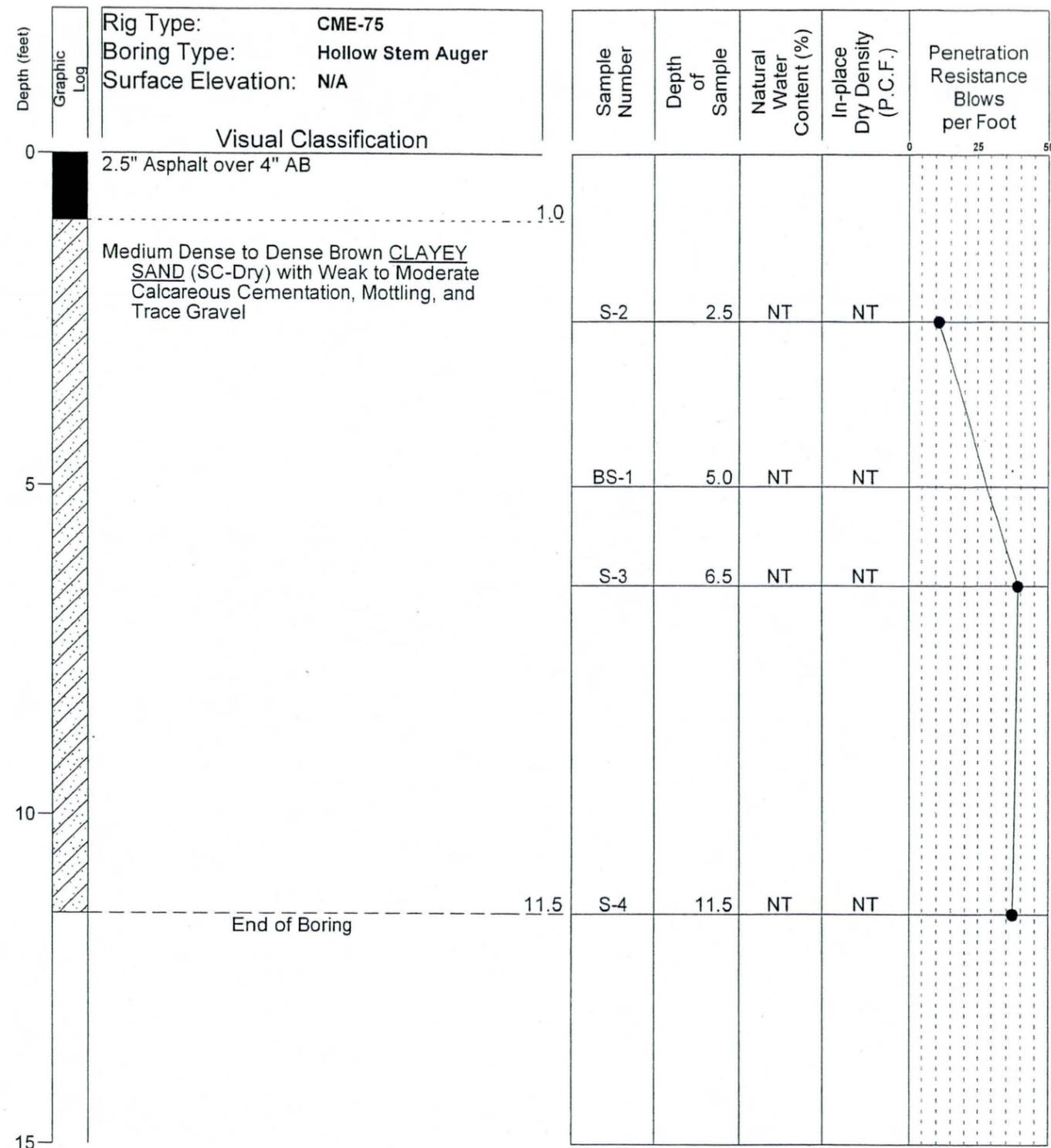
Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

SPEEDIE AND ASSOCIATES
 Log of Test Boring Number: B-2
 Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona
 Project No.: 030210SA

SPEEDIE 030210SA.GPJ GEN GEO.GDT 4/28/03



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-2	2.5	NT	NT	
BS-1	5.0	NT	NT	
S-3	6.5	NT	NT	
S-4	11.5	NT	NT	

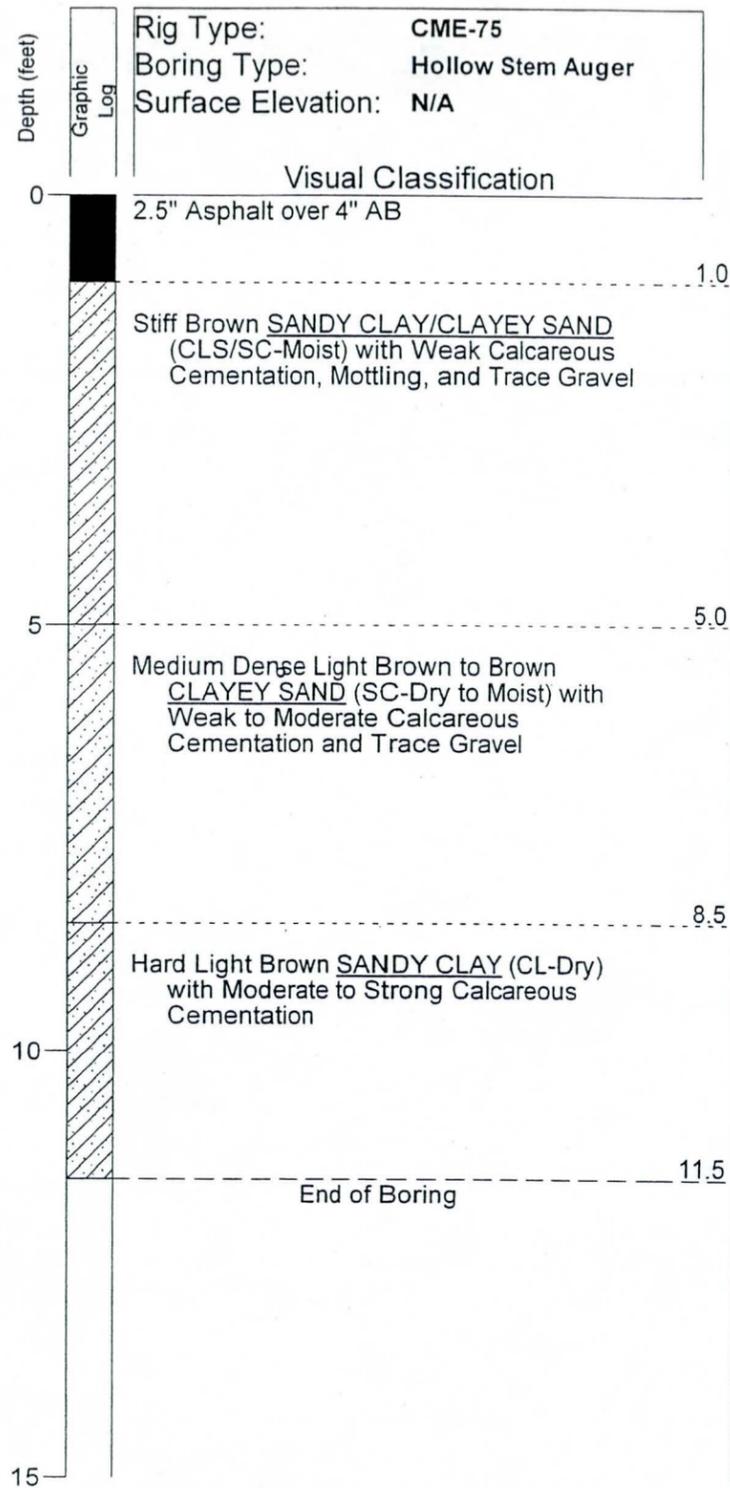
Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

SPEEDIE AND ASSOCIATES
 Log of Test Boring Number: B-3
 Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona
 Project No.: 030210SA

SPEEDIE 030210SA.GPJ GEN GEO.GDT 4/28/03



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	
S-2	6.5	NT	NT	
S-3	11.5	NT	NT	71/12"

Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

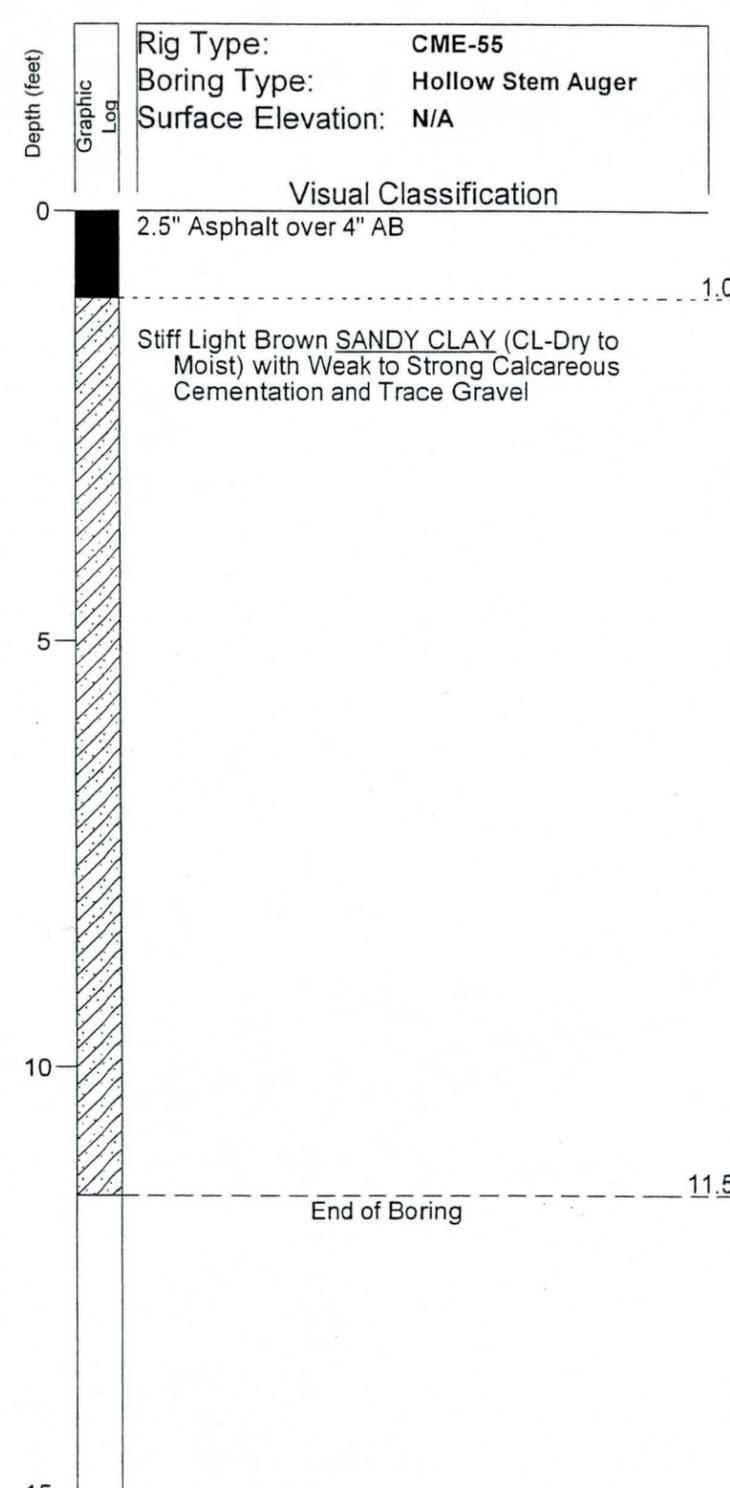
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B- 4**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GEN GEO.GDT 4/28/03



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	
S-2	6.5	NT	NT	
S-3	11.5	NT	NT	66/12"

Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

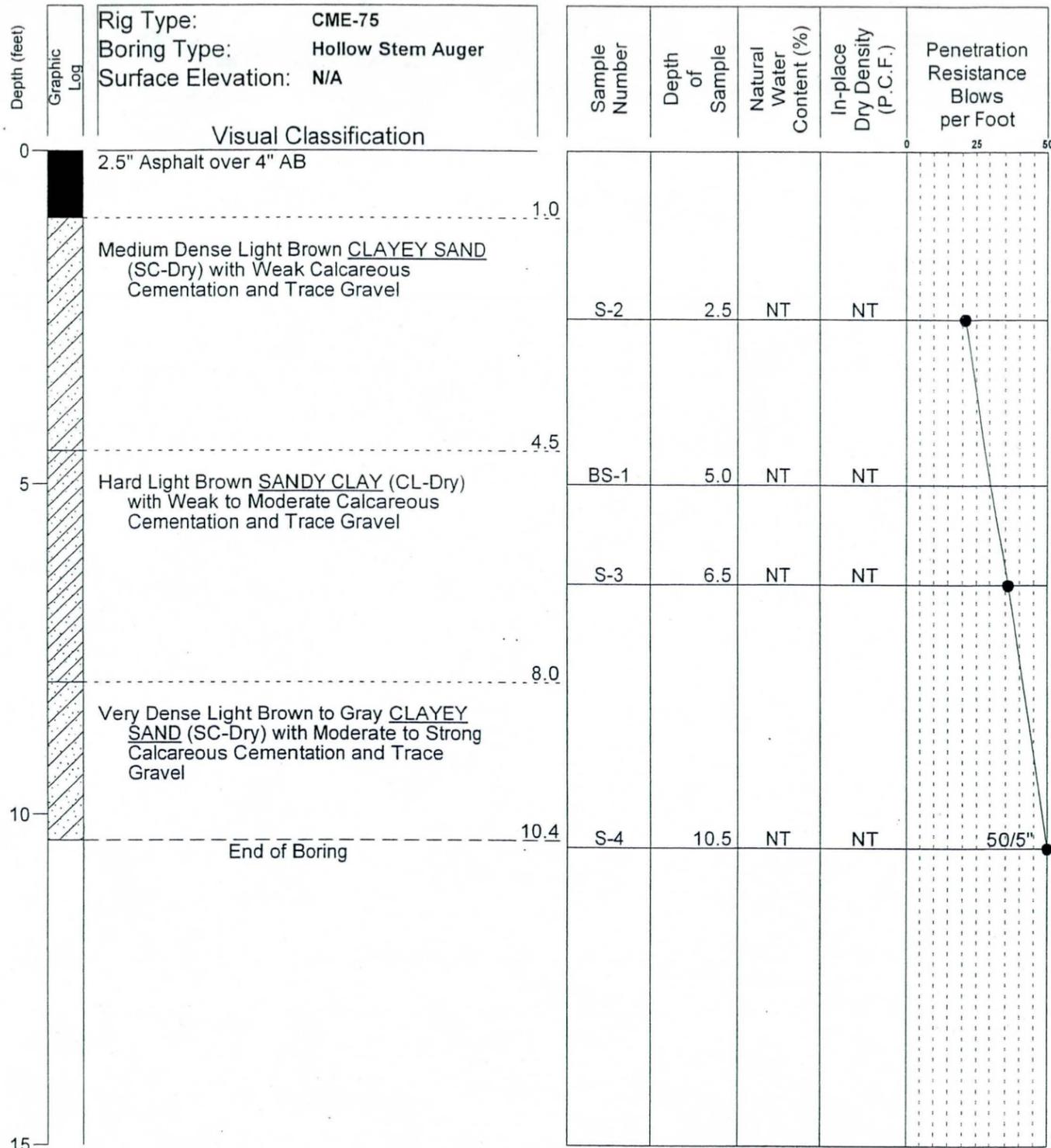
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B- 5**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GEN GEO.GDT 4/28/03



Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

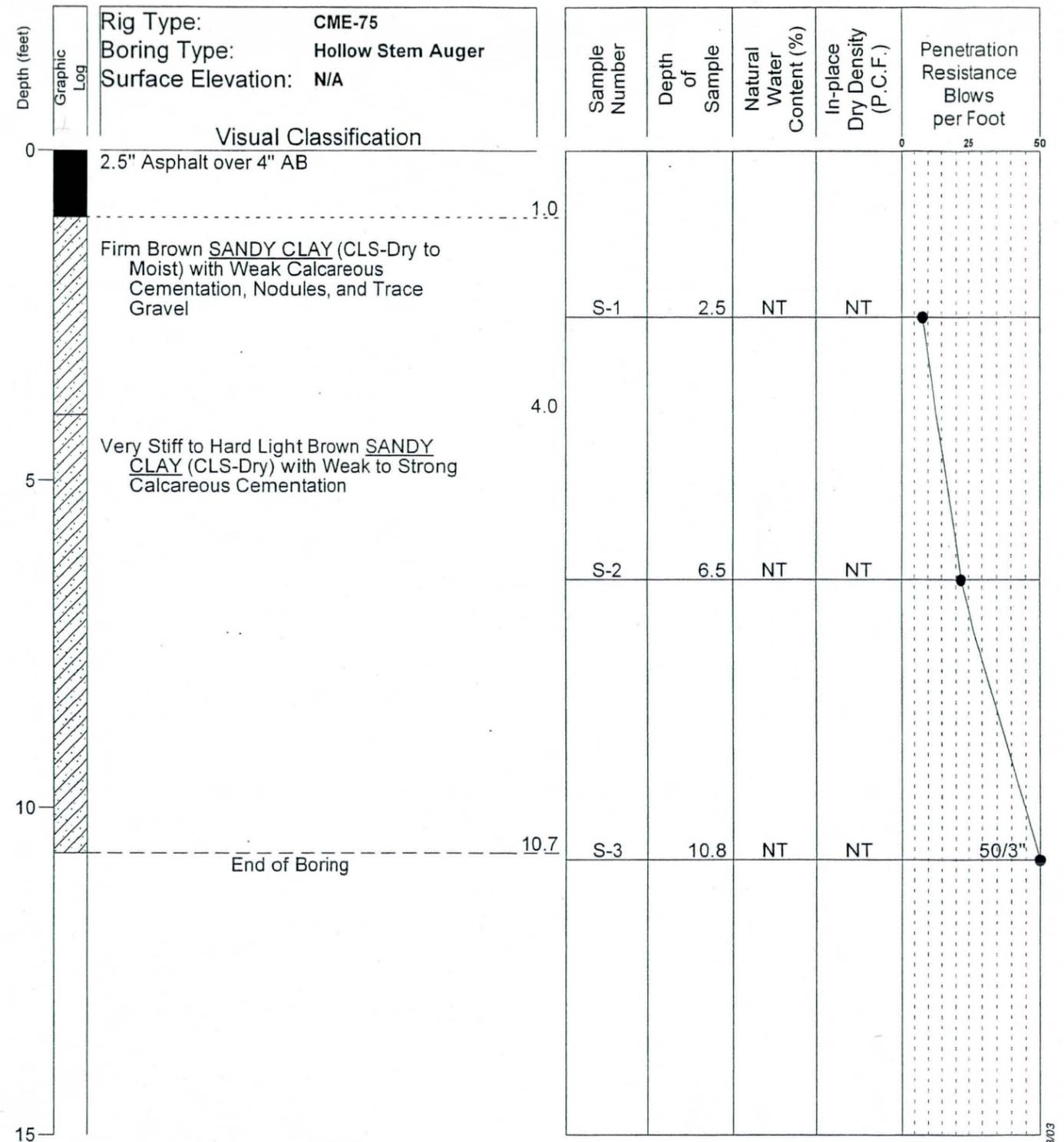
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B-6

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGE0.GDT 4/28/03



Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

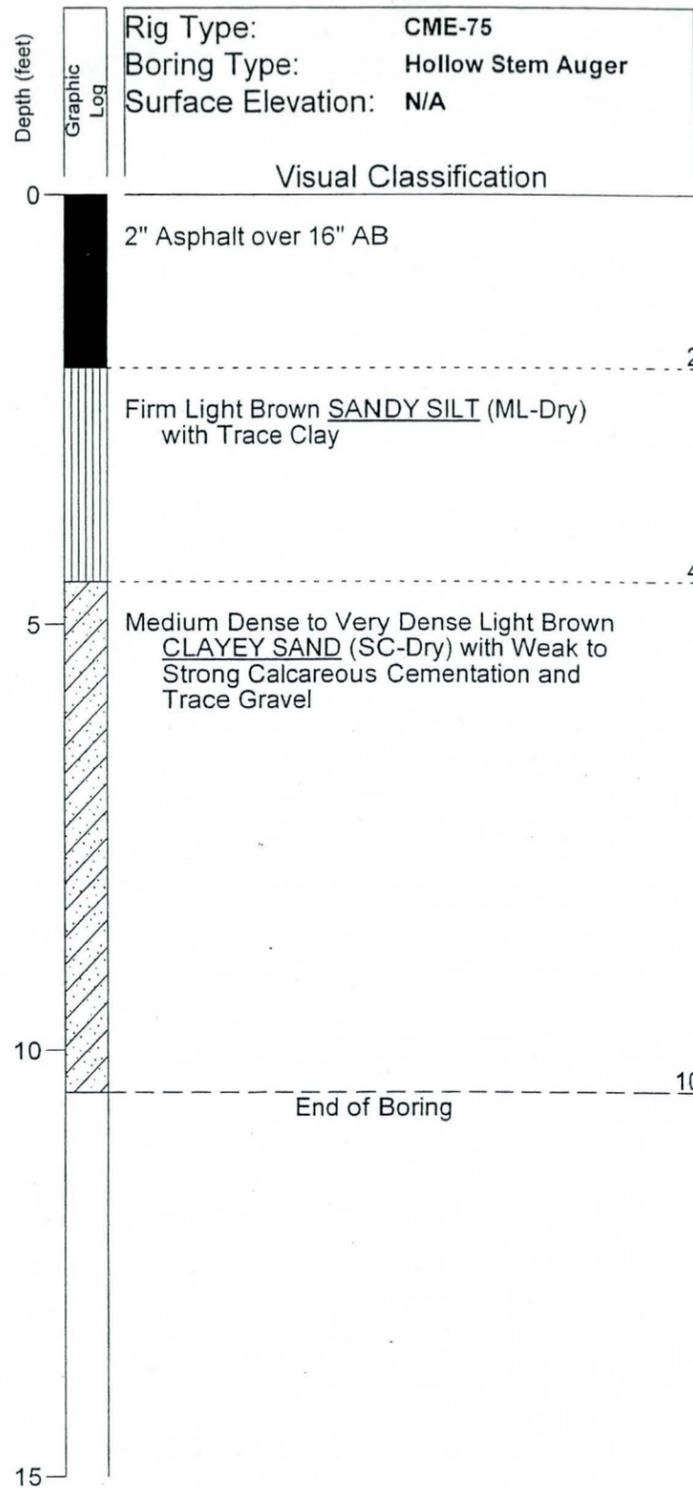
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: B-7

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGE0.GDT 4/28/03



Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	
S-2	6.5	NT	NT	
S-3	10.5	NT	NT	50/6"

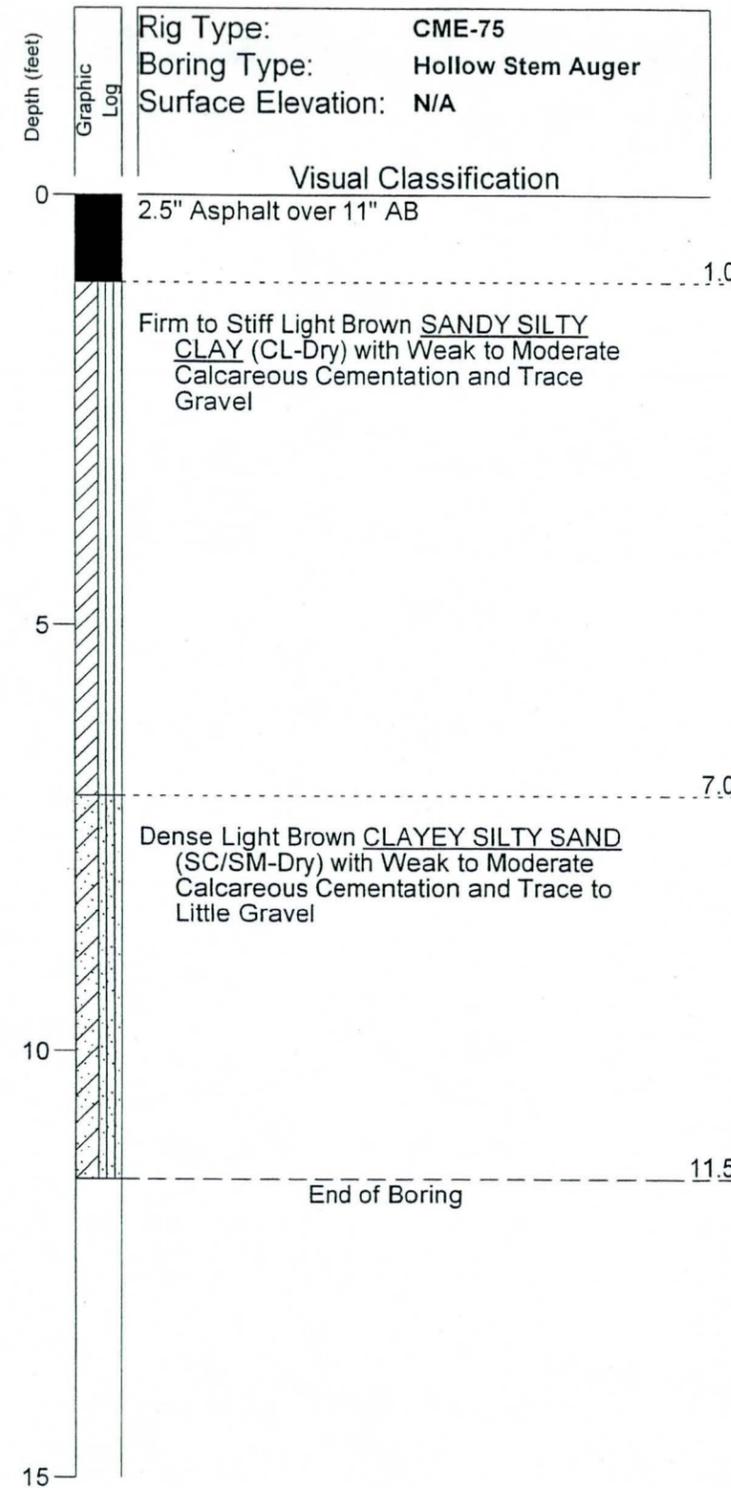
SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B- 8**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGEQ.GDT 4/28/03



Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-2	2.5	NT	NT	
BS-1	5.0	NT	NT	
S-3	6.5	NT	NT	
S-4	11.5	NT	NT	

SPEEDIE AND ASSOCIATES

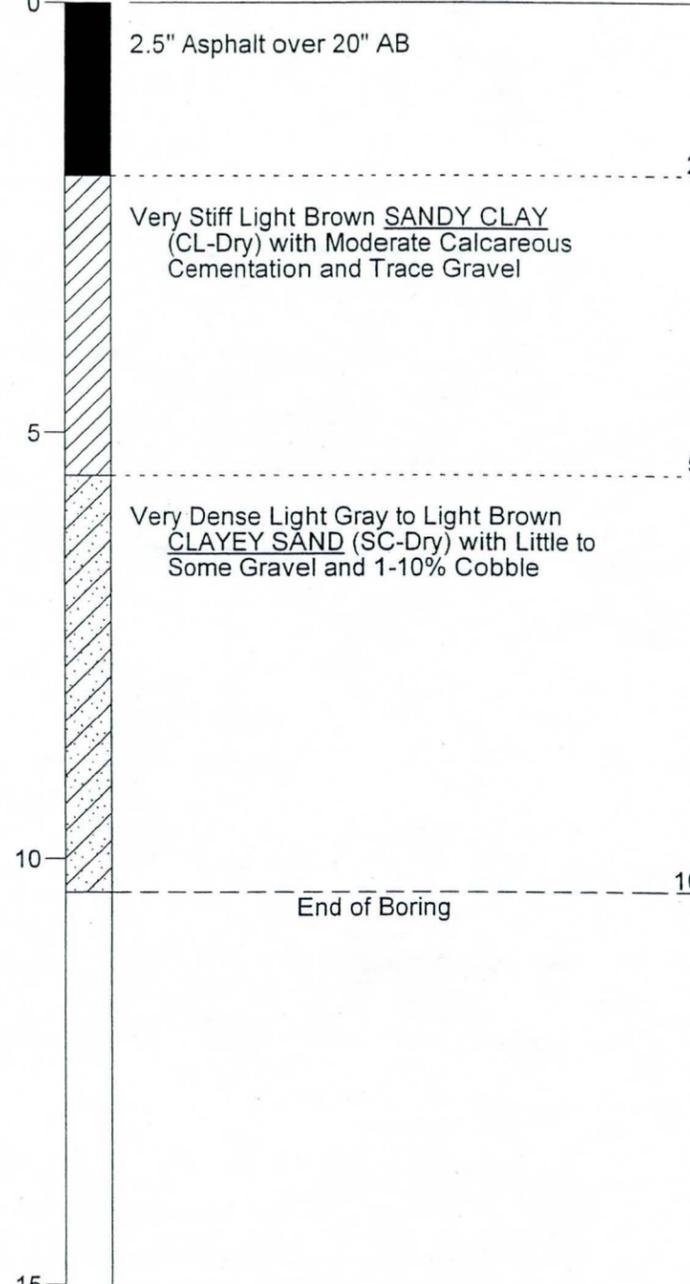
Log of Test Boring Number: **B- 9**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGEQ.GDT 4/28/03

Rig Type: CME-75
 Boring Type: Hollow Stem Auger
 Surface Elevation: N/A



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	2.5	NT	NT	50/4"
S-2	6.4	NT	NT	50/5"
S-3	10.4	NT	NT	50/5"

Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

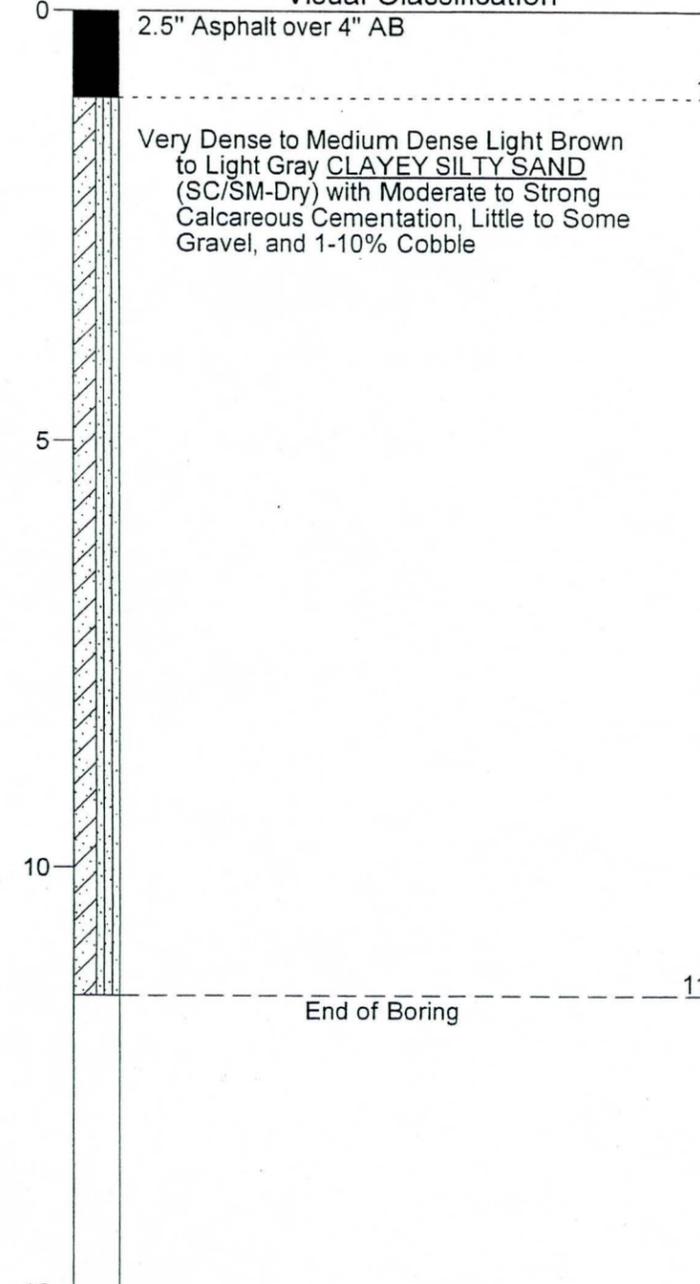
Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

SPEEDIE AND ASSOCIATES
 Log of Test Boring Number: B-10
 Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona
 Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGEODT 4/28/03

Rig Type: CME-75
 Boring Type: Hollow Stem Auger
 Surface Elevation: N/A



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	1.4	NT	NT	50/4"
S-2	5.5	NT	NT	50/6"
S-3	11.5	NT	NT	50/5"

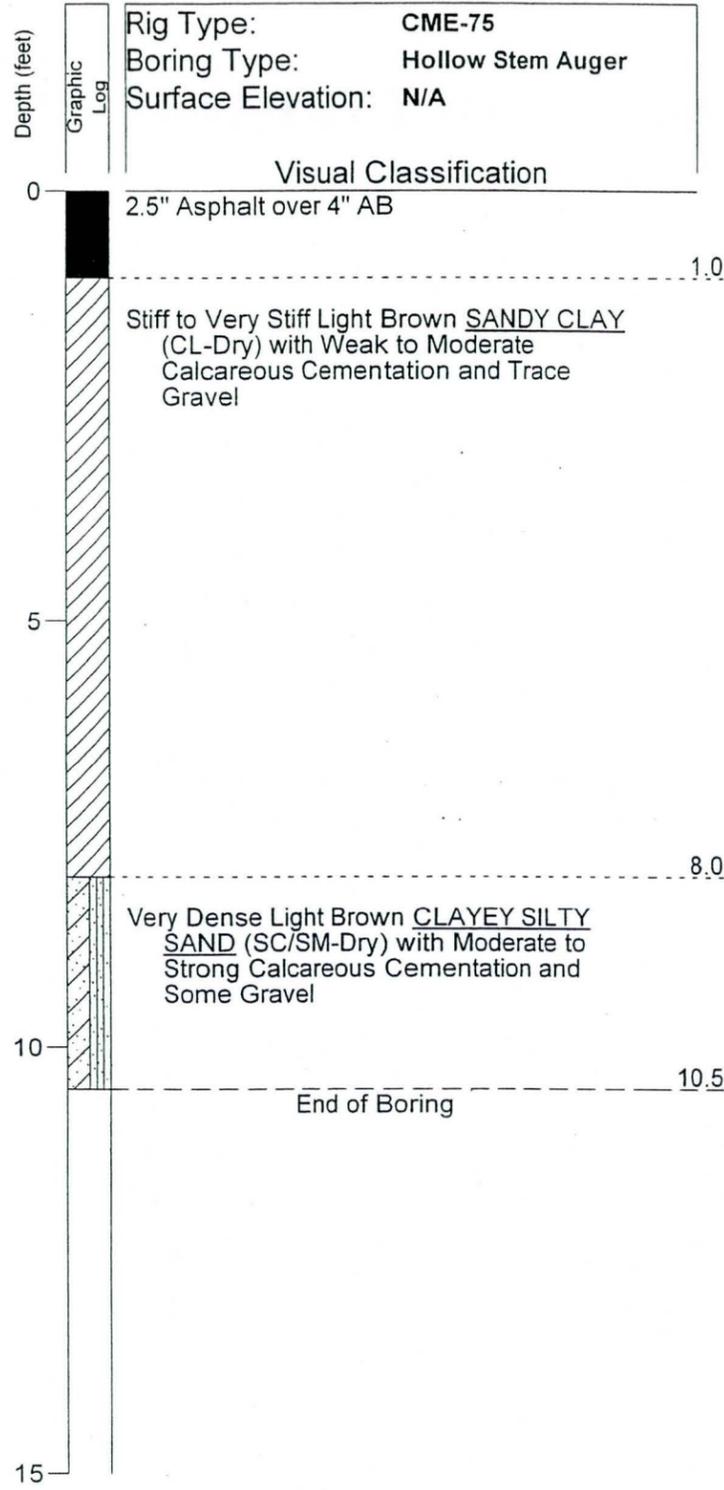
Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

SPEEDIE AND ASSOCIATES
 Log of Test Boring Number: B-11
 Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona
 Project No.: 030210SA

SPEEDIE 030210SA.GPJ GENGEODT 4/28/03



Rig Type: CME-75
 Boring Type: Hollow Stem Auger
 Surface Elevation: N/A

Visual Classification

Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-2	2.5	NT	NT	~15
BS-1	5.0	NT	NT	~25
S-3	6.5	NT	NT	~45
S-4	10.5	NT	NT	50/6"

Boring Date: 3-31-03
 Field Engineer/Technician: J. Laurie
 Driller: D. Arwood
 Contractor: Heber Mining

Depth	Hour	Date
Free Water was Not Encountered		

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-12**

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona

Project No.: 030210SA

TABULATION OF TEST DATA

SOIL BORING or TEST PIT NUMBER	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE INTERVAL (ft)	NATURAL WATER CONTENT (Percent of Dry Weight)	IN-PLACE DRY DENSITY (Pounds Per Cubic Foot)	PARTICLE SIZE DISTRIBUTION (Percent Finer)					ATTERBERG LIMITS			CORRELATED R VALUE	PH	RESISTIVITY (Ohm-Centimeters)	% SULFATE (SO4)	% CHLORIDE (CL)	UNIFIED SOIL CLASSIFICATION
						#200 SIEVE	#40 SIEVE	#10 SIEVE	#4 SIEVE	3" SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX						
B-1	S-1	SPT	1.0 - 2.5	NT	NT	58	78	95	99	100	40	15	25	17	NT	NT	NT	CL	
B-1	S-3	SPT	10.0 - 11.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	2666	NT	NT	CL	
B-2	S-1	SPT	1.0 - 2.5	NT	NT	61	83	98	100	100	41	15	26	16	NT	NT	NT	CL	
B-3	BS-1	BULK	0.0 - 5.0	NT	NT	39	61	79	90	100	43	19	24	22	1859	NT	NT	SC	
B-4	S-1	SPT	1.0 - 2.5	NT	NT	47	64	83	93	100	45	19	26	19	NT	NT	NT	SC	
B-4	S-3	SPT	10.0 - 11.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	2181	NT	NT		
B-5	S-3	SPT	10.0 - 11.5	NT	NT	48	74	92	98	100	101	31	70	3	NT	NT	NT	SC	
B-6	BS-1	BULK	0.0 - 5.0	NT	NT	47	68	88	94	100	33	18	15	29	1129	NT	NT	SC	
B-7	S-1	SPT	1.0 - 2.5	NT	NT	57	83	96	98	100	30	15	15	25	NT	NT	NT	CL	
B-8	S-1	SPT	1.0 - 2.5	NT	NT	53	82	95	98	100	26	25	1	46	NT	NT	ML		
B-9	BS-1	BULK	0.0 - 5.0	NT	NT	55	74	87	91	100	45	21	24	18	2058	NT	NT	CL	
B-10	S-1	SPT	1.0 - 2.5	NT	NT	51	74	89	94	100	27	15	12	31	NT	NT	CL		
B-11	S-2	SPT	5.0 - 5.5	NT	NT	18	31	48	62	100	35	26	9	56	NT	NT	SM		
B-12	BS-1	BULK	0.0 - 5.0	NT	NT	66	86	96	99	100	35	17	18	20	797	NT	NT	CL	

Sieve analysis results do not include material greater than 3". Refer to the actual boring logs for the possibility of cobble and boulder sized materials.

Pinnacle Peak Rd.
 Lake Pleasant Rd. to 83rd Ave.
 Peoria, Arizona
 Project No. 030210SA

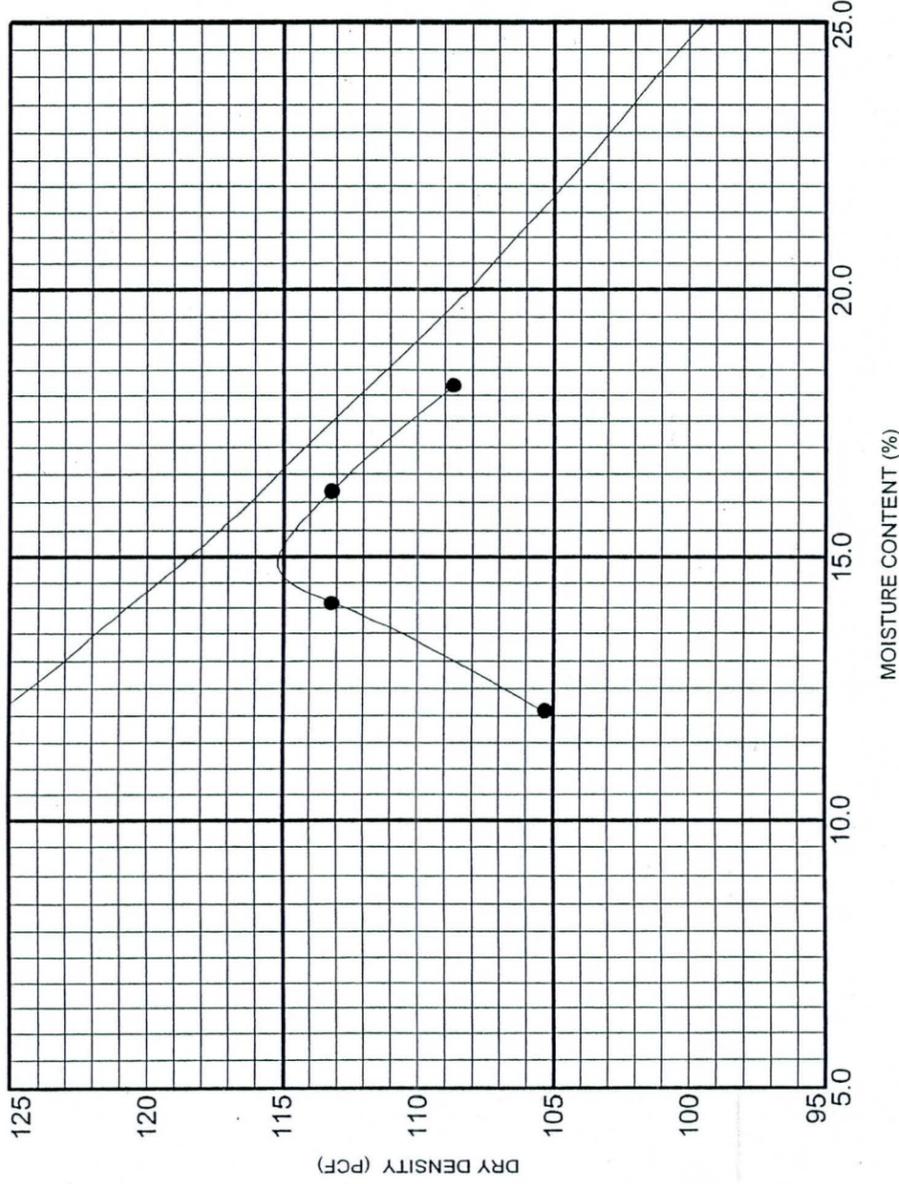


MOISTURE-DENSITY RELATIONS

PROJECT: Pinnacle Peak Rd. PROJECT NO.: 030210SA
 LOCATION: Lake Pleasant Rd. to 83rd Ave. DATE: 3/31/03
 BORING NO.: B-9 SAMPLE NO.: BS-1 SAMPLE DEPTH: 0 to 5 LABORATORY NO.: K9199
 METHOD OF COMPACTION: D698A
 LIQUID LIMIT: 45 PLASTIC LIMIT: 21 PLASTICITY INDEX: 24
 CLASSIFICATION: CL ASTM SOIL DESCRIPTION: SANDY LEAN CLAY

MAXIMUM DRY DENSITY: 115.2 PCF

OPTIMUM MOISTURE CONTENT: 14.9%



GEOTECH PROCTOR 030210SA.GPJ 4/28/03

SPEEDIE AND ASSOCIATES

SWELL TEST DATA

BORING or TEST PIT No.	SAMPLE DEPTH, ft	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	REMOLED DRY DENSITY (pcf)	INITIAL MOISTURE CONTENT (%)	PERCENT COMPACTION	FINAL MOISTURE CONTENT (%)	CONFINING LOAD (psf)	TOTAL SWELL (%)
B-9, S-2	2.5	115.2	14.9	109.7	13.2	95.2	20.8	100	5.2



APPENDIX E

PUBLIC INFORMATION

**MCDOT *RightRoads* Program
Summary of Public Involvement Meeting**

Pinnacle Peak Road
107th Avenue to 83rd Avenue
Design Concept Phase

Final Report
January 17, 2007

Meeting Date: December 4, 2006

Meeting Site: Sunrise Mountain Library
21200 N. 83rd Avenue, Peoria Arizona

Public Meeting

Participants: Tom Larson, MCDOT Project Manager
Roberta Crowe, MCDOT Planning
Mike Pavlina, MCDOT Planning
Doug LaMont, Parsons, Brinckerhoff, Quade and Douglas
Joy Melita, Parsons, Brinckerhoff, Quade and Douglas
Dave Moody, City of Peoria

Public Meeting Purpose

Public Involvement --- the Maricopa County Department of Transportation (MCDOT) RightRoads Program conducted this community open house meeting to discuss and gather public comment on conceptual design plans for roadway improvements to Pinnacle Peak Road between 107th Avenue and 83rd Avenue.

MCDOT, the Flood Control District of Maricopa County, the City of Peoria, Arizona State Land Department, impacted utilities, area developers, businesses and residents are all major stakeholders in this study. Public participation and multi-agency involvement aids in the development of a consistent roadway and the resolution of conflicting agency requirements while facilitating ultimate traffic flow and preserving the rights of adjacent property owners.

Gaining consensus among the partnering agencies and the public is critical to the success of this study and the future implementation of its recommendations to provide a safe and efficient roadway for the long term.

Project Background and Description:

The Maricopa County Department of Transportation (MCDOT), in partnership with the Flood Control District of Maricopa County (FCDMC) and the City of Peoria, is preparing a Design Concept Report (DCR) for a three-mile section of Pinnacle Peak Road between 107th Avenue the intersection of 83rd Avenue.

In 1999, MCDOT prepared a Candidate Assessment Report (CAR) for Pinnacle Peak Road from Lake Pleasant Pkwy to 83rd Avenue. The study recommended that an urban five-lane section be constructed symmetrically along the existing roadway centerline. Since the completion of the CAR, several projects have been initiated and/or completed that impact the CAR findings. These projects include the FCDMC Glendale/Peoria Area Drainage Master Plan Update (ADMP Update), the City of Peoria Lake Pleasant Parkway project between Williams Road and SR 74, and two interim signal projects on Pinnacle Peak Road at 91st Avenue (City of Peoria) and 83rd Avenue (MCDOT).

The DCR defines the project scope and identifies project issues. This information is then used to develop and evaluate roadway improvement alternatives subject to review of environmental conditions. The result is a recommended design alternative that can be evaluated for inclusion in MCDOT's Transportation Improvement Program (TIP) for final design or construction.

Through the course of this DCR, three alternatives for this segment of Pinnacle Peak Road have been developed and evaluated. All of the alternatives share the same urban typical section which is comprised of two through traffic lanes in each direction separated by a continuous left turn lane. Bike lanes, curb, gutter and sidewalk are also provided. The principal differences between the alternatives involve the roadway centerline alignment and roadway right-of-way width. The sidewalk width also varies between alternatives. All three alternatives require new right-of-way acquisition and utility relocation.

Improvements to several crossroads are also a critical element of this project. The crossroads fall within the City of Peoria jurisdiction. To accommodate the needed turn lane configurations at the intersections, widening along 91st Avenue, 89th Avenue, 87th Avenue and 83rd Avenue may be required. This DCR does not address the needed improvements to the cross roads beyond the curb return point.

Project Goals/Objectives

- Identify current corridor deficiencies
- Define long-term corridor needs and requirements
- Develop / evaluate alternatives
- Establish design criteria for future roadway
- Establish roadway operation and performance criteria
- Develop agreed-upon roadway plans and recommendations

Project Issues and Challenges

- Incorporate improvements identified in the Glendale/Peoria Area Drainage Master Plan (ADMP) and ADMP Updates
- Address current / future development
- Incorporate jurisdictional interests
- Address engineering challenges
- Consider roadway environment

DCR Phase Project Schedule

Project Start	April 2006
Draft DCR	November 2006
Public Input Meeting	December 4, 2006
Final DCR	February 2007

This project is currently unfunded and not programmed for final design or construction.

Public Comment

On December 4, 2006 approximately 50 people attended a public open house meeting to discuss and review conceptual plans for improvements to Pinnacle Peak Road between 107th Avenue and 83rd Avenue at Sunrise Mountain Library in Peoria.

This public meeting was conducted in an "open house" format. This provided a free, open and accurate exchange of information between area residents, with specific issues and questions, and the project team.

Comment sheets and project fact sheets were disseminated to attendees and study graphics and display exhibits presented information about the roadway alternatives.

The following are written comments received and comments received during discussions that project team members had with the attendees during the meeting:

- Existing access to the homes north of Pinnacle Peak Rd between 107th Ave and Lake Pleasant Pkwy is poor. The new improvements made to Lake Pleasant Pkwy limit access to right in and right out. As a result, some residents are required to make a lot of u-turns.
- A five-lane roadway between 107th Ave and Lake Pleasant Pkwy seems out of place. Keep roadway width and sidewalk width to a minimum.

- Connectivity between 107th Ave and Lake Pleasant Pkwy will increase commercial traffic on Pinnacle Peak Rd from the concrete plant heading north on Lake Pleasant Pkwy. This will negatively impact this highly residential area.
- Consider piping drainage instead of using an open channel in front of homes between 107th Ave and Lake Pleasant Pkwy.
- Alternative 3 does not offer any advantages over the other alternatives.
- I am hoping for two lanes each direction on Pinnacle Peak from 83rd to 91st Ave., along with a N. bound traffic light at 83rd and Pinnacle Peak with a dedicated left turn lane and signal to head west on Pinnacle Peak from 83rd Ave. I understand a traffic light is also projected for 91st Ave and Pinnacle Peak, if so, a dedicated RIGHT TURN LANE and dedicated signal both Westbound and Northbound would improve the flow of traffic at 91st Ave.
- The problem with Peoria is they never designate a specific lane for right hand turns and traffic backs up because the people going straight take the lane to turn right as is a **major** problem at 83rd Ave and Deer Valley intersection for those turning North onto 83rd Ave from Deer Valley. Designated right turn lanes should also be incorporated to improve the flow of traffic in this area as there are only 3 roads to head North out here.
- Thank you for your time and consideration of this matter.
- Residents do not want a roadway constructed from 107th to Lake Pleasant Pkwy.
- Consider constructing a cul-de-sac at the west end of the project to discourage through traffic.
- Residences North of Pinnacle Peak and west of Lake Pleasant Pkwy. need access.
- My husband and I are the property owners at 8708 W. Monte Lindo, (SW Corner of 87th Avenue & Pinnacle Peak Road). We oppose the Alternatives to widening Pinnacle Peak as proposed. While the City of Peoria or County already have ROW through to the fence line, Alternative 1 is the least obtrusive to our property, but it is still opposed if any change to our property line or HOA area should occur.
- Consideration should be given to traffic and related noise which is currently out of control.
- Rubberized pavement should be provided.
- Alternatives 2 and 3 are out of the question unless the county has the money to pay fair market value or above, plus moving expenses, sales commissions, etc., for properties that are valued at \$750,000 to \$1,000,000.
- I would suggest the road alignment shift to the north where there are unimproved or little improved county properties that are less expensive, and are an eyesore to the community. This would result in less expense to the county, overall, and could possibly help reduce noise for other residents by adding a landscaping buffer and rubberized pavement.
- Why not make it a parkway?
- Previous plans called for an equestrian trail along Pinnacle Peak. What happened to those? We have lots of horses in the area, and compare our area to Carefree.
- If the Southern section of Lake Pleasant Road at Williams or Daley were completed, and Happy Valley Road went through, much of the traffic would be taken off Pinnacle Peak, making it less of a traffic problem.
- We understand that drainage is an issue that needs to be addressed.

- Please note that the county is yet to pave all roads in the area, and dust and dirt continue to be a problem.
- Traffic speeds need to be monitored (especially on 87th Avenue).
- Thanks for your time!

Comments on Aerials (Post-it Note Comments)

- Provide multi-use/horse safe pathways and crossings
- Consider noise abatement
- Shift roadway to the north near 87th Ave to avoid property and HOA (Alternative 3).
- Use rubberized pavement.
- No more new ROW. I have already provided the County with ROW.
- Suggest improving Lake Pleasant Pkwy and direct traffic flow to it making Pinnacle Peak Rd only 3 lanes.
- Rubberized asphalt and noise barrier will be required in order to maintain the quiet neighborhoods in this area.
- Why 5-lanes?
- Improve drainage at 97th Ave.
- Widen 91st Ave first. Nothing has been done to help this area. 83rd Ave has already been improved.
- Provide unpaved multi-use path.
- Traffic volume does not justify a 5-lane roadway section.
- Use asphalt rubber overlay.
- BANANA (build absolutely nothing anywhere near anyone)

Outreach Methods

The following outreach methods were used to inform and notify the general public and impacted residents about the study and opportunities for input:

- Media releases
- Newspaper articles
- Display advertisements in local and regional publications
- MCDOT website
- Direct mail flyers to all property owners within one-half mile of project

Future Activities

Public input is an integral component of project development and is sought throughout the course of the project. Additional opportunities for public input will be provided during the Final Design Phase. Prior to construction, a Public Pre-Construction meeting will also be conducted.

For more information about the study, contact Tom Larson, MCDOT Project Manager, at 602/506-2166 or Roberta Crowe, MCDOT Public Information Officer, at 602/506-8003.

Pinnacle Peak Road

107th Avenue to 83rd Avenue

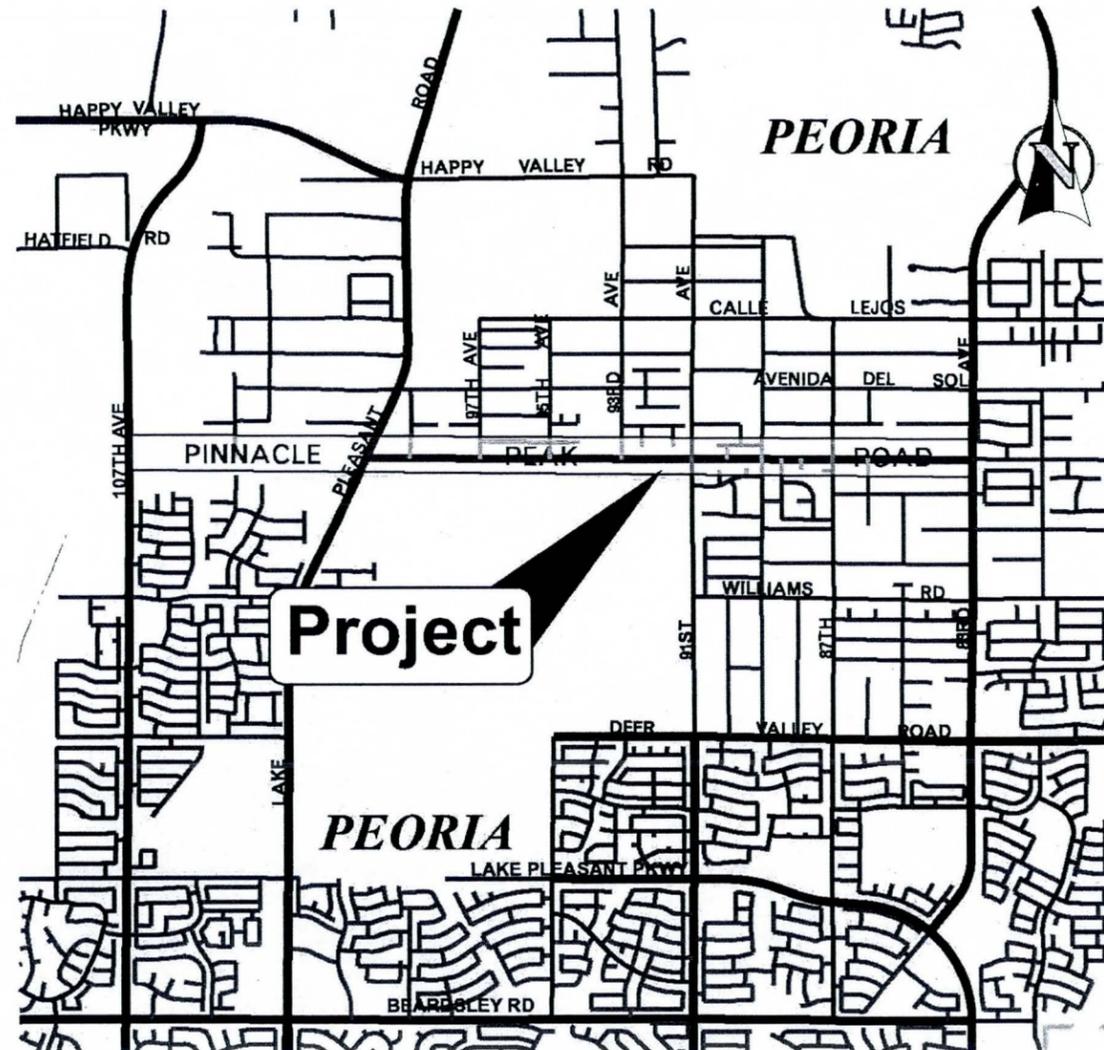
Design Concept Phase



The Right System The Right Time The Right Cost

Maricopa County Department of Transportation

December 4, 2006



Maricopa County
Department of Transportation

www.mcdot.maricopa.gov

Background Information

The Maricopa County Department of Transportation (MCDOT), in partnership with the Flood Control District of Maricopa County (FCDMC) and the City of Peoria, is in the process of preparing a Design Concept Report (DCR) for a section of Pinnacle Peak Road. The project is approximately three miles in length extending from the intersection of 107th Avenue east to the intersection of 83rd Avenue.

In 1999, MCDOT prepared a Candidate Assessment Report (CAR) for Pinnacle Peak Road from Lake Pleasant Pkwy to 83rd Avenue. The study recommended that an urban five-lane section be constructed symmetrically about the existing roadway centerline. Since the completion of the CAR, several projects have been initiated and/or completed that impact the CAR findings. These projects include the FCDMC Glendale/Peoria Area Drainage Master Plan Update (ADMP Update), the City of Peoria Lake Pleasant Parkway project between Williams Road and SR 74, and two interim signal projects on Pinnacle Peak Road at 91st Avenue (City of Peoria) and 83rd Avenue (MCDOT).

Study Purpose

- Respond to regional growth and local development
- Investigate the operational and capacity characteristics of the roadway
- Recommend needed improvements
- Implement regional transportation plans

Project Description

The DCR defines the project scope and identifies project issues. This information is then used to develop and evaluate roadway improvement alternatives subject to review of environmental conditions. The result is a recommended design alternative that can be evaluated for inclusion in MCDOT's Transportation Improvement Program (TIP) for final design or construction.

Through the course of this DCR, three alternatives for this segment of Pinnacle Peak Road have been developed and evaluated. All of the alternatives share the same urban typical section which is comprised of two through

traffic lanes in each direction separated by a continuous left turn lane. Bike lanes, curb, gutter and sidewalk are also provided. The principal differences between the alternatives involve the roadway centerline alignment and roadway right-of-way width. The sidewalk width also varies between alternatives. All three alternatives require new right-of-way acquisition and utility relocation.

Improvements to several crossroads are also a critical element of this project. The crossroads fall within the City of Peoria jurisdiction. To accommodate the needed turn lane configurations at the intersections, widening along 91st Avenue, 89th Avenue, 87th Avenue and 83rd Avenue may be required. This DCR does not address the needed improvements to the cross roads beyond the curb return point.

Goals and Objectives

- Identify current corridor deficiencies
- Define long-term corridor needs and requirements
- Develop / evaluate alternatives
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- Develop agreed-upon roadway plans and recommendations

Issues and Challenges

- Incorporate improvements identified in the Glendale/Peoria Area Drainage Master Plan (ADMP) and ADMP Updates
- Address current / future development
- Incorporate jurisdictional interests
- Address engineering challenges
- Consider roadway environment

For more information, contact Tom Larson at (602) 506-2166 or write to him at:
MCDOT, 2901 W. Durango Street, Phoenix, AZ 85009, or e-mail at: thomaslarson@mail.maricopa.gov.

Project Stakeholders

- Maricopa County Department of Transportation
- Flood Control District of Maricopa County
- City of Peoria
- Arizona State Land Department
- Impacted Utilities
- Area Developers, Businesses and Residents

DCR Phase Project Schedule

Project Start	April 2006
Draft DCR	November 2006
Public Input Meeting	December 4, 2006
Final DCR	February 2007

**This project is currently unfunded and not programmed for final design or construction.*

Estimated Probable Project Cost

Alternative 1 <i>Section Line Alignment with Variable Right-of-Way Width</i>	\$24,100,000
Alternative 2 <i>Section Line Alignment with 65-foot Right-of-Way Width</i>	\$30,400,000
Alternative 3 <i>Southern Alignment with 65-foot Right-of-Way Width</i>	\$37,500,000

**Public Involvement
Design Concept Phase**

Public input is an integral component of project development and is sought throughout the course of the project. Additional opportunities for public input will be provided during the Final Design Phase and prior to construction. A Public Pre-Construction meeting will also be conducted.

Existing/Future ADT's (Average Daily Traffic)

Roadway Segment	2006	2030	2030 vs. 2006 (% Increase or decrease)
107th Avenueto Lake Pleasant Parkway		5,347	
Lake Pleasant Parkway to 91st Avenue	4,861	6,212	28%
91st Avenueto 83rd Avenue	7,182	6,909	-4%

Evaluation of Alternatives Matrix

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Description	<ul style="list-style-type: none"> • Roadway Typical Section consists of 2 through lanes and a bike lane in each direction separated by a continuous left turn lane with curb, gutter and sidewalk. • Sidewalk width is 5 ft. • Roadway centerline is on section line (existing roadway centerline) except at the Lake Pleasant Pkwy intersection and between Lake Pleasant Pkwy and 91st Ave. • Right-of-Way width varies between 55 ft and 65 ft from the roadway centerline. 	<ul style="list-style-type: none"> • Roadway Typical Section consists of 2 through lanes and a bike lane in each direction separated by a continuous left turn lane with curb, gutter and sidewalk. • Sidewalk width is 8 ft. • Roadway centerline is on section line (existing roadway centerline) except at the Lake Pleasant Pkwy intersection and between Lake Pleasant Pkwy and 91st Ave. • Right-of-Way width is 65 ft from the roadway centerline. 	<ul style="list-style-type: none"> • Roadway Typical Section consists of 2 through lanes and a bike lane in each direction separated by a continuous left turn lane with curb, gutter and sidewalk. • Sidewalk width is 8 ft. • Roadway centerline is south of section line (existing roadway centerline) for most of the project limits. • Right-of-Way width is 65 ft from the roadway centerline.
Advantages	<ul style="list-style-type: none"> • Least number of residential properties impacted. • Least length of privacy walls that must be reconstructed. 	<ul style="list-style-type: none"> • Meets minimum Right-of-Way requirements. • Allows space for a continuous 8 foot sidewalk. 	<ul style="list-style-type: none"> • Least disruption to traffic since the existing roadway can be utilized while new roadway is being constructed. • Meets minimum Right-of-Way requirements. • Allows space for a continuous 8 foot sidewalk.
Disadvantages	<ul style="list-style-type: none"> • Drainage flows are conveyed in a box culvert between 91st Ave and 83rd Ave, which is more costly than an open channel. • Does not provide minimum Right-of-Way width per MCDOT and City of Peoria Typical Sections. 	<ul style="list-style-type: none"> • Drainage flows are conveyed in a box culvert between 91st Ave and 83rd Ave, which is more costly than an open channel. • Additional Right-of-Way is required from homeowners north and south of Pinnacle Peak. • Privacy walls must be reconstructed. • Irregular pattern of impact to residences. 	<ul style="list-style-type: none"> • Greatest number of residential properties impacted. • Greatest area of additional Right-of-Way is required from homeowners south of Pinnacle Peak Rd. • Longest length of privacy walls that must be reconstructed. • Box culverts must be provided for driveways to cross open channel.
New Right-of-Way Required	22.4 Acres	24.8 Acres	28.8 Acres
Impacted Properties	4 Residential Properties 0 Businesses	11 Residential Properties 1 Church (Potentially)	21 Residential Properties 1 Church
Costs	\$24,100,000	\$30,400,000	\$37,500,000
B/C Ratio			
Net Benefits (NPV) (In millions)			
Assumptions	1) Right-of-Way width is 130 ft total from MCDOT Roadway Design Manual. 2) Right-of-Way cost was approximated, to be updated with current information from MCDOT Right-of-Way Group. 3) Right-of-Way width does not include FCDMC improvements from ADMP Update.		
Recommendation	To be made after receiving input from the community		



Pinnacle Peak Road 107th Avenue to 83rd Avenue Design Concept Phase

Study Purpose

- Respond to regional growth and local development
- Investigate the operational and capacity characteristics of the roadway
- Recommend needed improvements
- Implement regional transportation plans

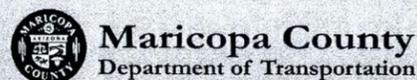
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12/04/2006

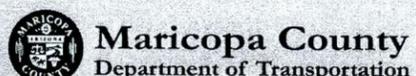


Pinnacle Peak Road 107th Avenue to 83rd Avenue Design Concept Phase

Project Stakeholders

- Maricopa County Department of Transportation
- Flood Control District of Maricopa County
- City of Peoria
- Arizona State Land Department
- Impacted Utilities
- Area Developers, Businesses and Residents

12/04/2006





Pinnacle Peak Road

107th Avenue to 83rd Avenue
Design Concept Phase

DCR Phase Project Schedule

Project Start April 2006

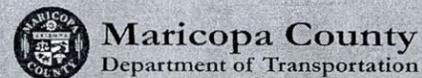
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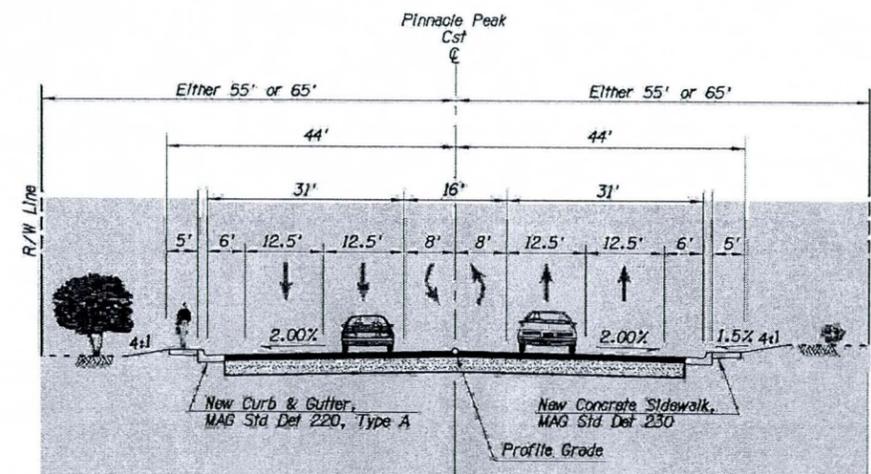
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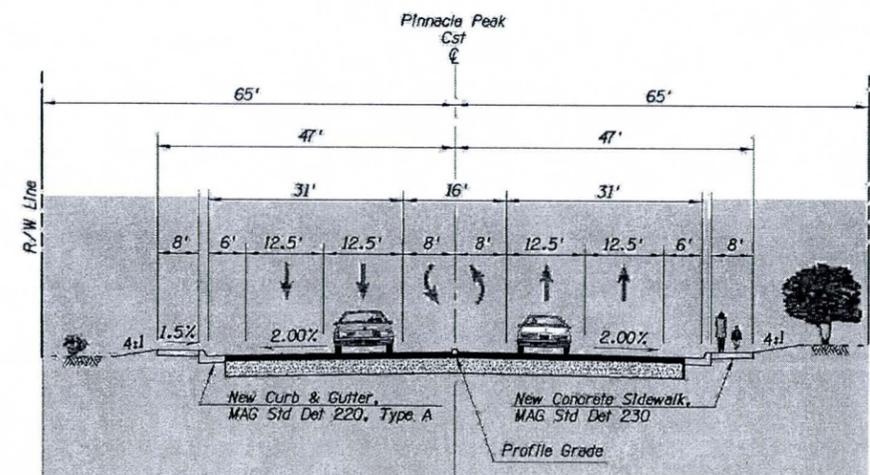


Pinnacle Peak Road

107th Avenue to 83rd Avenue
Design Concept Phase

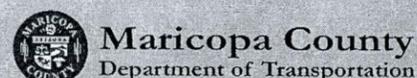


ALTERNATIVE 1



ALTERNATIVES 2 & 3

12/04/2006





Pinnacle Peak Road

107th Avenue to 83rd Avenue

Design Concept Phase

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12/04/2006



Maricopa County
Department of Transportation





Pinnacle Peak Road

107th Avenue to 83rd Avenue

Design Concept Phase

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12/04/2006

