September 30, 2010

Avenue 12 Enhancement Study: Transportation Plan (Final Report)

California Polytechnic State University, *California Polytechnic State University*

Avenue 12 Enhancement Study: Transportation Plan

(Final Report)

Prepared for

The Madera County Resource Agency

Madera, CA

Prepared by

California Polytechnic State University

San Luis Obispo, CA 93407

September 30, 2010

Table of Contents

List of Tables

List of Figures

Summary

Project

This report documents the Transportation Plan prepared as part of the Avenue 12 Enhancement project. The project has three distinct, but interrelated parts: (a) Community Visioning; (b) a Commercial Area Redesign Plan; and (c) a Transportation Plan. The latter two Plans were guided by a community-visioning process in which stakeholders determined how best to preserve their community's rural identity and enhance their quality of life in the face of their imminent changing surroundings.

Avenue 12 is currently a 2-lane country road which connects Highway 99 (SR 99) to the west and Highway 41 (SR 41) to the east. It bisects the southern commercial portion of the town of Madera Ranchos, which lies in the southeastern area of Madera County.

Several future development projects are proposed for new residential and commercial developments in areas located both east and west of the Ranchos, many of which are located on Avenue 12. The additional vehicle trips to be associated with these developments are anticipated to severely impact traffic flow on Avenue 12. The purpose of the Enhancement Plan is to develop a scenario through which the character of the Ranchos can be maintained, whilst accommodating rural development and the anticipated traffic growth along the Avenue 12 corridor. The project also includes the construction of a by-pass along Avenue 12 just to the south of the Ranchos. For medium and long term future conditions, this by-pass is included in the analysis.

Travel Alternatives

The Madera Ranchos area is a rural, low density, middle income community surrounded by agricultural uses. There are currently no viable transit alternatives to the private automobile. The focus of the study is thus primarily on private vehicle travel within and through the Ranchos. However, complete street principles are comprehensively utilized with the Ranchos to incorporate alternative modes of travel e.g. walking and bicycling.

Existing Levels of Service

Current traffic volumes are rural in character (relatively low when compared to urban areas, resulting in acceptable levels of service on Avenue 12 and parallel east-west routes throughout the day. The only exception is the finding of border-line acceptable level of service on Avenue 12 near Sate Route (SR) 41

Baseline Future

An evaluation of baseline future conditions revealed the following:

- Accuracy of the future baseline conditions, when compared to the County's travel demand model, is fair
- The two most recent impact reports (Tesoro Viejo and Gunner Ranch West) are both based on the County's Rio Mesa Model for 2025
- Available projections in these recent studies do not include concentrations of development proposals along Avenue 12.
- Nevertheless, projections suggest poor operating conditions on Avenue 12 by 2025.

- Future conditions on Avenue 12 are bound to be worse than thus far projected when trips associated with proposed new developments not included in the Rio Mesa Model are considered.

Overview of Potential Future Conditions

An assessment of potential future conditions points to significant changes in development proposals (+40%) and changes in locations of development proposals. This necessitated a new set of future projections under the changed circumstances. Trip generation, trip distribution and manual trip assignments were conducted for future conditions in the Avenue 12 area of Madera County assuming all proposed developments were implemented. The study also identified potential impacts of the new developments and possible measures to mitigate their traffic impacts.

Trip Generation

Trips were generated according to rates published by the Institute of Transportation Engineers (ITE). The trips were further adjusted for on-site (internal) capture at mixed use developments and pass-by capture for other retail uses.

Trip Distribution

Morning peak and afternoon peak distributions of traffic flows across a cordon around the study area track distributions of Ranchos residents to employment locations well, since the cordon distributions were combined with those reflected in the census data to derive directional distribution of trips used in this study.

Trip Assignment

Trip assignment in the four-step travel analysis process was initially based on an all-or-nothing assumption of trips taking the shortest travel time path between origins and destinations with a concentration of access via Avenue 12. Results indicated **significant increases in peak period traffic flow** if all developments were implemented as proposed. Even four lanes on Avenue 12 could not accommodate peak hour volumes and initial projected peak directional volumes could reach 5,500 vehicles per peak hour. New assignments were thus performed, in which travelers would use available back roads and redistribute through the broader road network to achieve a balanced or equilibrium flow.

Future Levels of Service

Levels of service (LOS) analyses were performed for key intersections on Avenue 12 to assess traffic impacts. The intersections include Avenue 12 at: (a) Road 35; (b) Road 36; (c) Road 38; (d) SR 41 SB; and (e) SR 41 NB. LOS analyses were conducted for morning and afternoon peak hours under two scenarios: (a) one without a bypass and (b) one with a proposed bypass around the central section of the Ranchos, with approximate limits from Road 35 to Road 38.

Without the bypass, LOS would be poor at all the key intersections signifying the same operating conditions along most of Avenue 12. With the bypass, LOS would be acceptable (at D or better) at the key intersections signifying the same operating conditions along the central section of Avenue 12.

Potential Improvement Measures

The analyses indicates that geometric improvements on Avenue 12 and the general Ranchos area are required to attain acceptable operating conditions under equilibrium flow conditions. The improvement options include the following:

1. Widening of Avenue 12 (as included in the financially constrained transportation improvement plan [TIP] for the area) to a three to four lane road.

2. Separate left and right turn bays at major intersections along Avenue 12.

3. Either a bypass for a 3- or 4-lane Avenue 12 through the central Ranchos or widening of Avenue 12 to 6 lanes

4. A grade separated Interchange at Avenue 12 and SR 41 (per the financially constrained TIP).

5. Four lanes on selected north-south roads (Road 33½, Road 36, and Road 39 ½) that are deemed necessary to provide interconnection with other east-west avenues.

6. Extension of the selected north-south roads to connect with all the east-west avenues.

Circulation Plan

Overview of Circulation Plan

The results of the transportation analyses were combined with community visions and the urban design plan to derive a set of recommendations for future transportation improvements along the Avenue 12 corridor and in the general study area. Specific elements addressed in the plan include: (a) area-wide roadway improvements; (b) Avenue 12 specific roadway improvements; (c)public transportation service to and from the Ranchos; (d) Bicycling and walking facilities in the Madera Ranchos area. Additional details with diagrams are included in Chapter 9 of this report. Layouts and cross sections are included in Chapter 10.

Area-wide Improvements

Improvements necessary for the area-wide transportation system to function properly under future build conditions include **widening on the major east-west routes** (Avenue 9, Avenue 12, Avenue 15 and SR 145). Hand in hand with these improvements will be the need to **extend and widen selected north-south roads** (Road 33½, Road 36, and Road 39 ½) to create a grid network of major arteries that would enable alternative route choices and distribution of trips for an efficient circulation system

Avenue 12 at Express Bypass

There are three possible **geometric configurations of the connecting points** between Business 12 and the Express Bypass. Depending on funding and growth in traffic, it is conceivable that these connecting points may take on each of these configurations at various points in time. The first is a signalized intersection. The second, which is an alternative to the first as an initial treatment, is a roundabout. The third, which is an upgrade to the first two, is an interchange.

Traffic Calming and Control

The circulation plan includes several **traffic calming and control** measures that would foster safety through the Ranchos. Traffic calming along the commercial segment of Avenue 12 through town is to be accomplished with a series of roundabouts, bulb-outs, and raised crosswalks at strategic locations. Traffic control is to be accomplished with a series of traffic signals or roundabouts and stop signs on side streets at the remaining intersections.

Public Transportation

Two forms of fixed route transit are recommended for the Madera Ranchos and area residents. One is an upgrade of the limited existing fixed route service that would operate as **local service** with detours through the Ranchos neighborhoods. The other is **express fixed-route service**, which should be inserted on the half hour during the morning and afternoon commute periods. **Dial-a-ride transit** is recommended to supplement fixed-route transit.

Bicycling and Walking

A network of bicycle paths and lanes are proposed to serve the need both for short-distance transportation between activities and for recreation. Recommendations include: a **two-way separated bicycle path; one-way separated bicycle paths; On-street bicycle lanes; and trails**. Pedestrian facilities include: **wide sidewalks; pedestrian crossings** including **raised cross-walks** at selected locations; and **bulb-outs**.

Plan Outcome

The fully implemented plan would result in the following outcomes in and around Madera Ranchos:

- The Southeast Madera County Area (SEMCA) would have a robust grid network of roadway improvements in which selected north-south roads link major east-west arterials to enable an efficient circulation system with multiple options for route choices.
- The segments of Avenue 12 east and west of the Ranchos together with the bypass around the central Ranchos would became an express route. The section of Avenue 12 through town wound become a three-lane wide Main Street that joins the express route.
- Traffic would be calmed along the main street section of Avenue 12 to foster safety and enable motorists to slow down, notice, stop and patronize establishments along the redesigned Main Street .
- A redesigned Main Street would have a three-way separation of travel channels for automobiles, bicyclists and walkers respectively. Wide sidewalks would adjoin the buildings. A central commercial center would serve as the central business district or downtown for the Ranchos and proposed future developments in the area. Downtown buildings would align both sides of median separated directional roadways of Main Street. The almond-shaped median would be a central park for community events.
- Public transportation service would be expanded to link the Ranchos area with neighboring urban centers of Madera and Fresno.
- An assortment of bicycle paths and lanes within the Ranchos would provide non-motorized access to activity centers and link up parks and recreation areas.
- The Ranchos would have a vibrant downtown while maintaining its small town character.

1.0 Introduction

1.1 PROJECT DESCRIPTION

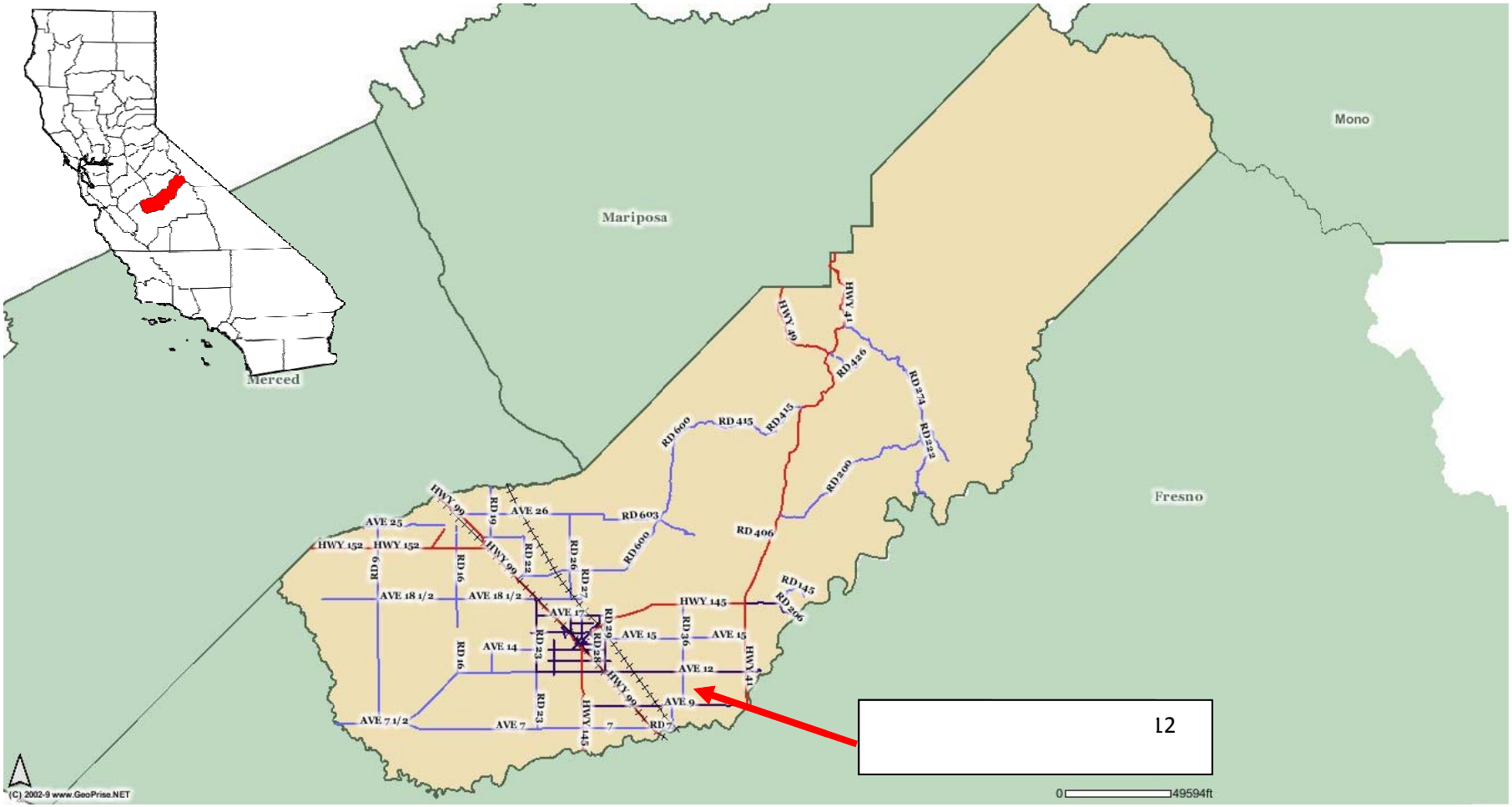
This report documents the Transportation Plan prepared as part of the Avenue 12 Enhancement project. The project has three distinct, but interrelated parts: (a) Community Visioning; (b) a Commercial Area Redesign Plan; and (c) a Transportation Plan. The latter two plans are to be informed by an initial community-visioning process in which stakeholders determine how best to preserve their community's identity and enhance their quality of life in the face of their changing surroundings. The objectives of the project therefore are the following:

- Create transportation alternatives for express traffic between Highways 41 and 99 in the southern Madera County area which bypasses through traffic around the Madera Ranchos commercial strip (about 1 mile of Avenue 12 between Road 36 and Road 38).
- Create an Urban Design plan for the re-configuration of the Avenue 12 commercial strip to make it attractive for residents and visitors in order to preserve the economic viability of the town's commercial area and enhance the livability of the community.
- Improve alternative mobility in the Madera Ranchos area through plans for pedestrian and bike trails, clean fuel shuttles, and other public transportation improvements to meet the needs of the residents who do not drive and to reduce automobile usage.
- Outline a vision for the future of the Madera Ranchos community to preserve its identity and livability in the face of new developments, which will guide and inform the above processes.

1.2 STUDY AREA

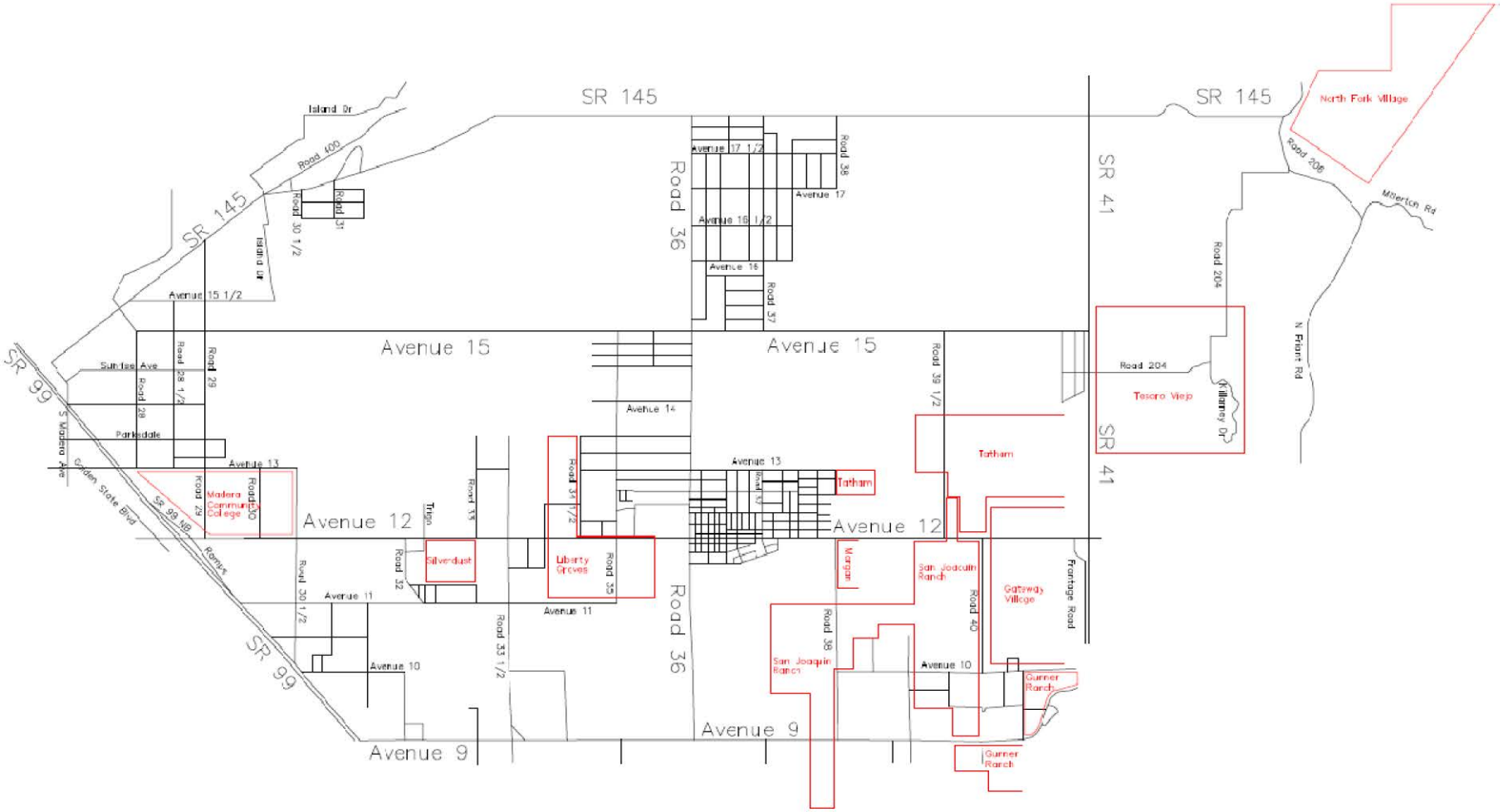
Avenue 12 is a 2-lane country road which connects Highway 99 (SR 99) to the west and Highway 41 (SR 41) to the east. It bisects the southern, commercial portion of the town of Madera Ranchos, which lies in the southeastern area of Madera County. See Figure 1-1. Madera County is primarily a rural county in the San Joaquin Valley. It lies to the immediate north of Fresno County and the City of Fresno. In January 2009, the entire county population of 152,331 was less than a third that of the neighboring city of Fresno with 495,913 people (CA Dept. of Finance, 2009). The County's population is expected to triple over the next 30 years. Much of this growth is anticipated to take place in the southeastern portion of the County as de facto expansion of the Fresno urban area. Madera Ranchos is a middle-income community with an estimated 2009 population of 9,300 people and is located in the center of this area of growth. Because of the lack of express routes between SR 99 and SR 41, Avenue 12 is one of the available east-west connectors that are used by vehicles traveling from one route to the other. See Figure 1-2.

Figure 1-1: Locations of Madera County and Madera Ranchos, California



Source: County Map by Madera County Resource Agency

Figure 1-2: The Avenue 12 Transportation Study Area & Network



1.3 MOTIVATION FOR THE STUDY

Several proposals are put forth for new residential and commercial developments in areas located both east and west of the Ranchos, many of which are on Avenue 12. Figure 1-2 shows locations of proposed new developments. The additional vehicle trips to be associated with these developments are anticipated to create intolerable congestion along Avenue 12. A solution under consideration is a bypass around the Ranchos. The community is worried that its commercial area could lose economic viability with the loss of the through traffic. The Avenue 12 Enhancement Study was launched therefore for a re-design of the Avenue 12 commercial corridor in Madera Ranchos so as to preserve and enhance the community in the face of these changes. Elements include traffic calming, streetscape improvements, areas to walk, sit and meet, and parking facilities for visitors. The crux of the enhancement plan is to outline the most favorable ways to divert the increased traffic around the community while still inviting travelers to stop and use the commercial areas. The final product is envisioned to be an integrated community plan that includes urban design and transportation elements.

2.0 Existing Conditions

2.1 LAND USE TYPES

The study community is referred to in official US Census records as the "Bonadelle Ranchos-Madera Ranchos Census Designated Place". It is a suburban community developed on nearly 12 square miles in the midst of agricultural lands. Figure 2-1 shows the Ranchos and its surroundings.

The built-up area is primarily residential with a strip of commercial development along Avenue 12 between Road 36 and Road 38. Other notable land uses are elementary schools, a high school and places of worship. Figure 2-2 shows existing land use within and surrounding the Ranchos Community.

2.2 TRAVEL CORRIDORS

The principal corridors of travel in the study area are dictated by the placement of major attractors. To the south and southeast are the City of Fresno and such major communities as Bakersfield and Los Angeles further beyond. To the northeast is the Yosemite National Park. To the northwest and north are the City of Madera, the largest in the County, and such major communities as Stockton and Sacramento further beyond. Travel between the major attractions beyond the study area is primarily accommodated via SR 99 and SR 41. Travel between the study area and attractions in these faraway places as well as those in the immediate cities of Fresno and Madera require east-west connections between SR 99 and SR 41 to enable movements diagonally to and from northwest and southeast. These diagonal connections are enabled by Avenue 9, Avenue 12, Avenue 15 and SR 145. This explains why these routes are of particular focus in this transportation study.

2.3 STUDY AREA ROADWAYS & GEOMETRIC CONDITIONS

The study network for the Transportation Plan is determined by the main corridors of travel. It extends from SR 99 on the west to SR 41 on the east and from Avenue 9 in the south to SR 145 in the north. See Figure 1-2.

State Route 145 (SR 145) provides east-west access from SR 99 in the City of Madera to Road 206 in the County. This connector road forms the northern boundary of the project study area and provides access to residential and commercial areas. This two lane roadway is planned to be expanded eventually into a four-lane divided arterial.

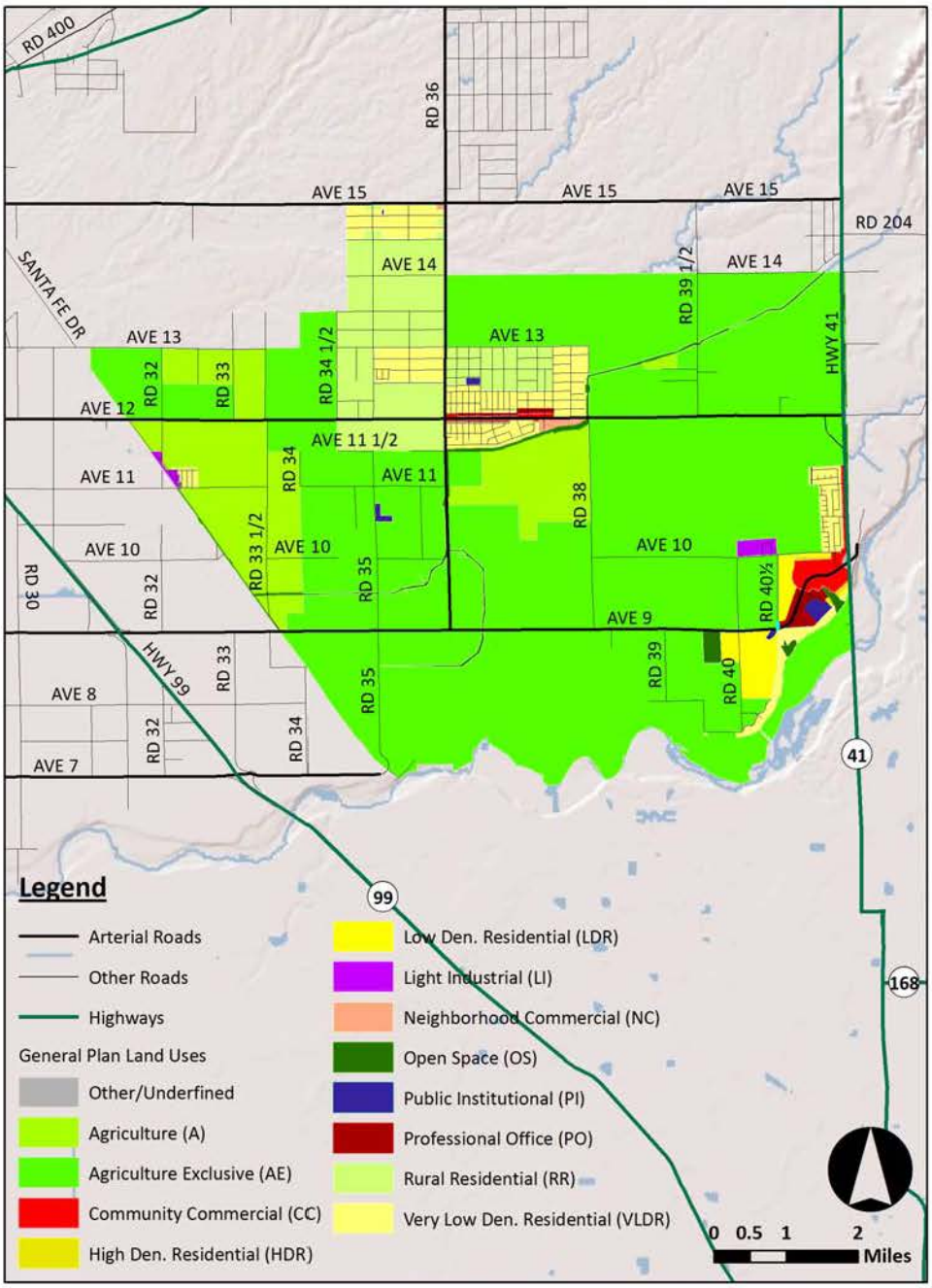
Avenue 15 functions as a two-lane east-west rural road extending from the City of Madera to SR 41. It provides access to residential and commercial areas. It is ultimately planned to be a four-lane divided arterial with an interchange at SR 41.

Avenue 12 functions as a two-lane, east-west road that extends from east of SR 41 to west of SR 99. Future plans call for an extension of this road through the Rio Mesa Area Plan and also for its expansion into a four-lane divided arterial with an interchange at SR 41.

Avenue 9 is a two lane east-west county road. It extends through mostly agricultural areas west to SR 99. It is joined on the east by Children's Boulevard, which has an interchange with SR 41.

Figure 2-1: Aerial View of Area Surrounding Madera Ranchos

Figure 2-2: Land Use in and around the Madera Ranchos Community



State Route 99 (SR 99) is a principal north-south highway of statewide importance. It is a fully grade-separated freeway with at least two through lanes plus auxiliary lanes in each direction. It lies on the western boundary of the study network.

State Route 41 (SR 41) is a principal highway of regional importance. It is a fully grade-separated freeway with at least two through lanes plus auxiliary lanes in each direction in the vicinity of Fresno. It transitions to a two lane express route southwest of Fresno. It transitions rapidly from a multilane highway to a two lane, two-way road north of Avenue 12. While it constitutes the eastern boundary of the study network, some of the proposed new developments lie to its immediate east.

2.4 TRANSPORTATION ALTERNATIVES

2.4.1 Non-Motorized Transportation

Non-motorized facilities include those means of travel that do not depend on mechanical engines. The use of such modes, if convenient, can preclude energy consumption and environmental pollution. Two of the commonest types are walking and bicycling. These modes depend on appropriate infrastructure and location of human activities to be convenient and attractive to users.

Pedestrian facilities include sidewalks, crosswalks and pedestrian signals. There is limited provision of sidewalks along existing roadways within the Ranchos. The California Department of Transportation (Caltrans) is constructing sidewalks along the commercial section of Avenue 12. Crosswalks are rarities that are found at major signalized intersections, such as Avenue 12 at Road 36.

Bicycle facilities are generally classified into three categories: (a) Class I bike paths are paved trails that are separated from roadways; (b) Class II bike lanes are lanes that are designated on roadways for use by bicycles through striping, pavement markings and signs; (c) Class III bike routes are simply designated with signs for roadways to be shared by automobiles and bicycles. They do not include additional pavement width for cyclists. While bicycle facilities are not provided within the study area, the Madera County 2004 Regional Bicycle Transportation Plan includes planned future facilities for the provision of (a) a Class II bike lane on Avenue 12 from Road 38 to SR 41; and (b) a Class III bike route on Avenue 12 from SR 41 to the San Joaquin River. The Rio Mesa Area Plan (RMAP) provides conceptual circulation plans for the development of bicycle facilities, including Class II bike lanes on all arterial and collector roads and Class III designation for local rural roads.

2.4.2 Pedestrian Travel Corridors in the Ranchos

Without pedestrian facilities, existing pedestrian corridors are not easily discernible. Human settlements still contain certain desire lines of travel to connect specific origins and destinations by walking. The apparent desire lines are those between residences and both the commercial strip and schools. The weather is very hot during summer months. This factor and low density development, in which uses are placed too far apart from each other, do not encourage walking.

2.4.3 Public Transportation

The Madera County Connection provides limited public transit service between the City of Madera, The Children's Hospital (located off Avenue 9 to the southeast of the Ranchos) and North Fork (located near the northeastern boundary of the County). The run between the Children's Hospital and

the City of Madera has one stop at the Madera Ranchos Market. Northbound has only one scheduled service in the morning at 9:45 a.m. and two scheduled stops in the afternoon at 2:56 p.m. and 5:20 p.m. Similarly, there are three runs in the opposite direction over the entire day. Appendix 2-0 has the bus schedule and map. Without direct access to Fresno and a limited number of runs per day, the service is at best inconvenient for other than discretionary travel.

There are two demand-response transit services that do not serve the Ranchos area. Dial-a-ride service area covers the western portion of the County and only extends as far as the Madera Community College on Avenue 12 just east of SR 99. The Eastern Madera County Senior Shuttle serves the communities of Oakhurst, Coarsegold, Bass Lake and Ahwahnee, all of which are located several miles north of the Ranchos.

2.4.4 Automobile Transportation

The lack of and convenience associated with transportation alternatives for residents of the Ranchos contribute to a preponderant dependence on the automobile. The 2000 US Census indicates, for instance, that the overwhelming majority of commute trips to work by Ranchos residents (96%) were by the automobile, which was divided between drive alone (85%) and carpools (11%). No one used public transportation to get to work. The only non-automobile mode choice was the 0.3 percent of residents who walked to their jobs within the Ranchos. The remainder (4%) is accounted for by those who worked at home. The remainder of the analysis therefore dwells on roadway transportation. Alternatives are dealt with later on as part of proposals for improvement.

2.5 EXISTING TRAVEL VOLUMES

2.5.1 Travel Data for Existing Conditions

Travel data on "existing" (or most current) conditions were compiled from a variety of sources. The study team conducted supplementary counts along Avenue 12 at its intersections with Road 34 1/2, Road 35, Road 37 and Road 38 in mid July, 2009. Weekday, peak period travel conditions were captured with counts from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. Other existing peak hour counts for additional intersections are reported for September 2006 and January 2007 by TPG Consulting and Fehr and Peers Consultants respectively. Detailed traffic count data are included in Appendix 2-1.

2.5.2 Daily Volumes along Avenue 12

Figure 2-3 shows average daily traffic (ADT) volumes by approach along Avenue 12, the primary artery of focus in the study. The volumes reflect a heavier orientation of trips toward Fresno, which is larger and closer to the Ranchos, than toward Madera, which is smaller and further away. Daily directional volumes range from 5,300 vehicles on the west near SR 99 to 8,500 vehicles on the east near SR 41. Daily, two-way volumes on the two-lane Avenue 12 therefore range between 11,300 near SR 99 to 15,500 near SR 41.

2.5.3 Peak Hour Volumes along Avenue 12

Figure 2-4 shows peak hour traffic volumes by approach along Avenue 12. Consistent with the observations about the daily volumes, the peak directional flows reflect a dependence on neighboring cities with heavier orientations of trips toward both Fresno and Madera in the morning and from these

cities in the afternoon peak periods. Peak hour directional volumes vary all along Avenue 12 from 225 vehicles to 735 vehicles. Two-way, peak hour volumes on Avenue 12 vary between 520 vehicles at Road 34½ in the morning to 1,155 vehicles (that is, more than two times as much) at Frontage Road on the east.

2.5.4 Comparative Peak Hour Volumes

To place the volume of traffic along Avenue 12 in context, its peak hour directional volumes are compared with those on parallel east-west routes in the area. Figure 2-5 compares peak hour traffic volumes by approach along Avenue 9, Avenue 12, Avenue 15 and SR 145. Looking at a screenline across these routes through the middle of the Ranchos at Road 36 reveals that the two southern routes, Avenue 12 and Avenue 9, are similarly and much more heavily used than the other parallel routes to the north. Table 2-1 summarizes the two-way, peak hour mainline volumes along these parallel routes. These findings are significant in light of the fact that most proposed new developments are centered on Avenue 12 and to a smaller extent on Avenue 9. The significance will be reflected in the assignment of trips to and from the development sites that is dealt with in subsequent tasks of this study.

Table 2-1: Comparative Two-way, Peak Hour Volumes on Parallel Routes

Location	AM Peak Hour	PM Peak Hour
SR 145 at Road 36	405	445
Avenue 15 at Road 36	270	275
Avenue 12 at Road 36	600	855
Avenue 9 at Road 36	660	770

Figure 2-3: Average Daily Directional Volumes on Avenue 12

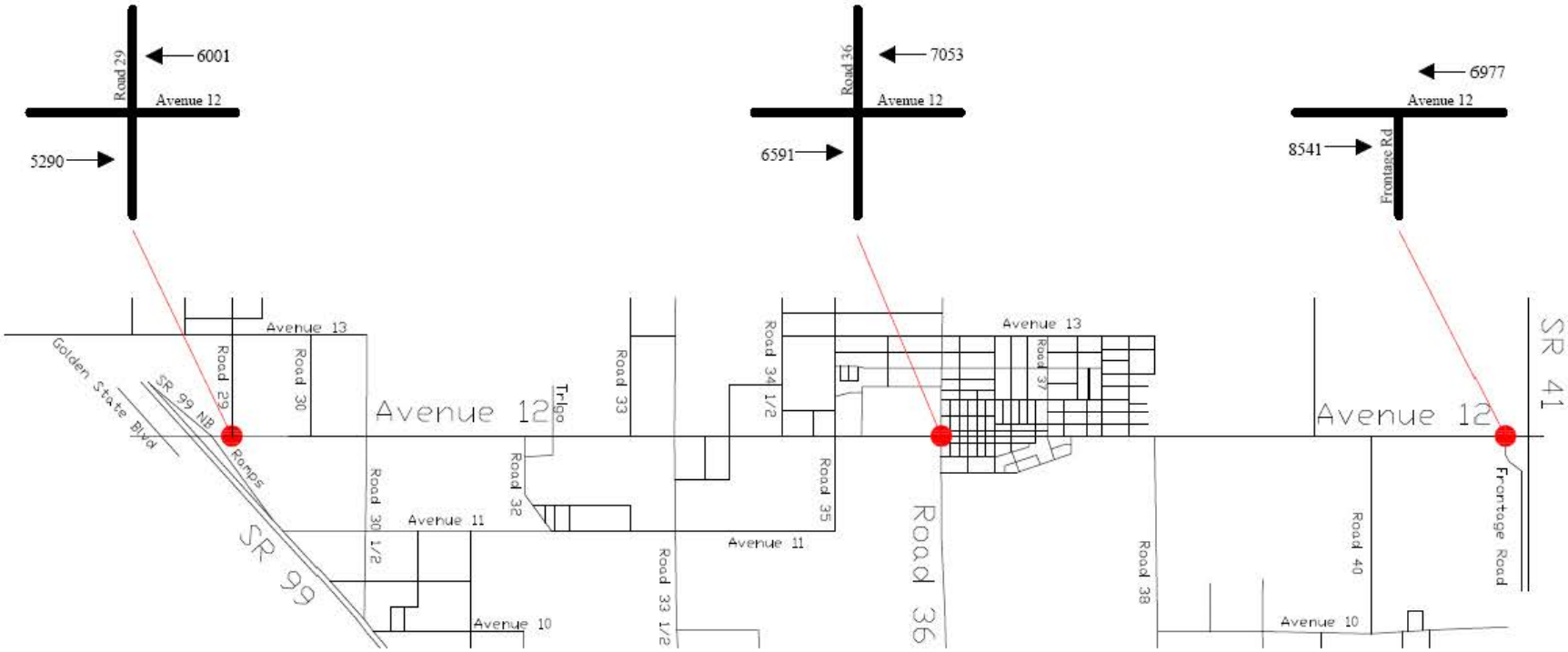


Figure 2-4: Peak Hour Directional Volumes on Avenue 12

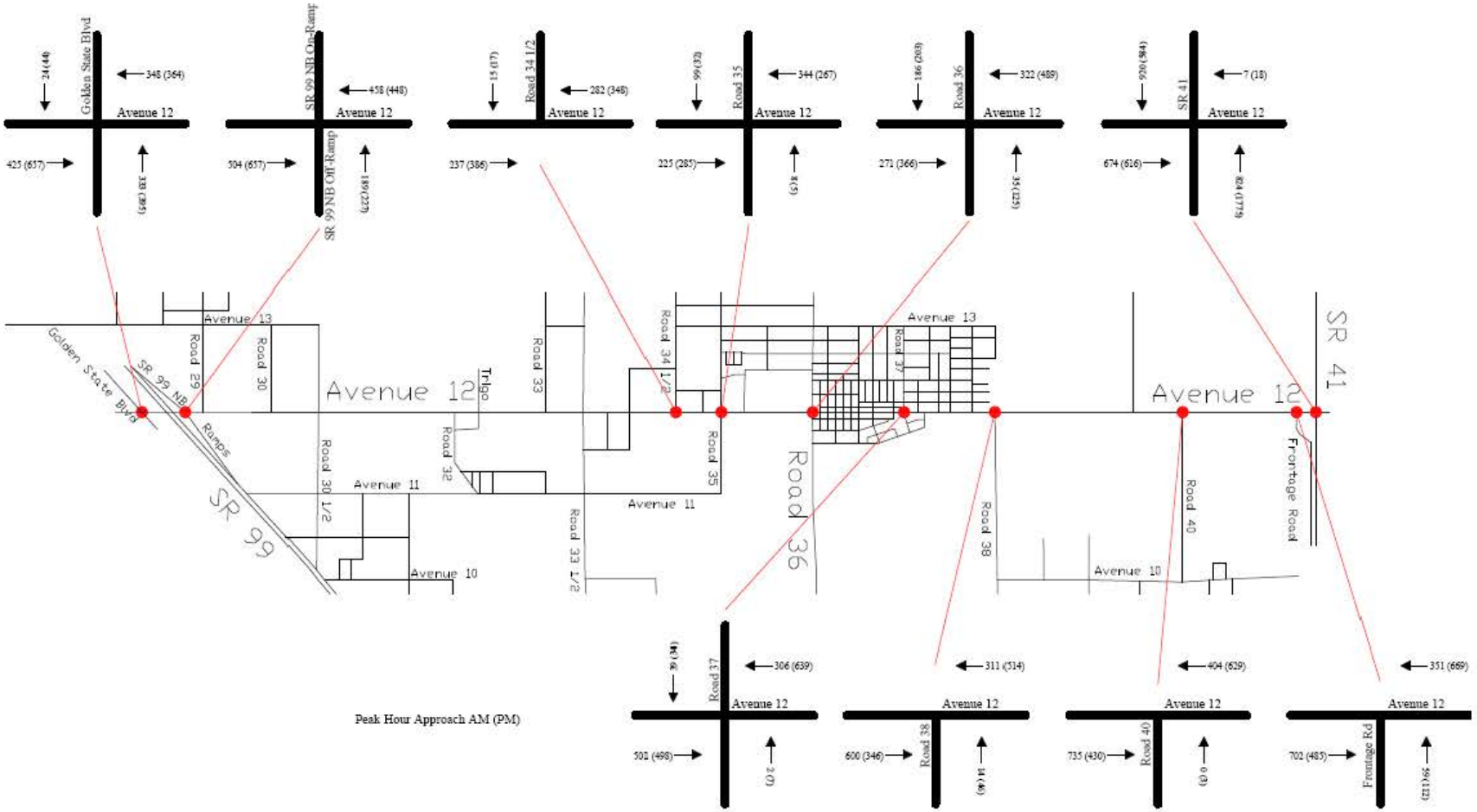
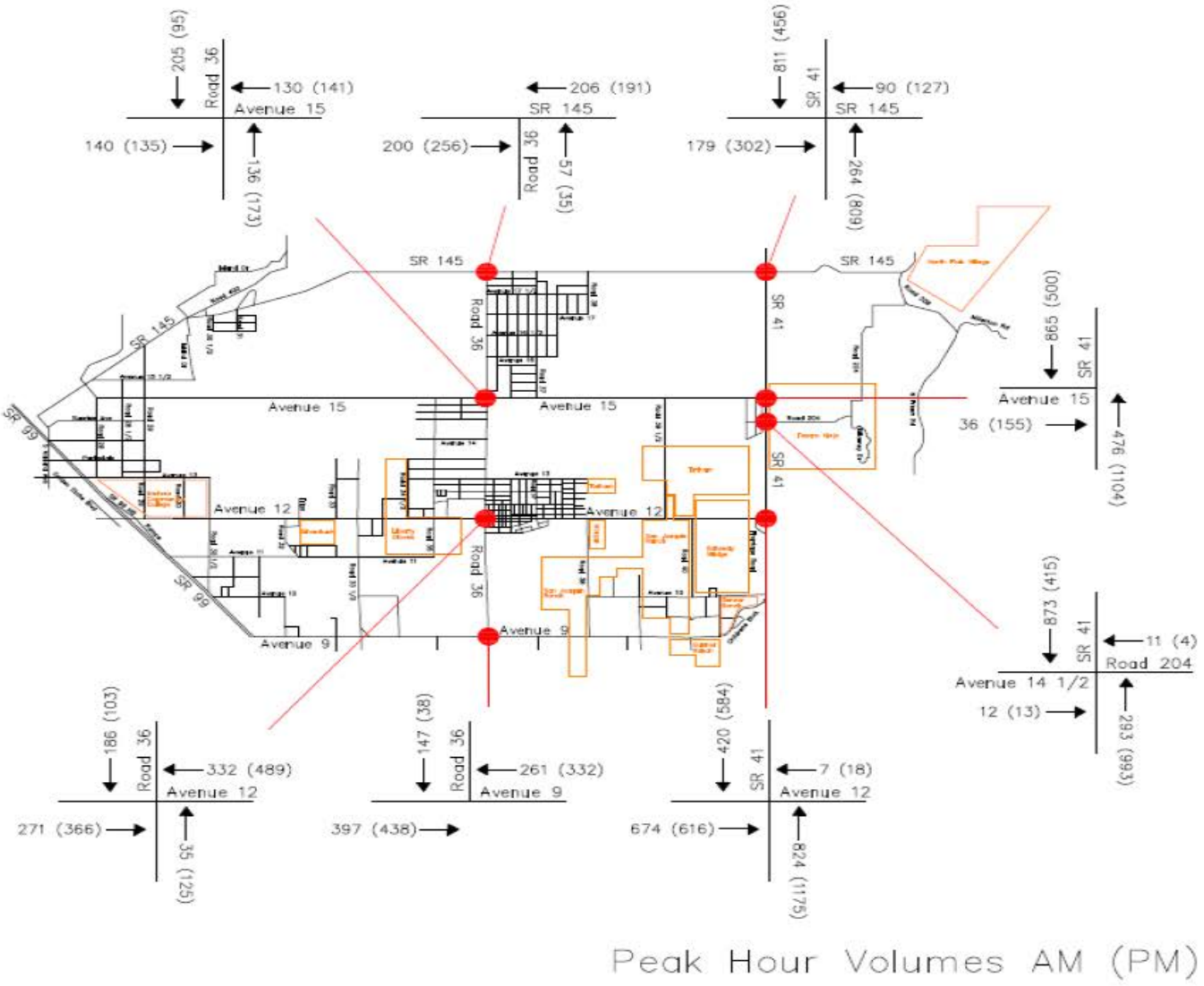


Figure 2-5: Comparative Peak Hour Directional Volumes on Avenue 12 and Parallel Routes



2.6 EXISTING LEVELS OF SERVICE

2.6.1 Definitions

The Highway Capacity Manual (2000) defines level of service (LOS) as use of "qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers". It is a similar perception that is held by community residents as traffic volumes change along roadways in their neighborhoods. Such a perception about probable future operating conditions is the impetus for proposals for bypasses and commercial area redevelopments in the Ranchos. Six levels of service are defined for various types of transportation facilities. They are designated by letters A through F with LOS A representing the best operating conditions and LOS F for the worst.

2.6.2 Standards for Road Segments

The Madera County General Plan (adopted 1995) requires that level of service be measured for roadway segments when conducting planning studies and that the minimum acceptable threshold is LOS D. The levels of service for segments are to be based on traffic volumes per lane per hour. The County's table of level of service volumes is derived from the 1980 version of the Highway Capacity Manual. Table 2-2 shows the County's threshold values for various levels of service.

Table 2-2: Madera County Level of Service Thresholds for Rural Road Segments

Level of Service	Freeway (vehicles per hour per lane)	Two-Lane Road (vehicles per hour per lane)	Multi-Lane Road (vehicles per hour per lane)
A	700	120	470
B	1,100	240	945
C	1,550	395	1285
D	1,850	675	1585
E	2,000	1,145	1800
F	2,001+	1,146+	1801+

Sources: Madera County General Plan, 1995; adapted from 1980 Highway Capacity Manual and Chapters 3, 7 and 8 of the 1985 Highway Capacity Manual

2.6.3 Peak Hour LOS for Selected Road Segments

Matching the peak hour directional volumes (Figure 2-5) with the County standards (Table 2-2) produces the levels of service results in Table 2-3. As shown, Avenue 12 and its parallel alternatives operate at the acceptable LOS D or better under 2009 conditions. It is notable, however, that the segment of Avenue 12 between Road 36 and SR 41 has high enough volumes during both morning and afternoon peak hours to indicate the upper limit of LOS D. This suggests that inevitable additions to future travel volumes through growth in either through traffic or new development traffic would result in unacceptable levels of service. This justifies the need to plan for mitigation measures.

Table 2-3: Road Segment Levels of Service

Segment	West of Road 36			East of Road 36		
Route	Peak Hour Volume	Period[1]	LOS	Peak Hour Volume	Period[1]	LOS
SR 145	256	PM	C	206	AM	B
Avenue 15	140	AM	B	141	PM	B
Avenue 12	366	PM	C	674	AM	D
Avenue 9	332	PM	C	438	PM	D

[1] Period of the day during which the highest hourly link volume is recorded

2.6.4 Level of Service Criteria for Intersections

In a built-up area, the bottlenecks to traffic flow are typically at intersections, where conflicting movements must be accommodated. The delay experienced by motorists in traversing intersections is used to measure the levels of service. In the study network, there are both signalized and unsignalized intersections. Thus two sets of level of service criteria are applied from the Highway Capacity Manual.

Traffic conditions were evaluated at signalized intersections using such characteristics as traffic volumes, lane geometry and signal phasing to estimate the average control delay experienced by motorists traveling through the intersections. Control delay is a combination of various delay components that are associated with deceleration, acceleration, stopping and moving along in queue at the intersection. Table 2-4 is a summary of the relationship between average control delay per vehicle and LOS for signalized intersections.

Table 2-4: Level of Service Criteria for Signalized Intersections

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	< 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	> 10.0 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20.0 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and/or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35.0 to 55.0
E	Operations with long delays indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	> 80.0

Source: Transportation Research Board, Highway Capacity Manual, 2000

Traffic conditions were evaluated at unsignalized intersections using average control delay per vehicle for each movement that must yield right-of-way to others. At two-way stop-controlled intersections, control delay is calculated as an average for the entire intersection and for each controlled, side-street movement and the left-turn movement from the major street. For controlled approaches on a single lane, the delay is computed as the average of all movements in that lane. At four-way stop-controlled intersections, LOS is based on the average delay experienced on all approaches. Table 2-5 is a summary of the relationship between average control delay per vehicle and LOS for signalized intersections.

Table 2-5: Level of Service Criteria for Unsignalized Intersections

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delays	< 10.0
B	Short delays	> 10.0 to 15.0
C	Average delays	> 15.0 to 25.0
D	Long delays	> 25.0 to 35.0
E	Very long delays	> 35.0 to 50.0
F	Extreme levels of delay that are generally unacceptable to motorists	> 50.0

Source: Transportation Research Board, Highway Capacity Manual, 2000

2.6.5 Peak Hour LOS for Intersections

All level of service calculations were conducted with version 6.0 of the Synchro software, which applies the methods of the Highway Capacity Manual. Figure 2-6 and Figure 2-7 show existing geometric configurations and turning volume counts respectively on Avenue 12. Additional traffic count data for other intersections in the study network are included in Appendix 2-1. Results of level of service analyses are shown in Table 2-6. Additional details are included in Appendix 2-2. Under existing conditions, levels of service are generally acceptable at key intersections on the primary east-west routes. The notable exception is the intersection of Avenue 12 at SR 41 during the afternoon peak hour when motorists experience LOS F.

A close look at detailed results in Appendix 2-2 reveals that for the most part, the intersections along Avenue 12 depict LOS “A” for the eastbound and westbound approaches. This is a reasonable result because the eastbound and westbound traffic neither faces stop signs nor traffic signals except for the signalized intersections at Roads 36 and SR 41. The northbound and southbound LOS results vary from good to poor depending on the traffic volume and delay on the approaches.

Table 2-6: Comparative Intersection Levels of Service

Intersection	Type of Control	AM Peak Hour		PM Peak Hour	
		LOS	Average Delay (seconds)	LOS	Average Delay (seconds)
SR 145/Road 36	SSSC	A	2	A	1
SR 145/SR 41	Signal	B	18	D	26
Avenue 15/Road 36	SSSC	B	12	A	8
Avenue 15/SR 41	SSSC	A	2	A	7
Avenue 12/Road 36	Signal	B	15	B	15
Avenue 12/Road 36 NB	*Signal*	*D*	*39*	*D*	*30*
Avenue 12/Road 36 SB	*Signal*	*D*	*27*	*D*	*33*
Avenue 12/SR 41	Signal	D	26	**F**	**61**
Avenue 9/Road 36	SSSC	A	3	A	2
Children's Blvd at SR 41 SB Ramps	Signal	A	3	A	4

SSSC – Side street stop controlled

Figure 2-6: Intersection Lane Configurations along Avenue 12

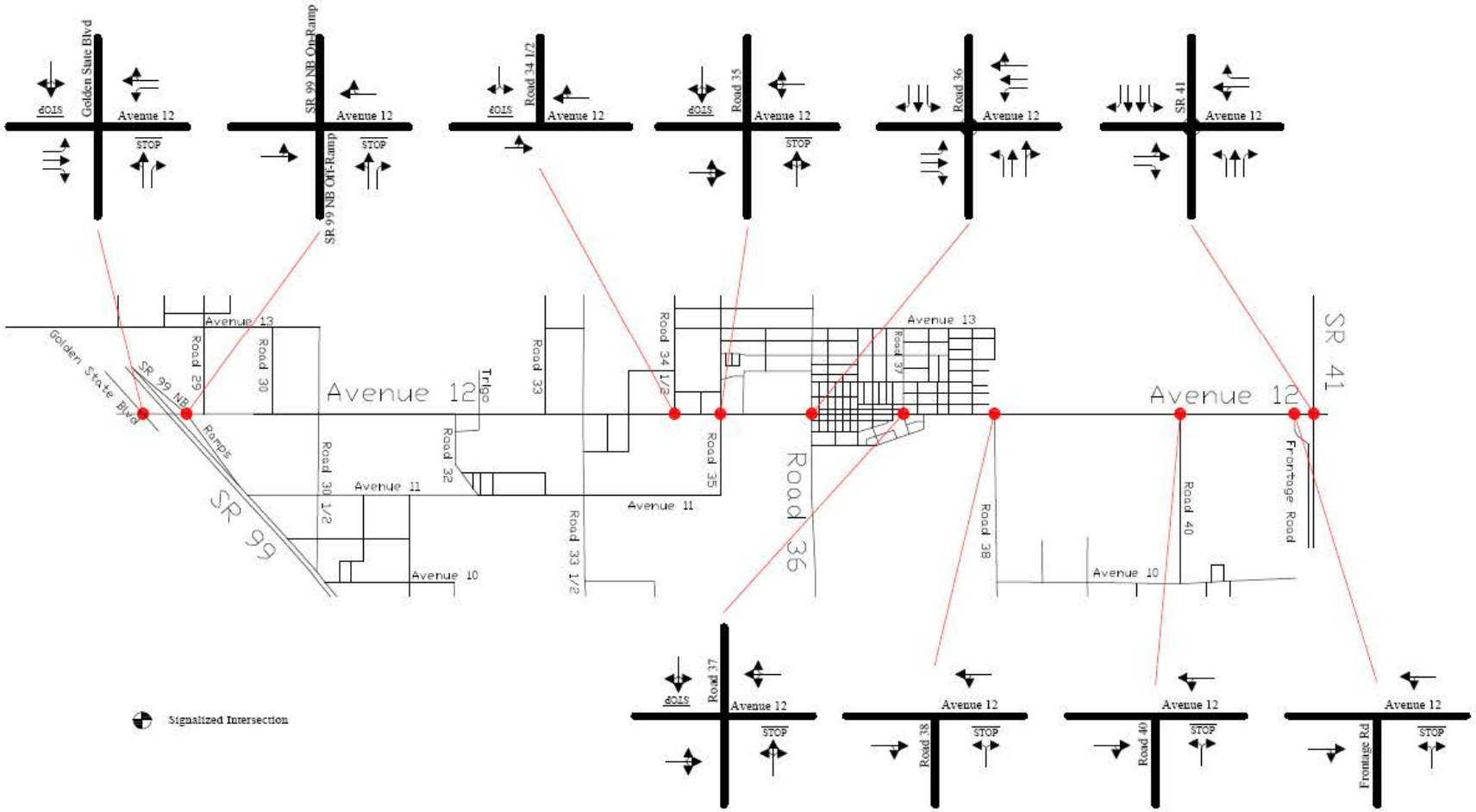
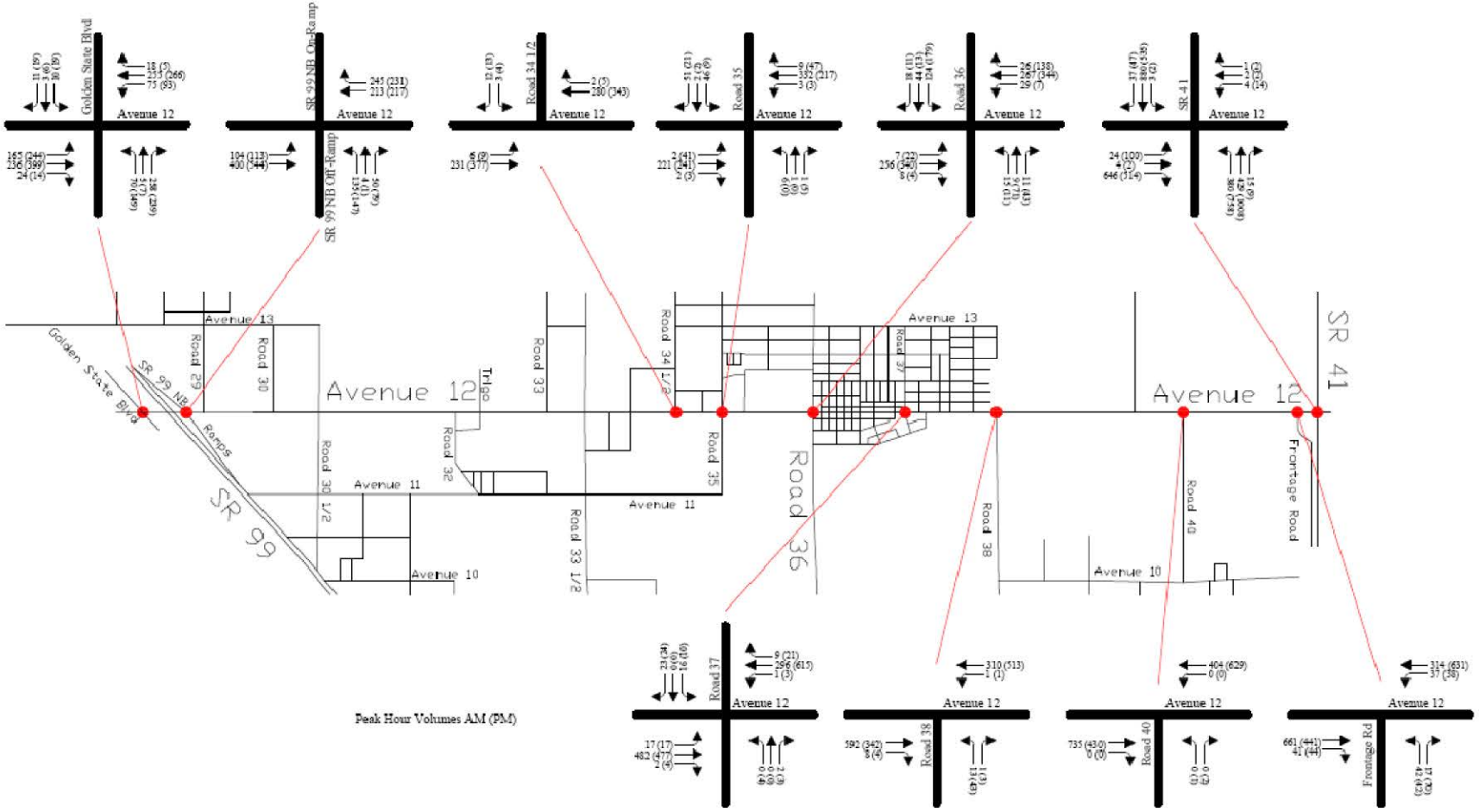


Figure 2-7: Peak Hour Turning Volumes along Avenue 12



3.0 Roadway Improvement Proposals

3.1 MADERA COUNTY TRANSPORTATION PLAN

The Madera County 2007 Regional Transportation Plan (RTP) includes several roadway improvement proposals that are targeted to be implemented by 2030. Transportation Planning Studies for projects in the County assumed these improvements to be in place. Prominent among these proposals is the widening of Avenue 12 to four lanes. Appendix 3-1 has the list of improvements in the Plan. Key improvements to affect the Avenue 12 Study area are summarized in Table 3-1.

Table 3-1: Roadway Improvement Proposal in Avenue 12 Study Area

Map ID	Route	Project Limits	Description
2	SR 99	Ave 12 Interchange	Reconstruct Interchange
9	SR 99	SR 145 Interchange	Reconstruct Interchange
28	CHILDREN'S BLVD	Road 401/2 to Peck Blvd	Widen to 6 Lanes
29	CHILDREN'S BLVD	SR 41 NB ramps to Peck Blvd	Widen to 8 lanes
30	CHILDREN'S BLVD	SR 41 to Lanes Bridge	Widen to 8 lanes
31	AVE 12	SR 41 to North Rio Mesa Blvd	Widen to 6 Lanes
32	AVE 10	Road 401/2 to SR 41	Widen to 4 Lanes
33	LANES BRIDGE	At Children's Blvd	Widen to 6 Lanes
34	CHILDREN'S BLVD	Between SR 41 Ramps	Widen to 6 Lanes
35	N. RIO MESA	Rio Mesa Blvd to Avenue 15 @ SR 41	Widen to 4 Lanes
36	ROAD 30 1/2	Ave 12 to Avenue 13	Widen to 4 Lanes
37	41	NB on ramp/SR 41 @ Children's Blvd	Widen to 2 lanes
38	41	Madera County line to Avenue 10	Widen to 6 Lanes
39	41	Ave 10 to Avenue 12	4 lane freeway and Interchange at Avenue 12
40	41	SR 145 to Road 200	Construct passing lanes
41	41	Road 420 to SR 49 South of Oakhurst	Widen to 4 Lanes
42	AVE 12	Road 38 to SR 41	Widen to 4 Lanes
43	ROAD 29	Olive to Avenue 13	Widen to 4 Lanes
44	AVE 12	SR 99 to Road 32	Widen to 4 Lanes
45	ROAD 29	Avenue 12 to Avenue 13	Widen to 4 Lanes and realignment

3.2 RIO MESA AREA PLAN

The Rio Mesa Area Plan (RMAP) was prepared in 2007 and used the County's travel demand model, which assumed the proposed improvements in the RTP to be in place. Additional network improvements are envisioned to address existing deficiencies and support land development proposals in the RMAP area. These improvements were applied in the Tesoro Viejo Circulation Plan in a cumulative list of roadway and intersection improvement projects that would satisfy LOS D (or better). The list is included in Appendix 3-2. It served as a base projects list later on when traffic assignment was done.

4.0 Madera County Travel Model

4.1 BASE YEAR MODEL

The Madera County Transportation Commission maintains a regional travel demand forecasting model for county-wide and large scale transportation planning projects. The model was calibrated in 2001 for a 2000 base year and was adopted in 2002. The calibrated model includes trip generation rates applicable to three geographic areas in Madera County: (a) urban areas; (b) rural areas; and (c) foothills and mountain areas. The Avenue 12 study area lies within the urban area designation.

For each type of geographic designation, the model has daily trip rates for four primary trip purposes: (a) home-based work; (b) home-based shopping; (c) home-based other; and (d) non home-based. Residential trips are referred to as "productions"; employment trips are referred to as "attractions". Table 4-1 shows the County's trip generation rates for urban areas. Because trips are forecast for daily travel, peak hour trips are derived as proportions of daily trips.

Table 4-1: Trip Generation Rates for Urban Areas in Madera County

Trip Productions

Land use	Units	Home-Work	Home-Shop	Home-Other	Non-Home[1]	Total [2]
Single Family	Dwelling Units	2.574	1.430	3.875	2.903	7.879
Multi-Family	Dwelling Units	1.860	1.144	1.573	1.502	4.577

Trip Attractions

Land use	Units	Home-Work	Home-Shop	Home-Other	Non-Home	Total[3]
Retail	Employment	3.773	5.600	4.675	8.023	30.094
Office	Employment	2.772		1.360	1.232	6.596
Industrial	Employment	2.772		0.510	0.308	3.898
Other	Employment	2.310		1.360	1.232	6.134
Government	Employment	1.232		0.187	0.169	1.757
Education	Employment	1.694		6.290	2.310	12.604

Notes:
[1]. Used for control total only.
[2]. Non-home based trips not included in total.
[3]. Total includes Non-home based trips x 2 to account for Non-Home based reallocation to non-home uses.
Source: Madera County, Travel Forecasting Model Documentation and User Manual, Table 11, August 27, 2001.

4.2 MODEL ACCURACY

4.2.1 Modeling and Forecast Refinement

The County model applies the traditional four-step process, which includes trip generation, trip distribution, mode choice and assignment. As is typical with such modeling procedure, a refinement process is necessary to produce facility-specific or small area forecasts.

The County model has a separate module to refine initial, assigned trips by further adjusting link-specific forecast volumes. The purpose of the adjustments is to correct for residual errors in model

calibration. The post-processor also calculates service levels for roadway segments. Service levels are based on volume-to-capacity (V/C) ratios that correspond to various levels of service. Level of service thresholds are based directly on the capacity threshold standards of the County (Table 2-2). Table 4-2 shows resultant V/C ratios for various types of highway facilities.

Table 4-2: Volume to Capacity Ratios and Levels of Service by Type of Facility

Level of Service	Freeways	Two-Lane Rural Highways	Multi-lane Rural Highways	Urban Streets
A	0.35	0.10	0.26	0.60
B	0.55	0.21	0.53	0.70
C	0.78	0.34	0.71	0.80
D	0.93	0.59	0.88	0.90
E	1.00	1.00	1.00	1.00
F	1.01+	1.01+	1.01+	1.01+

4.2.2 Model Calibration

The model calibration process involved adjustments to model parameters to derive estimates that are comparable to observed 2000 average daily traffic (ADT) volumes. Observed and forecast volumes were compared across 10 screenlines and one cordon line in the County for validation. The screenlines were selected to be "both representative and comprehensive in their coverage of travel within the County". The goal of the calibration process was to bring estimates of the screenlines to within 10 percent of observed volumes. While the calibration process improved the conformance of model output with observed volumes, it was not possible to achieve the 10 percent goal for several screenlines. The overall county-wide total for the screenlines fell within less than 1 percent, indicating that overall trip generating characteristics and through trip characteristics were well represented. Figure 4-1 shows the model validation results included in the model documentation.

4.2.3 Model Accuracy in Study Area

A close look at model accuracy for specific roadways reveals more dramatic deviations of model data from observed data. In the Avenue 12 Study area, deviations are moderate. Avenue 12, for instance shows a 13.5 percent under-estimation of trips by the model whereas SR 41 and SR 99 show fairly accurate results. Figure 4-2 shows the model validation results included in the model documentation for roadways in the study area.

Figure 4-1: Base Year Model Validation Results

Table 16
Calibration Spreadsheet
Observed vs. Modeled 2000 Data
Countywide Summary

	Observed Volume		Modeled Volume		Total Variation	
Summary	Northbound	Southbound	Northbound	Southbound	Model - Observed	Model/Observed
Screenline 1: South of Avenue 25	30,560	30,560	26,360	26,451	(8,309)	-13.59%
Screenline 2: North of Avenue 15 1/2 & Cleveland Avenue	61,037	61,037	58,984	59,059	(4,031)	-3.30%
Screenline 3: North of Avenue 7	44,171	44,171	46,745	46,498	4,901	5.55%
Screenline 4: East of Road 9	8,562	8,562	7,085	7,254	(2,785)	-16.26%
Screenline 5:East of D Street	63,789	63,789	70,825	75,365	18,612	14.59%
Screenline 6: West of SR 41	19,996	19,996	17,195	17,237	(5,560)	-13.90%
Screenline 7: Foothills	7,908	7,908	7,206	7,205	(1,405)	-8.88%
Screenline 8: North of Olive/City of Madera	53,888	53,888	52,229	51,910	(3,637)	-3.37%
Screenline 9: North of Sunset/4th Street - City of Madera	56,813	56,813	50,578	50,650	(12,398)	-10.91%
Screenline 10: East of Gateway Drive - City of Madera	32,124	32,124	29,570	29,326	(5,352)	-8.33%
Cordon 1: Around Downtown Madera	52,484	52,484	60,034	60,033	15,099	14.38%
Total	431,332	431,332	426,811	430,988	(4,865)	-0.56%

Figure 4-2: Base Year Model Validation Results for Key Roadways in Study Network

Table 22
Calibration Spreadsheet
Observed vs. Modeled 2000 Data
Screenline 6: West of SR 41

	Observed Volume		Modeled Volume		Total Variation	
	Northbound	Southbound	Northbound	Southbound	Model - Observed	Model/Observed
SR 49	4250	4250	3343	3343	(1,814)	-21.34%
Road 416	2567	2567	1859	1862	(1,413)	-27.52%
Road 406	46	46	0	0	(92)	-100.00%
SR 145	1775	1775	1758	1755	(37)	-1.04%
Avenue 15	1236	1236	954	950	(568)	-22.98%
Avenue 12	5254	5254	4480	4615	(1,413)	-13.45%
Avenue 10	4868	4868	4801	4712	(223)	-2.29%
Total	19996	19996	17195	17237	(5,560)	-13.90%

Table 19
Calibration Spreadsheet
Observed vs. Modeled 2000 Data
Screenline 3: North of Avenue 7

	Observed Volume		Modeled Volume		Total Variation	
	Northbound	Southbound	Northbound	Southbound	Model - Observed	Model/Observed
Road 9	360	360	249	242	(229)	-31.81%
Fircbaugh Blvd.	920	920	699	703	(438)	-23.80%
Road 23	331	331	378	379	95	14.35%
SR 145	2650	2650	4112	4055	2,867	54.09%
SR 99	25500	25500	26721	26594	2,315	4.54%
Road 35	660	660	977	967	624	47.27%
SR 41	13750	13750	13609	13558	(333)	-1.21%
Total	44171	44171	46745	46498	4,901	5.55%

4.3 BASELINE STUDY AREA MODEL

4.3.1 The 2030 Rio Mesa Model

The "Rio Mesa Model" was created in 2007 from the base year model parameters and future land use and socio-economic information to forecast trips in the general vicinity of the Avenue 12 study area. The Rio Mesa model was developed as a cumulative land use scenario that reflects the full build-out of (a) proposed housing and commercial developments and (b) proposed road improvements in the Rio Mesa study area by 2025. The Cumulative Rio Mesa Model was then modified to forecast for a 2030 horizon year. This model is considered the baseline model for the Avenue 12 study.

4.3.2 Land Use Assumptions in the Rio Mesa Model

There were thirteen development proposals in the Rio Mesa model. Together they add up to 33,998 dwelling units and 35,690 job opportunities. Appendix 4-1 identifies individual development proposals and sizes. As shown later in Chapter 5, many of these proposals were no longer active by the time of the Avenue 12 study. This could necessitate refinements to the trip forecasts to match the most current list of development proposals.

4.3.3 Infrastructure Improvement Assumptions in the Rio Mesa Model

The Rio Mesa model included a list of fiscally constrained, capacity increasing candidate projects envisioned to be implemented through the year 2030. This list of transportation improvements remain in the analysis for the Avenue 12 Enhancement Project. They were identified in Chapter 3. Figure 4-3 shows the general coverage area of the Rio Mesa Model with proposed roadway improvements.

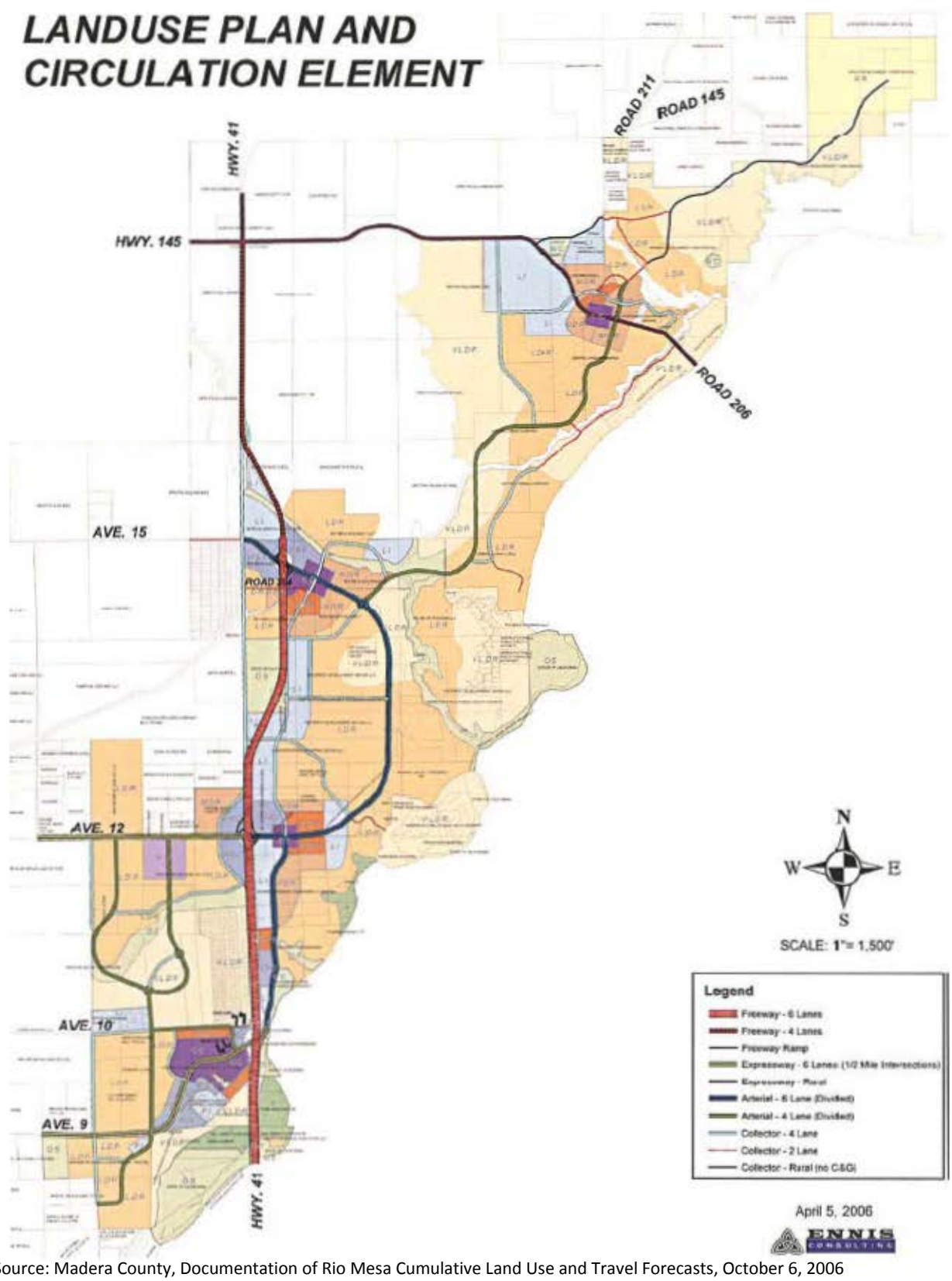
4.3.4 Projected Baseline Future Trips (Rio Mesa Model)

The Rio Mesa Model produced projected trips assuming proposed new developments at the time were implemented. Table 4-3 compares the existing and projected “cumulative” volumes on Avenue 12. Additional details on the cumulative volumes are presented in Appendix 4-2. Projections suggest that daily traffic volumes on Avenue 12 could triple near SR 41, double toward the western part of the Ranchos and grow by more than 50 percent near SR 99. Base year model accuracy and projected growth near certain key intersections are shown in Figure 4-4 with additional details in Appendix 4-2.

Table 4-3: Existing vs. Projected ADT Growth on Avenue 12

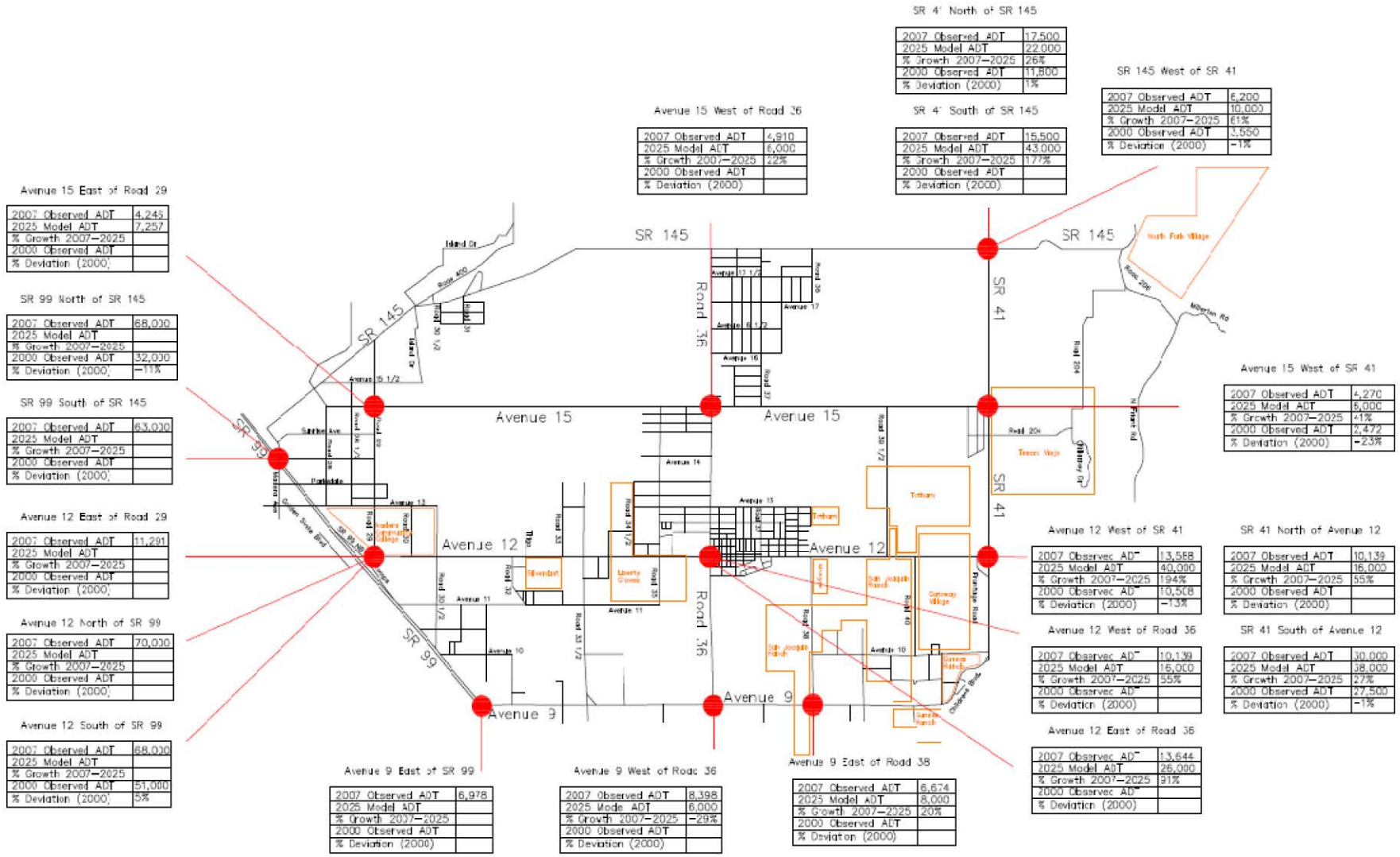
Location:	East of Road 29	East of Road 36	West of SR 41
Existing 2007 ADT	11,300	13,650	15,500
Model Projected 2025 ADT	16,000	26,000	40,000
Percent Growth (2007 to 2025)	+55%	+91%	+194%

Figure 4-3: Study Area and Roadway Improvements in the Rio Mesa Model



Source: Madera County, Documentation of Rio Mesa Cumulative Land Use and Travel Forecasts, October 6, 2006

Figure 4-4: Accuracy of Rio Mesa Model in the Vicinity of Key Intersections



4.3.5 2025 Baseline Future Trips (Rio Mesa Model plus Development Impact Studies)

Two development Impact studies applied the Rio Mesa Model output in projecting future peak hour turning movement counts at certain major intersections in the study network. First the Tesoro Viejo Impact Analysis (November 2007) applied the Rio Mesa Model. Then the Gunner Ranch West Impact Analysis (February 2009) pivoted off the 2007 study. Both studies covered the same key intersections and used the same turning volumes for "existing conditions" within the Avenue 12 study network. The latest available "future" projections, therefore, are the peak hour turning volumes in the 2009 study shown on Figure 4-5. These are considered the baseline future volumes in this Avenue 12 study

4.3.6 2025 Baseline Future Levels of Service (Rio Mesa Model plus Impact Studies)

Projected levels of service for key intersections suggest very poor operating conditions across the board by 2025. Despite the fact that very little of new development trips from the Tesoro Viejo and Gunner Ranch West developments were assigned onto Avenue 12, the route indicates LOS F at all major intersections analyzed except at Road 36. Results are extracted for Avenue 12 and included in Figure 4-6. Additional details are included in Appendix 4-2. It is worth noting that trips associated with many of the newly updated development proposals presented in the next section are not included in these existing impact studies. These new trips are likely to use Avenue 12 making for poorer operating conditions than so far projected. Figure 4-7 is a comparative summary of peak hour (AM/PM) directional volumes side-by-side for (a) existing 2007, (b) Tesoro 2025 and (c) Gunner 2025. The numbers reveal that the two studies assigned new trips north-south along SR 41, but largely ignored assignments east-west along Avenue 12; the Gunner West study made an attempt and showed significantly increased volumes on the east-west approaches of Avenue 12 at SR 41, but did not carry the numbers through westward.

4.4 CHANGES IN LAND USE PROPOSALS

To determine the continued applicability of the baseline model, development proposals assumed in the Rio Mesa Model were compared with the most current set of development proposals as of August, 2009. Table 4-4 summarizes the differences. The comparison reveals that there are significant increases in both the number of dwelling units and employment by approximately 40 percent. This change needs to be accounted for in the future numbers and impacts of trips anticipated in the study area. Appendix 4-1 has additional details on land use changes. Besides the change in quantity of developments, there were also changes in the locations of developments, a factor that influences travel patterns and impacts.

Table 4-4: Differences in land Use Proposals

	Dwelling Units	Employment
Rio Mesa Model	33,998	35,690
Development Proposal (August 2009)	47,800	48,830
Net Change from Rio Mesa model	13,802	13,140
Percent Change from Rio Mesa model	41%	37%

Figure 4-5: Baseline 2025 Peak Hour Turning Volumes at Key Intersections

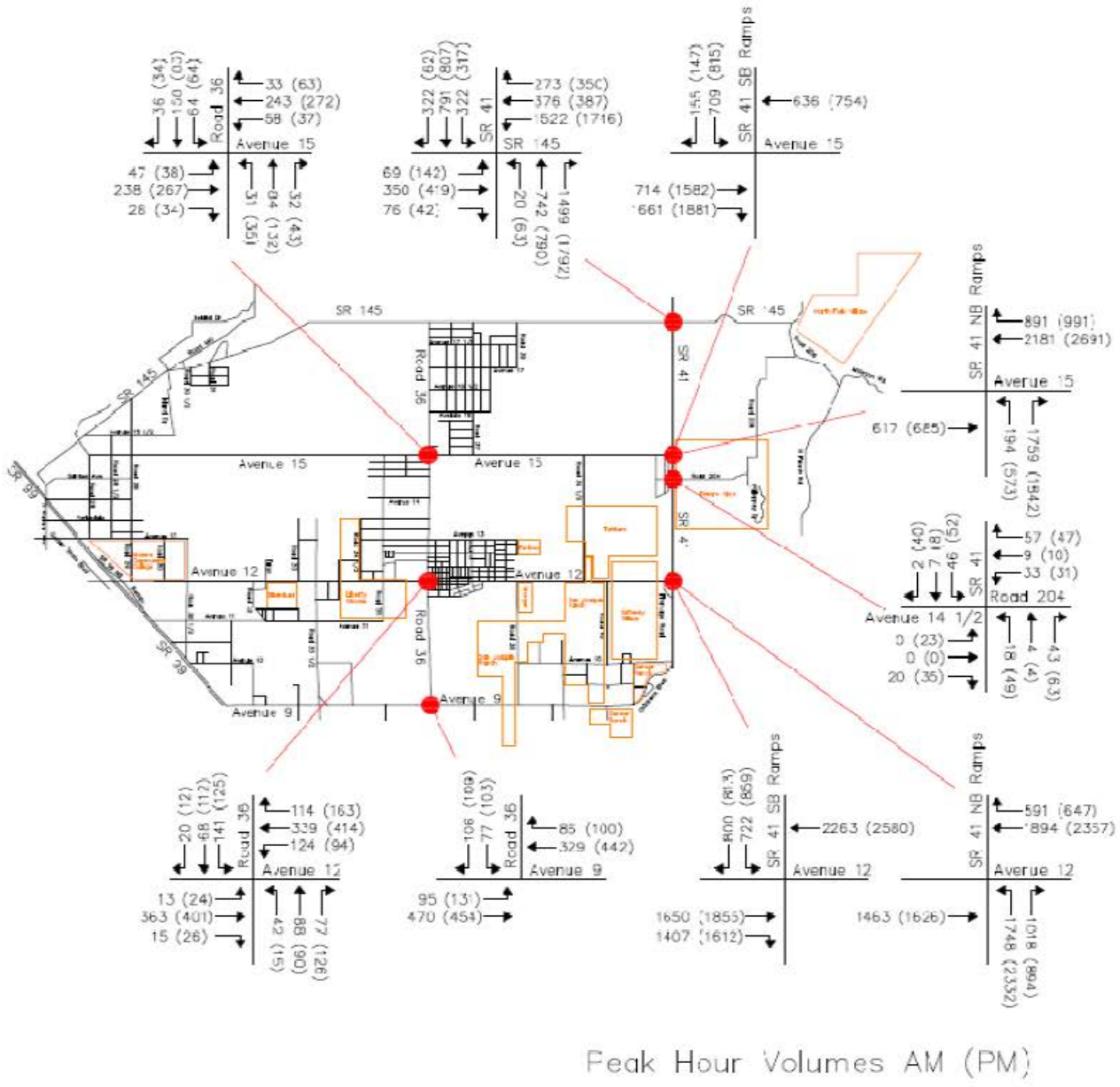

Road 36
Avenue 15
36 (34)
150 (03)
64 (64)
33 (63)
243 (272)
58 (37)
47 (38)
238 (267)
28 (34)
31 (35)
84 (132)
32 (43)
SR 41
SR 145
322 (62)
791 (807)
322 (317)
273 (350)
376 (387)
1522 (1716)
69 (142)
350 (419)
76 (42)
20 (63)
742 (790)
1499 (1792)
SR 41 SB Ramps
155 (147)
709 (815)
636 (754)
714 (1582)
1661 (1881)
SR 41 NB Ramps
891 (991)
2181 (2691)
617 (685)
194 (573)
1759 (1842)
SR 99
Avenue 12
Avenue 9
Road 204
Avenue 14 1/2
57 (47)
9 (10)
33 (31)
0 (23)
0 (0)
20 (35)
18 (49)
4 (4)
43 (63)
20 (12)
68 (112)
141 (125)
114 (163)
329 (414)
124 (94)
13 (24)
363 (401)
15 (26)
42 (15)
88 (90)
77 (126)
106 (109)
77 (103)
85 (100)
329 (442)
95 (131)
470 (454)
800 (813)
722 (859)
2263 (2580)
1650 (1855)
1407 (1612)
591 (647)
1894 (2357)
1463 (1626)
1748 (2332)
1018 (804)
Peak Hour Volumes AM (PM)

Figure 4-6: Baseline 2025 Peak Hour Intersection Levels of Service along Avenue 12

	INTERSECTION	PEAK HOUR	CUMULATIVE 2010 WITH PROJECT		CUMULATIVE 2015 WITH PROJECT		CUMULATIVE 2020 WITH PROJECT		CUMULATIVE 2025 WITHOUT PROJECT		CUMULATIVE 2025 WITH PROJECT	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
22	Randall Way / Goodwin Way [2]	AM	9.3	A	15.2	C	21.0	C	0.0	A	23.1	C
		PM	9.4	A	11.3	B	11.9	B	8.9	A	12.2	B
23	Avenue 11 / West Frontage Road (Old SR 41) [2]	AM	9.0	A	9.2	A	9.4	A	9.1	A	9.4	A
		PM	11.2	B	12.0	B	12.6	B	11.0	B	13.0	B
24	Golden State Dr / SR 99 SB Ramps	AM	>50.0 [2]	F*	>50.0 [2]	F	>50.0 [2]	F	>80.0 [1]	F	>80.0 [1]	F
		PM	>50.0 [2]	F*	>50.0 [2]	F	>50.0 [2]	F	59.3 [1]	E	61.3 [1]	E
25	Avenue 12 / Golden State Dr [1]	AM	41.9	D	65.3	E	>80.0	F	>80.0	F	>80.0	F
		PM	47.5	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
26	Avenue 12 / SR 99 NB Ramps [1]	AM	26.7	C	74.2	E	>80.0	F	>80.0	F	>80.0	F
		PM	25.7	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
27	Avenue 12 / Road 29 [1]	AM	49.7	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	62.4	E	>80.0	F	>80.0	F	>80.0	F	>80.0	F
28	Avenue 12 / Road 36 [1]	AM	26.9	C	29.5	C	31.9	C	34.1	C	34.2	C
		PM	27.2	C	29.1	C	30.7	C	33.1	C	33.3	C
29	Avenue 12 / Root Creek Parkway East [1]	AM	35.9	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	20.9	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
30	Avenue 12 / Root Creek Parkway West [1]	AM	29.9	C	61.9	E	>80.0	F	>80.0	F	>80.0	F
		PM	31.8	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
31	Avenue 12 / West Frontage Road (Old SR 41) [2]	AM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
32	Avenue 15 / SR 41 SB Ramps [1]	AM			20.2	C	55.0	D	>80.0	F	>80.0	F
		PM			22.9	C	>80.0	F	>80.0	F	>80.0	F
33	Avenue 15 / SR 41 NB Ramps [1]	AM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
34	Avenue 10 / Road 40 1/2 [2]	AM	13.5	B	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	15.1	C	>50.0	F	>50.0	F	>50.0	F	>50.0	F
35	Avenue 10 / Lane's Bridge Dr [3]	AM	10.7	B	22.2	C	>50.0	F	>50.0	F	>50.0	F
		PM	12.3	B	38.1	E	>50.0	F	>50.0	F	>50.0	F
36	Children's Blvd / Crocket Way [2]	AM	>50.0	F*	>50.0	F	>50.0	F	14.7	B	>50.0	F
		PM	30.1	D*	>50.0	F	>50.0	F	11.7	B	>50.0	F

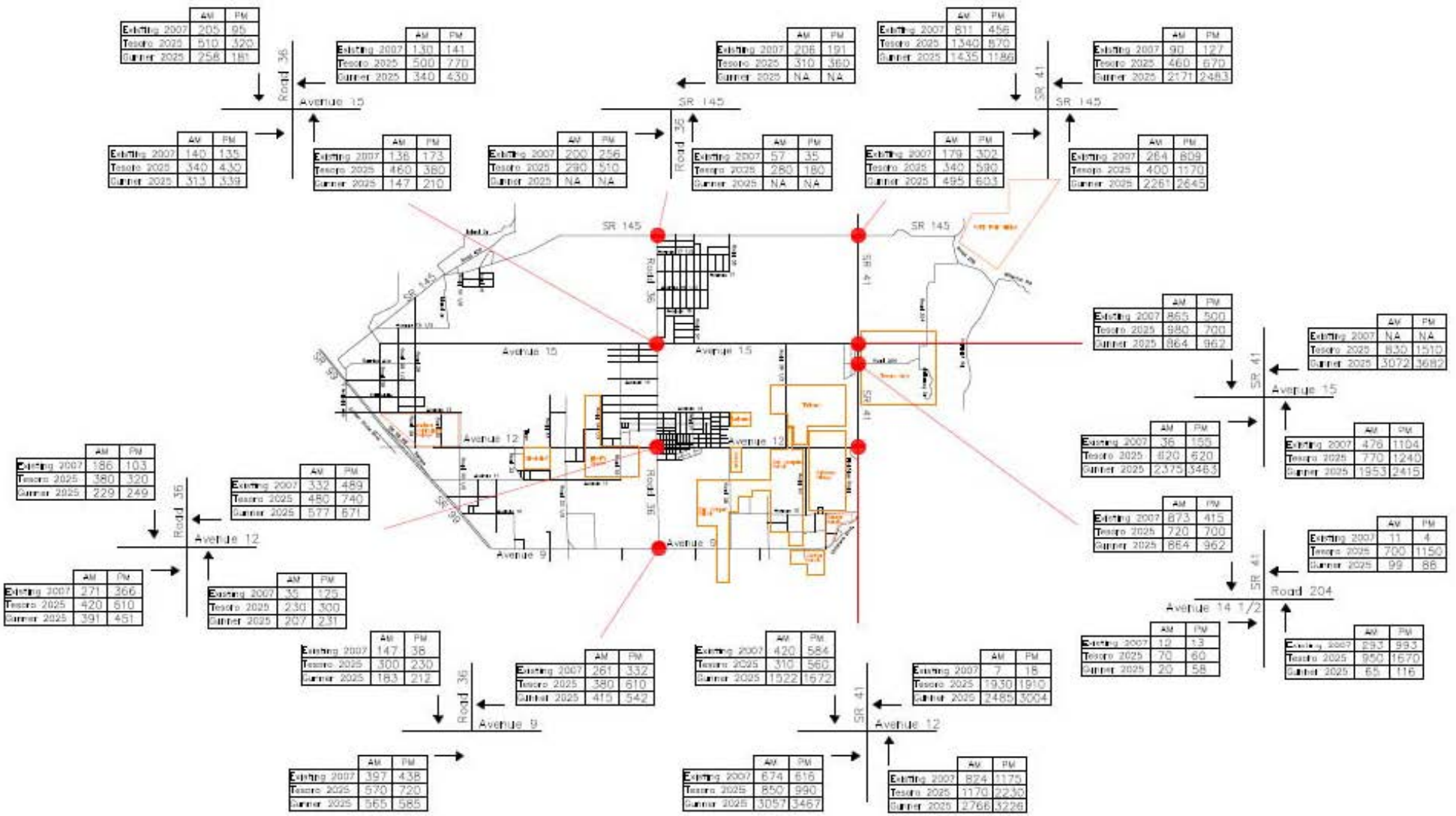
DELAY is measured in seconds.
LOS = Level of Service
For unsignalized two-way stop controlled intersections, the delay refers to the worst-case movement.
* Does not meet signal warrants.
Intersection does exist during this scenario.
(1) signalized intersection
(2) unsignalized two-way stop controlled intersection
(3) unsignalized all-way stop controlled intersection

Source: Gunner Ranch West Traffic Impact Study, 2009 Table 3-3: Intersection Operations

4.5 RECOMMENDED DIRECTION FOR THE ANALYSIS

The changes in quantity and locations of developments suggested the need to update future travel projections for the Avenue 12 study. This constituted the primary focus of tasks in the next phase of the project.

Figure 4-7: Comparative Summary of Existing and 2025 Peak Hour (AM/PM) Directional Volumes



5.0 Land Development Proposals & Trips

5.1 NEW DEVELOPMENTS AND MAGNITUDE

The Avenue 12 Enhancement project took a comprehensive look at all developments likely to impact travel in the southeastern Madera County area. Figure 1-2 and 5-1 identify the individual locations of various developments. Thirteen development proposals were active in August 2009. They include the following:

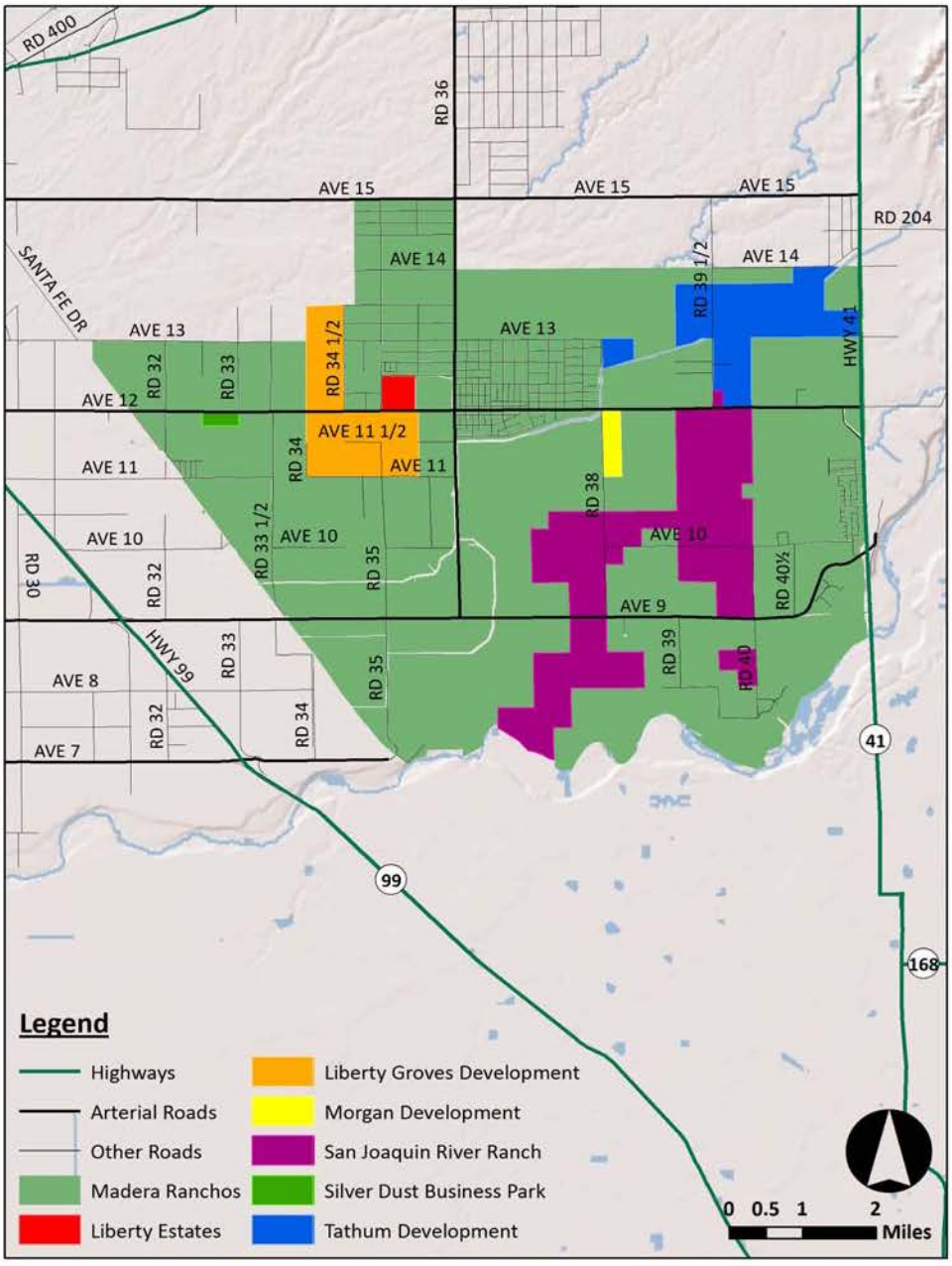
1. Center Point Industrial Park
2. Gateway Village
3. Gunner Ranch
4. Liberty Groves
5. Madera State Center Community College Specific Plan
6. Morgan
7. New English Ranchos
8. North Fork Village
9. Orchard Park
10. San Joaquin River Ranch
11. Silverdust
12. Tatham
13. Tesoro Viejo

Residential developments range in size from 363 units (Orchard Park) to 15,405 units (San Joaquin River Ranch). Commercial developments range in size from 63 acres (Silverdust) to 268 acres (Center Point Industrial Park). The development proposals together add up to more than 47,000 dwelling units and approximately 17 million square feet of commercial development. Table 5-1 is a summary of development quantities by land use type. Details of individual proposals are included in Appendix 5-1.

Table 5-1: Summary of Development Proposals for Avenue 12 Study Area

Land Use	Quantity	Unit
Residential	47,470	Dwelling Units
Commercial Office	9,116,000	Gross Square Feet
Shopping	1,133,000	Gross Square Feet
Light Industry	5,338,000	Gross Square Feet
Mixed Use	2,050,000	Gross Square Feet
Mixed Use	132	Acres
Industrial Park	331	Acres

Figure 5-1: Development Proposals (Summer 2009)



5.2 TRIP GENERATION

To demonstrate the potential traffic impacts of all the proposed developments, trips were generated for daily and peak hours of the day using equations in the 8th Edition (2008) of the ITE Trip Generation Manual. Results are summarized in Table 5-2. Appendix 5-2 contains details of land uses, associated trip rates, equations and trip calculations. The development proposals together are projected to add approximately 430,600 new trips each day to area roadways. During peak periods, between 40,000 and 50,000 projected new trips could occur per hour.

Table 5-2: Summary of Trip Generation by New Developments

	Trip Generation		
Land Use	**Daily Trips**	**AM Peak Hour**	**PM Peak Hour**
Residential	277,382	21,203	25,899
Commercial Office	52,627	8,241	10,446
Shopping	32,891	645	3,234
Industrial	56,631	7,897	8,912
Mixed Use	11,068	1,570	1,776
Total	**430,599**	**39,556**	**50,267**

5.3 POTENTIAL IMPACTS AND IMPLICATIONS

It is apparent that the magnitude of proposed new developments in the study area is enormous when looked at together. Similarly, the projected volume of associated new trips is high. At existing levels of over-dependence on the automobile, projected new trips are the approximate equivalence of twenty freeway lanes or forty rural two-lane highways. Table 5-3 illustrates the approximate equivalences in numbers of lanes by facility type, using the County's capacity rates. To put the enormity of the impacts in perspective, Avenue 9, Avenue 12, Avenue 15, SR 145 and SR 41 combined have roughly 12 lanes in the project area. If the number of lanes were doubled on all these key routes, it would result in 24 lanes. The situation would be much more complicated since proposed developments are not evenly distributed along these key roadways. With the centering of many developments on Avenue 12, it could be disproportionately impacted. This possibility is further investigated with the analysis of trip distribution and assignment in the next phase of the project.

Table 5-3: Equivalent Impacts of New Development Trips

		Equivalent Number of Lanes Required	
Facility Type	**Capacity (vehicles per lane)**	**AM Peak Hour**	**PM Peak Hour**
Freeway	2000	20	25
Multilane Highway	1800	22	28
Two-lane Highway	1145	35	44

5.4 ADJUSTMENTS TO TRIP GENERATION

This phase of the transportation study focused, for the most part, on methods, procedures and results of the four-step transportation planning process. Initial trip generation was presented in the previous section, but the initial volumes were adjusted for "capture" before the trip distribution and trip assignments tasks. Mode choice is skipped as vehicle trips were generated from the onset. Because of the mixture of residential and commercial uses in proposed developments, some of the trips would be captured on site or from motorists already on the roadways as explained in the following subsections.

5.4.1 Explanation of Capture Statistics Applied

Trips generated according to rates published by the Institute of Transportation Engineers (ITE) are further adjusted for "capture". A 50 percent ***on-site capture*** rate is used for reduction in retail patronage that would come from a mixed use site itself. Ultimately, it is the type of uses on site that would determine the percentage of patronage from the site. The Madera County Planning office can insist during the development review and approval process on the inclusion of commercial uses that residents are likely to frequent in order to achieve high onsite capture.

Data on ***pass-by capture*** show a range of 34 percent to 62 percent for a not so well defined future. Which statistic would most closely represent the ideas being tossed around for developments in the Madera Ranchos area? Assuming 60% pass-by capture is tantamount to a scenario of heavy highway and local-serving commercial use as one cannot truly predict what the outcome will be. But the County can insist on approaching the target set by the scenario during the development review and approval process. Indeed since the cities of Madera and Fresno are more than abundantly served with commercial establishments, highway and local serving commercial are the most feasible options for the Ranchos area. Expect few people to leave Madera City or Fresno purposely to shop in the Ranchos area unless they are already traveling through the Ranchos area.

By way of illustration, if a mixed use development is estimated according to ITE rates to nominally generate 100 retail vehicle trips during the peak hour, 50 percent of the patronage will come from the mixed-use site itself (on-site capture). That means 50 vehicle trips would come from outside the site. However, 60 percent of the trips from outside are already on the highway. So 50 vehicle trips would enter the site, but only 20 trips would be newly generated while 30 trips would come from vehicles already on the roadway. Appendix 7-1 has further details on the justification backing up the adjustments to trips.

5.4.2 Details of Capture Statistics Applied

Specific capture rates applied are presented at the beginning of Chapter 7.0 on Trip Assignment. It is the adjusted trips that are assigned to assess the impact of proposed developments on the area road network.

6.0 Trip Distribution

6.1 GRAVITY MODEL: BASIS OF TRIP DISTRIBUTION

Trip distribution in the four-step travel analysis process is based on the Gravity Model. This model is the basis of trip distribution in the Madera County Travel Demand Forecasting process. It also forms the basis of the trip distribution applied in the manual trip assignment used in this project. The model determines the number of trips from an origin to a destination to be directly proportional to the level of attraction at the destination and inversely proportional to the spatial separation between them. Accessibility to employment of all types is a surrogate for what attracts people to activities of various types. For instance, the number of jobs in retail at a location relates to the number of workers and the number of shoppers who visit that location.

6.2 TRIP DISTRIBUTION IMPLICIT IN 2006 CENSUS LEHD DATA

To determine the attractiveness of activity centers in the Madera Ranchos area to proposed new developments, we looked at the existing level of attractiveness of these centers to Ranchos workers. We used the Longitudinal Employment and Household Dynamics (LEHD) data from the US Bureau of Census. The data shows quantities and percentages of workers who travel to such area centers as the City of Madera, the City of Fresno, Madera Acres, points north toward Yosemite and points southwest beyond Fresno, among others. Table 6-1 shows the proportional distribution of trips to these areas according to the LEHD data. See Appendix 6-1 for further details.

Table 6-1: Proportional Distribution of Ranchos Workers to Area Activity Centers

Direction & Location of Activities	Proportion of Workers
North of Ranchos: Madera County and beyond	**52%**
City of Madera	30%
Yosemite area and points to the north	16%
Madera Ranchos	3%
"Other"	3%
South of Ranchos: Fresno County and beyond	**43%**
City of Fresno	26%
Other southern points	17%
"Other" places	**5%**
Total	**100%**

Source: US Bureau of Census, Longitudinal Employment and Household Dynamics (LEHD), 2006

6.3 VALIDATION WITH 2007 PEAK HOUR CORDON COUNTS

The trip distribution percentages implicit in the distribution of work locations is validated with available counts of traffic volumes that go across a cordon created around the study network. The cordon results in four major entry and exit points to the study area: northwest, southwest, northeast and southeast. All destinations are accessible via these entry and exit points. Peak period counts are used in the validation for the following reasons:

1. The distribution of work locations related to work trips that are primarily peak period phenomena.
2. The manual trip assignments to which the distributions will be applied are peak hour trips.

Table 6-2 compares the distribution implicit in the census data and those reflected by cordon counts. Additional details are in Appendix 6-2 and 6-3. First the data shows similarity between morning peak and afternoon peak distributions. Secondly, the cordon and census distributions track each other well. Differences may be accounted for by two key factors:

1. Cordon distributions include "through trips" while census distributions only consider those who travel from the Ranchos.
2. Census distribution includes trips that are "internal", that is, they originate and end within the Ranchos while cordon distributions do not include these.

Table 6-2: Comparison of Directional Distributions from Census and Cordon Counts

Direction	AM	PM	Census	Tesoro Viejo Study
Northwest (toward Madera)	24%	26%	30%	13%
Southwest (beyond Fresno)	16%	11%	17%	0%
Northeast (toward Yosemite)	28%	27%	16%	5%
Southeast (toward Fresno)	32%	37%	26%	25%
"Other" Internal	--	--	11%	57%
Total	100%	100%	100%	100%

An additional comparison is made with the directional distribution of trips used in the Tesoro Viejo Traffic Impact Study. It shows a wide diversion from the distributions indicated by both the cordon counts and census data. The most noticeable point of deviation is the assumption that nearly 60% of trips will originate and end within the study area. Additional details on the Tesoro Viejo Study are included in Appendix 6-4.

6.4 DERIVATION OF DIRECTIONAL DISTRIBUTIONS

6.4.1 Status Quo

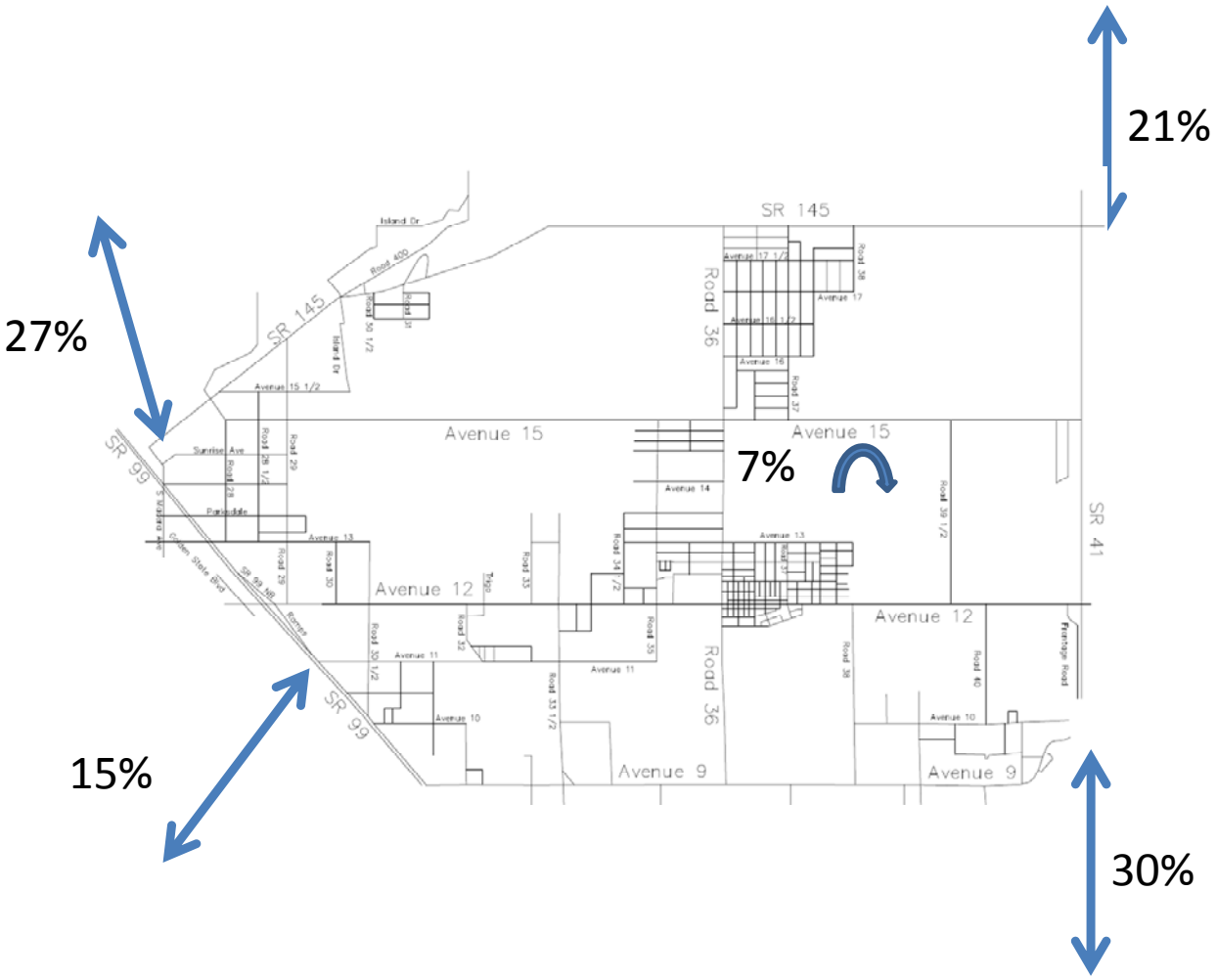
The directional trip distributions were derived from a three-step process. First, the morning and evening peak hour cordon distributions were combined into an average cordon distribution. Then the percentages were adjusted to reflect the portion of "internal" trips.

Finally the adjusted cordon distributions were combined with those reflected in the census data. The resulting directional distribution of trips captures what is reflected by the two sets of data (cordon and census) and is shown in Table 6-3 and Figure 6-1. But these directional distributions reflect the status quo, that is, development in the area is predominantly residential with opportunities for other activities mostly elsewhere.

Table 6-3: Directional Distributions derived from Census and Cordon Counts

Direction	AM Cordon Count	PM Cordon Count	Average AM/PM	AM/PM Adjusted for Internal	Census (LEHD)	Average Census/ Cordon
Northwest (toward Madera)	24%	26%	25%	24%	30%	**27%**
Southwest (beyond Fresno)	16%	11%	13%	13%	17%	**15%**
Northeast (toward Yosemite)	28%	27%	27%	26%	16%	**21%**
Southeast (toward Fresno)	32%	37%	35%	34%	26%	**30%**
"Other" Internal	--	--	--	3%	11%	**7%**
Total	100%	100%	100%	100%	100%	100%

Figure 6-1: Directional Distributions at Entry/Exit Points (Status Quo)



6.4.2 Jobs-Housing Balance Scenario

The County of Madera is adopting the policy of requiring new planned unit developments to demonstrate a balance between jobs and housing as part of the plan approval process. The latest collection of development proposals (summer 2009), for instance, indicate 48,000 jobs for approximately equal number of housing units. Under this policy, adjustments were made to the trips from Trip Generation Analysis before assignment. For the remaining trips going out of the study area, the status quo directional distributions would apply. Conceptually, one can also estimate very roughly that the directional distributions would reduce by roughly half as shown in Appendix 6-4b.

7.0 Trip Assignment

7.1 TRIP ASSIGNMENT METHODOLOGY

This chapter outlines the methodology, basis and results of manual trip assignments for the Avenue 12 and the Southeast Madera Area. The methods are applied to morning (AM) and afternoon (PM) peak hour travel. The following paragraphs and subsections outline the principles followed and the analytic steps taken in this phase of the transportation analysis.

A. Adjust trip generation calculations for mixed-use and retail land uses

For land uses that have mixed use original trip generation is reduced as follows:

i. In a mixed-use development, 50% of retail patronage is from onsite capture. Therefore only 50% of retail patronage constitutes external trips. Reduce unadjusted rates **to** 50%.

ii. For retail uses in general, 60% of external trips are pass-by trips. Therefore only 40% of external retail trips are new trips. Reduce unadjusted rates **to** 40%

B. Calculate number of IN/OUT trips for trips generated following adjustments

i. Apply the IN/OUT percentages from ITE to appropriate land uses.

ii. For each land use type and development proposal, split the trip results from step (A) into the IN/OUT percentages.

C. Create table of IN/OUT trips by directional distribution (NW, NE, SW, SE)

i. For each development proposal, add up all trips IN separate and all trips OUT separate for the particular peak hour.

ii. Now divide the totaled trips by directional distributions that were previously developed under Trip Distribution. See Table 7-1 and Figure 7-1:

D. Assign trips in table to network between development site and external cordon

For each of the proposed development sites, assignment tables are created to look somewhat like Table 7-1. Trips in the last row (total) are assigned to the network

Table 7-1: Sample Trip Assignment Table

AM Peak	27% Northwest		15% Southwest		21% Northeast		30% Southeast		7% Internal	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Residential										
Office										
Retail										
TOTAL										

7.2 BASIS OF TRIP ASSIGNMENT

Trip assignment in the four-step travel analysis process is based initially on all or nothing assumption of trips taking the shortest travel time path between origins and destinations. Origins and destinations are the entry/exit points on the study area cordon identified during

trip distribution (see Figure 6-1) and the locations of various proposed developments (See Figure 7-1). Note that most proposed new developments are centered on Avenue 12.

7.3 RESULTS OF INITIAL TRIP ASSIGNMENT

The initial set of trip assignments assumes motorists will use the shortest travel time path between origins and destinations regardless of capacity. Results indicate **enormous increase in peak period traffic flow** if all developments are implemented as proposed (see Figure 7-2). The trips assigned were adjusted for onsite capture for mixed use developments and pass-by capture for retail developments. Yet trip volumes on Avenue 12 are very high during peak hours. Even four lanes on Avenue 12 could not accommodate peak hour volumes. Initial projected peak directional volumes can reach 5500 vehicles per hour.

7.4 REFINEMENTS TO TRIP ASSIGNMENT

New assignments were performed, in which travelers would use available back roads and redistribute through the network to achieve a balanced or equilibrium flow. The new set of assignments assumed the following geometric improvements (see Figure 7-3):

1. 4 lanes on each of major east-west routes (i.e. Avenue 9. and Avenue 12) as included in the financially constrained transportation improvement plan (TIP) for the area.

2. Other east-west routes (i.e. Avenue 15 and SR 145) would remain two-lane roads

3. 4 lanes on selected north-south roads (Road 33½, Road 36, and Road 39 ½) that are deemed necessary to provide interconnection with the east-west avenues.

4. Extension of the selected north-south roads to connect with all the east-west avenues.

5. 4 lanes on SR 41 with interchange at Avenue 12 (that has two intersections for turning movements) as included in the financially constrained TIP.

The reassignment of trips is based on the concept that motorists would continue to search for the shortest travel time routes. As an initial route becomes congested, travel time increases and an alternative would become attractive for additional motorists. This process would continue to redistribute traffic volumes till flows and travel times are balanced along alternative routes between sets of origins and destinations. The resulting equilibrium assignment is shown in summary form as peak directional volumes in Figure 7-4 and as turning volumes in Figure 7-5.

Figure 7-1: The Avenue 12 Transportation Study Area, Network & Proposed New Developments

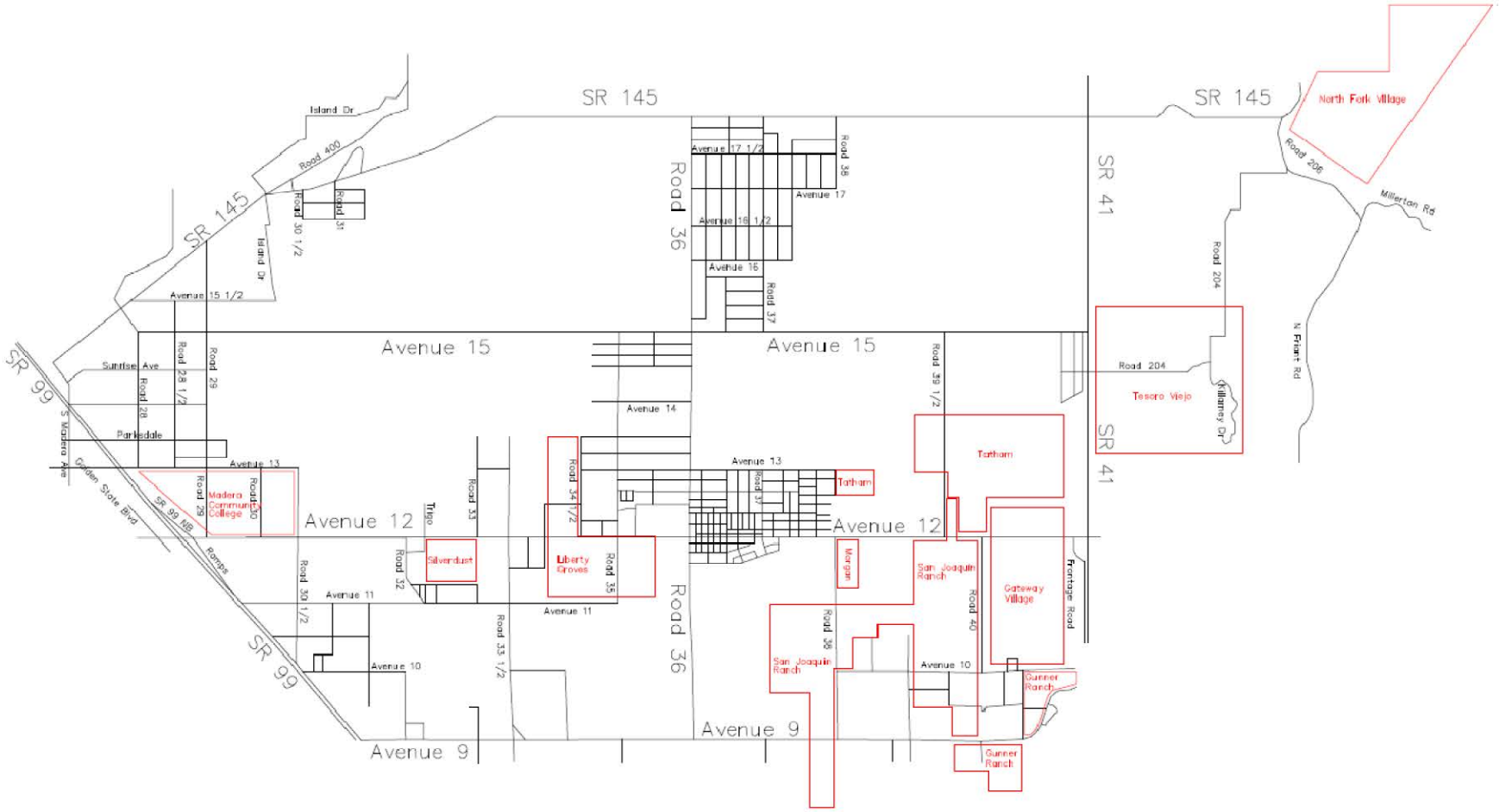


Figure 7-2: Future Peak Hour Volumes under Proposed New Developments (All or Nothing Assignment only)

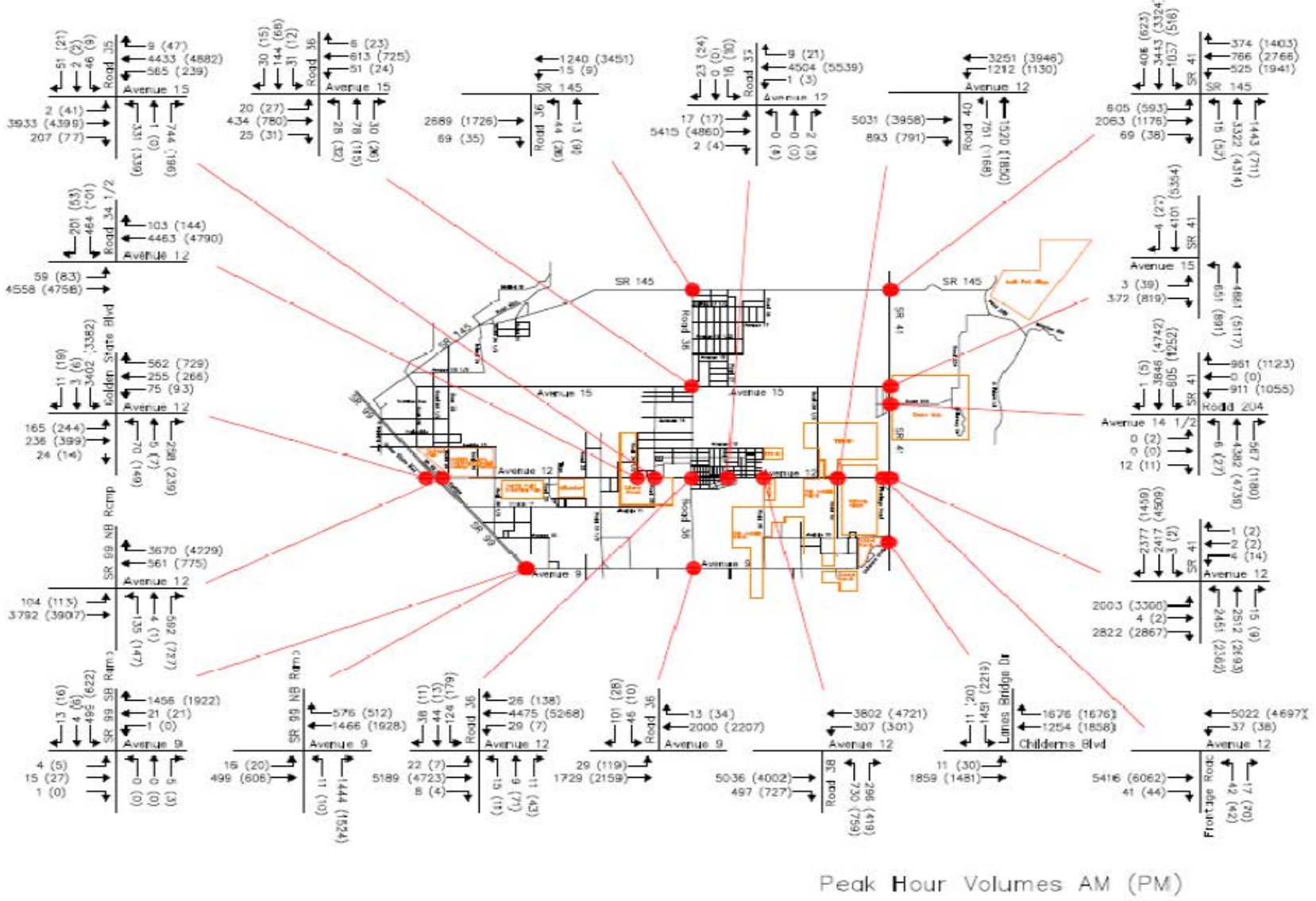


Figure 7-3: Geometric Improvements Assumed under Equilibrium Assignment

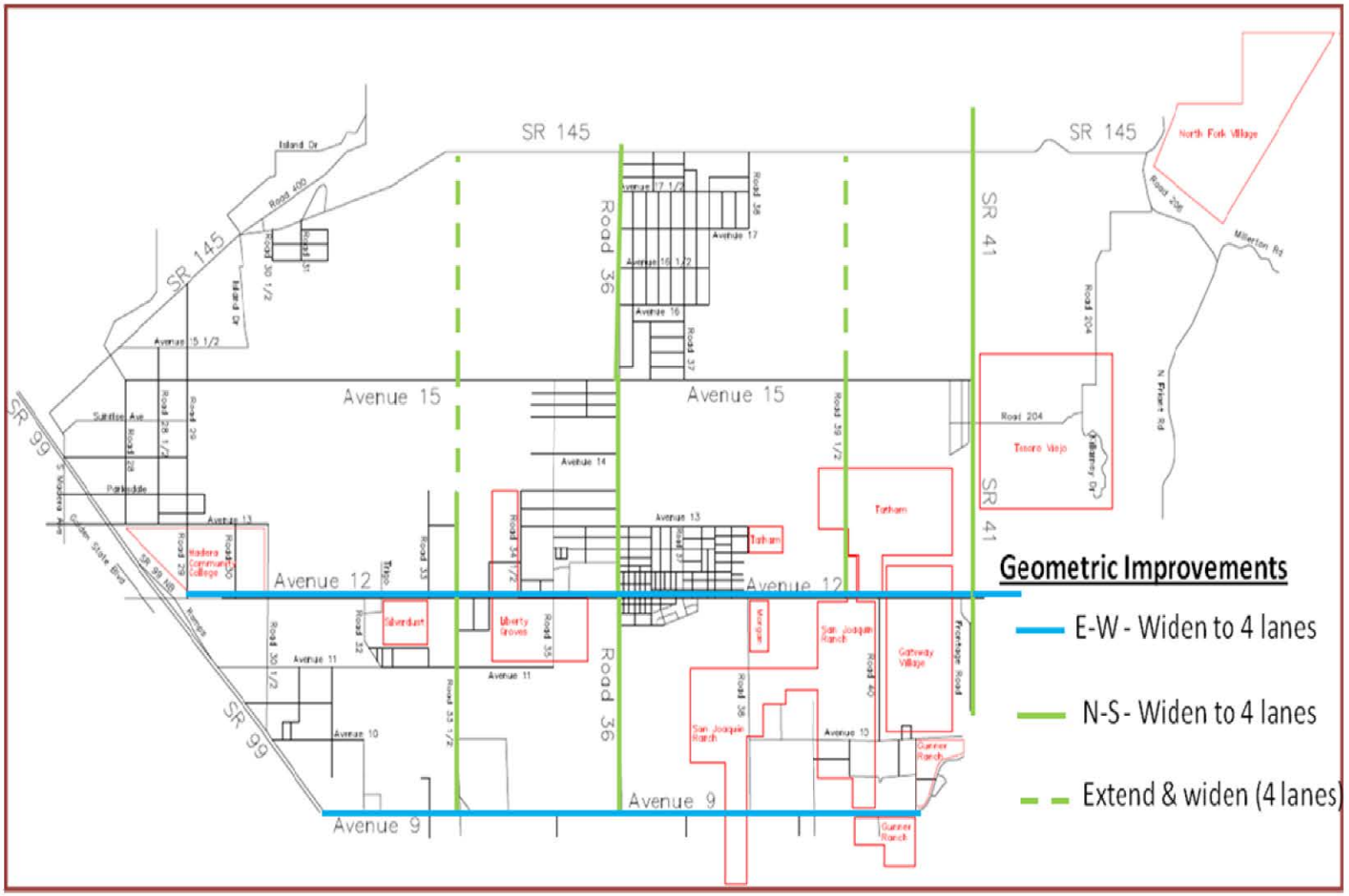


Figure 7-4: Future Peak Hour <u>Directional</u> Volumes under Proposed New Developments (Equilibrium Assignment)

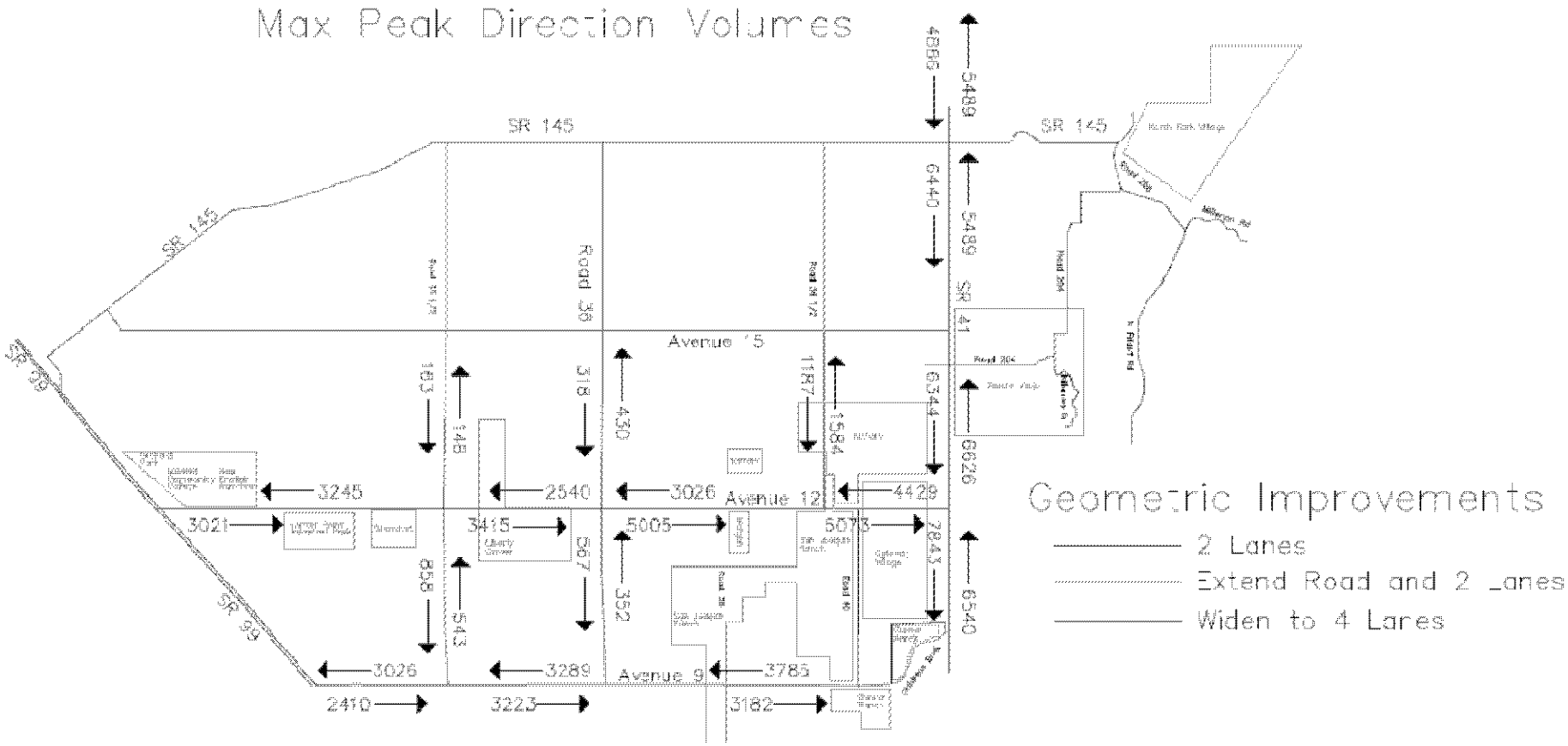
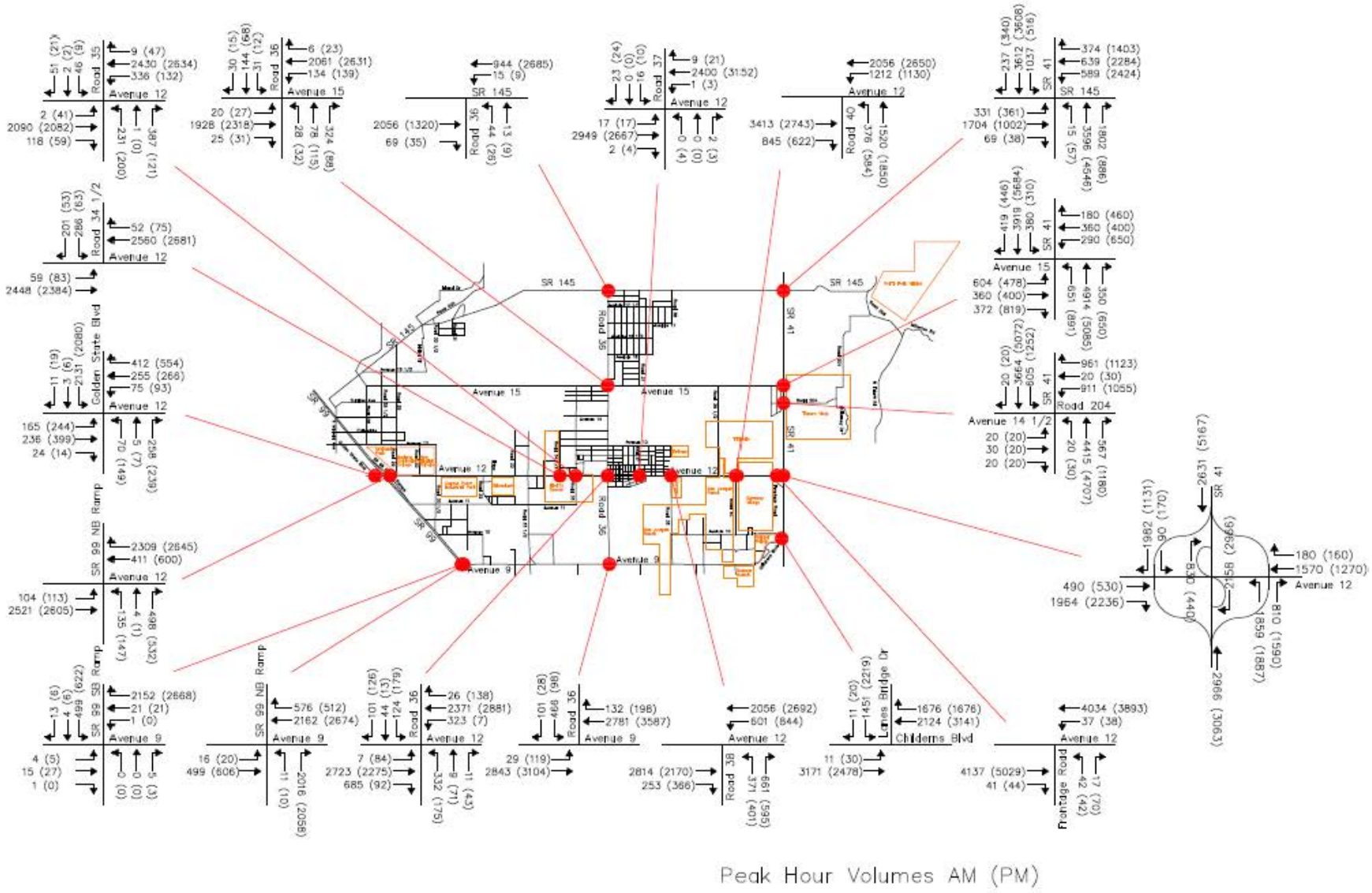


Figure 7-5: Future Peak Hour Turning Volumes under Proposed New Developments (Equilibrium Assignment)



8.0 Impacts and Potential Mitigation Measures

8.1 FUTURE OPERATING CONDITIONS ON AVENUE 12

Levels of service (LOS) analyses were performed for key intersections on Avenue 12 to assess traffic impacts. The intersections include Avenue 12 at: (a) Road 35; (b) Road 36; (c) Road 38; (d) SR 41 SB; and (e) SR 41 NB. LOS analyses were conducted for morning and afternoon peak hours under two scenarios: (a) one without a bypass and (b) one with a proposed bypass around the central section of the Ranchos, with approximate limits from Road 35 to Road 38. See Figure 8-1 for the concepts for the bypass. Appendix 8-0 shows intersection lane configurations investigated under various scenarios.

8.1.1 LOS without Bypass

Table 8-1 shows a summary of LOS results. Without the bypass, LOS is poor at all the key intersections signifying the same operating conditions along most of Avenue 12. . It is worth noting that the two intersections created at Avenue 12 and the SR 41 ramps would operate at a fair level of LOS E during most peak hours. Additional details are included in Appendix 8-1.

To achieve acceptable LOS of D would require widening Avenue 12 to six through lanes with separate turn bays for left and right turns, but this lane configuration is neither in the plans for the area nor will it solve the problem at all intersections. Additional LOS details are included in Appendix 8-2.

8.1.2 LOS with Bypass

To analyze the bypass scenario, the equilibrium assignment was modified for the section of Avenue 12 from Road 35 to Road 38. Left turn and right turn volumes on Avenue 12 would remain largely unaffected as they originate from or are destined for locations along central Madera Ranchos. Through volumes are affected by the bypass and are distributed between Avenue 12 and the Bypass according to probabilities of motorists choosing (a) Avenue 12 at 30 mph for 3 miles vs. (b) a Bypass at 60 mph for 4 miles.

Applying the BPR curve to an estimated directional through volume of 2400 vehicles per hour (vph) in each peak hour produced a split of: (a) 960 directional through vehicles on Avenue 12; and (b) 1440 directional through vehicles on the bypass. To determine the resulting traffic volumes on Avenue 12, 1440 vph were subtracted from the through volumes in each direction over the section of Avenue 12 from Road 35 to Road 38. Appendix 8-4 shows the derivation of through trips on the Bypass.

With the bypass, LOS is acceptable (at D or better) at the key intersections signifying the same operating conditions along the central section of Avenue 12. Additional details are included in Appendix 8-3.

Table 8-1 shows a summary of the results by scenario. Figure 8-1 illustrates the projected levels of service by scenario along Avenue 12. Results indicate that Avenue 12 through the central Ranchos could operate with three or four lanes with the complementary Bypass.

Table 8-1: Summary of Future Levels of Service Analyses by Scenario

NO Bypass						
Scenario:	No Bypass; 3-lane Avenue 12		No Bypass; 4-lane Avenue 12		No Bypass; 6-lane Avenue 12	
Intersection	AM	PM	AM	PM	AM	PM
Avenue 12 at Golden State Blvd	F	F	E	F	D	D
Avenue 12 at SR 99 NB	F	F	D	D	B	C
Avenue 12 at Road 35	F	F	E	C	C	B
Avenue 12 at Road 36	F	F	F	F	D	D
Avenue 12 at Road 37	F	F	C	C	A	A
Avenue 12 at Kensington	F	F	C	B	B	A
Avenue 12 at Road 38	F	F	F	F	E	E
Avenue 12 at Road 40	F	F	F	F	F	F
Avenue 12 at Frontage Road	F	F	F	F	B	E
Avenue 12 at SR 41 SB	F	F	E	B	C	B
Avenue 12 at SR 41 NB			E	D	C	B
With Bypass						
Scenario:	4-lane Bypass; 3-lane Avenue 12		4-lane Bypass; 4-lane Avenue 12		6-lane Bypass; 4-lane Avenue 12	
Intersection	AM	PM	AM	PM	AM	PM
Avenue 12 at Golden State Blvd	F	F	E	F	D	D
Avenue 12 at SR 99 NB	F	F	D	D	B	C
Avenue 12 at Road 35	E	E	C	B	C	B
Avenue 12 at Road 36	F	E	C	C	C	C
Avenue 12 at Road 37	E	E	A	A	A	A
Avenue 12 at Kensington	E	E	A	A	A	A
Avenue 12 at Road 38	F	F	D	C	D	C
Avenue 12 at Road 40	F	F	F	F	F	F
Avenue 12 at Frontage Road	F	F	F	F	B	E
Avenue 12 at SR 41 SB	F	F	E	B	C	B
Avenue 12 at SR 41 NB			E	D	C	B

Notes:

AM = Morning Peak Hour

PM = Evening Peak Hour

Figure 8-1: Concepts for a Bypass around Central Madera Ranchos

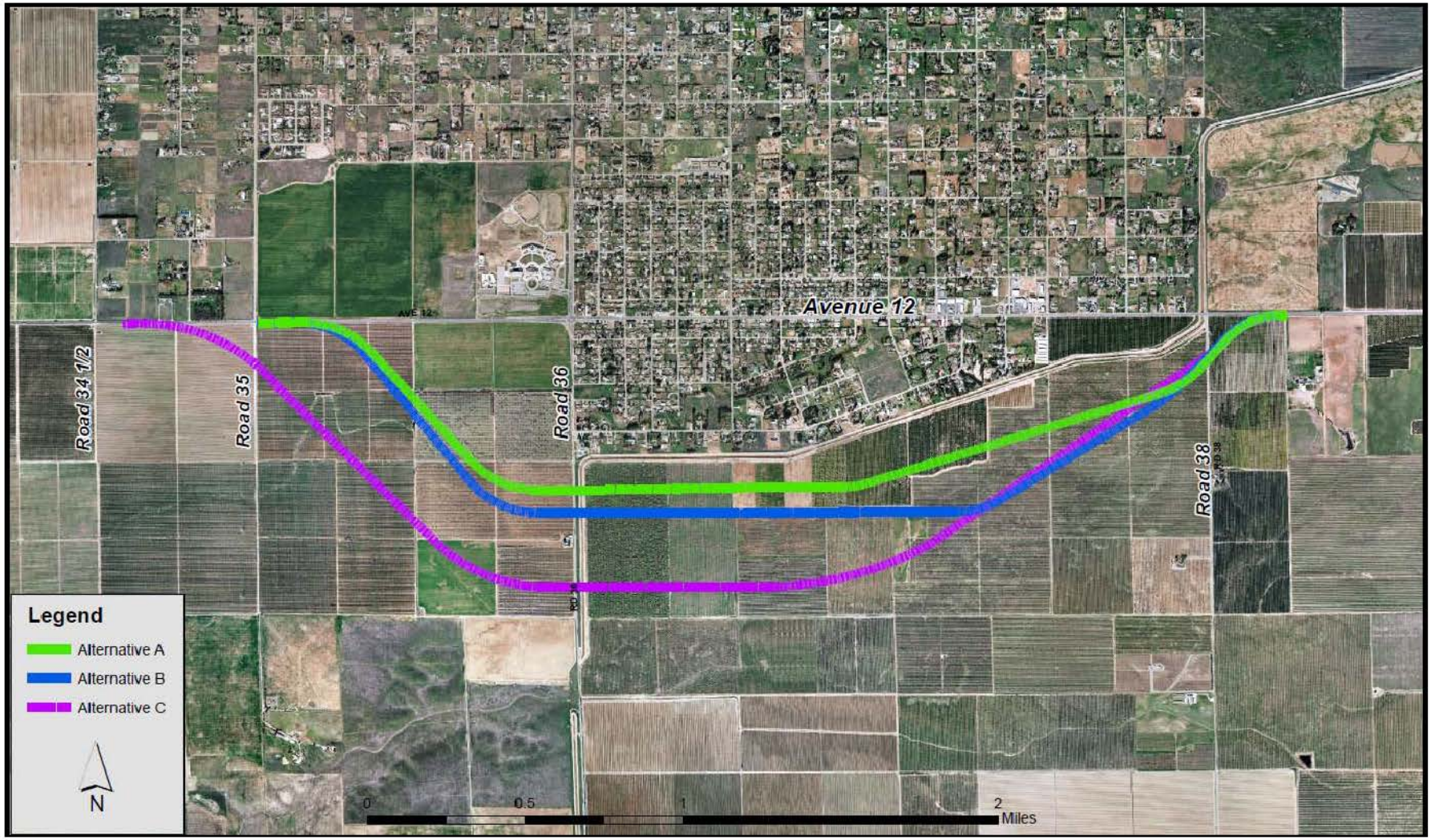


Figure 8-2: Distribution of Future Peak Hour Levels of Service by Scenario along Avenue 12

	Avenue 12 at Road 35		Avenue 12 at Road 36		Avenue 12 at Road 37		Avenue 12 at Kensington		Avenue 12 at Road 38		Avenue 12 at Road 40		Avenue 12 at Frontage Road		Avenue 12 at SR 41 SB		Avenue 12 at SR 41 NB	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
3A+0B	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
4A+0B	E	C	D	D	C	C	C	B	F	F	F	F	F	E	E	E	E	D
6A+0B	C	B	D	D	A	A	B	A	E	E	F	F	B	E	C	B	C	B
3A+4B	E	E	F	E	E	E	E	E	F	F	F	F	F	F	F	F	F	F
4A+4B	C	B	C	C	A	A	A	A	D	C	F	F	F	F	E	B	E	D
3A+6B	C	B	C	C	A	A	A	A	D	C	F	F	B	E	C	B	C	B

Legend:

C	LOS better than D (room available)	3A+0B	= 3-lane Ave. 12 + No Bypass	3A+4B	= 3-lane Ave. 12 + 4-lane Bypass
D	LOS is D or E (near capacity)	4A+0B	= 4-lane Ave. 12 + No Bypass	4A+4B	= 4-lane Ave. 12 + 4-lane Bypass
F	LOS is F (breakdown)	6A+0B	= 6-lane Ave. 12 + No Bypass	3A+6B	= 3-lane Ave. 12 + 6-lane Bypass

8.2 POTENTIAL MITIGATION MEASURES

The analyses suggest certain geometric improvements along Avenue 12 and in the general Madera Ranchos area to attain acceptable operating conditions under equilibrium flow conditions. These roadway and alternative modal improvements are outlined in the subsections that follow.

8.2.1 Roadway Improvements

Avenue 12:

- At least 4 lanes (as in TIP,) but preferably 6 lanes on Avenue 12 west of the central Ranchos beyond the connection point of the proposed bypass
- No less than 6 lanes (higher than indicated in TIP, but preferable) on Avenue 12 east of the central Ranchos beyond the connection point of the proposed bypass
- Separate left and right turn bays at major intersections along Avenue 12 in the central Ranchos

Bypass Options:

- Not building a bypass would require a 6-lane Avenue 12 plus turn lanes
- A 2-lane bypass would require a 4-lane Avenue 12 plus turn lanes
- A 4-lane bypass can accommodate a 3-lane cross-section on Avenue 12

Other Roadway Improvements:

These other improvements are necessary for the area transportation system to function properly. They include:

- 4 lanes on selected north-south roads (Road 33½, Road 36, and Road 39 ½). These improvements would be necessary to provide interconnection between Avenue 12 and other east-west avenues (that is, Avenue 9, Avenue 15 and SR 145).

- Extension of the selected north-south roads to connect with the identified east-west avenues.

- Interchange at Avenue 12 and SR 41 as in TIP
- 4 lanes on Avenue 9 (as in TIP)

8.2.2 Bicycling & Walking

Pedestrian facilities are inadequate and need to be upgraded as follows:

- Sidewalks between high school and Ranchos
- Crossings and footpaths to link major centers for shopping, recreation and services in the Ranchos.

Bicycle Lanes/Paths are sparse and need to be upgraded as follows:

- Bike lanes along Avenue 12 to connect to the high school
- Bike lanes within the Ranchos with connections to major centers for shopping, recreation and services

8.2.3 Public Transportation:

Public Transportation services are inadequate and need to be upgraded to include the following:

- Regular hourly service between Madera and Fresno through the Ranchos with runs that swing through the Ranchos for “local Service”

- "Express runs" inserted on the half hour between Madera and Fresno through the Ranchos (with no local detours) during peak periods (7 – 9 AM and 4 – 6 PM)
- Small-van, on-call, dial-a-ride service to operate within the Ranchos and link it with neighboring communities.

9.0 Elements of the Circulation Plan

9.1 OVERVIEW OF PLAN ELEMENTS

The results of the transportation analyses are combined with community visions and urban design plan to derive a set of recommendations for future transportation improvements along the Avenue 12 corridor and in the general study area. Specific elements addressed in this section include: (a) area-wide roadway improvements; (b) Avenue 12 specific roadway improvements; (c)public transportation service to and from the Ranchos; (d) Bicycling and walking in the Madera Ranchos area.

9.2 AREA-WIDE ROADWAY IMPROVEMENTS

The set of area-wide improvements necessary for the area transportation system to function properly under future build conditions include widening on the major east-west routes (Avenue 9, Avenue 12, Avenue 15 and SR 145). Hand in hand with these improvements will be the need to extend and widen selected north-south roads (Road 33½, Road 36, and Road 39 ½) to create a grid network of major arteries that would enable alternative route choices and distribution of trips for an efficient circulation system. An already planned improvement is the upgrade of the intersection of Avenue 12 at SR 41 to an interchange. Figure 9-1 illustrates the recommended area-wide improvements at build-out.

9.3 AVENUE 12 SPECIFIC ROADWAY IMPROVEMENTS

9.3.1 Business 12 and Express Bypass

Several improvements are called for on Avenue 12 for it to continue to serve its dual purpose as an area-wide arterial road and “Main Street” through the Ranchos. To remain a primary artery, Avenue 12 needs a bypass (termed Express Bypass) round the central Ranchos with widening to preferably six lanes on its eastern and western segments beyond the bypass. Consistent with community aspirations, the section of Avenue 12 through the central Ranchos (termed Business 12) can maintain a three-lane cross-section with the middle lane for left turns or conversion to landscaped medians as included in the urban design plan. Figure 9-2 illustrates the concept of the Business 12 and Express Bypass combination.

There are three possible geometric configurations of the connecting points between Business 12 and the Express Bypass. Depending on funding and growth in traffic, it is conceivable that these connecting points may take on each of these configurations at various points in time. The first is a standard signalized intersection shown in Figure 9-2. The second, which is an alternative to the first as an initial treatment, is the roundabout. With a diameter of 150 feet for the inscribed circle, it would calm traffic speed to 25 mph and enable two lanes on the circle. Figure 9-3 illustrates the roundabout configuration. The third, which is an upgrade to the first two, is an interchange. Figure 9-4 illustrates the interchange alternative. It is noteworthy that all three configurations recognized the treatment of movements to and from the bypass as those on the primary artery.

Figure 9-1: Recommended Area-Wide Improvements at Build-Out

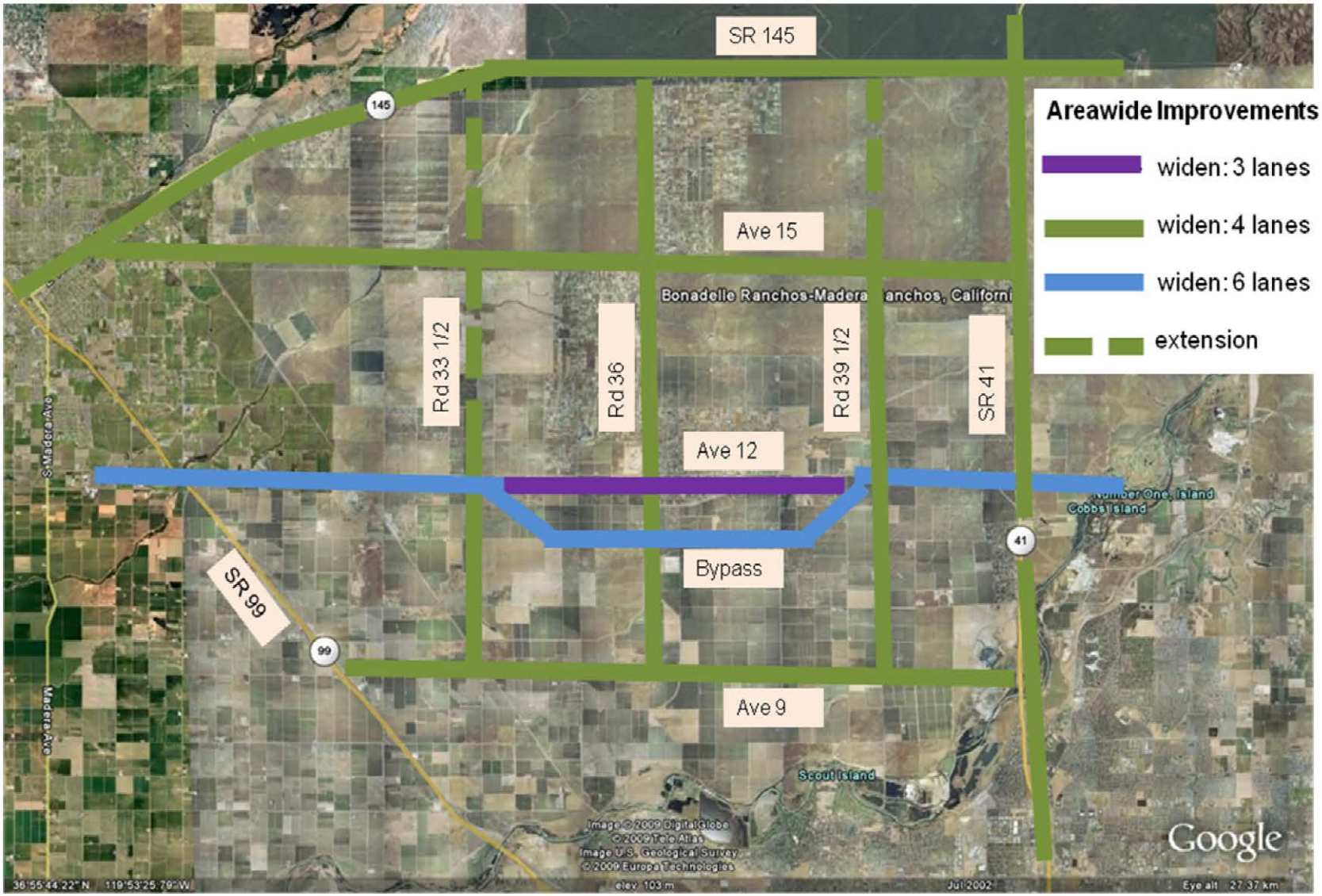


Figure 9-2: Geometric Configuration of Business 12 at Express Bypass: Intersection Alternative

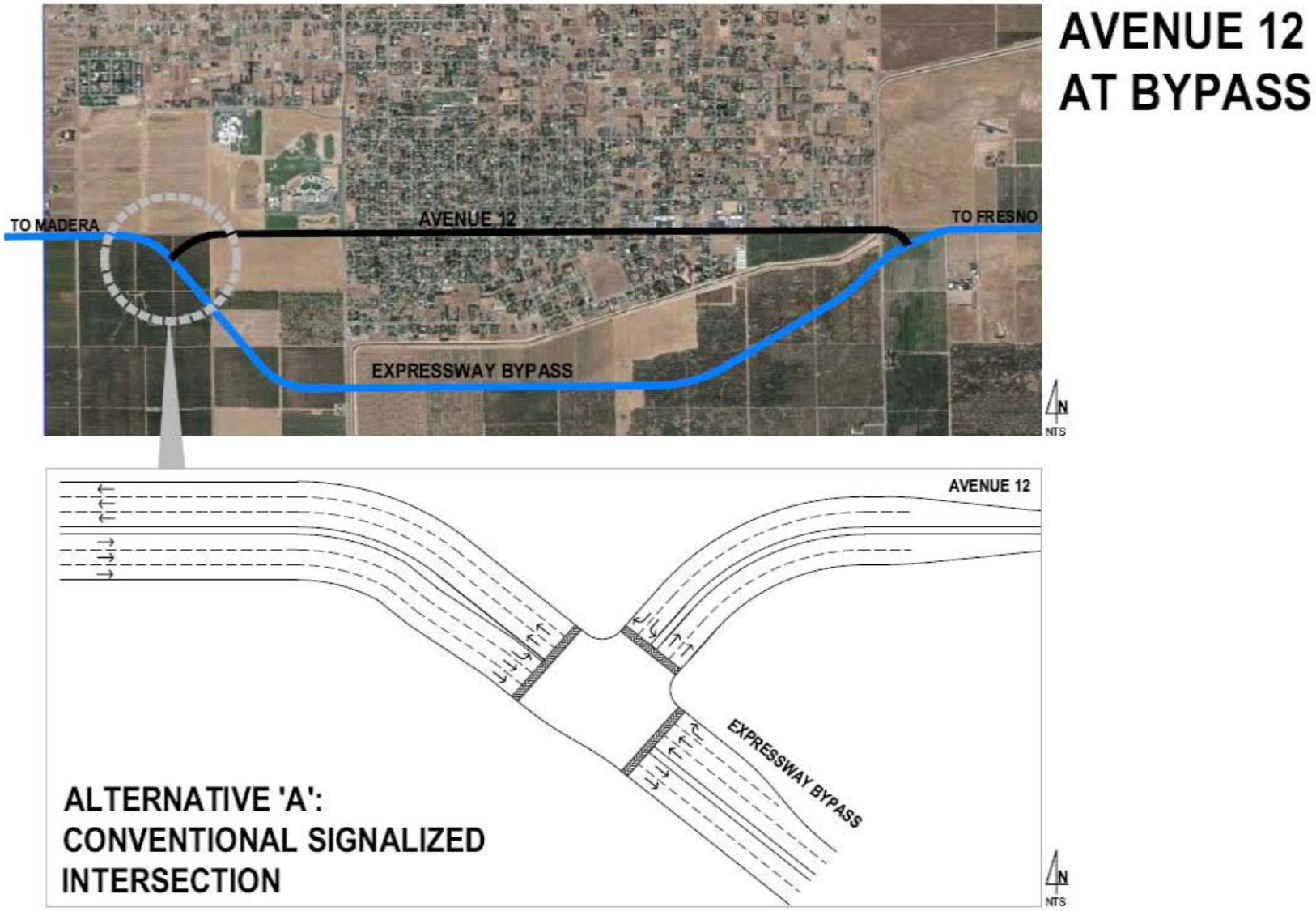


Figure 9-3: Geometric Configuration of Business 12 at Express Bypass: Roundabout Alternative

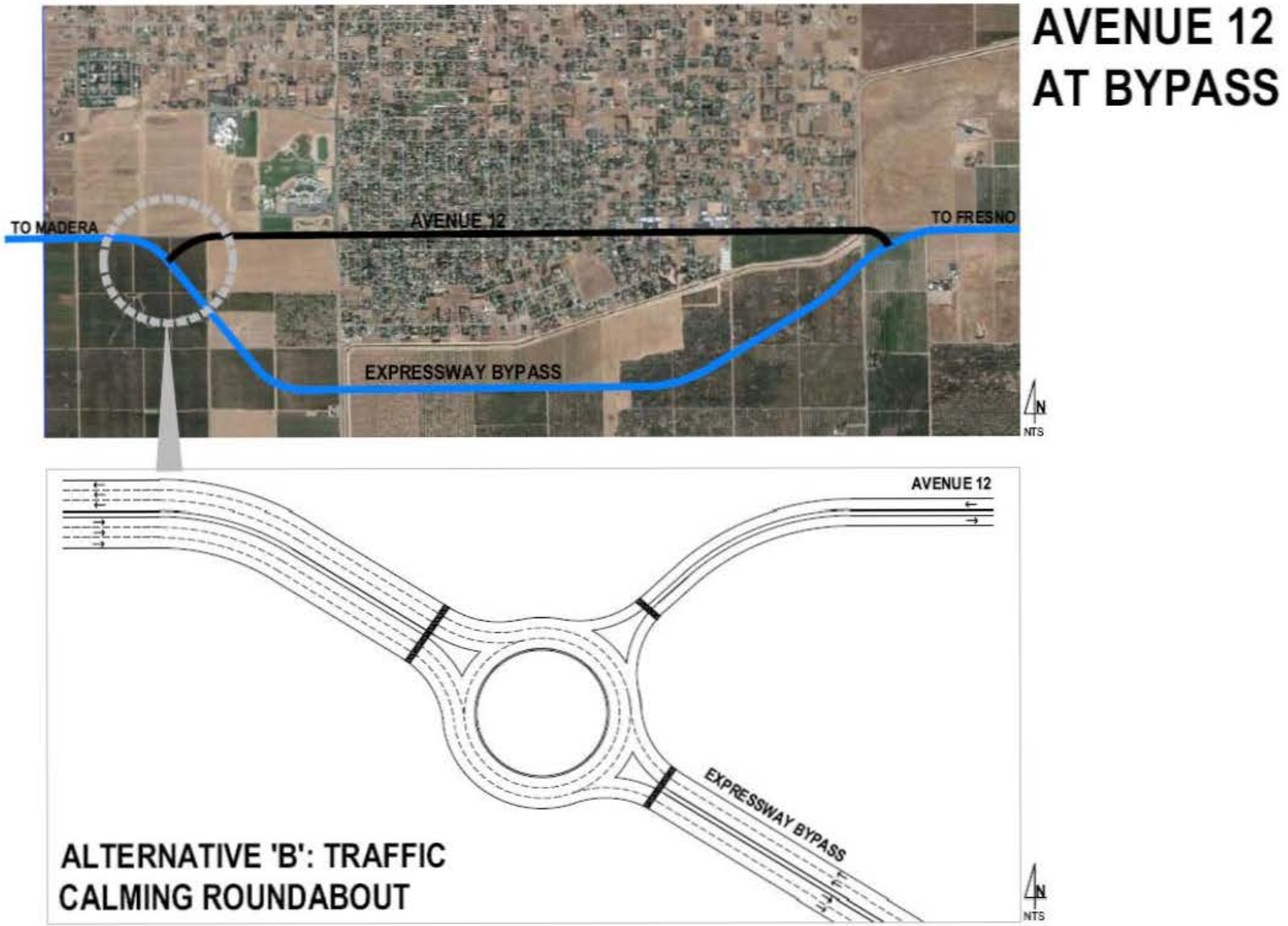
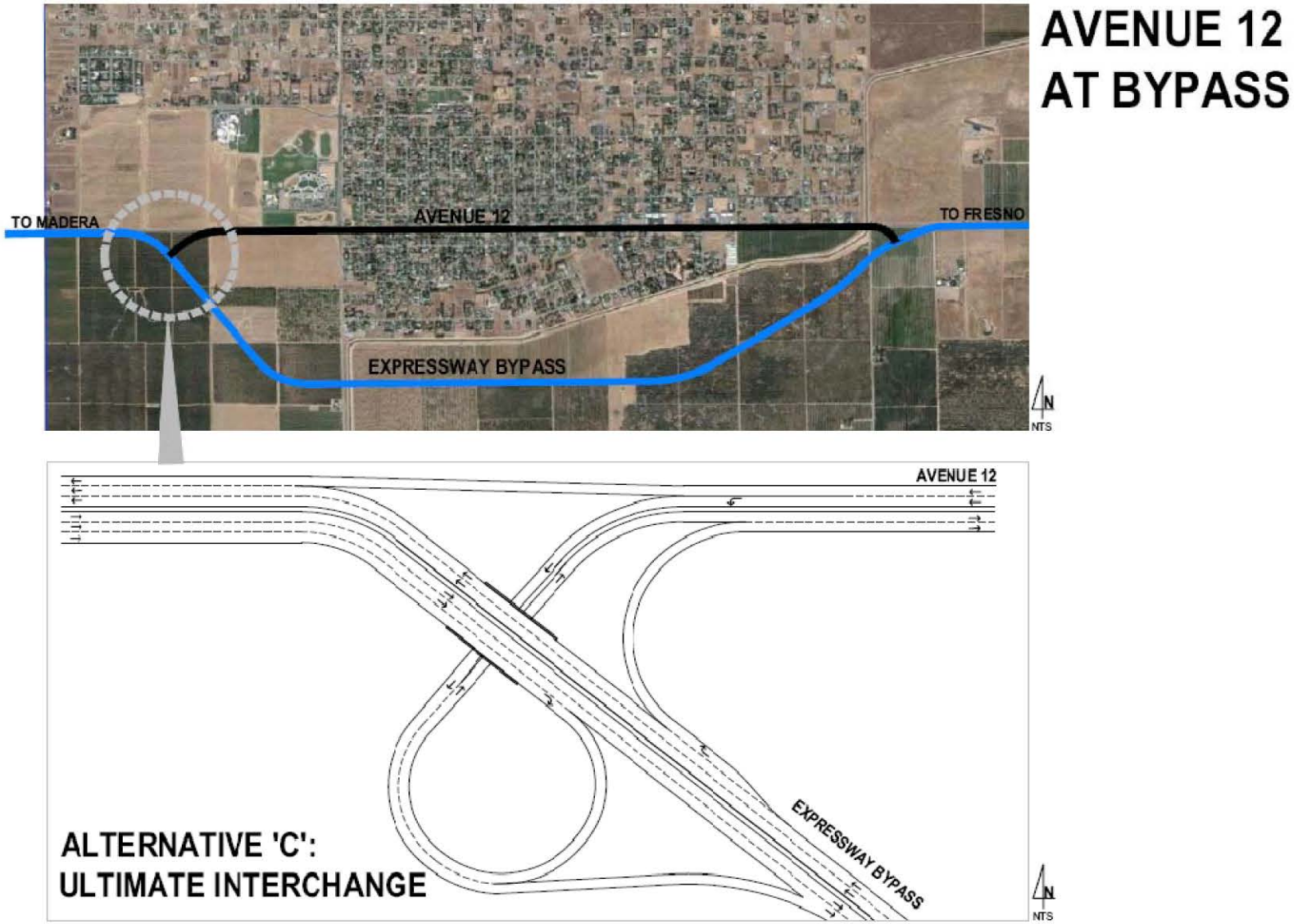


Figure 9-4: Geometric Configuration of Business 12 at Express Bypass: Interchange Alternative



9.3.2 Traffic Calming and Control

The circulation plan includes several traffic control measures that would foster safety through the Ranchos. Traffic is to be calmed along the commercial segment of Avenue 12 through town. This is to be accomplished with a series of traffic signals or roundabouts and raised crosswalks at strategic locations indicated in Figure 9-5.

Traffic signals should be semi actuated. They should rest on Avenue 12 unless there is a call from the side streets in which case detectors will signal if vehicles are within the dilemma zone or not before stopping traffic on Avenue 12. Signals on Avenue 12 should be coordinated to control traffic flow at 30 mph. The choice between traffic signals and roundabouts will depend on future levels of traffic flow and justification that appropriate warrants are met. The suggested locations for traffic signals are the major intersections along the segment of Avenue 12 through town.

Roundabouts have a natural calming effect on traffic flow as motorists are compelled to slow down on approach, but do not necessarily have to stop. The elimination of stops can reduce the incidence of rear-end collisions. To navigate the circle, motorists must slow down to 25 mph even for a dual-lane roundabout with an inscribed circle of 150 feet in diameter. Potential locations are shown in Figure 9-5. The suggested locations for roundabouts are the major intersections along the segment of Avenue 12 through town.

Raised pedestrian crosswalks are to be strategically placed between traffic signals or roundabouts to foster traffic calming. Also termed speed tables, these raised crosswalks rise to 4 or 6 inches over a six-foot distance, maintain that elevation over a 10-foot distance and descend over a six-foot distance. They make pedestrians much more visible to motorists, while they slow down the speed of the vehicles as they navigate the table. Locations of raised crosswalks are indicated in Figure 9-5. The suggested locations for raised cross-walks are locations where land uses in the redesigned downtown area would require heavy pedestrian crossing activity in between the major intersections along the segment of Avenue 12 through town.

Stop signs should be installed on the side street approaches to Avenue 12 at those intersections where neither traffic signals nor roundabouts are warranted. No stop signs are envisioned for Avenue 12 traffic.

9.4 PUBLIC TRANSPORTATION IMPROVEMENTS

9.4.1 Fixed-Route Transit

Two forms of fixed route transit are recommended for the Madera Ranchos and area residents. One is an upgrade of the limited existing fixed route service. See Figure 9-6.

Local fixed-route service should run hourly between the two major cities of Fresno and Madera. Within the Ranchos, it should detour through neighborhoods. Figure 9-6 shows the recommended routing and potential bus stop locations. The local bus line is routed through the Ranchos and bus stop locations are selected to expand the number of residents who are within walking distance of bus stops. Stop locations are selected to ensure proximity to such major activity centers as downtown and schools.

Express fixed-route service should be inserted on the half hour during the morning and afternoon commute periods. Intended to serve workers primarily, it will have a limited number of stops including two along Avenue 12 within the Ranchos. Express service runs are envisioned to occur in each direction of the route at 6:30 AM, 7:30 AM, and 8:30 AM as well as 3:30 PM, 4:30 PM and 5:30 PM. The express bus line is not routed through the Ranchos in order to maintain expedited service but stop locations are expanded along Avenue 12 to ensure proximity to such major activity centers as downtown and schools.

9.4.2 Flexible-Route Transit

Dial-a-ride transit is recommended to supplement fixed-route transit. It is envisioned especially to provide accessibility to uses that are off the bus routes including access to and from fixed-route stops. Dial-a-ride service has not fixed routes nor fixed stops as it provides door-to-door transportation.

9.5 BICYCLING AND WALKING FACILITY IMPROVEMENTS

9.5.1 Bicycle Paths and Lanes

A network of bicycle paths and lanes are proposed to serve the need for short-distance transportation between activities and for recreation. See Figure 9-7.

A two-way separated bicycle path is the primary means for non-motorized circulation over most of the segment of Avenue 12 between the high school on the west and the canal crossing on the east. This path is within the northern right-of-way of Avenue 12.

One-way separated bicycle paths are recommended for each direction of traffic flow within the downtown area. This is to facilitate movement in what is envisioned to become a very busy section of town.

On-street bicycle lanes are to be marked to run concurrently with each direction of traffic flow within the Ranchos. These are shown in the northern part of the Ranchos.

Trails are recommended (for both recreational bicyclists and walkers) to circulate two park and open space areas in the southern part of the Ranchos. These trails are also connected with each other and with the other bicycling and walking facilities.

9.5.2 Sidewalks and Crossings

Wide sidewalks (of 8 feet wide or more) are the primary pedestrian facility to run on both sides of Avenue 12 between the high school on the west and the canal crossing on the east. See Figure 9-7. Wider sidewalks are envisioned in the downtown area. See cross sections in the next chapter for additional details.

Pedestrian crossings should be provided at all intersections; this includes the locations of raised cross-walks. Crossings were presented in the section on Traffic Calming and Control and Figure 9-5.

Bulb-outs should be included in the design of intersections to shorten the crossing distance for pedestrians. They also create narrow turning radii which slow down turning vehicles at intersections and enhance pedestrian safety. Figure 10-1 in the next chapter shows an example of a bulb-out treatment at an intersection.

Figure 9-5: Traffic Control

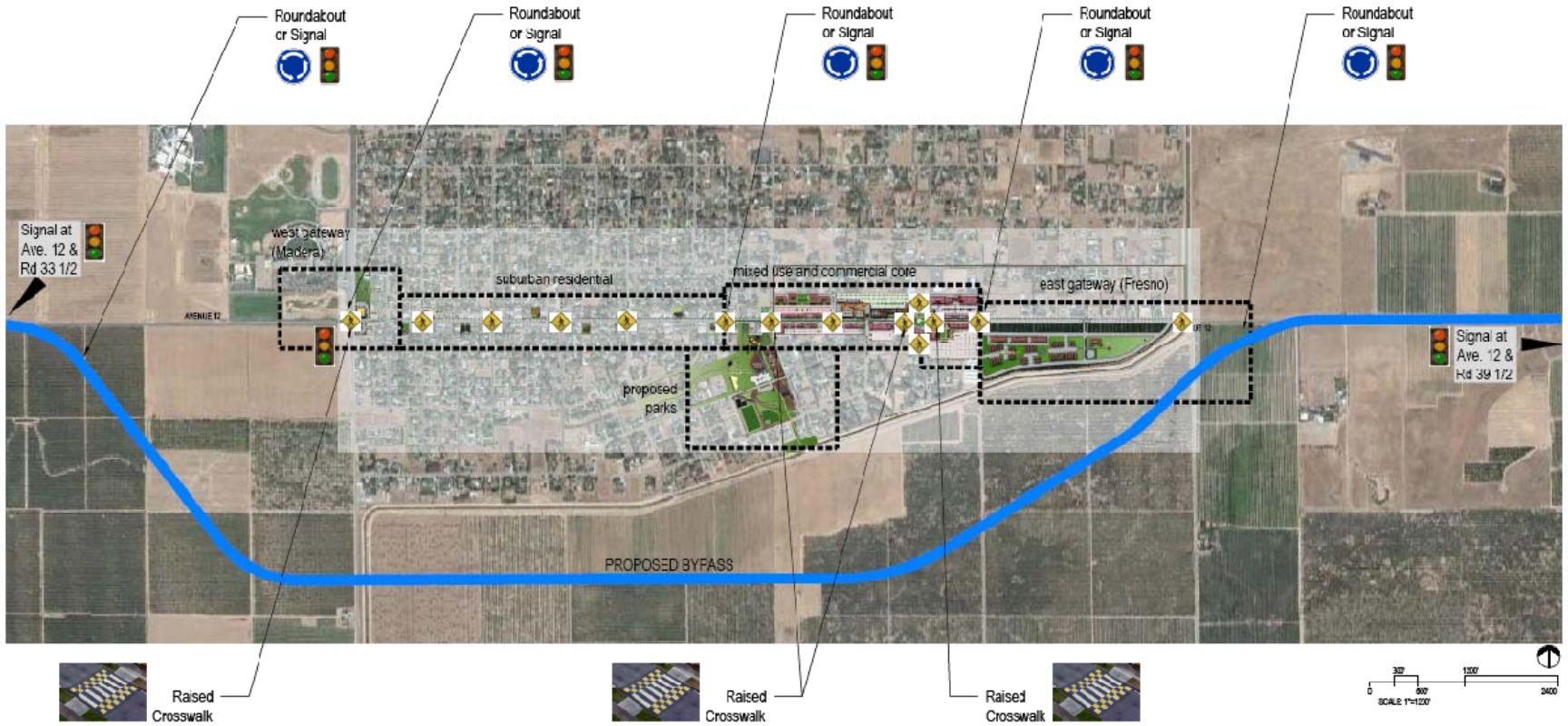


Figure 9-6: Public Transportation Improvements

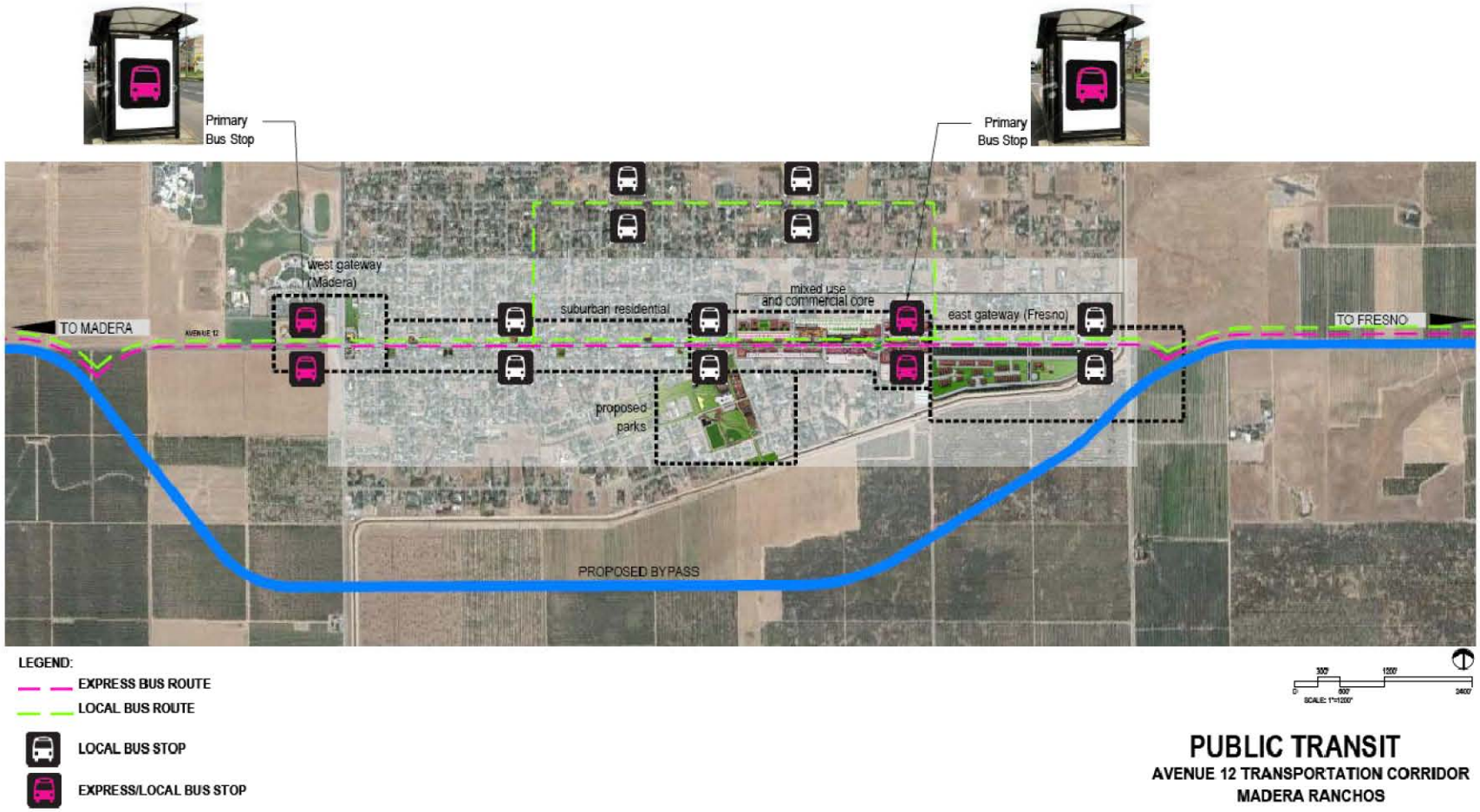
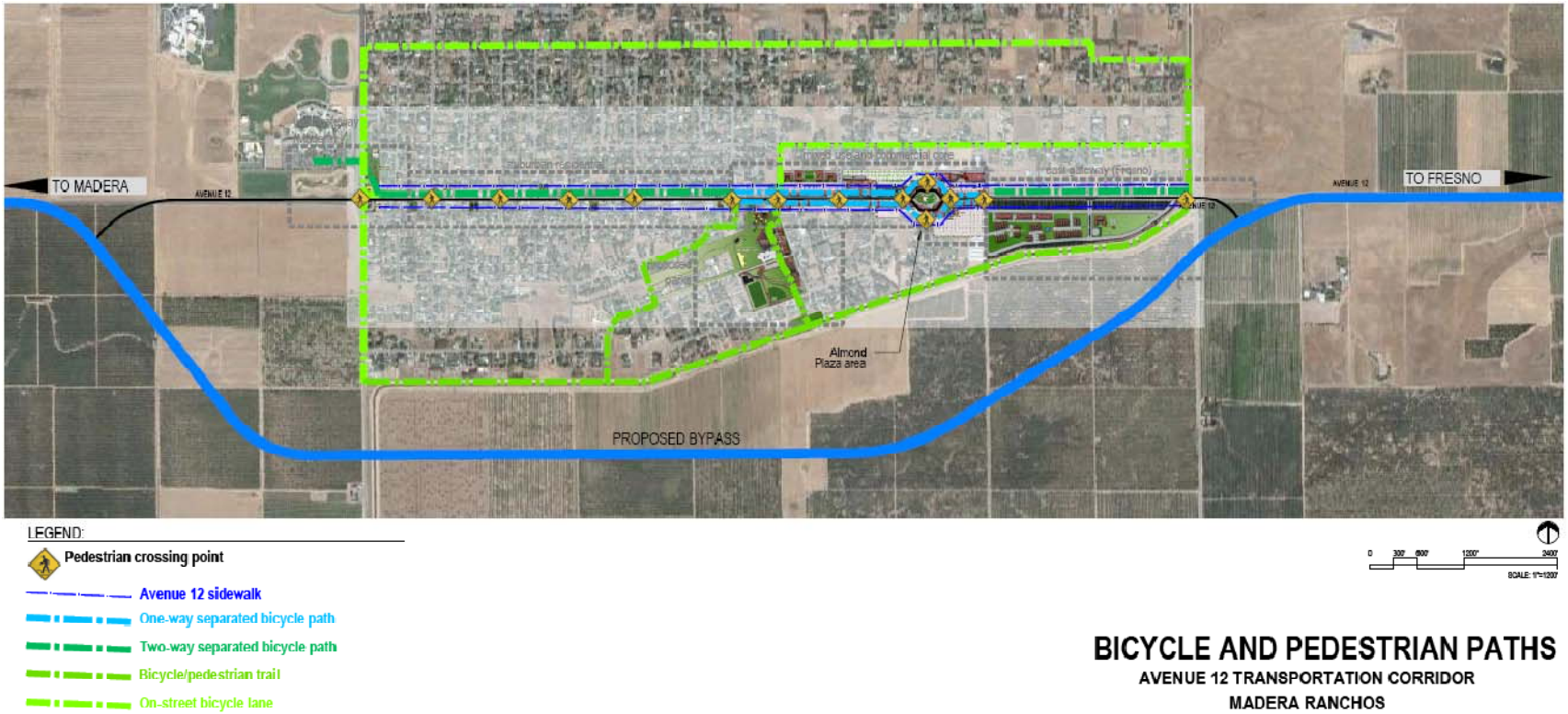


Figure 9-7: Bicycling and Walking Facility Improvements



9.6 TIMELINE FOR IMPROVEMENTS

Table 9-1 summarizes the suggested timeline for implementing the various elements of the circulation plan. Considerations in determining the order of the recommendations for programming improvements include sensitivity to shortage of funding at all levels of government for all purposes, recognition of projects that are already programmed, and the realization that many improvements would become warranted if certain levels of physical development and associated operating conditions are achieved. Improvements are grouped within four time frames as follows:

(a) **Short term** improvements include elements that are already slated for implementation within the next five years or are already under implementation.

(b) **Medium term** improvements include those items that typically involve modest costs and are envisioned to be implementable within the next twenty years following adoption of the circulation plan and their inclusion in the transportation improvement projects (TIP) list for prioritization of funding.

(c) **Long term** improvements include the more capital intensive elements and those which additional developments would warrant; they are envisioned to be needed within the next fifty years.

(d) At **full build-out**, the level of proposed new residential and commercial developments underlying the analyses in this study would have been accomplished and all elements of the circulation plan would have been implemented.

Table 9-1: Suggested Timeline for Improvements and Projected Conditions

Time	Term	Improvements
2010 to 2015	Short Term	• Ongoing improvements, e.g. sidewalk on Avenue 12 in the Ranchos • Implement center two-way left turn lane on Avenue 12 in the Ranchos • Adopt Circulation Plan to place related projects on Transportation Improvement Program (TIP) for future funding • Begin expansion of public transit service with dial-a-ride operations • LOS D projected for Avenue 12 by 2015
2015 to 2035	Medium Term	• 2-lane Bypass required from 2015 • Begin construction of traffic calming projects by 2020 • Begin expansion of fixed-route public transit service • Expand construction of bicycle and pedestrian facilities • Transportation Improvement Program (TIP) funds available to widen Avenue 12 (off the Ranchos) & Avenue 9 to 4 lanes each by 2025 • LOS D projected for Avenue 12 (with 2-lane Bypass) by 2030 • Widening of Bypass to 4 lanes required by 2035
2035 to 2060	Long Term	• Widening of selected north-south roads (Road 33½, Road 36, and Road 39 ½) to 4 lanes required by 2040 • LOS D projected for Avenue 12 (with 4-lane Bypass) by 2045 • 6-lane Bypass required by 2050 • Complete construction of bicycle and pedestrian facilities
2060 and beyond	Full Build-out	• Projected completion of development projects • Complete all elements of circulation plan

10.0 Layouts and Cross Sections

10.1 INTERSECTION LAYOUTS

The various recommendations for the transportation plan will have varying effects on different intersections along Avenue 12. Figures 10-1 through 10-7 present typical intersection configurations for the following circumstances:

1. Avenue 12 at Minor Side Roads
2. Avenue 12 at Major Side Roads
3. Avenue 12 at Side Roads with specialized Bicyclist Cross-over
4. Avenue 12 at a T-intersection
5. Avenue 12 at a Major Side Road Intersection
6. Avenue 12 at a Major Side Road Roundabout
7. Avenue 12 at the Downtown Plaza

10.2 CROSS SECTIONS

Figures 10-8 and 10-9 present typical cross sections for the following:

1. Avenue 12 near downtown with a one-way bicycle path on each side
2. Avenue 12 off downtown with a two-way bicycle path on one side

Figure 10-1: Typical Intersection Layout: Avenue 12 at Minor Side Road

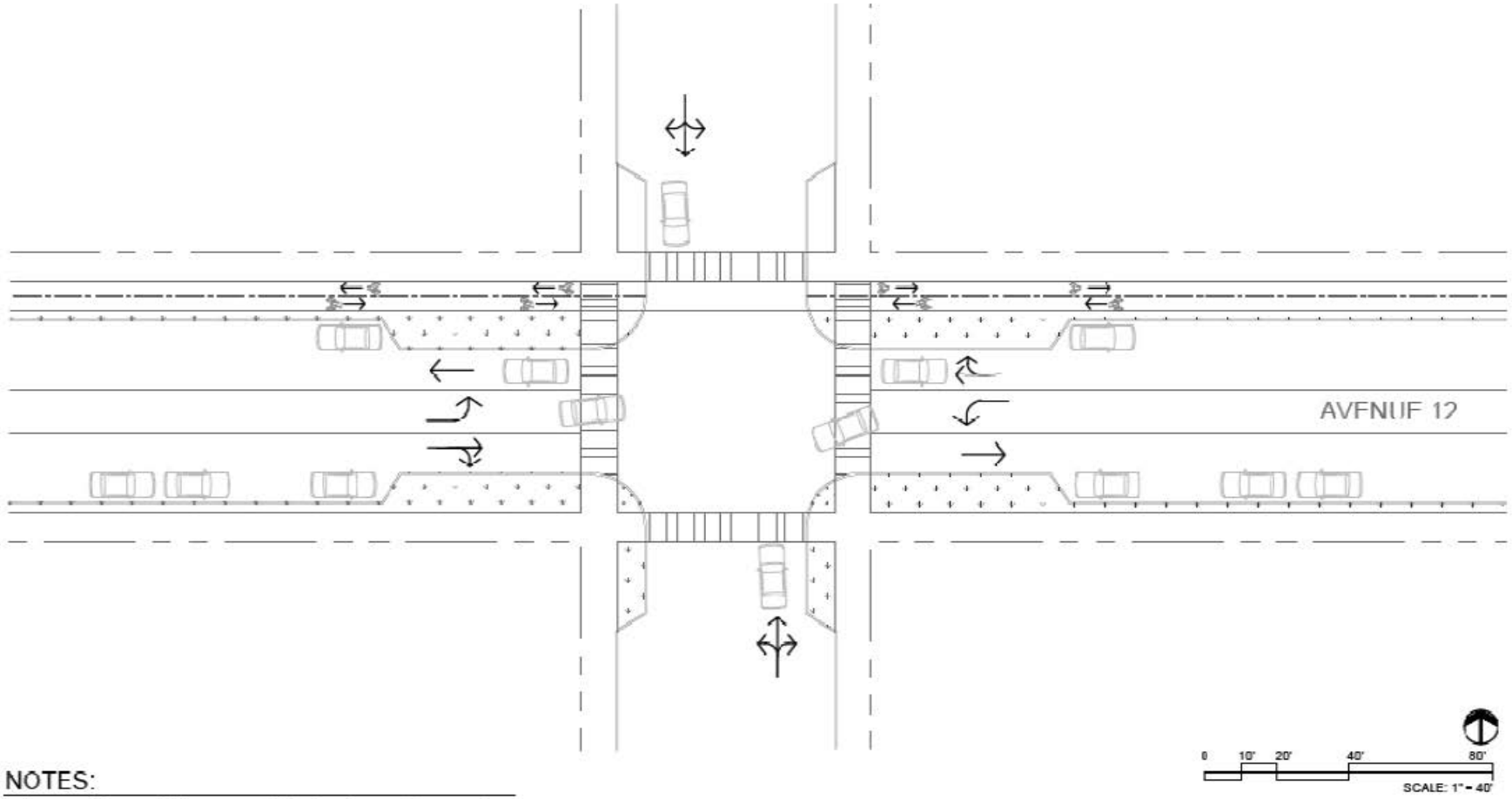


Figure 10-2: Typical Intersection Layout: Avenue 12 at Major Side Road

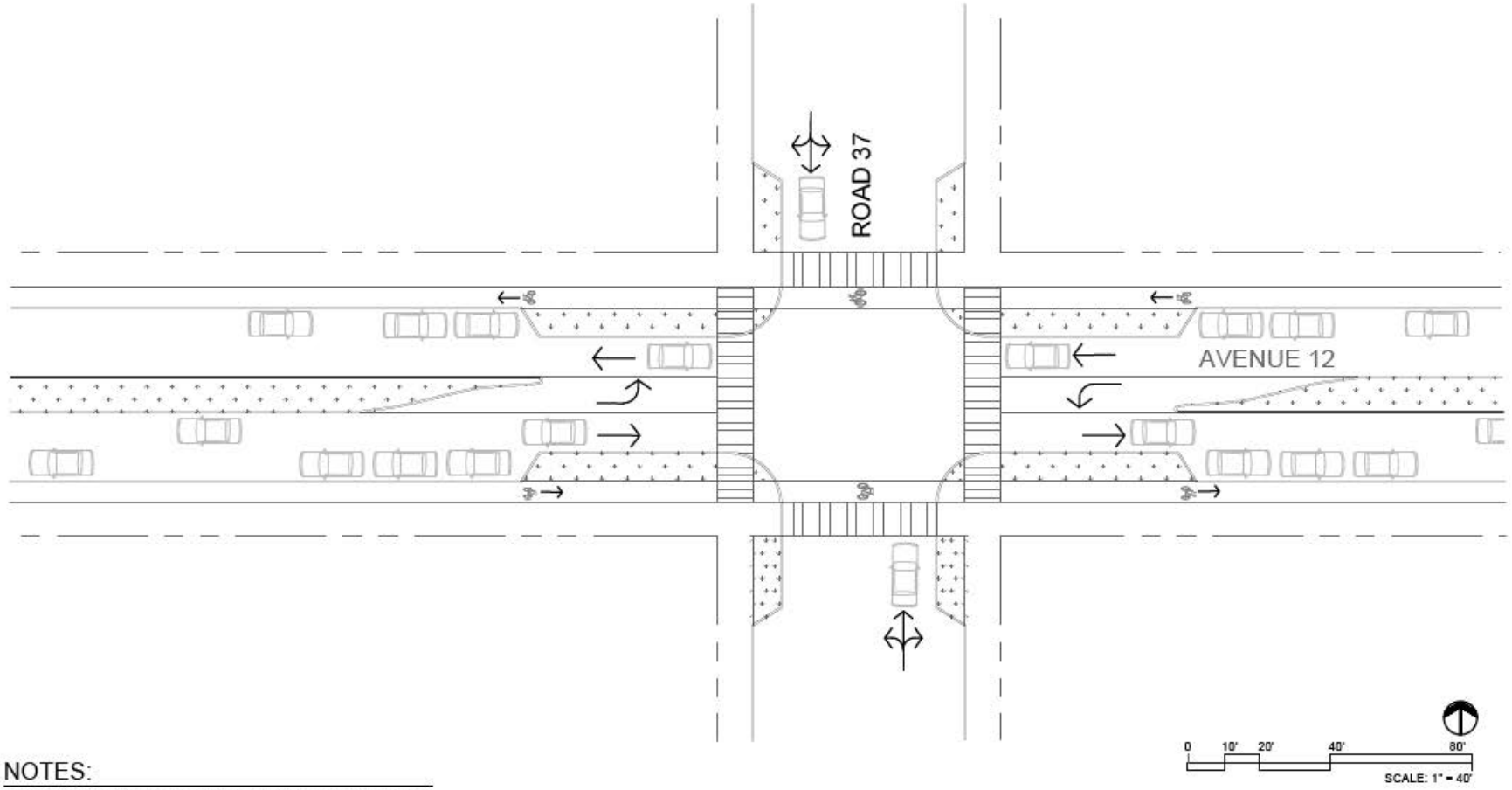
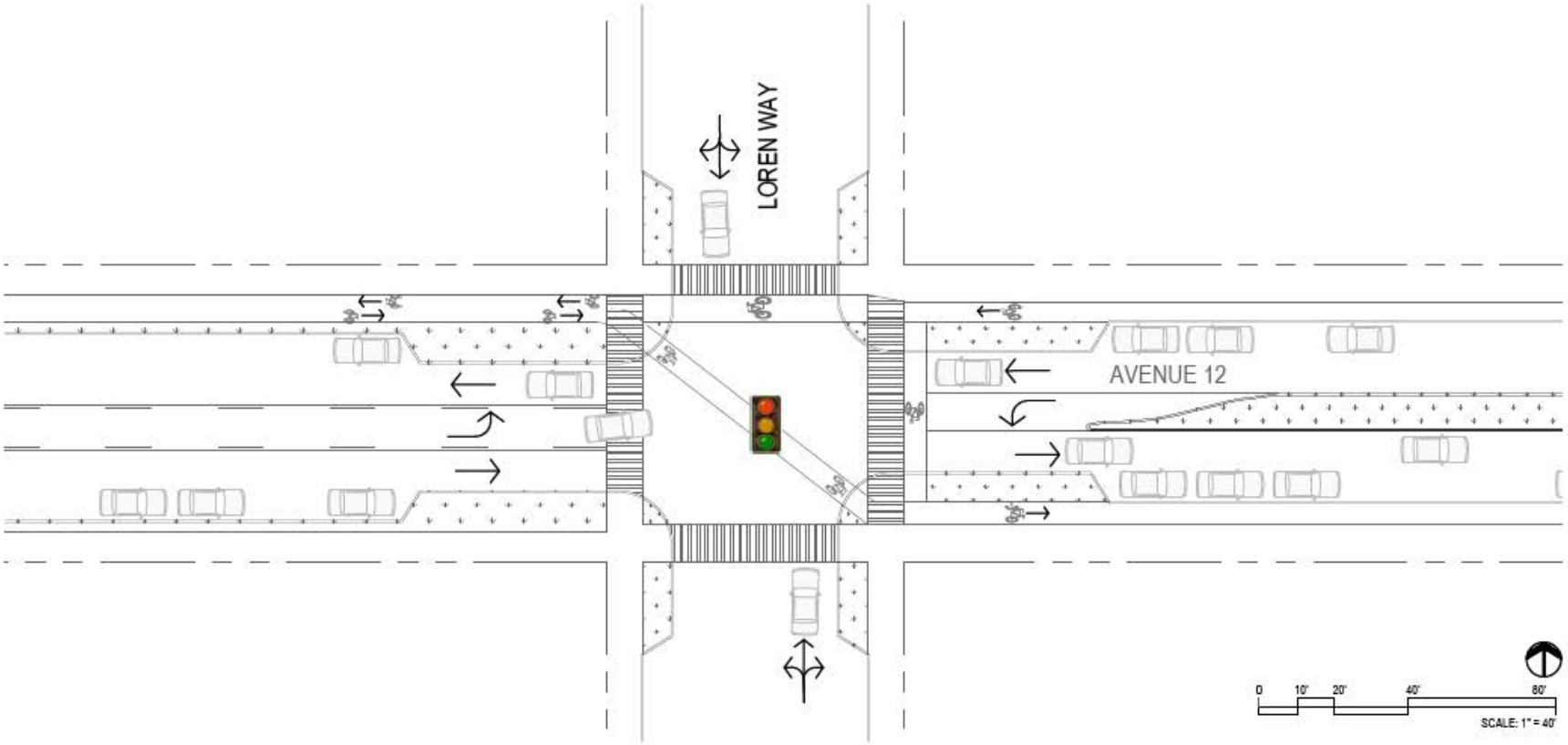


Figure 10-3: Typical Intersection Layout: Avenue 12 at Side Road with Special Bicyclist Cross-Over



NOTES:

Intersections of Avenue 12 at:

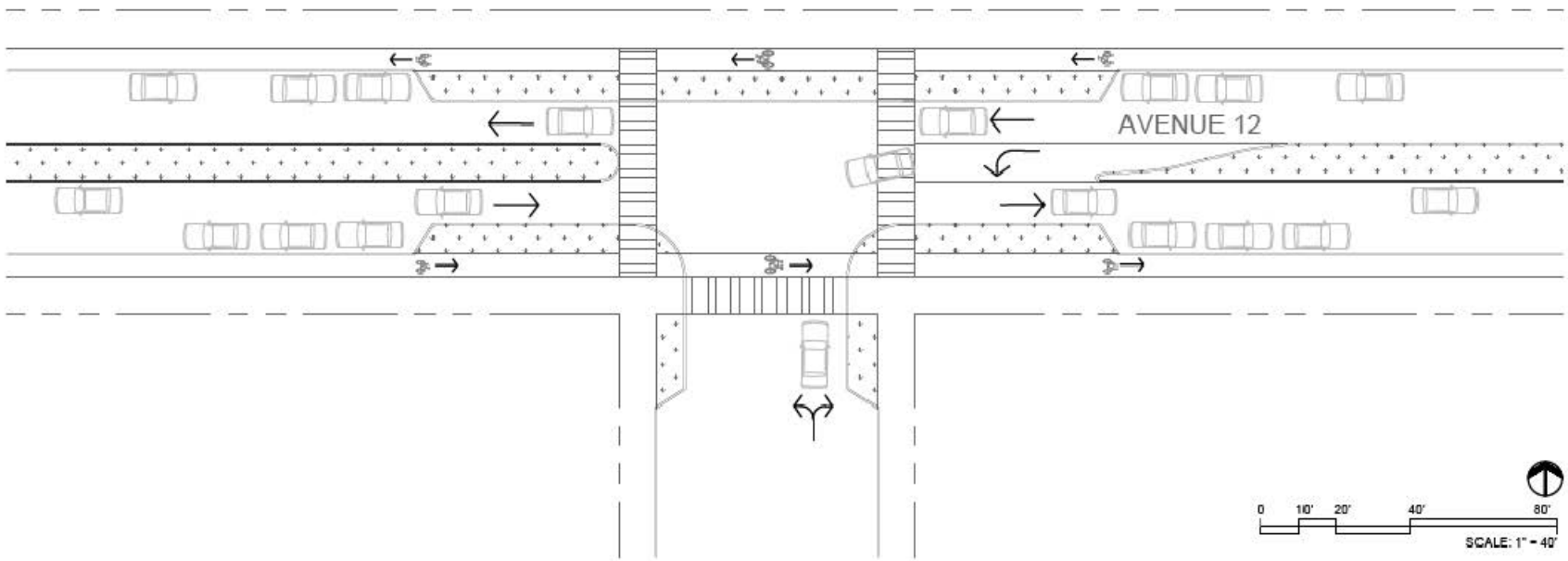
- Loren Way
- Road 37 1/2

SIGNALIZED INTERSECTION ALTERNATIVE

AVENUE 12 TRANSPORTATION CORRIDOR

MADERA RANCHOS

Figure 10-4: Typical Intersection Layout: Avenue 12 at T-intersection



NOTES:

Intersections of Avenue 12 at:

- Kensington Avenue
- Maywood Drive

TYPICAL INTERSECTION LAYOUT

AVENUE 12 TRANSPORTATION CORRIDOR

MADERA RANCHOS

Figure 10-5: Typical Intersection Layout: Avenue 12 at Major Side Road Signalized Intersection

NOTES:
Intersections of Avenue 12 at Road 36.
(Signalized Alternative)

ROAD 36 INTERSECTION LAYOUT
AVENUE 12 TRANSPORTATION CORRIDOR
MADERA RANCHOS

Figure 10-6: Typical Intersection Layout: Avenue 12 at Major Side Road Roundabout

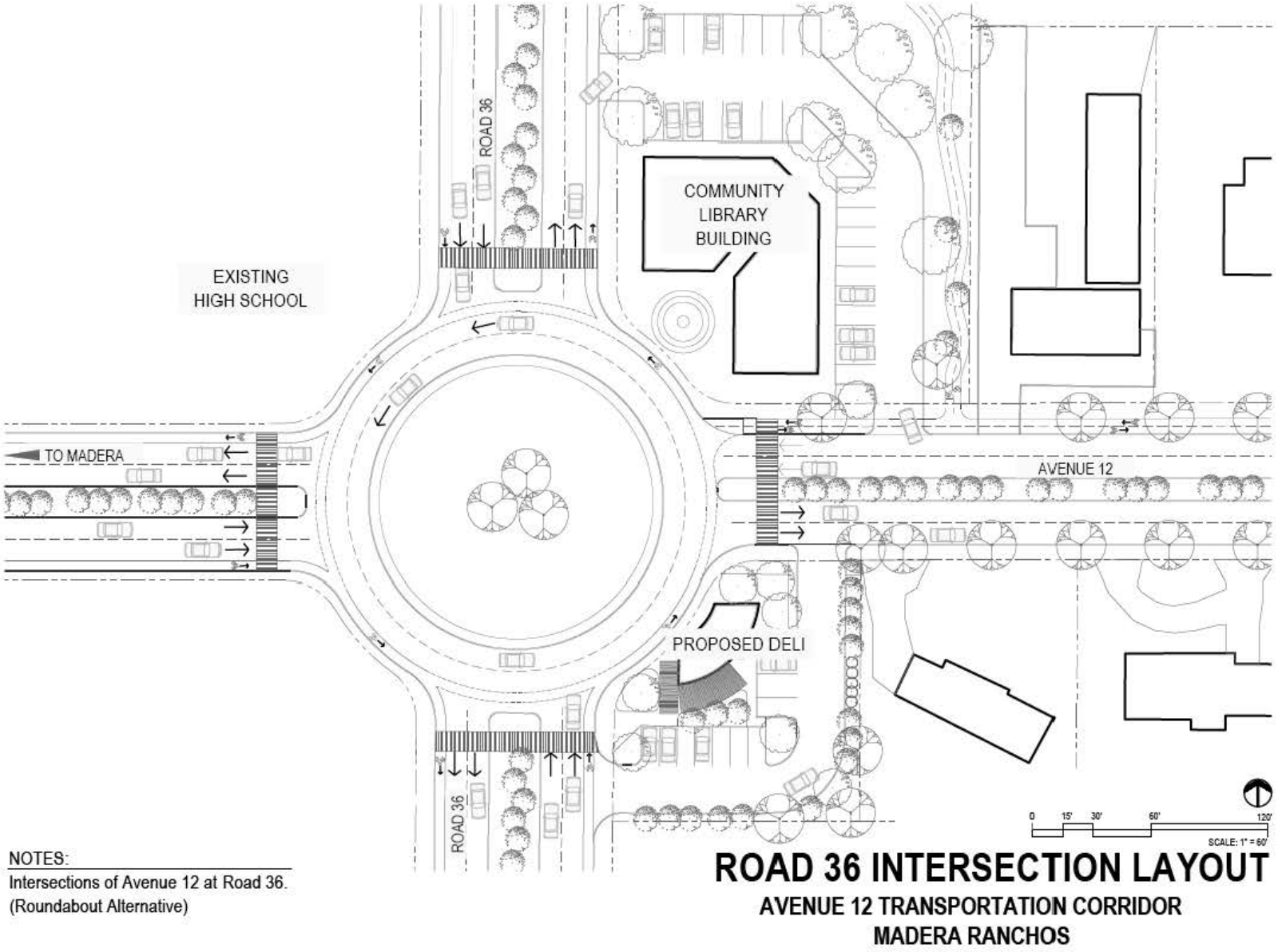


Figure 10-7: Avenue 12 at Downtown Plaza

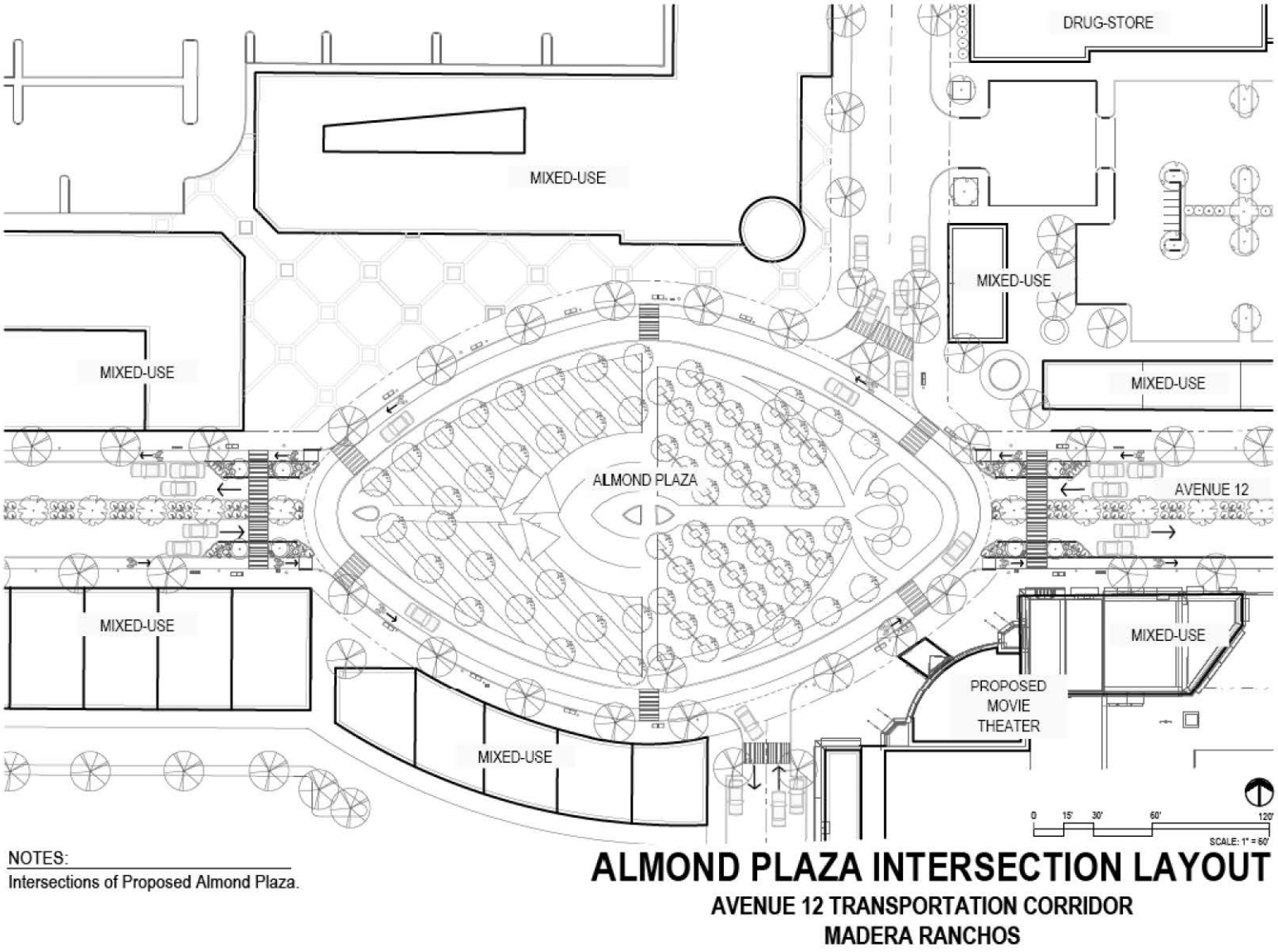
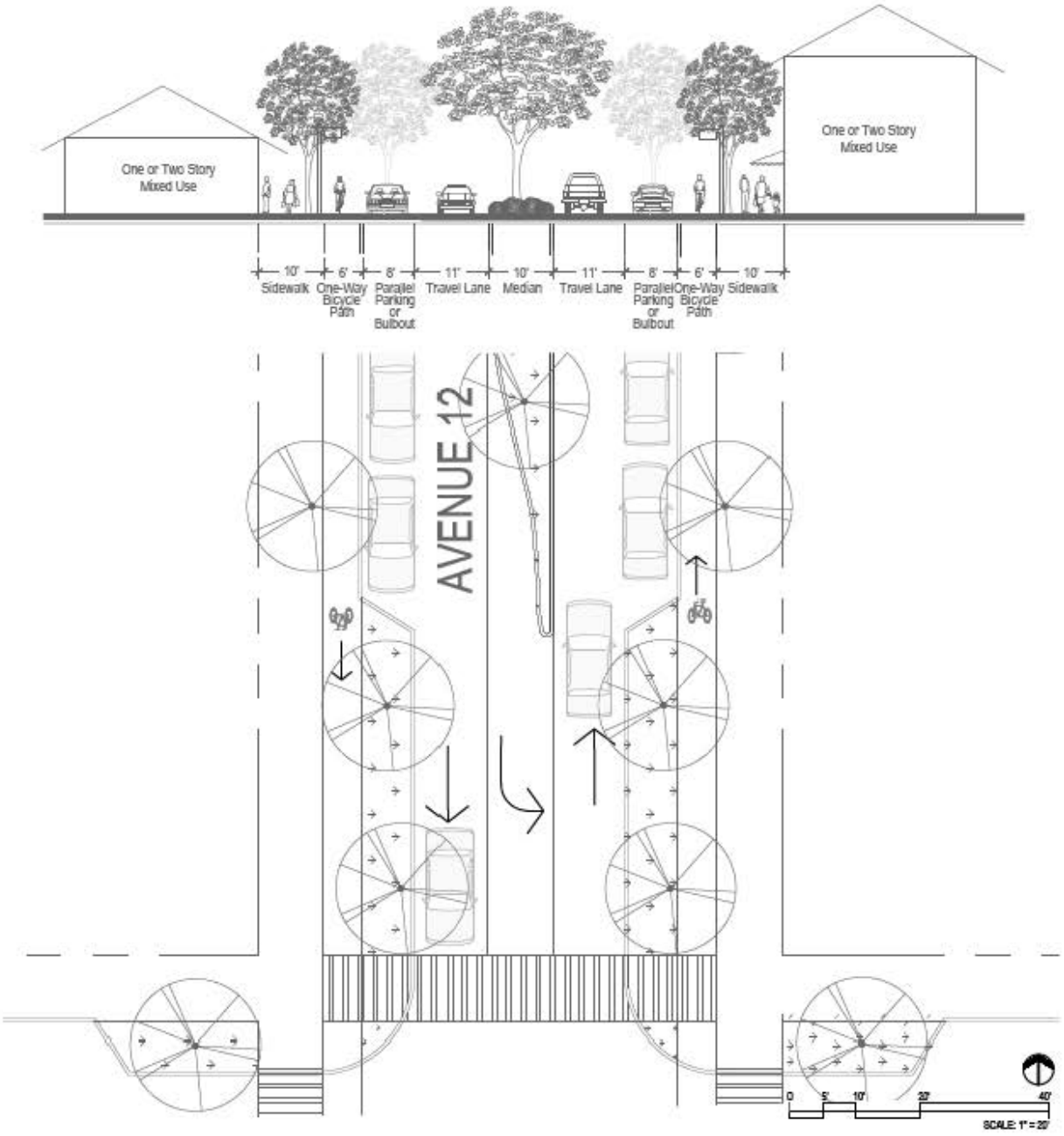


Figure 10-8: Avenue 12 Cross-Section near Downtown Area



NOTES:

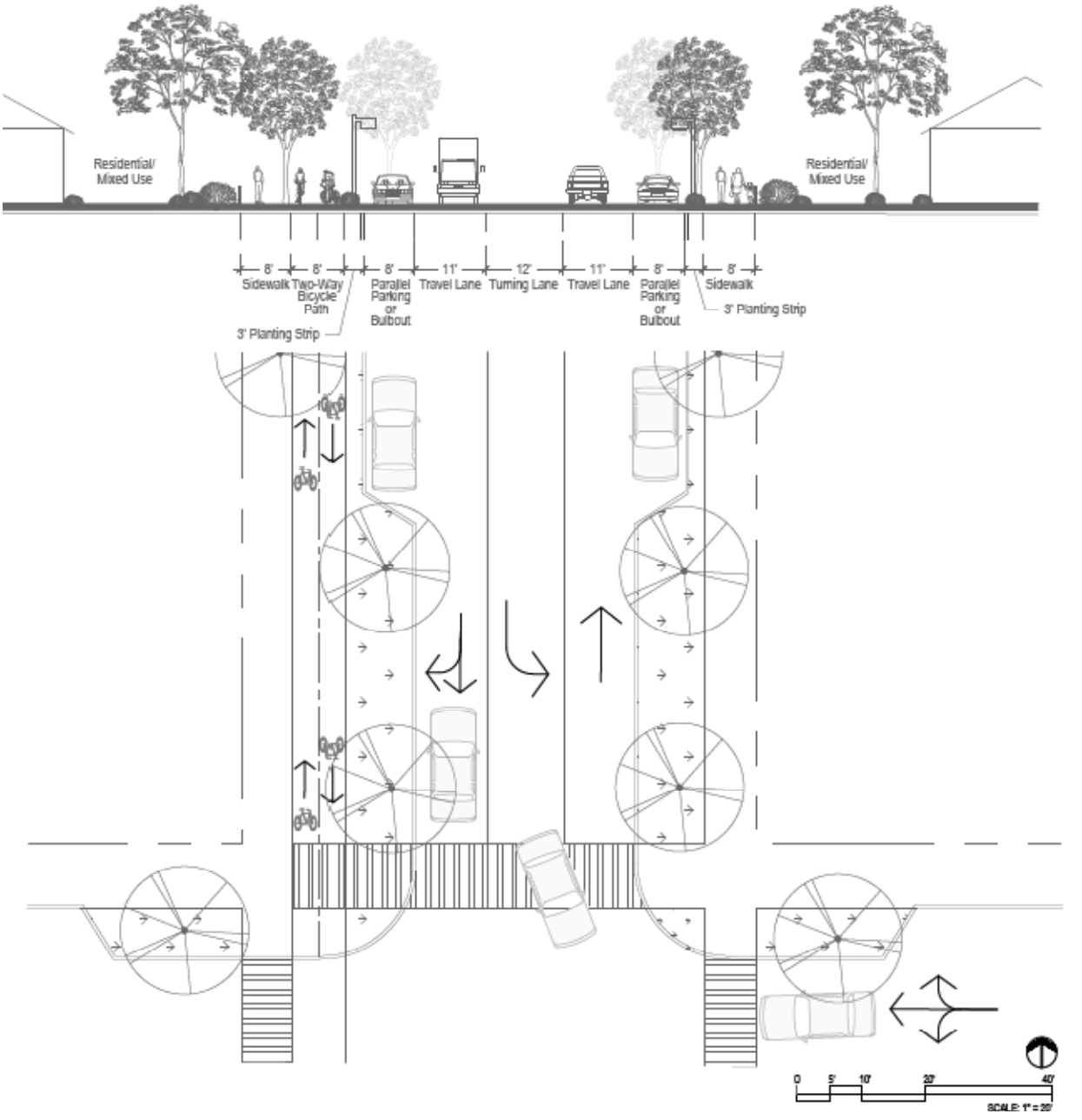
- Cross-Section of Avenue 12 between Loren Way and 37 $\frac{1}{2}$ Road excluding the Almond Plaza

TYPICAL STREET CROSS-SECTION

AVENUE 12 TRANSPORTATION CORRIDOR

MADERA RANCHOS

Figure 10-9: Avenue 12 Cross-Section off Downtown Area



NOTES:

- Cross-Section of Avenue 12 between Topper Road and Loren Way

TYPICAL STREET CROSS-SECTION

AVENUE 12 TRANSPORTATION CORRIDOR

MADERA RANCHOS

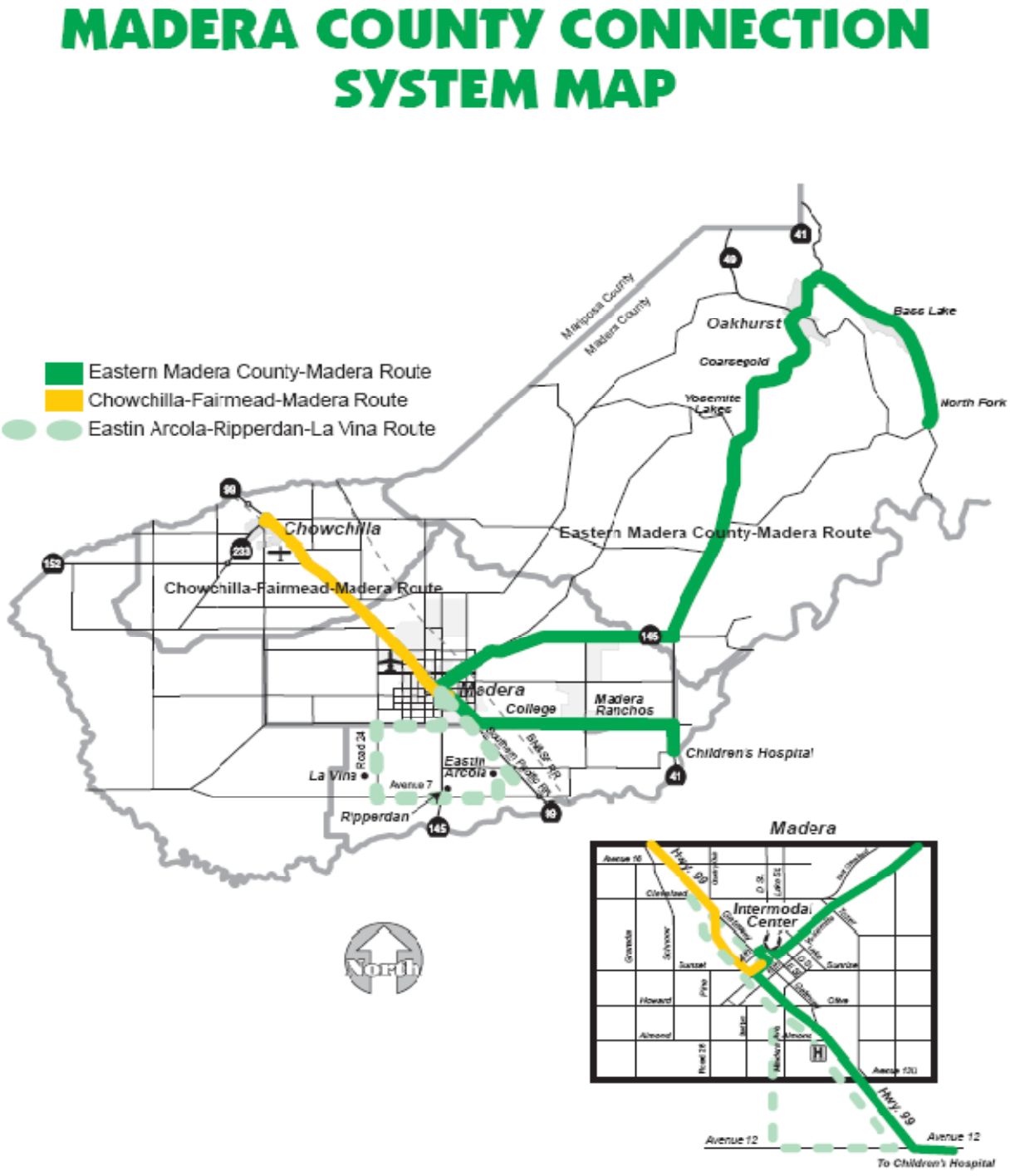
References

1. Institute of Transportation Engineers (2008), Trip generation: an ITE informational report; Institute of Transportation Engineers. Washington, DC
2. ESA (2006), **Gateway Village** Specific Plan; accessed online at http://www.madera-county.com/rma/archives/uploads/1164230267_Document_upload_gatewayvillageeir.pdf
3. ESA (2008), **Gunner Ranch** Draft EIR; accessed online at http://gunnerranchwest.com/index.php?option=com_content&view=article&id=22&Itemid=38
4. Fehr and Peers (2007), **Tesoro Viejo** Project Traffic Impact Analysis Report, accessed online at : http://www.maderacounty.com/rma/archives/uploads/1203523836_Document_upload_05_apph_trafficimpactanalysisreport.pdf
5. Forma, Ennis Consulting (2006), **North Fork Village** Specific Plan; accessed online at http://www.madera-county.com/rma/archives/uploads/1179173364_Document_upload_northforkvillagespecificplan.pdf
6. Korve Engineering (2000). Madera County Travel Forecasting Model (2000), Model Documentation and User Manual;
7. Korve Engineering and Ennis Consulting (2006). Documentation of Rio Mesa Cumulative Land Use and Travel Forecasts;
8. Madera County Traffic Monitoring Program (2008), 2008 Annual Report; accessed online at: http://www.maderactc.org/pdf_files/2008%20Traffic%20Volumes%20Report.pdf
9. PBS&J (2008), **Tesoro Viejo** Specific Plan Final Environmental Impact Report; accessed online at http://www.madera-county.com/rma/archives/uploads/1221158950_Document_upload_frontmattervol_ivrtcs_20080912.pdf
10. TPG Consulting (2006), Traffic Impact Study for **Gateway Village**; accessed online at: http://www.maderacounty.com/rma/archives/uploads/1164229396_Document_upload_gatewayvillagetrafficstudy.pdf
11. Vail Engineering Corporation, Michael Brandman Associates (1995**), Madera State Center Community College**; accessed online at http://www.madera-county.com/rma/archives/uploads/1144768429_Document_upload_statecenter.pdf
12. VRPA Technologies, **Gunner Ranch West** (2009), Traffic Impact, Analysis, February 2, 2009

Appendices

APPENDIX 2-0: MADERA COUNTY CONNECTION SYSTEM MAP AND SCHEDULE

MCC System Map



Eastern Madera County Bus Schedule

EASTERN MADERA COUNTY SERVICE

CHILDREN'S HOSPITAL - MADERA - EASTERN MADERA COUNTY

WEEKDAYS	AM	AM	PM	PM
Children's Hospital		9:30	2:41	5:05
Rolling Hills - Ave. 10 1/2 / Hwy. 41		9:35	2:46	5:10
Madera Ranchos Market		9:45	2:56	5:20
Madera Community College		9:55	3:10	5:30
Downtown Madera	**6:00**	**10:05**	**3:20**	**5:40**
Hwy 41 / Road 145 - Park & Ride Lot	6:20	10:25		6:00
Hwy 41 / Road 200 - Park & Ride Lot	6:31	10:35		6:10
Yosemite Lakes Park / Hwy. 41		10:39		6:14
Chevron (Meadow Ridge Road)		10:55		6:30
Coarsegold - Historic Village		11:00		6:35
Oakhurst - Medical Center		11:10		6:45
Oakhurst - Met Cinema		11:11		6:46
Oakhurst - Community College		11:15		6:50
Oakhurst - 41969 Hwy 41 / Calworks		11:20		6:55
Road 222 / Hwy 41		11:22		6:57
Bass Lake - Government Center		11:27		7:02
Bass Lake - Pines Resort		11:32		7:07
North Fork - Lyonz Den	7:00	——		——
North Fork - Supermarket		11:50		7:25

EASTERN MADERA COUNTY - MADERA - CHILDREN'S HOSPITAL

WEEKDAYS	AM	AM	PM	PM
North Fork - Lyonz Den	7:00	11:51		——
North Fork - Supermarket	——	——		7:26
Bass Lake - Pines Resort	7:16	12:08		
Bass Lake - Government Center	7:21	12:23		
Road 222 / Hwy 41	7:25	12:28		
Oakhurst - 41969 Hwy 41 / Calworks	7:27	12:30		
Oakhurst - Community College	7:31	12:35		
Oakhurst - Met Cinema	7:33	12:39		
Oakhurst - Medical Center	7:39	12:40		
Coarsegold - Historic Village	7:49	12:50		
Chevron (Meadow Ridge Road)	7:57	1:06		
Yosemite Lakes Park / Hwy. 41	8:05	1:22		
Hwy 41 / Road 200 - Park & Ride Lot	8:09	1:26		7:50
Hwy 41 / Road 145 - Park & Ride Lot	8:20	1:36		8:00
Downtown Madera (Arrive)	**8:40**	**1:56**		**8:20**
Downtown Madera (Depart)	**8:50**	**2:01**	**4:25**	
Madera Community College	9:00	2:11	4:35	
Ranchos - Ave.12 / Jason Ct.	9:10	2:21	4:45	
Rolling Hills - Ave. 10 1/2 / Hwy. 41	9:20	2:31	4:55	
Children's Hospital	9:25	2:36	5:00	

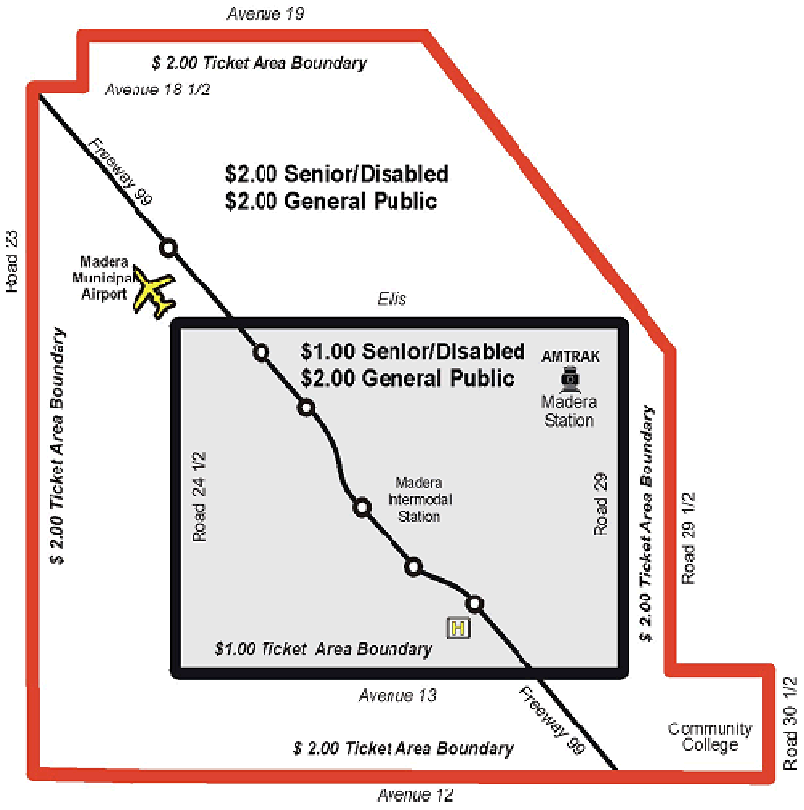
Demand –Response Service 1 – Dial-a-Ride

DIAL-A-RIDE

Madera Dial-A-Ride (DAR)

Demand-response system	
Weekdays	7:00am-6:30pm
Saturday	9:00am-4:00pm
Sunday	8:30am-2:30pm
Fare	$2.00 (General public)
	$1.00 (Seniors/Disabled - City Area)
	$2.00 (Senior/Disabled – County Area)
Information and Reservations (minimum. 2 hour advance notice)	559-661-7433
Service Improvement Requests	559-661-3692

DIAL-A-RIDE



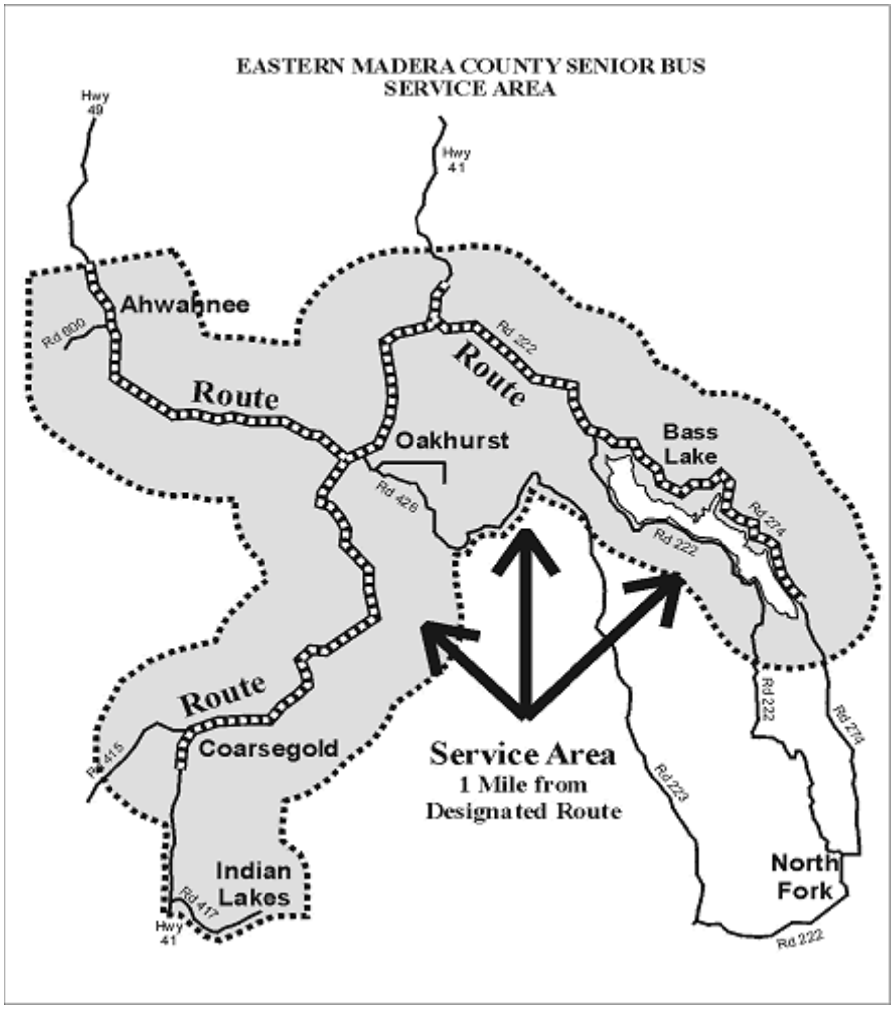
Demand –Response Service 2 – Senior Shuttle

Eastern Madera County Senior Bus

Demand-response

Oakhurst, Coarsegold, Bass Lake, Ahwahnee

Weekdays	8:00am-4:00pm
Fare	$1.50 (Seniors/Disabled Only)
Reservations	559-658-5555



APPENDIX 2-1: DETAILED TRAFFIC COUNT DATA

Compilation of Turning Movement Counts (Existing Conditions) – Avenue 12

1	**Intersection:**	**Ave 12 at SR 41**												
	Street:	**SR 41**												
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	311	280	8	1	1081	39	1	1	0	28	2	648	2400
PM	**PM PEAK HOUR**	561	960	3	104	492	2	2	4	30	77	3	385	2623
	Data Source	Traffic Impact Study Gateway Village												
	Year	Nov-06												
	Level of Service (AM)	C												
	Level of Service (PM)	E												

2	**Intersection:**	**Ave 12 at Frontage Rd.**												
	Street:	**Frontage Rd.**												
	Approach:	**Northbound Off-ramp**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	42		17				37	314			661	41	1112
PM	**PM PEAK HOUR**	42		70				38	631			441	44	1266
	Data Source	Traffic Impact Study Gateway Village												
	Year	Nov-06												
	Level of Service (AM)	D												
	Level of Service (PM)	E												

3	**Intersection:**	**Ave 12 at Road 40**												
	Street:	**Road 40**												
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	0	7	0	0	0	0	0	404	0	1	735	0	1147
PM	**PM PEAK HOUR**	1	1	2	1	0	0	0	629	0	2	430	0	1066
	Data Source	Traffic Impact Study Gateway Village												
	Year	Nov-06												
	Level of Service (AM)	D			C			A			A			
	Level of Service (PM)	C			C			A			A			

4	**Intersection:**	**Ave 12 at Road 38**												
	Street:	**Road 38**												
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	13		1					592	8	1	310		925
PM	**PM PEAK HOUR**	43		3					342	4	1	513		906
	Data Source	Turning Movement Counts Field Data Sheet (Counted by Joe Yu)												
	Year	Jul-09												
	Level of Service (AM)													
	Level of Service (PM)													

5	**Intersection:**	**Ave 12 at Road 37**												
	Street:	**Road 37**												
	Approach:	**Northbound Off-ramp**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	0	0	2	16	0	23	17	482	2	1	296	9	848
PM	**PM PEAK HOUR**	4	0	3	10	0	24	17	477	4	3	615	21	1178
	Data Source	Turning Movement Counts Field Data Sheet (Counted by Shahram Shariati)												
	Year	Jul-09												
	Level of Service (AM)													

6	Intersection:	Ave 12 at Road 36												
	Street:	Road 36												
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	15	9	11	124	44	18	7	256	8	29	267	26	814
PM	PM PEAK HOUR	11	71	43	79	13	11	22	340	4	7	344	138	1083
	Data Source	Transportation Impact Analysis Tesoro Viejo Development												
	Year	Nov-07												
	Level of Service (AM)	B												
	Level of Service (PM)	B												

7	Intersection:	Ave 12 at Road 35												
	Street:	Road 35												
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	6	1	1	46	2	51	2	221	2	3	332	9	676
PM	PM PEAK HOUR	0	0	5	9	2	21	41	241	3	3	217	47	589
	Data Source	Turning Movement Counts Field Data Sheet (Counted by Joe Yu)												
	Year	Jul-09												
	Level of Service (AM)													
	Level of Service (PM)													

8	Intersection:	Ave 12 at Road 34 1/2												
	Street:	Road 34 1/2												
	Approach:	Northbound Off-ramp			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR				3		12	6	231			380	2	634
PM	PM PEAK HOUR				4		13	9	377			343	5	751
	Data Source	Turning Movement Counts Field Data Sheet (Counted by Shahram Shariati)												
	Year	Jul-09												
	Level of Service (AM)													
	Level of Service (PM)													

9	Intersection:	Ave 12 at SR 99												
	Street:	SR 99												
	Approach:	Northbound Off-ramp			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	135	4	50				104	400			213	245	1151
PM	PM PEAK HOUR	147	1	79				113	544			217	231	1332
	Data Source	Traffic Impact Study Gateway Village												
	Year	Nov-06												
	Level of Service (AM)	E			N/A			A			N/A			
	Level of Service (PM)	F			N/A			A			N/A			

10	Intersection:	Ave 12 at Golden State Blvd												
	Street:	Golden State Blvd.												
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	70	5	258	10	3	11	165	236	24	75	255	18	1130
PM	PM PEAK HOUR	149	7	239	19	6	19	244	399	14	93	266	5	1460
	Data Source	Traffic Impact Study Gateway Village												
	Year	Nov-06												
	Level of Service (AM)	C			D			A			A			
	Level of Service (PM)	F			F			A			A			

Compilation of Turning Movement Counts (Existing Conditions) – Avenue 9/Children's Blvd

1	Intersection:	Avenue 9 @ Road 36												
	Street:	Road 36						Avenue 9						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR				46		101	29	368			248	13	805
PM	PM PEAK HOUR				10		28	119	319			298	34	808
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** C **PM:** B												

2	Intersection:	Avenue 9 @ Road 40 1/2 @ Children's Blvd												
	Street:	Road 40 1/2 & Avenue 9						Avenue 9 & Children's Blvd						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	1	0	0	3	0	1	1	338	0	0	214	0	558
PM	PM PEAK HOUR	0	0	0	5	2	2	4	235	0	0	290	5	543
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** C **PM:** B												

3	Intersection:	Children's Blvd @ Peck Blvd												
	Street:	Peck Blvd						Children's Blvd						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	2		161					298	33	498	238		1230
PM	PM PEAK HOUR	17		561					284	5	82	296		1245
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** B **PM:** C												

4	Intersection:	Children's Blvd & Rio Mesa Blvd @ Lanes Bridge Dr												
	Street:	Lanes Bridge Dr						Children's Blvd & Rio Mesa Blvd						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR				180		11	11	449			723	136	1510
PM	PM PEAK HOUR				198		20	30	577			396	351	1572
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** F **PM:** E												

5	Intersection:	Avenue 9 @ Road 40												
	Street:	Road 40						Avenue 9						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	0		5					329	0	0	209		543
PM	PM PEAK HOUR	1		3					247	1	2	236		490
	Data Source	TPG Consulting												
	Year	2004												
	LOS	**AM:** ***EB:*** A ***WB:*** A ***NB:*** B ***SB:*** B **PM:** ***EB:*** A ***WB:*** A ***NB:*** B ***SB:*** B												

6	Intersection:	Children's Blvd & SR 41 NB Off-Ramp @ SR 41 SB Ramps												
	Street:	SR 41 SB Ramps						Children's Blvd & SR 41 NB Off-Ramp						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR				3	0	43		13	613		766		1438
PM	PM PEAK HOUR				2	1	15		38	869		532		1457
	Data Source	TPG Consulting												
	Year	2004												
	LOS	**AM:** ***NB:*** B ***SB:*** B **PM:** ***NB:*** B ***SB:*** A												

Compilation of Turning Movement Counts (Existing Conditions) – Avenues 10 & 11

7	Intersection:	Avenue 10 @ Road 40												
	Street:	Road 40						Avenue 10						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR			0	0	3	7	4	17		1	19	6	57
PM	PM PEAK HOUR			1	13	0	4	6	23		0	37	3	87
	Data Source	TPG Consulting												
	Year	2004												
	LOS	**AM:** ***EB:*** A ***WB:*** A ***NB:*** A ***SB:*** A **PM:** ***EB:*** A ***WB:*** A ***NB:*** A ***SB:*** A												

8	Intersection:	Avenue 11 @ Frontage Road												
	Street:	Frontage Road						Avenue 11						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	8	28	0		57	6	16	1	45			1	162
PM	PM PEAK HOUR	32	86	2		47	8	8	0	13			0	196
	Data Source	TPG Consulting												
	Year	2004												
	LOS	**AM:** ***EB:*** A ***WB:*** A ***NB:*** A ***SB:*** A **PM:** ***EB:*** A ***WB:*** A ***NB:*** A ***SB:*** A												

9	Intersection:	Avenue 10 @ Road 40 1/2												
	Street:	Road 40 1/2						Avenue 10						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	4		1					40	3	0	86		134
PM	PM PEAK HOUR	5		3					93	4	1	52		158
	Data Source	TPG Consulting												
	Year	2004												
	LOS	**AM:** ***WB:*** A ***NB:*** A **PM:** ***WB: A NB:*** A												

Compilation of Turning Movement Counts (Existing Conditions) – Avenue 15

1	**Intersection:**	**Avenue 15 @ Road 36**												
	Street:	**Road 36**						**Avenue 15**						
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	28	78	30	31	144	30	20	95	25	51	73	6	611
PM	**PM PEAK HOUR**	32	115	26	12	68	15	27	77	31	24	94	23	544
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** C **PM:** B												

2	**Intersection:**	**Avenue 15 @ SR 41**												
	Street:	**SR 41**						**Avenue 15**						
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	111	365			861	4	3		33				1377
PM	**PM PEAK HOUR**	260	844			473	27	39		116				1759
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** C **PM:** F												

3	**Intersection:**	**Avenue 14 1/2 @ SR 41**												
	Street:	**SR 41**						**Avenue 14 1/2**						
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	6	286	1	2	870	1	0	0	12	10	0	1	1189
PM	**PM PEAK HOUR**	27	957	9	2	408	5	2	0	11	3	0	1	1425
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM:** E **PM:** E												

Compilation of Turning Movement Counts (Existing Conditions) – SR 145

4	**Intersection:**	**SR 145 @ Road 36**												
	Street:	**Road 36**						**SR 145**						
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	44	0	13	0	0	0	0	131	69	15	191	0	463
PM	**PM PEAK HOUR**	26	0	9	0	0	0	0	221	35	9	182	0	482
	Data Source	Fehr and Peers												
	Year	2006												
	LOS	**AM: PM:**												

5	**Intersection:**	**SR 145 @ SR 41**												
	Street:	**SR 41**						**SR 145**						
	Approach:	**Northbound**			**Southbound**			**Eastbound**			**Westbound**			
	Peak Hour	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**left**	**through**	**right**	**Total**
AM	**AM PEAK HOUR**	15	241	8	32	711	68	57	53	69	17	55	18	1344
PM	**PM PEAK HOUR**	57	739	13	27	373	56	129	135	38	11	64	52	1694
	Data Source	Fehr and Peers												
	Year	2007												
	LOS	**AM: PM:**												

Composite Summary of Traffic Volumes along alternative Routes

Table 2
Existing Peak Hour Intersection Volumes along SR 145, Avenue 15, Avenue 12, and Avenue 9

Intersection	Peak Hour Volume[1] AM (PM)	Daily Directional Volume[2]
1. Avenue 9/Road 36		
• SB Approach	147 (38)	
• EB Approach	261 (332)	5,098
• WB Approach	397 (438)	3,300
2. Children's Boulevard/SR 41 SB Ramps		
• SB Approach	46 (18)	
• EB Approach	626 (907)	
• WB Approach	756 (532)	
3. Avenue 12/Road 36		
• NB Approach	35 (125)	
• SB Approach	186 (103)	
• EB Approach	271 (366)	6,591
• WB Approach	332 (489)	7,053
4. Avenue 12/SR 41		
• NB Approach	824 (1775)	
• SB Approach	420 (584)	
• EB Approach	674 (616)	8,541
• WB Approach	7 (18)	6,977
5. Avenue 15/Road 36		
• NB Approach	136 (173)	
• SB Approach	205 (95)	
• EB Approach	140 (135)	2,470
• WB Approach	130 (141)	2,440
6. Avenue 15/SR 41		
• NB Approach	476 (1104)	
• SB Approach	865 (500)	
• EB Approach	36 (155)	2,642
• WB Approach		1,628
7. SR 145/Road 36		
• NB Approach	57 (35)	
• EB Approach	200 (256)	
• WB Approach	206 (191)	
8. SR 145/SR 41		
• NB Approach	136 (173)	
• SB Approach	205 (95)	
• EB Approach	140 (135)	
• WB Approach	130 (141)	

Note:

1. Data from Fehr and Peers Transportation Impact Analysis (2007)
2. Data from Madera County Traffic Monitoring Program (2008 Annual Report)

APPENDIX 2-2: DETAILS OF LEVEL OF SERVICE CALCULATIONS

Composite of Avenue 12 Level of Service Results

Table 1
Existing Peak Hour Intersection Levels of Service Along Avenue 12

Intersection[1]	Control[2]	Peak Hour (AM/PM)	LOS	Delay (seconds)
1. Avenue 12/Golden State Blvd.	SSSC	AM PM		
• NB Approach		AM PM	C F	20.9 279.6
• SB Approach		AM PM	D F	31.9 111.1
• EB Approach		AM PM	A A	8.5 8.7
• WB Approach		AM PM	A A	8.1 8.6
2. Avenue 12/SR 99	SSSC	AM PM		
• EB Approach		AM PM	A A	8.9 8.9
• NB Approach		AM PM	E F	46.9 95.1
3. Avenue 12/Road 34 ½	SSSC	AM PM		
• SB Approach		AM PM	B B	11.7 11.5
• EB Approach		AM PM	A A	0.3 0.3
• WB Approach		AM PM	A A	0 0
4. Avenue 12/Road 35	SSSC	AM PM		
• NB Approach		AM PM	A A	14.3 9.6
• SB Approach		AM PM	B B	13.4 11.4
• EB Approach		AM PM	A A	0.1 1.4
• WB Approach		AM PM	A A	0.1 0.1
5. Avenue 12/Road 36	Signal	AM PM	B B	15 15
• NB Approach		AM PM	D B	39.3 30
• SB Approach		AM PM	C A	26.7 32.5
• EB Approach		AM PM	B C	10.2 13.1
• WB Approach		AM PM	B C	10.2 8.3
6. Avenue 12/Road 37	SSSC	AM PM		

• NB Approach		AM PM	B C	11.5 24.7
• SB Approach		AM PM	B C	14.7 20.4
• EB Approach		AM PM	A A	0.4 0.6
• WB Approach		AM PM	A A	0 0.1
7. Avenue 12/Road 38	SSSC	AM PM		
• NB Approach		AM PM	C C	17.2 17.7
• EB Approach		AM PM	A A	0 0
• WB Approach		AM PM	A A	0 0
8. Avenue 12/Road 40	SSSC	AM PM		
• NB Approach		AM PM	D C	25.8 19.5
• SB Approach		AM PM	C C	22.6 22.7
• EB Approach		AM PM	A A	8.2 9.0
• WB Approach		AM PM	A A	9.4 8.3
9. Avenue 12/Frontage Rd.	SSSC	AM PM		
• NB Approach		AM PM	D C	25.1 23.5
• EB Approach		AM PM	A A	9.5 8.6
• WB Approach		AM PM	A A	9.5 8.6
10. Avenue 12/SR 41	Signal	AM PM	C E	26 61
• NB Approach		AM PM	B F	15.1 88.6
• SB Approach		AM PM	B C	19.1 22.3
• EB Approach		AM PM	D B	49.5 18.5
• WB Approach		AM PM	C C	34.7 30.3

Note:
1. Data for intersections 1, 2 and 8 are from TPG Consulting's Traffic Impact Study (2006). Data for intersections 5 and 10 are from Fehr and Peers Transportation Impact Analysis (2007). Data for intersections 3, 4, 6 and 7 were counted and analyzed by Joe Yu and Shahram Shariati (2009).
2. Signal = signalized intersection, SSSC = side-street stop-controlled intersection

Composite of Level of Service Results along alternative Routes

Table 3
Existing Peak Hour Intersection Levels of Service along SR 145, Avenue 15, Avenue 12, and Avenue 9

Intersection[1]	Control[2]	Peak Hour (AM/PM)	LOS	Delay (seconds)
1. Avenue 9/Road 36	SSSC	AM	A	3.0
		PM	A	2.0
• SB Approach		AM	C	15.0
		PM	B	13.8
• EB Approach		AM	A	0.9
		PM	A	3.2
• WB Approach		AM	A	0
		PM	A	0
2. SR 41 SB Ramps/Children's Blvd	Signal	AM	A	3.0
		PM	A	4.0
• SB Approach		AM	C	32.2
		PM	C	32.3
• EB Approach		AM	A	1.7
		PM	A	1.7
• WB Approach		AM	A	2.2
		PM	A	5.0
3. Avenue 12/Road 36	Signal	AM	B	15
		PM	B	15
• NB Approach		AM	D	39.3
		PM	B	30
• SB Approach		AM	C	26.7
		PM	A	32.5
• EB Approach		AM	B	10.2
		PM	C	13.1
• WB Approach		AM	B	10.2
		PM	C	8.3
4. Avenue 12/SR 41	Signal	AM	C	26
		PM	E	61
• NB Approach		AM	B	15.1
		PM	F	88.6
• SB Approach		AM	B	19.1
		PM	C	22.3
• EB Approach		AM	D	49.5
		PM	B	18.5
• WB Approach		AM	C	34.7
		PM	C	30.3
5. Avenue 15/Road 36	SSSC	AM	B	12
		PM	A	8
• NB Approach		AM	C	17.4
		PM	B	14.3
• SB Approach		AM	C	20.7
		PM	B	12.8
• EB Approach		AM	A	1.2
		PM	A	1.4
• WB Approach		AM	A	3.2
		PM	A	1.6
6. Avenue 15/SR 41	SSSC	AM	A	2
		PM	A	7

• NB Approach			AM PM	B A	2.6 2.3
• SB Approach			AM PM	A A	0 0
• EB Approach			AM PM	C F	21.3 65.4
7.	SR 145/Road 36	SSSC	AM PM	A A	2 1
• NB Approach			AM PM	B B	11.4 11.5
• EB Approach			AM PM	A A	0 0
• WB Approach			AM PM	A A	0.7 0.4
8.	SR 145/SR 41	Signal	AM PM	B C	18 26
• EB Approach			AM PM	B C	14.9 31.2
• WB Approach			AM PM	B B	17.3 15.1
• NB Approach			AM PM	C C	24.4 29.8
• SB Approach			AM PM	C B	23.4 20.0

Note:
1. Data from Traffic Impact Analysis (2007 Fehr and Peer's)
2. Signal = signalized intersection, SSSC = side-street stop-controlled intersection

Avenue 12 Worksheets (AM)

Lanes, Volumes, Timings
16: Ave 12 & Road 34.5 9/1/2009

Lane Group	EDL	EDT	WDT	WDR	SDL	SDR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12
Turning Speed (mph)	15			9	15	9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.999		0.889	
Flt Protected		0.999			0.991	
Satd. Flow (prot)	0	1861	1861	0	1586	0
Flt Permitted		0.999			0.991	
Satd. Flow (perm)	0	1861	1861	0	1586	0
Headway Factor	1.00	1.00	1.00	1.00	1.04	1.00
Link Speed (mph)		30	30		30	
Link Distance (ft)		5260	1065		1080	
Travel Time (s)		119.5	24.2		24.5	
Volume (vph)	6	231	380	2	3	12
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	7	269	442	2	3	14
Lane Group Flow (vph)	0	276	444	0	17	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.1%		ICU Level of Service A	
Analysis Period (min) 15			

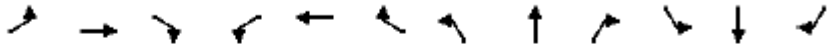
HCM Unsignalized Intersection Capacity Analysis
16: Ave 12 & Road 34.5 9/1/2009

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	6	231	380	2	3	12
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	269	442	2	3	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			1065			
pX, platoon unblocked						
vC, conflicting volume	444				726	443
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	444				726	443
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	98
cM capacity (veh/h)	1116				389	615

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	276	444	17
Volume Left	7	0	3
Volume Right	0	2	14
cSH	1116	1700	551
Volume to Capacity	0.01	0.26	0.03
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.3	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
19: Ave 12 & Road 35 9/1/2009



Lane Group	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
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	15	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.997			0.983			0.930	
Flt Protected								0.964			0.977	
Satd. Flow (prot)	0	1859	0	0	1857	0	0	1942	0	0	1862	0
Flt Permitted								0.964			0.977	
Satd. Flow (perm)	0	1859	0	0	1857	0	0	1942	0	0	1862	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	1.00	1.00	0.88	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1320			5320			1000			564	
Travel Time (s)		30.0			120.9			22.7			12.8	
Volume (vph)	2	221	3	3	332	9	6	1	1	46	2	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	2	226	3	3	339	9	6	1	1	47	2	52
Lane Group Flow (vph)	0	231	0	0	351	0	0	8	0	0	101	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.4%		ICU Level of Service A	
Analysis Period (min) 15			

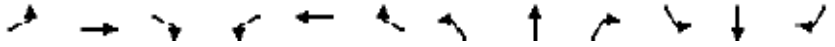
HCM Unsignalized Intersection Capacity Analysis
19: Ave 12 & Road 35 9/1/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	221	3	3	332	9	6	1	1	46	2	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	2	226	3	3	339	9	6	1	1	47	2	52
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	348			229			634	585	227	582	582	343
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348			229			634	585	227	582	582	343
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	100	100	89	100	93
cM capacity (veh/h)	1211			1340			360	421	812	422	423	699

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	231	351	8	101
Volume Left	2	3	6	47
Volume Right	3	9	1	52
cSH	1211	1340	395	530
Volume to Capacity	0.00	0.00	0.02	0.19
Queue Length 95th (ft)	0	0	2	17
Control Delay (s)	0.1	0.1	14.3	13.4
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.1	14.3	13.4
Approach LOS			B	B

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	32.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lanes, Volumes, Timings
25: Ave 12 & Road 37 9/1/2009



Lane Group	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
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.996			0.865			0.920	
Flt Protected		0.998									0.980	
Satd. Flow (prot)	0	1859	0	0	1855	0	0	1826	0	0	1903	0
Flt Permitted		0.998									0.980	
Satd. Flow (perm)	0	1859	0	0	1855	0	0	1826	0	0	1903	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		5290			5290			1000			528	
Travel Time (s)		120.2			120.2			22.7			12.0	
Volume (vph)	17	482	2	1	296	9	0	0	2	16	0	23
Peak Hour Factor	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	524	2	1	322	10	0	0	2	17	0	25
Lane Group Flow (vph)	0	544	0	0	333	0	0	2	0	0	42	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.7%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
25: Ave 12 & Road 37 9/1/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	482	2	1	296	9	0	0	2	16	0	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	524	2	1	322	10	0	0	2	17	0	25
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	332			526			916	896	525	893	892	327
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	332			526			916	896	525	893	892	327
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			100	100	100	93	100	97
cM capacity (veh/h)	1228			1041			241	275	552	258	277	715

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	545	333	2	42
Volume Left	18	1	0	17
Volume Right	2	10	2	25
cSH	1228	1041	552	414
Volume to Capacity	0.02	0.00	0.00	0.10
Queue Length 95th (ft)	1	0	0	8
Control Delay (s)	0.4	0.0	11.5	14.7
Lane LOS	A	A	B	B
Approach Delay (s)	0.4	0.0	11.5	14.7
Approach LOS			B	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
29: Ave 12 & Road 38 9/1/2009

Lane Group	EDT	EDR	WDL	WDT	NDL	NDR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	14	12
Turning Speed (mph)		9	15		15	9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.990				0.990	
Flt Protected					0.956	
Satd. Flow (prot)	1859	0	0	1863	1881	0
Flt Permitted					0.956	
Satd. Flow (perm)	1859	0	0	1863	1881	0
Headway Factor	1.00	1.00	1.00	1.00	0.92	1.00
Link Speed (mph)	30			30	30	
Link Distance (ft)	5290			1345	1000	
Travel Time (s)	120.2			30.6	22.7	
Volume (vph)	592	8	1	310	13	1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	598	8	1	313	13	1
Lane Group Flow (vph)	606	0	0	314	14	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 41.6%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
29: Ave 12 & Road 38 9/1/2009

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	592	8	1	310	13	1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	598	8	1	313	13	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			606		917	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			606		917	602
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			972		302	500

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	606	314	14
Volume Left	0	1	13
Volume Right	8	0	1
cSH	1700	972	310
Volume to Capacity	0.36	0.00	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	17.2
Lane LOS		A	C
Approach Delay (s)	0.0	0.0	17.2
Approach LOS			C

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Avenue 12 Worksheets (PM)

Lanes, Volumes, Timings
16: Ave 12 & Road 34.5 9/1/2009

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	11	12
Turning Speed (mph)	15			9	15	9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.998		0.895	
Flt Protected		0.999			0.989	
Satd. Flow (prot)	0	1861	1859	0	1594	0
Flt Permitted		0.999			0.989	
Satd. Flow (perm)	0	1861	1859	0	1594	0
Headway Factor	1.00	1.00	1.00	1.00	1.04	1.00
Link Speed (mph)		30	30		30	
Link Distance (ft)		5260	1065		1080	
Travel Time (s)		119.5	24.2		24.5	
Volume (vph)	9	377	343	5	4	13
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	9	393	357	5	4	14
Lane Group Flow (vph)	0	402	362	0	10	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.1%		ICU Level of Service A	
Analysis Period (min) 15			

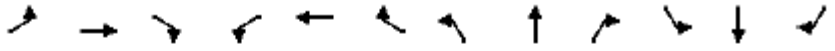
HCM Unsignalized Intersection Capacity Analysis
16: Ave 12 & Road 34.5 9/1/2009

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	9	377	343	5	4	13
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	9	393	357	5	4	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			1065			
pX, platoon unblocked						
vC, conflicting volume	362				771	360
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	362				771	360
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	98
cM capacity (veh/h)	1196				365	685

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	402	362	18
Volume Left	9	0	4
Volume Right	0	5	14
cSH	1196	1700	568
Volume to Capacity	0.01	0.21	0.03
Queue Length 95th (ft)	1	0	2
Control Delay (s)	0.3	0.0	11.5
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	11.5
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
19: Ave 12 & Road 35 9/1/2009



Lane Group	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
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	15	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.976			0.865			0.910	
Flt Protected		0.993			0.999						0.987	
Satd. Flow (prot)	0	1848	0	0	1816	0	0	1772	0	0	1840	0
Flt Permitted		0.993			0.999						0.987	
Satd. Flow (perm)	0	1848	0	0	1816	0	0	1772	0	0	1840	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	1.00	1.00	0.88	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1320			5320			1000			564	
Travel Time (s)		30.0			120.9			22.7			12.8	
Volume (vph)	41	241	3	3	217	47	0	0	5	9	2	21
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	42	248	3	3	224	48	0	0	5	9	2	22
Lane Group Flow (vph)	0	293	0	0	275	0	0	5	0	0	33	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.1%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
19: Ave 12 & Road 35 9/1/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	41	241	3	3	217	47	0	0	5	9	2	21
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	42	248	3	3	224	48	0	0	5	9	2	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	272			252			611	613	250	594	590	248
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	272			252			611	613	250	594	590	248
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	100	99	98	99	97
cM capacity (veh/h)	1291			1314			383	393	789	403	405	791

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	294	275	5	33
Volume Left	42	3	0	9
Volume Right	3	48	5	22
cSH	1291	1314	789	595
Volume to Capacity	0.03	0.00	0.01	0.06
Queue Length 95th (ft)	3	0	0	4
Control Delay (s)	1.4	0.1	9.6	11.4
Lane LOS	A	A	A	B
Approach Delay (s)	1.4	0.1	9.6	11.4
Approach LOS			A	B

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	48.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Lanes, Volumes, Timings
25: Ave 12 & Road 37

9/1/2009

Lane Group	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
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.996			0.942			0.904	
Flt Protected		0.998						0.972			0.986	
Satd. Flow (prot)	0	1857	0	0	1855	0	0	1933	0	0	1882	0
Flt Permitted		0.998						0.972			0.986	
Satd. Flow (perm)	0	1857	0	0	1855	0	0	1933	0	0	1882	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		5290			5290			1000			528	
Travel Time (s)		120.2			120.2			22.7			12.0	
Volume (vph)	17	477	4	3	615	21	4	0	3	10	0	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	19	530	4	3	683	23	4	0	3	11	0	27
Lane Group Flow (vph)	0	553	0	0	709	0	0	7	0	0	38	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.5%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
25: Ave 12 & Road 37 9/1/2009

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	477	4	3	615	21	4	0	3	10	0	24
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	530	4	3	683	23	4	0	3	11	0	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	707			534			1298	1283	532	1275	1274	695
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	707			534			1298	1283	532	1275	1274	695
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			97	100	99	92	100	94
cM capacity (veh/h)	892			1033			128	161	547	140	163	442

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	553	710	8	38
Volume Left	19	3	4	11
Volume Right	4	23	3	27
cSH	892	1033	190	271
Volume to Capacity	0.02	0.00	0.04	0.14
Queue Length 95th (ft)	2	0	3	12
Control Delay (s)	0.6	0.1	24.7	20.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.6	0.1	24.7	20.4
Approach LOS			C	C

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
29: Ave 12 & Road 38 9/1/2009

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	14	12
Turning Speed (mph)		9	15		15	9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.998				0.991	
Flt Protected					0.955	
Satd. Flow (prot)	1859	0	0	1863	1860	0
Flt Permitted					0.955	
Satd. Flow (perm)	1859	0	0	1863	1860	0
Headway Factor	1.00	1.00	1.00	1.00	0.92	1.00
Link Speed (mph)	30			30	30	
Link Distance (ft)	5290			1345	1000	
Travel Time (s)	120.2			30.6	22.7	
Volume (vph)	342	4	1	513	43	3
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	349	4	1	523	44	3
Lane Group Flow (vph)	353	0	0	524	47	0
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.8%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
29: Ave 12 & Road 38 9/1/2009

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	342	4	1	513	43	3
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	349	4	1	523	44	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			353		877	351
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			353		877	351
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		86	100
cM capacity (veh/h)			1206		319	692

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	353	524	47
Volume Left	0	1	44
Volume Right	4	0	3
cSH	1700	1206	330
Volume to Capacity	0.21	0.00	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.0	0.0	17.7
Lane LOS		A	C
Approach Delay (s)	0.0	0.0	17.7
Approach LOS			C

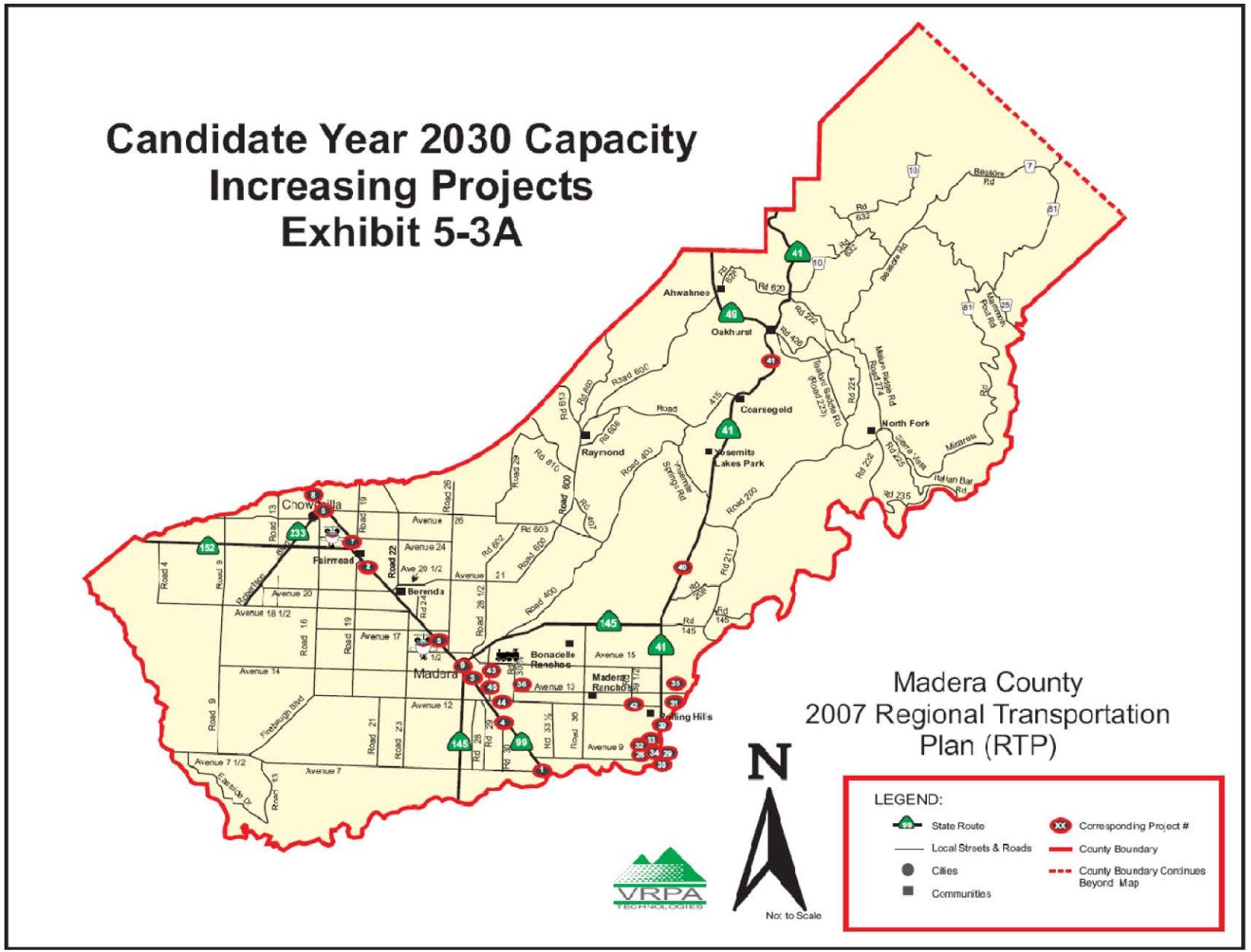
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

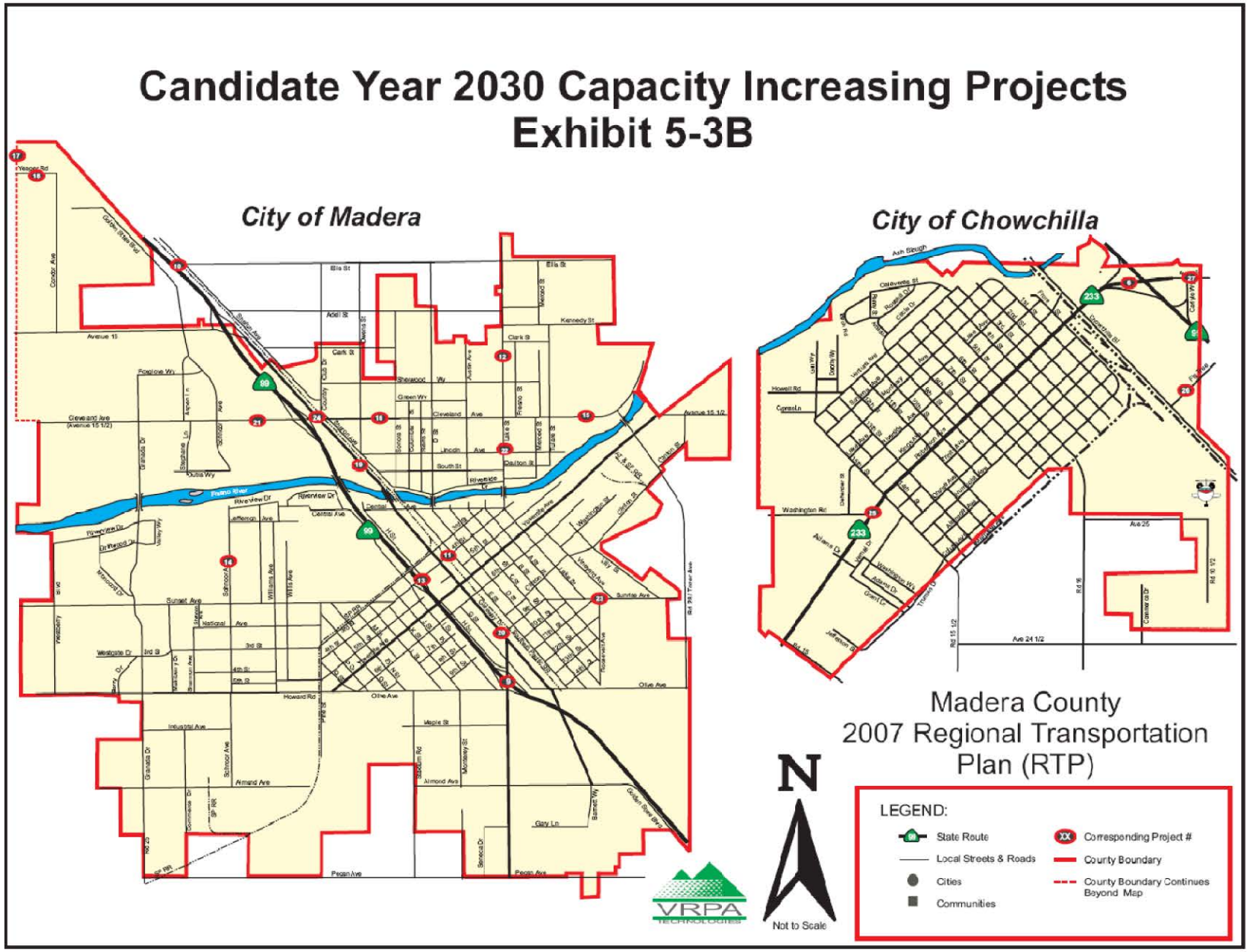
APPENDIX 3-1: MADERA COUNTY 2007 TRANSPORTATION PLAN PROJECTS

TABLE 5-4

Constrained Candidate Capacity Increasing Projects for Inclusion in the Madera County 2007 Regional Transportation Plan

Agency Identifier	Map ID Number	Route	Project Limits	Description	Estimated Cost	Funding Year	Conformity Analysis Year	Funding Source
CALTRANS CANDIDATE PROJECTS - 2007 RTP PROJECT LIST (CT RTP)								
CTRTP	1	99	Ashlan Ave. in Fresno Co. to Ave. 7	4-Lane Freeway to 6-Lane Freeway	$25,000,000	2011-12	2013	ITIP
CTRTP	2	99	Ave 12 Interchange	Reconstruct Interchange	$68,000,000	2011-12	2013	99 Bond/RTIP/Meas T/IF
CTRTP	3	99	Ave 12 to Ellis Ave	4-Lane Freeway to 6-Lane Freeway and IC at Ellis	$155,000,000	2013-14	2020	ITIP
CTRTP	4	99	Ave 7 to Ave 12	4-Lane Freeway to 6-Lane Freeway	$77,000,000	2013-14	2020	ITIP
CTRTP	5	99	Ellis Ave to Ave 17	4-Lane Freeway to 6-Lane Freeway and Recon IC at Ave 17	$100,000,000	2015-16	2020	ITIP/IF
CTRTP	6	99	SR 233 Interchange	Reconstruct Interchange	$35,000,000	2015-16	2020	ITIP/RTIP/Meas T/IF
CTRTP	7	99	SR 152 Interchange	New Interchange and Rail Crossing	$96,600,000	2017-18	2020	ITIP
CTRTP	8	99	SR 152 to Merced County Line	4-Lane Freeway to 6-Lane Freeway nad Recon IC at Ave 24	$125,000,000	2019-20	2020	ITIP/IF
				Subtotal:	$681,600,000			
CITY OF MADERA CANDIDATE STREET AND ROAD PROJECT LIST (MADCITY)								
MADCITY	9	99	SR 145 Interchange	Reconstruct Interchange	$5,400,000	2008	2010	RTIP/Meas A
MADCITY	10	Ellis Ave	Granada to Road 26	Recon street and new SR 99 OC at Ellis	$17,000,000	2009	2010	RTIP/Meas T/Mease A/IF
MADCITY	11	4TH	K Street to Lake	2 to 4 lanes	$4,000,000	2009	2010	RTIP/Meas T/IF
MADCITY	12	LAKE	Green to Ellis	Widen to 4 Lanes	$1,550,000	2010	2010	Meas T
MADCITY	13	4TH	Interchange @ SR 99	IC Recon	$7,000,000	2010	2010	RTIP/Meas T/IF
MADCITY	14	SCHNOOR	Trevor to Sunset	Restripe to 4 lanes	$830,000	2012	2020	Meas T
MADCITY	15	CLEVELAND	Tozer to Lake	Restripe to 4 lanes	$280,000	2014	2020	Meas T
MADCITY	16	CLEVELAND	Lake to Rd. 26 (Country Club Drive)	Restripe to 4 lanes	$30,000	2014	2020	Meas T
MADCITY	17	AIRPORT	Ave 17 to Yeager	Restripe to 4 lanes	$270,000	2016	2020	Meas T
MADCITY	18	YEAGER	Airport to Falcon	Restripe to 4 lanes	$270,000	2018	2020	Meas T
MADCITY	19	GATEWAY	Cleveland to Yosemite	Widen to 4 Lanes	$3,200,000	2020	2020	RTIP/Meas T/IF
MADCITY	20	GATEWAY (SR 145)	Yosemite to SR 99	Widen to 4 Lanes	$2,800,000	2020	2020	RTIP/Meas T/IF
MADCITY	21	CLEVELAND	Schnoor to SR 99	2 to 4 lanes	$3,400,000	2021	2030	RTIP/Meas T/IF
MADCITY	22	LAKE	4th to Cleveland	2 to 4 lanes	$1,600,000	2028	2030	RTIP/Meas T/IF
MADCITY	23	SUNRISE	B Street to Road 28	2 to 4 lanes	$1,600,000	2028	2030	RTIP/Meas T/IF
MADCITY	24	CLEVELAND	Road 28 to SR 99	4 to 6 lanes	$8,300,000	2029	2030	RTIP/Meas T/IF
				Subtotal:	$57,530,000			
CITY OF CHOWCHILLA - CANDIDATE STREET AND ROAD PROJECT LISTING (CHOWCITY)								
CHOWCITY	25	ROBERTSON	15th Street to Palm Pkwy	Restripe 2 to 4 Lanes	$903,000	2011	2013	SHOPP/Meas T
CHOWCITY	26	FIG TREE	SR 99 Overcrossing	2 Lane OC to Chowchilla Blvd	$10,800,000	2012	2013	IF
CHOWCITY	27	AVENUE 26	SR 99 to Coronado	Widen to 4 Lanes	$5,400,000	2030	2030	IF
				Subtotal:	$17,103,000			
COUNTY OF MADERA STREET AND ROAD PROJECT LISTING (MADCO)								
MADCO	28	CHILDREN'S BLVD	Road 401/2 to Peck Blvd	Widen to 6 Lanes	$2,280,000	2010	2010	IF
MADCO	29	CHILDREN'S BLVD	SR 41 NB ramps to Peck Blvd	Widen to 8 lanes	$3,800,000	2010	2010	IF
MADCO	30	CHILDREN'S BLVD	SR 41 to Lanes Bridge	Widen to 8 lanes	$1,900,000	2010	2010	IF
MADCO	31	AVE 12	SR 41 to North Rio Mesa Blvd	Widen to 6 Lanes	$2,500,000	2012	2013	IF
MADCO	32	AVE 10	Road 401/2 to SR 41	Widen to 4 Lanes	$4,400,000	2012	2013	IF
MADCO	33	LANES BRIDGE	At Children's Blvd	Widen to 6 Lanes	$2,900,000	2012	2013	IF
MADCO	34	CHILDREN'S BLVD	Between SR 41 Ramps	Widen to 6 Lanes	$5,000,000	2015	2020	IF
MADCO	35	N. RIO MESA	Rio Mesa Blvd to Ave 15 @ SR 41	Widen to 4 Lanes	$11,400,000	2015	2020	IF
MADCO	36	ROAD 30 1/2	Ave 12 to Ave 13	Widen to 4 Lanes	$4,800,000	2015	2020	IF
MADCO	37	41	NB on ramp/SR 41 @ Children's Blvd	Widen to 2 lanes	$20,200,000	2015	2020	IF
MADCO	38	41	Madera County Ln to Ave 10	Widen to 6 Lanes	$4,700,000	2015	2020	IF
MADCO	39	41	Ave 10 to Ave 12	4 lane freeway and IC at Ave 12	$67,300,000	2015	2020	RTIP/Meas T/IF
MADCO	40	41	SR 145 to Road 200	Construct passing lanes	$30,560,000	2019	2020	RTIP/Meas T/IF
MADCO	41	41	Road 420 to SR 49 South of Oakhurst	Widen to 4 Lanes	$22,900,000	2023	2030	RTIP/Meas T/IF
MADCO	42	AVE 12	Road 38 to SR 41	Widen to 4 Lanes	$21,300,000	2025	2030	RTIP/Meas T/IF
MADCO	43	ROAD 29	Olive to Ave 13	Widen to 4 Lanes	$4,900,000	2025	2030	RTIP/Meas T/IF
MADCO	44	AVE 12	SR 99 to Road 32	Widen to 4 Lanes	$12,200,000	2027	2030	RTIP/Meas T/IF
MADCO	45	ROAD 29	Ave 12 to Ave 13	Widen to 4 Lanes and realignment	$9,600,000	2027	2030	RTIP/Meas T/IF
				Subtotal:	$232,640,000			
				TOTAL:	$988,873,000			


Candidate Year 2030 Capacity
Increasing Projects
Exhibit 5-3A
Madera County
2007 Regional Transportation
Plan (RTP)
LEGEND:
State Route
Local Streets & Roads
Cities
Communities
Corresponding Project #
County Boundary
County Boundary Continues
Beyond Map
N
Not to Scale
VRPA
TECHNOLOGIES
Ahwahnee
Oakhurst
Coarsegold
Raymond
Yosemite
Lakes Park
North Fork
Chowchilla
Fairmead
Berenda
Madera
Bonadelle
Ranchos
Madera
Ranchos
Rolling Hills
Road 600
Road 400
Avenue 24
Avenue 15
Avenue 13
Avenue 12
Avenue 9
Avenue 7
Avenue 7 1/2
Avenue 14
Avenue 17
Avenue 18 1/2
Avenue 20
Ave 20 1/2
Road 22
Road 23
Road 21
Road 19
Road 16
Road 9
Road 4
Fig 5-3A


Candidate Year 2030 Capacity Increasing Projects
Exhibit 5-3B
City of Madera
City of Chowchilla
Madera County
2007 Regional Transportation
Plan (RTP)
N
Not to Scale
LEGEND:
State Route
Local Streets & Roads
Cities
Communities
Corresponding Project #
County Boundary
County Boundary Continues
Beyond Map
VRPA
TECHNOLOGIES

APPENDIX 3-2: TRANSPORTATION IMPROVEMENT PROPOSALS – TESORO VIEJO PLAN

TABLE 10
CUMULATIVE NO PROJECT INTERSECTION AND ROADWAY IMPROVEMENTS

Retrofit Existing Intersections and Roadway Segments	
Location	**Improvement**
SR 41: Avenue 12 to SR 145	• Widen both the northbound and southbound approach to two lanes, with a new freeway interchange at Avenue 12. In the study area, it is a four-lane rural undivided highway north of the Avenue 12 interchange, a four-lane north-south freeway from Avenue 12 to Friant Road, and a six-lane freeway south of Friant Avenue through the City of Fresno.
1. Road 36/SR 145	• Northbound approach: o Convert the shared right-and-left turn lane into separate right-turn and left-turn only lanes
2. SR 41/SR 145	• • •• Northbound approach: o Convert existing right-turn only lane to a shared through-right lane Southbound approach: o Add second through and left-turn only lanes Eastbound approach: o Convert approach to contain two left-turn only lanes, as well as a shared through-right lane Westbound approach: o Convert existing shared through-left lane into separate through and left-turn only lanes
4. Road 206/Friant Rd	• Signalize intersection • For the northbound, southbound, and westbound approaches, re-stripe approaches to have shared through-right lane as well as a left-turn only lane • Eastbound approach: o Convert approach from a single lane to a four-lane approach, which contains two left-turn only lanes, a designated through lane, as well as a right-turn only lane
5. Road 36/Avenue 15	• Signalize intersection
6. SR 41/Avenue 15	•• Signalize intersection For the northbound and southbound approach, provide an additional through

TABLE 10
CUMULATIVE NO PROJECT INTERSECTION AND ROADWAY IMPROVEMENTS

Retrofit Existing Intersections and Roadway Segments	
Location	**Improvement**
	lane
7. SR 41/Road 204	• Signalize intersection • For the northbound and southbound approaches, re-stripe approaches to contain a left-turn only lane, a through lane, and a shared through-right lane
9. Road 36/Avenue 12	• Optimize signal timing
11. Road 36/Avenue 9	•• Signalize intersection Eastbound approach: o Convert shared through-left lane into separate through and left-turn only lanes
12. Road 40 ½ / Avenue 9/Children's Blvd	•• Signalize intersection For the eastbound and westbound approaches, modify existing lane configuration to contain a shared through-right lane and a left-turn only lane
13. Children's Blvd/Peck Blvd	• •••• Add north leg to intersection with shared through-left-right lane for the southbound approach, and a single receiving lane for the northbound approach Signalize intersection Northbound approach: o Convert existing right-turn lane into a free right, and the existing left-turn lane into a shared through-right configuration Eastbound approach: o Add a left-turn lane Westbound approach: o Add second left turn lane and convert existing through lane into a shared through-right lane
14. Children's Blvd/Lanes Bridge Dr	• Southbound approach: o Convert existing left-turn lane into a shared left-right turn lane • Eastbound approach: o Add a third through lane • Westbound approach: o Removed U-turn lane, add a third through lane, and convert a through lane to a shared through-right lane
15. SR 41 SB Ramps/Children's Blvd/Rio Mesa Blvd	• Eastbound approach: o Convert a through lane into a shared through-right lane
16. SR 41 NB Ramps/Children's Blvd/Rio Mesa Blvd	• • Provide north leg connection to intersection, a left-turn lane and a shared through-right lane for the southbound approach, and two receiving lanes for the northbound approach Northbound approach: o Convert existing through lane into a second left-turn lane
17. SR 41 SB Ramps/Friant Rd/Blackstone Avenue	• Southbound approach:

TABLE 10
CUMULATIVE NO PROJECT INTERSECTION AND ROADWAY IMPROVEMENTS

Retrofit Existing Intersections and Roadway Segments	
Location	**Improvement**
	o Add a shared right-left turn lane • Eastbound approach: o Construct a free-flow right-turn lane as well as a free-flow shared through-right lane by installing a median stretching from the southbound on-ramp to the northbound on-ramp o Provide proper signage instructing drivers desiring to get on to the southbound or northbound on-ramps to start merging right before reaching the median o Signage should be placed at appropriate locations west of the intersection to indicate correct lanes to access on-ramps
18. SR 41 NB Ramps/Friant Rd/Blackstone Avenue	• Northbound approach: o Add a signal-controlled right-turn lane o Provide a designated left-turn receiving lane to allow for simultaneous northbound left and westbound through movements • Westbound approach: o Change approach to be an uncontrolled free-flow movement
19. SR 41 SB Ramps/Herndon Avenue	• Southbound approach: o Convert exiting right-turn lane into a shared right-left turn lane • Eastbound approach: o Convert existing shared through-right lane into a free-flow right-turn lane • Westbound approach: o Add a second free-flow right-turn lane
20. SR 41 NB Ramps/Herndon Avenue	• Northbound approach: o Add a second right-turn and left-turn only lane • Westbound approach: o Construct a free-flow shared through-right, and free-flow through lane by installing a median stretching from east of the intersection to the southbound looping on-ramp o Provide proper signage instructing drivers desiring to get on to the northbound and southbound on-ramps to start merging to the right three lanes before reaching the median o Signage should be placed at appropriate locations east of the Herndon Avenue/Fresno Street intersection to indicate correct lanes to access on-ramps o Only three through lanes will be signal-controlled
	New Intersections
8. SR 41/Avenue 13	• Construct a new signalized intersection with the following configurations: o Northbound approach: Two through lanes, one left-turn lane, and one right-turn lane o Southbound approach:

TABLE 10
CUMULATIVE NO PROJECT INTERSECTION AND ROADWAY IMPROVEMENTS

Retrofit Existing Intersections and Roadway Segments	
Location	**Improvement**
	. One through lane, a shared through-right lane, and a left-turn lane o Eastbound approach: . One shared through-right-left turn lane o Westbound approach: . One shared through-right turn lane, and two left-turn lanes
10. SR 41 SB Ramps/Avenue 12	• Construct a new interchange with a signalized junction on the local roads with the following lane configurations: o Southbound approach: . One right-turn lane, as well as one left-turn lane o Eastbound approach: . One through lane with a free-flow right-turn lane o Westbound approach: . One through lane with a free-flow right-turn lane
21. SR 41 NB Ramps/Avenue 12	• Construct a new interchange with a signalized junction on the local roads with the following lane configurations: o Northbound approach: . One left-turn lane a free-flow right-turn lane o Eastbound approach: . One through lane with a free-flow right-turn lane o Westbound approach: . One through lane and a shared through-right lane

Source: Fehr & Peers, 2007.

APPENDIX 4-1: CHANGES IN DEVELOPMENT PROPOSALS (2006-2009)

Rio Mesa Model

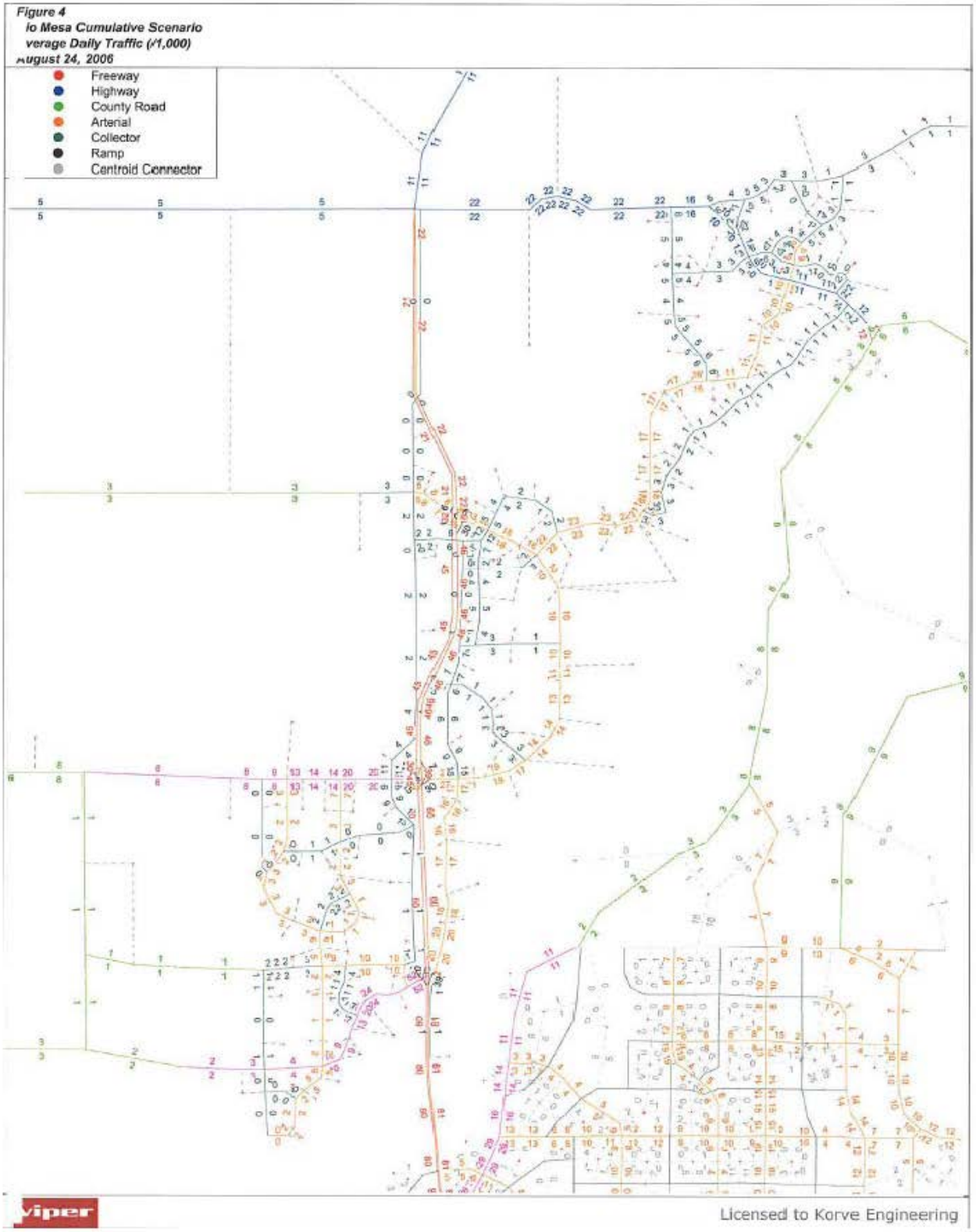
Description	Dwelling Units	Employment	TAZ ID (Range)
Kesterson	3,057	2,337	4100
Urretia	1,887	5,094	4200
Freels	4,984	766	4300
McCaffrey	4,729	6,270	4400
Sumner Ranch	212	-	4451
Combs	3,723	3,321	4500
Gunner East	4,716	5,582	4600
Riverbend Ranch	427	-	4650
Jim Cobb	826	1,712	4670
Gateway Village	4,945	2,457	4700
Rolling Hills, et. al.	311	1,112	4750
Dunmore Homes	1,403	81	4800
Gunner West	2,778	6,958	4900
Total	**33,998**	**35,690**	
(a) built;			
(b) discontinued;			
(c) active			

Active Development Proposals (August 2009)

	Proposed Development	Dwelling Units	Employment
1	Center Point Industrial Park	-	2,377
2	Gateway Village	6,908	16,138
3	Gunner Ranch	2,840	2,050
4	Liberty Groves	8,228	-
5	Madera State Center Community College Specific Plan	4,500	2,667
6	Morgan	-	1,494
7	New English Ranchos	1,400	-
8	North Fork Village	2,966	20,640
9	Orchard Park	363	-
10	San Joaquin River Ranch	15,405	-
11	Silverdust	-	559
12	Tatham	-	-
13	Tesoro Viejo	5,190	2,905
	Total	**47,800**	**48,830**

APPENDIX 4-2: PROJECTIONS BASED ON RIO MESA MODEL

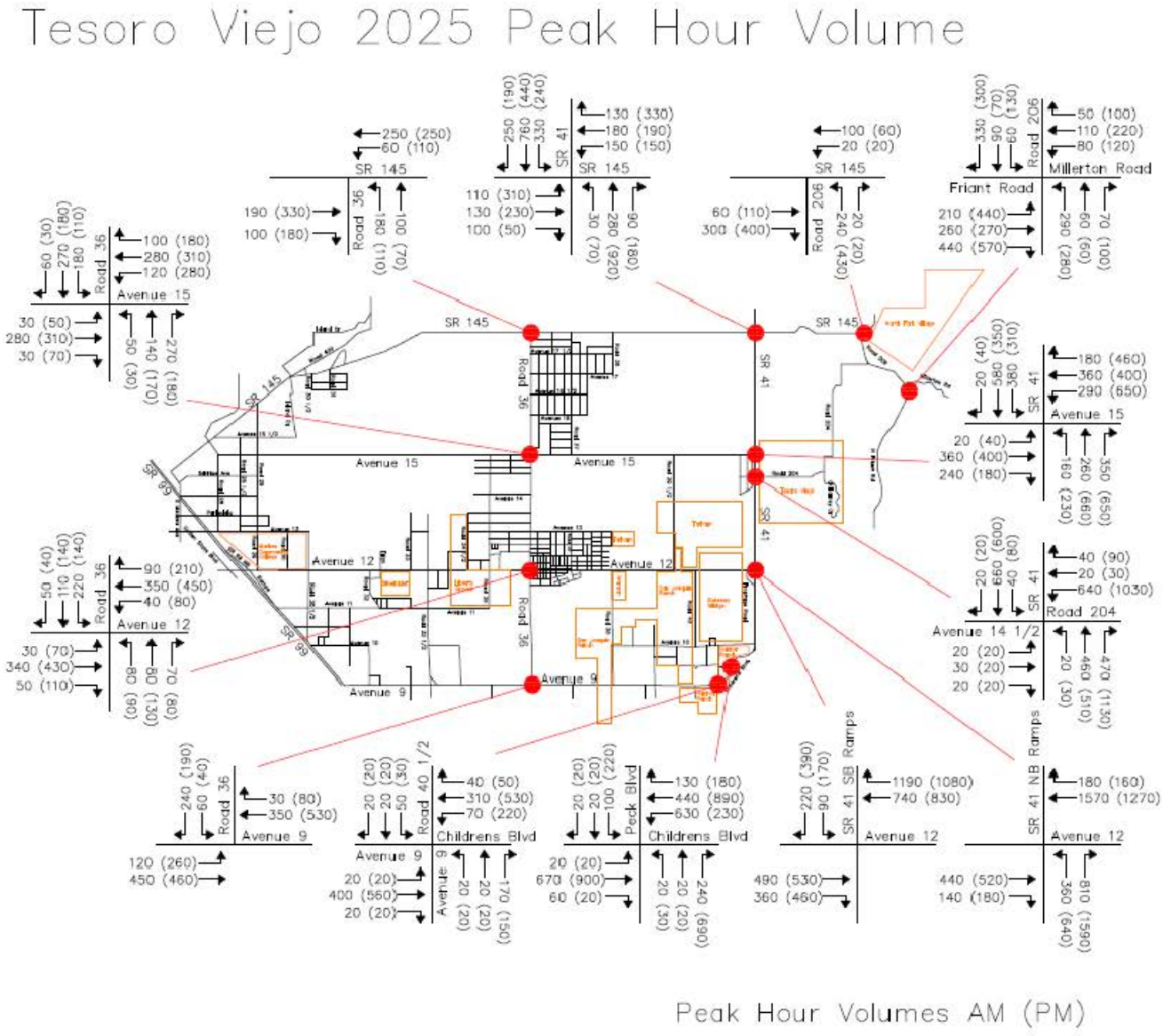
Projected 2025 ADT Volumes (Rio Mesa Model)

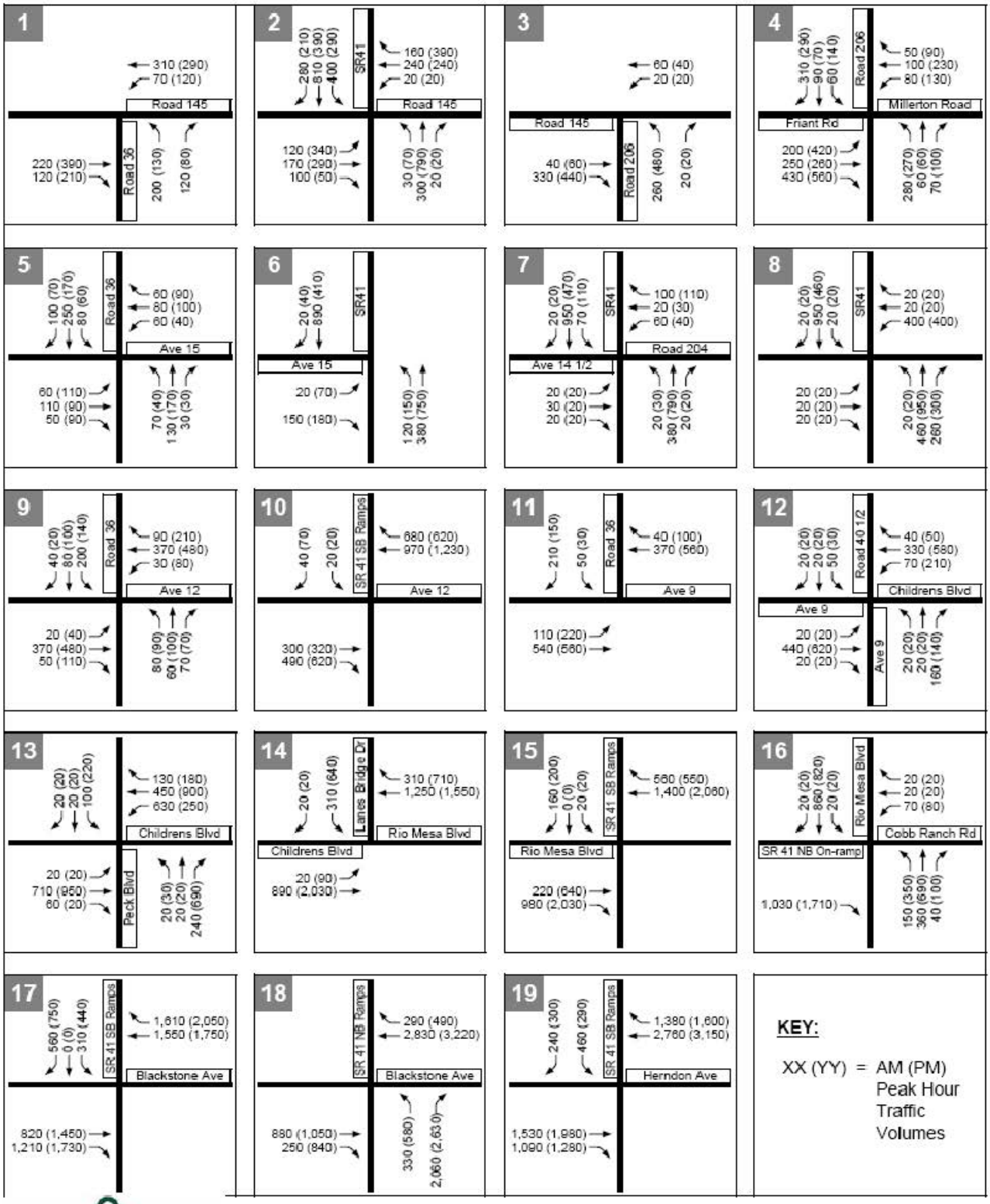


Projected Growth on Study Network Links by Rio Mesa Model

			2007 Daily Traffic Volumes					2007 Model Volumes for 2025		2000 Model Volumes			2007 Peak Hour
Street Counted	Location Description	Milepost	Direction 1	Volume 1	Direction 2	Volume 2	Two-way Observed	Estimate	% Growth	Two-way Observed	Estimate	% deviation	Two-Way
Avenue 9	west of Road 36		EB	5098	WB	3300	8,398	6,000	-29%				
Avenue 9	east of Road 38		EB	3818	WB	2856	6,674	8,000	20%				
Avenue 9	east of SR 99		EB	4036	WB	2942	6,978						
Avenue 12	west of SR 41		EB	6552	WB	7036	13,588	40,000	194%	10,508	9,095	-13%	
Avenue 12	east of Road 36		EB	6591	WB	7053	13,644	26,000	91%				
Avenue 12	west of Road 36		EB	4881	WB	5438	10,319	16,000	55%				
Avenue 12	east of Road 29		EB	5290	WB	6001	11,291						
Avenue 15	west of SR 41		EB	2642	WB	1628	4,270	6,000	41%	2,472	1,904	-23%	
Avenue 15	west of Road 36		EB	2470	WB	2440	4,910	6,000	22%				
Avenue 15	west of Road 29		EB	3011	WB	4246	7,257						
SR 41	south of Avenue 12	3.23	NB/SB				30,000	38,000	27%	27,500	27,167	-1%	2,600
SR 41	north of Avenue 12	3.23	NB/SB				15,500	43,000	177%				1,400
SR 41	south of SR 145	9.25	NB/SB				15,500	43,000	177%				1,400
SR 41	north of SR 145	9.25	NB/SB				17,500	22,000	26%	11,800	11,931	1%	1,850
SR 99	south of Avenue 12	7.46	NB/SB				68,000			51,000	53,315	5%	6,100
SR 99	north of Avenue 12	7.46	NB/SB				70,000						6,200
SR 99	south of SR 145	10.27	NB/SB				63,000						5,600
SR 99	north of SR 145	10.27	NB/SB				68,000			32,000	28,492	-11%	6,100
SR 145	west of SR 41	25.46	EB/WB				6,200	10,000	61%	3,550	3,513	-1%	620

Projected 2025 Peak Turning Volumes (Tesoro Viejo Traffic Study)





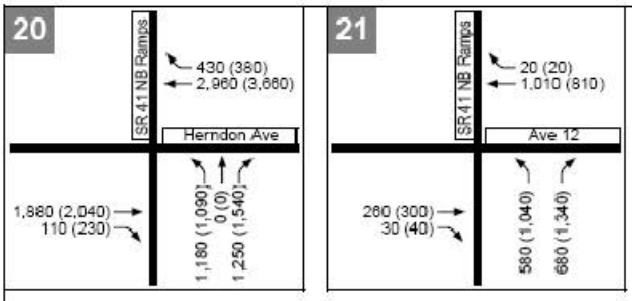
Tesoro Viejo Transportation Study

FEHR & PEERS
TRANSPORTATION CONSULTANTS

July 2007
F&Pvol2.0.xls

CUMULATIVE (2025) PEAK HOUR TRAFFIC VOLUMES

FIGURE 6A



KEY:

XX (YY) = AM (PM) Peak Hour Traffic Volumes

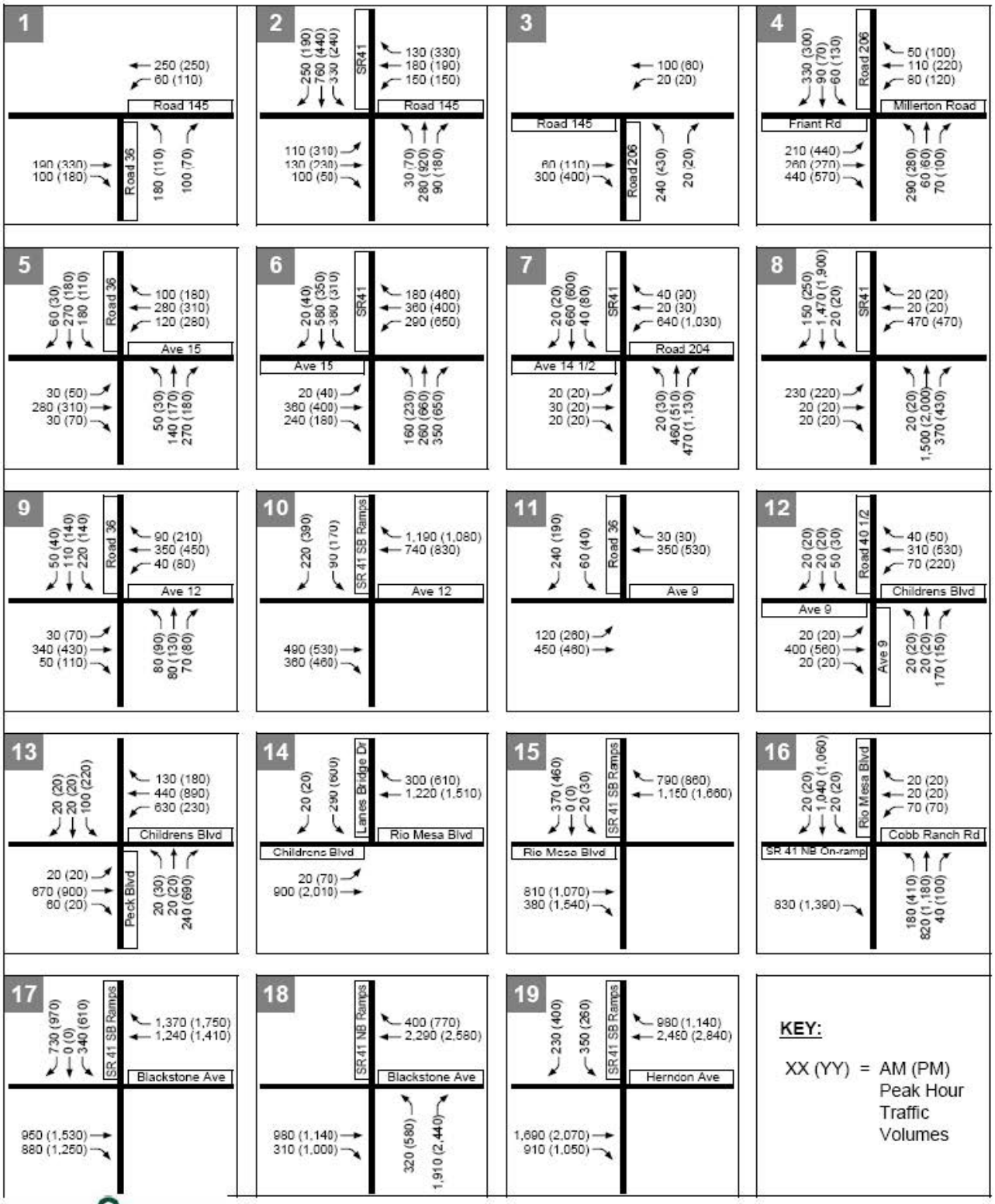
Tesoro Viejo Transportation Study

FEHR & PEERS
TRANSPORTATION CONSULTANTS

CUMULATIVE (2025) PEAK HOUR TRAFFIC VOLUMES

FIGURE 6B

July 2007
F&Pvol2.0.xls



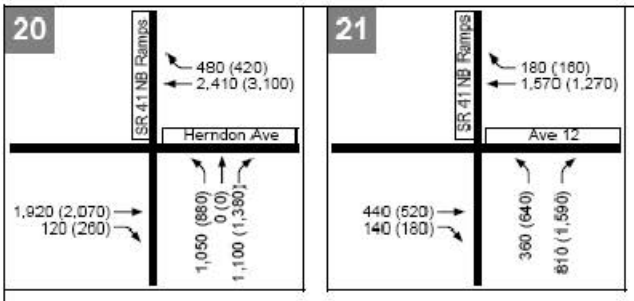
Tesoro Viejo Transportation Study

CUMULATIVE (2025) PLUS PROJECT PEAK HOUR TRAFFIC VOLUMES

FIGURE 7A

FEHR & PEERS
TRANSPORTATION CONSULTANTS

July 2007
F&Pvol2.0.xls



KEY:

XX (YY) = AM (PM) Peak Hour Traffic Volumes

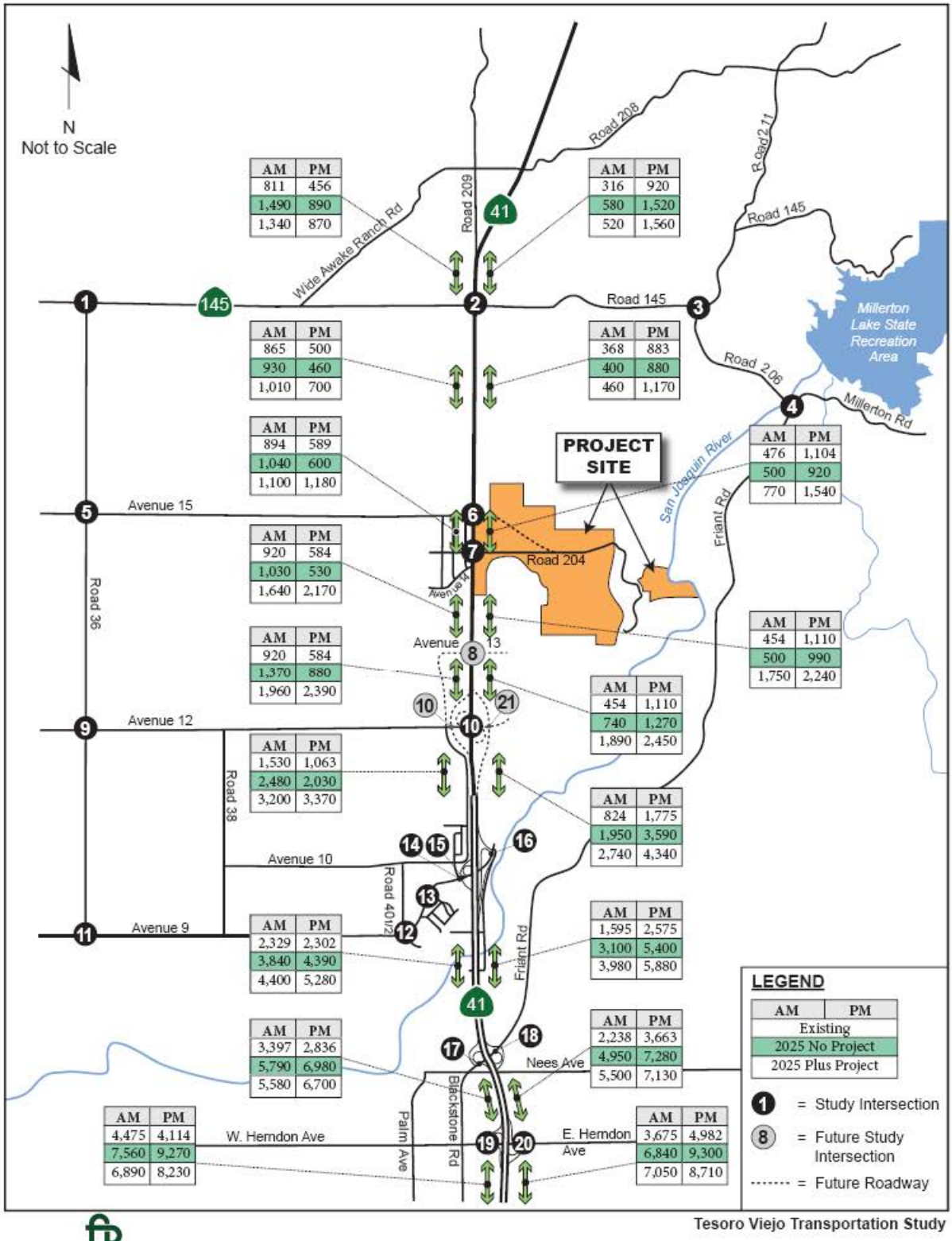
FEHR & PEERS
TRANSPORTATION CONSULTANTS

July 2007
F&Pvol2.0.xls

Tesoro Viejo Transportation Study

CUMULATIVE (2025) PLUS PROJECT PEAK HOUR TRAFFIC VOLUMES

FIGURE 7B



Tesoro Viejo Transportation Study

FEHR & PEERS
TRANSPORTATION CONSULTANTS

July 2007
WC06-2361_8

MAINLINE SEGMENT PEAK HOUR VOLUMES

Figure 8

Projected 2025 Peak Turning Volumes (Gunner Ranch West Traffic Study)

1	Intersection:	Road 36 at Avenue 15												
	Street:	Road 36						Avenue 15						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	31	84	32	64	158	36	47	238	28	58	243	33	1052
PM	PM PEAK HOUR	35	132	43	64	83	34	38	267	34	37	272	63	1102
	Data Source	Gunner Ranch-VRPA Technologies												
	Year	2025												
	Level of Service (AM)													
	Level of Service (PM)													
2	Intersection:	Road 36 at Avenue 12												
	Street:	Road 36						Avenue 12						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	42	88	77	141	68	20	13	363	15	124	339	114	1404
PM	PM PEAK HOUR	15	90	126	125	112	12	24	401	26	94	414	163	1602
	Data Source	Gunner Ranch-VRPA Technologies												
	Year	2025												
	Level of Service (AM)	C												
	Level of Service (PM)	C												
3	Intersection:	Road 36 at Avenue 9												
	Street:	Road 36						Avenue 9						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR				77		106	95	470			329	86	1163
PM	PM PEAK HOUR				103		109	131	454			442	100	1339
	Data Source	Gunner Ranch-VRPA Technologies												
	Year	2025												
	Level of Service (AM)													
	Level of Service (PM)													
4	Intersection:	SR 41 at SR 145												
	Street:	SR 41						SR 145						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	20	742	1499	322	791	322	69	350	76	1522	376	273	6362
PM	PM PEAK HOUR	63	790	1792	317	807	62	142	419	42	1746	387	350	6917
	Data Source	Gunner Ranch-VRPA Technologies												
	Year	2025												
	Level of Service (AM)													
	Level of Service (PM)													
5	Intersection:	*Please see new configuration for SR 41 below												
	Street:	SR 41 SB Ramps						Avenue 15						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR													
PM	PM PEAK HOUR													
	Data Source													
	Year													
	Level of Service (AM)													
	Level of Service (PM)													
6	Intersection:	SR 41 at Road 14 1/2 and Road 204												
	Street:	SR 41						Road 14 1/2 and Road 204						
	Approach:	Northbound			Southbound			Eastbound			Westbound			
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total
AM	AM PEAK HOUR	18	4	43	46	7	2	0	0	20	33	9	57	239
PM	PM PEAK HOUR	49	4	63	52	8	40	23	0	35	31	10	47	362
	Data Source	Gunner Ranch-VRPA Technologies												
	Year	2025												
	Level of Service (AM)													
	Level of Service (PM)													

7	Intersection:	***Please see new configuration for SR 41 below**													
	Street:	SR 41 SB Ramps						Avenue 12							
	Approach:	Northbound			Southbound			Eastbound			Westbound				
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total	
AM	AM PEAK HOUR														
PM	PM PEAK HOUR														
	Data Source														
	Year														
	Level of Service (AM)														
	Level of Service (PM)														

*Proposed New Intersections

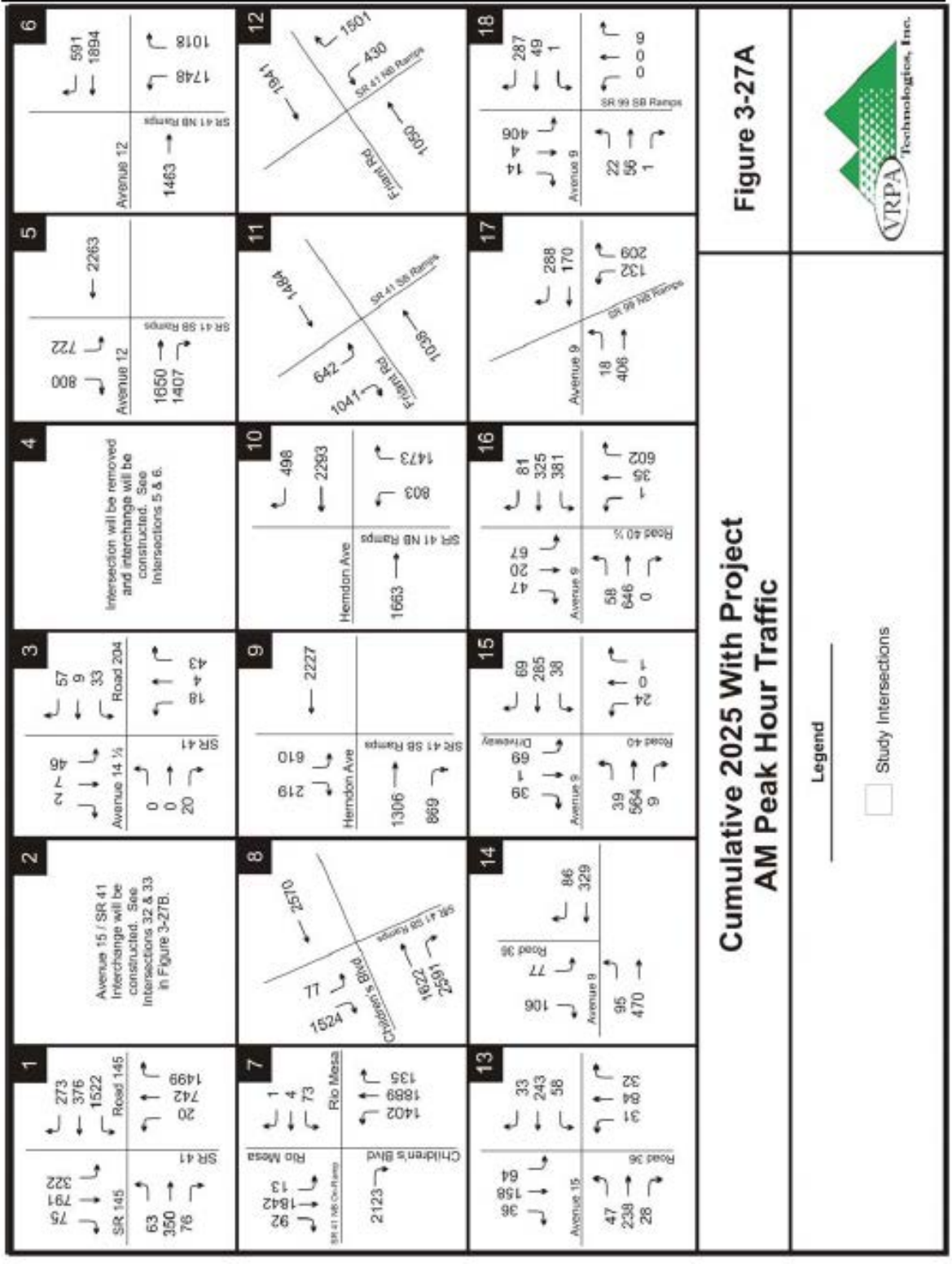
1	Intersection:	SR 41 SB Ramps at Avenue 15													
	Street:	SR 41 SB Ramps						Avenue 15							
	Approach:	Northbound			Southbound			Eastbound			Westbound				
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total	
AM	AM PEAK HOUR				709		155		714	1661		636		3875	
PM	PM PEAK HOUR				815		147		1582	1881		754		5179	
	Data Source	Gunner Ranch-VRPA Technologies													
	Year	2025													
	Level of Service (AM)	C													
	Level of Service (PM)	C													

2	Intersection:	SR 41 NB Ramps at Avenue 15													
	Street:	SR 41 NB Ramps						Avenue 15							
	Approach:	Northbound			Southbound			Eastbound			Westbound				
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total	
AM	AM PEAK HOUR	194		1759					617			2181	891	5642	
PM	PM PEAK HOUR	573		1842					685			2691	991	6782	
	Data Source	Gunner Ranch-VRPA Technologies													
	Year	2025													
	Level of Service (AM)	C													
	Level of Service (PM)														

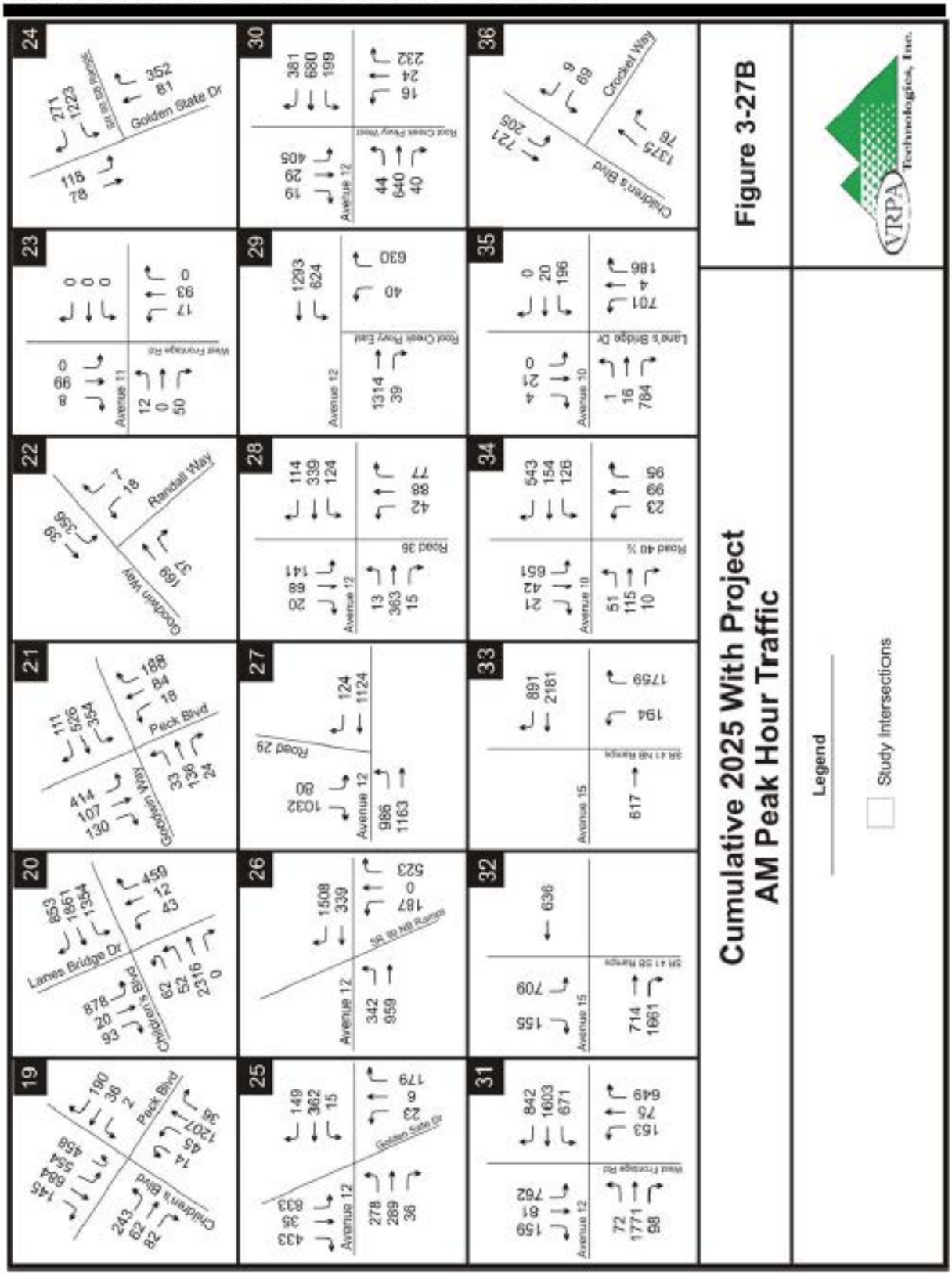
3	Intersection:	SR 41 SB Ramps at Avenue 12													
	Street:	SR 41 SB Ramps						Avenue 12							
	Approach:	Northbound			Southbound			Eastbound			Westbound				
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total	
AM	AM PEAK HOUR				722		800		1650	1407		2263		6842	
PM	PM PEAK HOUR				859		813		1855	1612		2580		7719	
	Data Source	Gunner Ranch-VRPA Technologies													
	Year	2025													
	Level of Service (AM)	C													
	Level of Service (PM)	C													

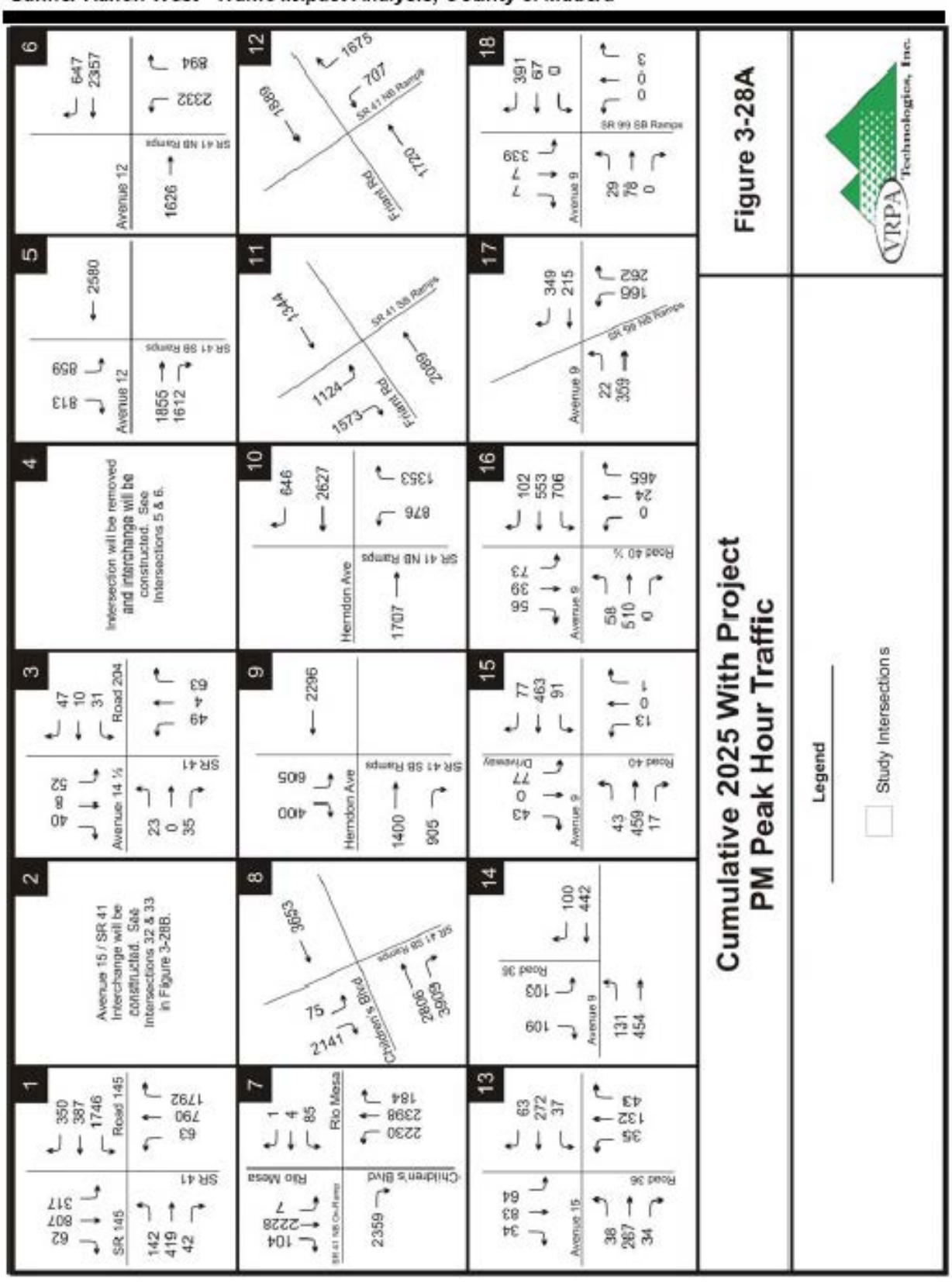
4	Intersection:	SR 41 NB Ramps at Avenue 12													
	Street:	SR 41 NB Ramps						Avenue 12							
	Approach:	Northbound			Southbound			Eastbound			Westbound				
	Peak Hour	left	through	right	left	through	right	left	through	right	left	through	right	Total	
AM	AM PEAK HOUR	1748		1018					1463			1894	591	6714	
PM	PM PEAK HOUR	2332		894					1626			2357	647	7856	
	Data Source	Gunner Ranch-VRPA Technologies													
	Year	2025													
	Level of Service (AM)	C													
	Level of Service (PM)														

Gunner Ranch West– Traffic Impact Analysis, County of Madera

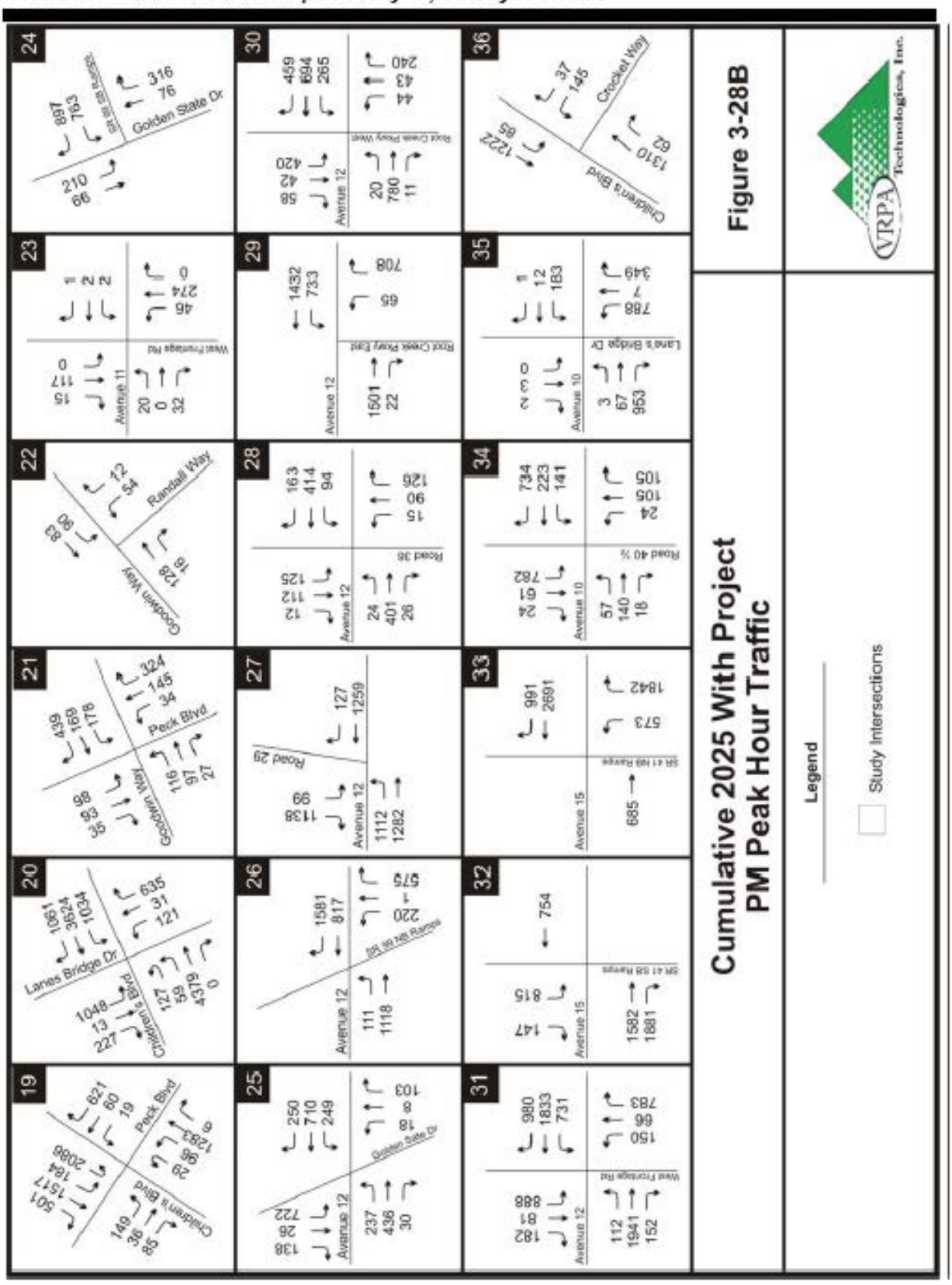


Gunner Ranch West– Traffic Impact Analysis, County of Madera




Gunner Ranch West– Traffic Impact Analysis, County of Madera
Cumulative 2025 With Project
PM Peak Hour Traffic
Figure 3-28A
Legend
Study Intersections
VRPA Technologies, Inc.
Avenue 15 / SR 41 Interchange will be constructed. See Intersections 32 & 33 in Figure 3-28B.
Intersection will be removed and interchange will be constructed. See Intersections 5 & 6.
SR 41
Road 145
Road 204
Avenue 14 ½
Avenue 12
SR 41 SB Ramps
SR 41 NB Ramps
Herndon Ave
Fresno River
Chowchilla Blvd
Rio Mesa
Road 36
Avenue 15
Avenue 9
Road 40
Driveway
SR 99 NB Ramps
SR 99 SB Ramps
Fresno Rd
SR 41 NB Ramps
SR 41 SB Ramps

Gunner Ranch West– Traffic Impact Analysis, County of Madera



Projected 2025 Peak Levels of Service (Gunner Ranch West Traffic Study)

Gunner Ranch West– Traffic Impact Analysis, County of Madera

Table 3-3
INTERSECTION OPERATIONS

	INTERSECTION	PEAK HOUR	CUMULATIVE 2010 WITH PROJECT		CUMULATIVE 2015 WITH PROJECT		CUMULATIVE 2020 WITH PROJECT		CUMULATIVE 2025 WITHOUT PROJECT		CUMULATIVE 2025 WITH PROJECT	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1	SR 41 / SR 145 / Road 145 / Millerton Rd [1]	AM	44.4	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	>80.0	F	>80.0	F	>80.0	F	>80.0	F	>80.0	F
2	SR 41 / Avenue 15 [2]	AM	45.9	E								
		PM	>50.0	F								
3	SR 41 / Road 204 [2]	AM	>50.0	F*	9.0	A	9.3	A	9.7	A	9.7	A
		PM	>50.0	F*	9.4	A	9.8	A	10.5	B	10.5	B
4	SR 41 / Avenue 12 [1]	AM	>80.0	F								
		PM	>80.0	F								
5	SR 41 SB Ramps / Avenue 12 [1]	AM			24.1	C	76.0	E	>80.0	F	>80.0	F
		PM			29.6	C	>80.0	F	>80.0	F	>80.0	F
6	SR 41 NB Ramps / Avenue 12 [1]	AM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
7	SR 41 NB Ramps / Rio Mesa [1]	AM	14.5	B	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	14.1	B	>80.0	F	>80.0	F	>80.0	F	>80.0	F
8	SR 41 SB Ramps / Children's Blvd [1]	AM	39.5	D	>80.0	F	>80.0	F	75.6	E	>80.0	F
		PM	>80.0	F	>80.0	F	>80.0	F	>80.0	F	>80.0	F
9	SR 41 SB Ramps / Herndon Ave [1]	AM	20.4	C	24.5	C	27.9	C	21.2	C	33.8	C
		PM	18.4	B	21.7	C	27.9	C	19.3	B	33.7	C
10	SR 41 NB Ramps / Herndon Ave [1]	AM	66.9	E	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	>80.0	F	>80.0	F	>80.0	F	>80.0	F	>80.0	F
11	SR 41 SB Ramps / Friant Rd [1]	AM	22.4	C	30.7	C	34.3	C	29.3	C	44.7	D
		PM	26.8	C	49.5	D	>80.0	F	50.7	D	>80.0	F
12	SR 41 NB Ramps / Friant Rd [1]	AM	20.1	C	21.4	C	23.7	C	25.1	C	24.9	C
		PM	23.7	C	24.6	C	25.8	C	26.8	C	27.2	C
13	Avenue 15 / Road 36 [3]	AM	10.4	B	11.8	B	13.9	B	17.4	C	17.7	C
		PM	10.0	A	11.5	B	14.3	B	19.2	C	20.0	C
14	Avenue 9 / Road 36 [2]	AM	15.8	C	20.3	C	25.2	D*	20.5	C	31.3	D*
		PM	17.8	C	28.3	D	>50.0	F*	29.8	D	>50.0	F*
15	Avenue 9 / Road 40 [2]	AM	19.8	C	25.4	D	30.0	D*	19.6	C	39.4	E*
		PM	20.1	C	29.3	D	>50.0	F*	20.2	C	>50.0	F*
16	Avenue 9 / Road 40 1/2 [2]	AM	>50.0	F	>50.0	F	>50.0	F	19.2	C	>50.0	F
		PM	>50.0	F	>50.0	F	>50.0	F	20.1	C	>50.0	F
17	Avenue 9 / SR 99 NB Ramps [2]	AM	13.9	B	16.3	C	19.5	C	21.5	C	24.3	C
		PM	13.2	B	16.4	C	21.5	C	24.5	C	32.2	D
18	Avenue 9 / SR 99 SB Ramps [2]	AM	13.0	B	15.8	C	19.9	C	22.7	C	27.3	D*
		PM	12.2	B	15.1	C	20.5	C	22.4	C	30.8	D*
19	Children's Blvd / Peck Blvd [2]	AM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
20	Children's Blvd / Lane's Bridge Dr [2]	AM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
21	Peck Blvd/ Goodwin Way [2]	AM	>50.0	F*	>50.0	F	>50.0	F	44.5	E*	>50.0	F
		PM	18.5	C*	>50.0	F	>50.0	F	25.2	D*	>50.0	F

Gunner Ranch West– Traffic Impact Analysis, County of Madera

	INTERSECTION	PEAK HOUR	CUMULATIVE 2010 WITH PROJECT		CUMULATIVE 2015 WITH PROJECT		CUMULATIVE 2020 WITH PROJECT		CUMULATIVE 2025 WITHOUT PROJECT		CUMULATIVE 2025 WITH PROJECT	
			DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
22	Randall Way / Goodwin Way (2)	AM	9.3	A	15.2	C	21.8	C	8.8	A	23.1	C
		PM	9.4	A	11.3	B	11.9	B	8.9	A	12.2	B
23	Avenue 11 / West Frontage Road (Old SR 41) (2)	AM	9.0	A	9.2	A	9.4	A	9.1	A	9.4	A
		PM	11.2	B	12.0	B	12.6	B	11.0	B	13.0	B
24	Golden State Dr / SR 99 SB Ramps	AM	>50.0 (2)	F*	>50.0 (2)	F	>50.0 (2)	F	>80.0 (1)	F	>80.0 (1)	F
		PM	>50.0 (2)	F*	>50.0 (2)	F	>50.0 (2)	F	59.3 (1)	E	61.3 (1)	E
25	Avenue 12 / Golden State Dr (1)	AM	41.9	D	65.3	E	>80.0	F	>80.0	F	>80.0	F
		PM	47.5	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
26	Avenue 12 / SR 99 NB Ramps (1)	AM	26.7	C	74.2	E	>80.0	F	>80.0	F	>80.0	F
		PM	25.7	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
27	Avenue 12 / Road 29 (1)	AM	49.7	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	62.4	E	>80.0	F	>80.0	F	>80.0	F	>80.0	F
28	Avenue 12 / Road 36 (1)	AM	26.9	C	29.5	C	31.9	C	34.1	C	34.2	C
		PM	27.2	C	29.1	C	30.7	C	33.1	C	33.3	C
29	Avenue 12 / Root Creek Parkway East (1)	AM	35.9	D	>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM	20.9	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
30	Avenue 12 / Root Creek Parkway West (1)	AM	29.9	C	61.9	E	>80.0	F	>80.0	F	>80.0	F
		PM	31.8	C	>80.0	F	>80.0	F	>80.0	F	>80.0	F
31	Avenue 12 / West Frontage Road (Old SR 41) (2)	AM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	>50.0	F	>50.0	F	>50.0	F	>50.0	F	>50.0	F
32	Avenue 15 / SR 41 SB Ramps (1)	AM			20.2	C	55.0	D	>80.0	F	>80.0	F
		PM			22.9	C	>80.0	F	>80.0	F	>80.0	F
33	Avenue 15 / SR 41 NB Ramps (1)	AM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
		PM			>80.0	F	>80.0	F	>80.0	F	>80.0	F
34	Avenue 10 / Road 40 1/2 (2)	AM	13.5	B	>50.0	F	>50.0	F	>50.0	F	>50.0	F
		PM	15.1	C	>50.0	F	>50.0	F	>50.0	F	>50.0	F
35	Avenue 10 / Lane's Bridge Dr (3)	AM	10.7	B	22.2	C	>50.0	F	>50.0	F	>50.0	F
		PM	12.3	B	30.1	C	>50.0	F	>50.0	F	>50.0	F
36	Children's Blvd / Crocket Way (2)	AM	>50.0	F*	>50.0	F	>50.0	F	14.7	B	>50.0	F
		PM	30.1	D*	>50.0	F	>50.0	F	11.7	B	>50.0	F

DELAY is measured in seconds
LOS = Level of Service
For unsignalized two-way stop controlled intersections, the delay refers to the worst-case movement.
* Does not meet signal warrants.
Intersection does exist during this scenario.
(1) signalized intersection
(2) unsignalized two-way stop controlled intersection
(3) unsignalized all-way stop controlled intersection

APPENDIX 5-1: DETAILS OF DEVELOPMENT PROPOSALS

	Lane Use:	Planned unit development	Single family homes	Commercial office	shopping	industrial park	light industry	mixed use	
	Units:	***dwelling unit***	***dwelling unit***	***1000 sf***	***1000 sf***	***acres***	***1000ft***		
	Development Proposals								
1	**Center Point Industrial Park**					268			
2	**Gateway Village**	6,578		2,124			3,204	**132**	acres
3	**Gunner Ranch**	2,840						**2,050**	1000 SF
4	**Liberty Groves**	8,228							
5	**Madera State Center Community College Specific Plan**	4,500		800					
6	**Morgan**						1,494		
7	**New English Ranchos**		1,400						
8	**North Fork Village**	2,966		6,192					
9	**Orchard Park**	363							
10	**San Joaquin River Ranch**	15,405							
11	**Silverdust**					63			
12	**Tatham**								
13	**Tesoro Viejo**	5,190			1,133		640		
	Total	**46,070**	**1,400**	**9,116**	**1,133**	**331**	**5,338**		

Summary

Land Use	Quantity	Unit
Residential	47,470	Dwelling Units
Commercial Office	9,116	1,000 SF
Shopping	1,133	1,000 SF
Light Industry	5,338	1,000 SF
Mixed Use	2,050	1,000 SF
Mixed Use	132	acres
Industrial Park	331	acres

APPENDIX 5-2: DETAILS OF TRIP GENERATION CALCULATIONS

Daily Trips

	Lane Use:	Planned unit development		Single family homes		Commercial office		shopping		industrial park		light industry		mixed use	mixed use	mixed use	Total
	Rate/Equation:	x= # dwelling unit	trips= $e^{.88\ln(x)+2.82}$	x= # dwelling unit	trips= $e^{.92\ln(x)+2.71}$	x= # 1000 sf	trips= $e^{.77\ln(x)+3.65}$	x= # 1000 sf	trips= $e^{.65\ln(x)+5.83}$	x= # acres	trips= 47.94x +595.34	x= # 1000ft	Trips= 7.47x-101.92	x= # acres	x= # 1000ft	trips= {calc} * 0.5	
1	Center Point Industrial Park									268	13443						13,443
2	Gateway Village	6578	38427			2124	14031					3204	23832	132		3462	79,751
3	Gunner Ranch	2840	18350												2050	7606	25,956
4	Liberty Groves	8228	46792														46,792
5	Madera State Center Community	4500	27513			800	6615										34,128
6	Morgan											1494.11	11059				11,059
7	New English Ranchos			1400	11786												11,786
8	North Fork Village	2966	19064			6192	31980										51,045
9	Orchard Park	363	3002														3,002
10	San Joaquin River Ranch	15405	81255														81,255
11	Silverdust									63	3616						3,616
12	Tatham																-
13	Tesoro Viejo	5190	31193					1132.56	32891			640.322	4681				68,765
																	430,599
	Total	46,070	265,596	1,400	11,786	9,116	52,627	1,133	32,891	331	17,059	5,338	39,572	132	2,050	11,068	**430,599**
		LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	LU	Trips	

Land Use	Quantity	Unit	Trips
Residential	47,470	Dwelling Units	277,382
Commercial Offic	9,116	1,000 SF	52,627
Shopping	1,133	1,000 SF	32,891
Light Industry	5,338	1,000 SF	56,631
Mixed Use	2,050	1,000 SF	11,068
Mixed Use	132	acres	
Industrial Park	331	acres	
			430,599

AM Peak Hour Trips

	Lane Use	Planned unit development		Single family homes		Commercial office		shopping		industrial park		light industry		mixed use	mixed use	mixed use	Total
	rate	x= # dwelling unit	trips= $e^{.93\ln(x)-.20}$	x= # dwelling unit	trips= .70x+9.74	x= # 1000 sf	trips= $e^{.80\ln(x)+1.55}$	x= # 1000 sf	trips= $e^{.59\ln(x)+2.32}$	x= # acres	trips= $e^{.78\ln(x)+2.89}$	x= # 1000ft	Trips= 1.18x-89.28	x= # acres	x= # 1000ft	trips= {calc} * 0.5	
1	Center Point Industrial Park									268	1409						1,409
2	Gateway Village	6578	2911			2124	2162					3204	3691	132		406	9,170
3	Gunner Ranch	2840	1333												2050	1165	2,498
4	Liberty Groves	8228	3584														3,584
5	Madera State Center Community College Specific Plan	4500	2045			800	990										3,035
6	Morgan											1494.11	1674				1,674
7	New English Ranchos			1400	990												990
8	North Fork Village	2966	1388			6192	5089										6,476
9	Orchard Park	363	197														197
10	San Joaquin River Ranch	15405	6422														6,422
11	Silverdust									63	456						456
12	Tatham																-
13	Tesoro Viejo	5190	2335					1132.56	645			640.322	666				3,646
																	39,556
	Total	46,070	20,213	1,400	990	9,116	8,241	1,133	645	331	1,865	5,338	6,032	132	2,050	1,570	**39,556**
		LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	LU	Trips	

Summary

Land Use	Trips
Residential	21,203
Commercial Office	8,241
Shopping	645
Industrial	7,897
Mixed Use	1,570
	39,556

PM Peak Hour Trips

	Lane Use	Planned unit development		Single family homes		Commercial office		shopping		industrial park		light industry		mixed use	mixed use	mixed use	Total
	rate	x= # dwelling unit	trips= $e^{.90\ln(x)+.27}$	x= # dwelling unit	trips= $e^{.90\ln(x)+.51}$	x= # 1000 sf	trips= 1.12x+78.81	x= # 1000 sf	trips= $e^{.67\ln(x)+3.37}$	x= # acres	trips= e.72ln(x)+3.14	x= # 1000ft	Trips= 1.43x-157.36	x= # acres	x= # 1000ft	trips= {calc} * 0.5	
1	Center Point Industrial Park									268	1294						1,294
2	Gateway Village	6578	3577			2124	2458					3204	4424	132		389	10,848
3	Gunner Ranch	2840	1680												2050	1387	3,067
4	Liberty Groves	8228	4375														4,375
5	Madera State Center Community College Specific Plan	4500	2542			800	975										3,517
6	Morgan											1494.11	1979				1,979
7	New English Ranchos			1400	1130												1,130
8	North Fork Village	2966	1747			6192	7014										8,761
9	Orchard Park	363	264														264
10	San Joaquin River Ranch	15405	7694														7,694
11	Silverdust									63	456						456
12	Tatham																-
13	Tesoro Viejo	5190	2890					1132.56	3234			640.322	758				6,883
																	50,267
	Total	46,070	24,769	1,400	1,130	9,116	10,446	1,133	3,234	331	1,750	5,338	7,162	132	2,050	1,776	**50,267**
		LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	Trips	LU	LU	Trips	

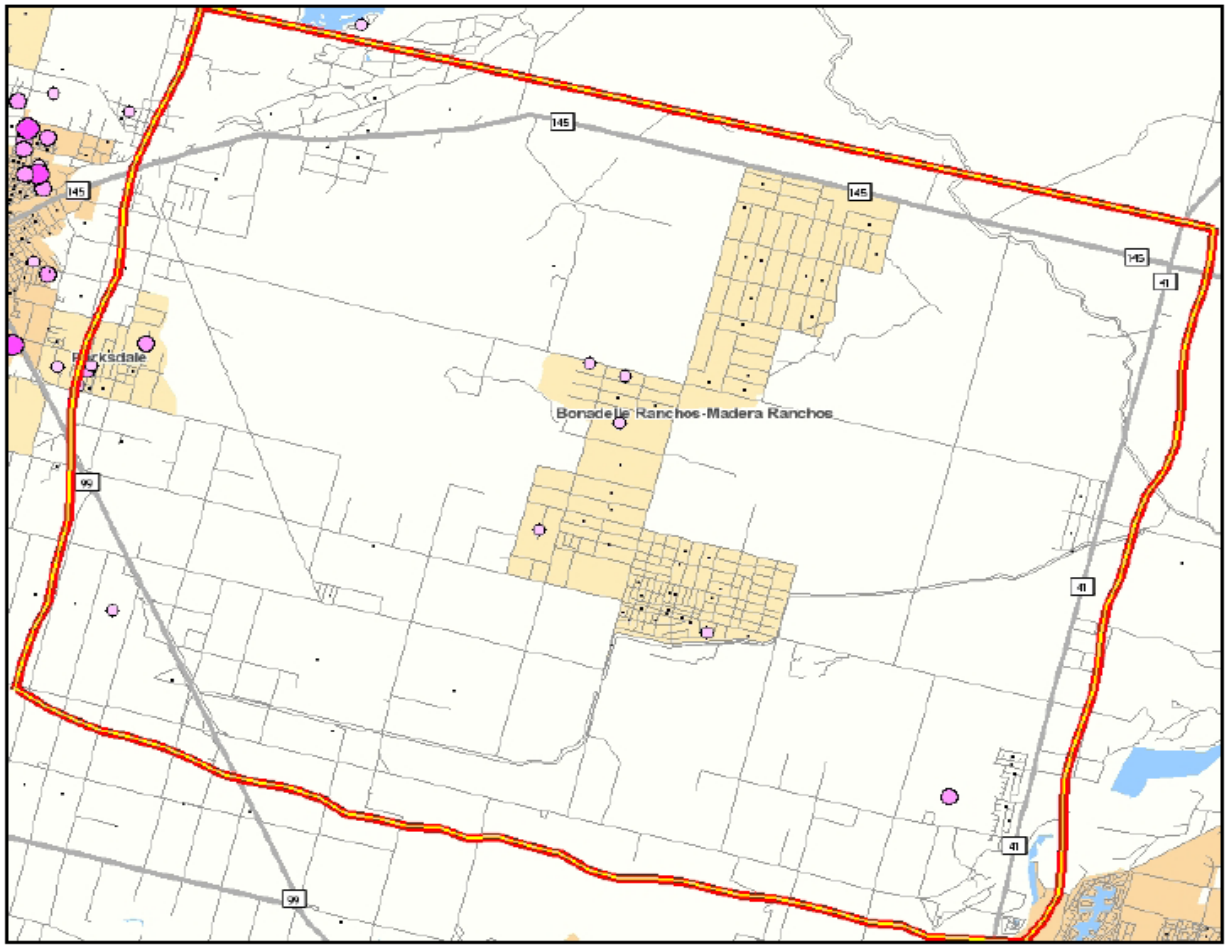
Summary

Land Use	Trips
Residential	25,899
Commercial Office	10,446
Shopping	3,234
Industrial	8,912
Mixed Use	1,776
	50,267

APPENDIX 6-1: DIRECTIONAL DISTRIBUTIONS IN CENSUS LEHD DATA

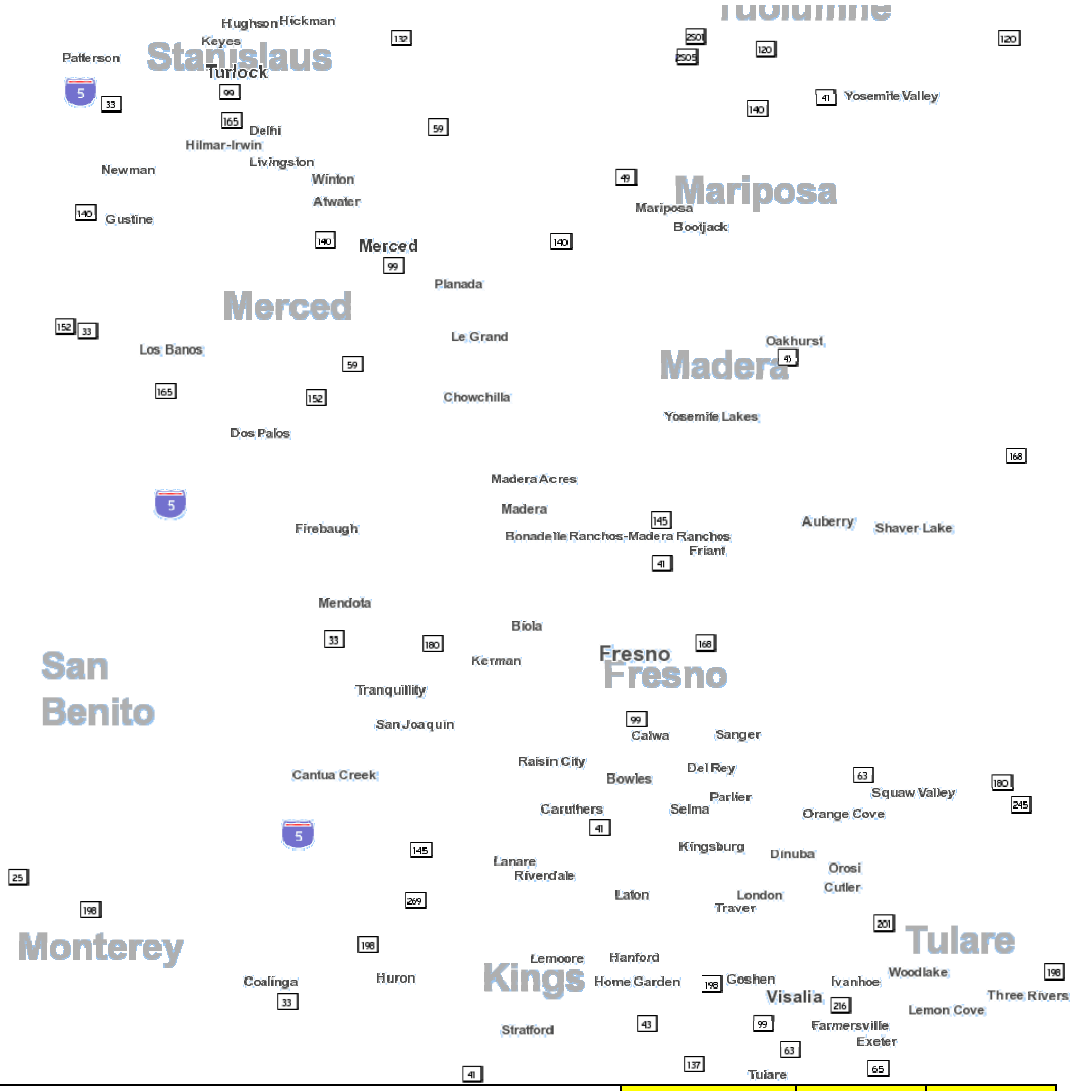
LEHD within our Network		
Madera Ranchos		
	2006	
	Count	Share
Total All Jobs	2,086	100%
Job Counts in Cities/Towns Where Workers Live	2006	
	Count	Share
Fresno, CA	540	25.9%
Madera, CA	437	20.9%
Madera Acres, CA	96	4.6%
Clovis, CA	70	3.4%
Bonadelle Ranchos-Madera Ranchos, CA	63	3.0%
Chowchilla, CA	36	1.7%
Yosemite Lakes, CA	29	1.4%
Parksdale, CA	24	1.2%
Sanger, CA	21	1.0%
Parkwood, CA	21	1.0%
All Other Locations	749	35.9%
Job Counts in Counties Where Workers Live	2006	
	Count	Share
Madera Co., CA	960	46.0%
Fresno Co., CA	816	39.1%
Merced Co., CA	39	1.9%
Tulare Co., CA	36	1.7%
Stanislaus Co., CA	34	1.6%
Sacramento Co., CA	24	1.2%
Monterey Co., CA	23	1.1%
Los Angeles Co., CA	22	1.1%
Kings Co., CA	15	0.7%
San Mateo Co., CA	13	0.6%
All Other Locations	104	5.0%
Job Counts in States Where Workers Live	2006	
	Count	Share
California	2,076	99.5%
Kentucky	3	0.1%
Colorado	2	0.1%
Arizona	2	0.1%

Pennsylvania	1	0.0%
All Other Locations	2	0.1%
Report Settings		
Year(s):	2006	
Job Type:	All Jobs	
Labor Market Segment	All Workers	
Report Generation Date:		
Data Sources		



This map is for demonstration purposes only. For a more detailed and customizable map ouput, please use the "Print Map" tool located above the Map Viewer.

2006
0 - 1 Workers
2 - 1 Workers
2 - 2 Workers
3 - 3 Workers
4 - 6 Workers
7 - 11 Workers



BY Cities/Towns	Count	Share	
Fresno, CA	540	25.9%	S
Madera, CA	437	20.9%	N
Madera Acres, CA	96	4.6%	N
Clovis, CA	70	3.4%	S
Bonadelle Ranchos-Madera Ranchos, CA	63	3.0%	
Chowchilla, CA	36	1.7%	N
Yosemite Lakes, CA	29	1.4%	N
Parksdale, CA	24	1.2%	
Sanger, CA	21	1.0%	
Parkwood, CA	21	1.0%	
All Other Locations	749	35.9%	

APPENDIX 6-2: CORDON COUNTS AND DIRECTIONAL DISTRIBUTIONS

Direction	IN	OUT	TOTAL	
AM	**Volume**	**Volume**	**Volume**	**Percent**
Northwest	484	449	933	24%
Southwest	346	260	606	16%
Northeast	811	264	1075	28%
Southeast	824	420	1244	32%
Total	**2465**	**1393**	**3858**	100%

PM	**Volume**	**Volume**	**Volume**	**Percent**
Northwest	714	516	1230	26%
Southwest	249	270	519	11%
Northeast	456	809	1265	27%
Southeast	1175	584	1759	37%
Total	**2594**	**2179**	**4773**	100%

APPENDIX 6-3: OTHER CENSUS TRAVEL DATA

National Household Travel Survey, 2001: Work Trips as Percent of All Trips

business and pleasure—has regained the levels and growth rates prior to 9/11. Previous estimates indicated that intercity passenger travel could constitute as much as 25% of total passenger miles of travel by all modes.[2]

We can place commuting in context with local metropolitan passenger travel by residents if we look at the shares of total travel by the different purposes for travel, in effect focusing only on two categories of transportation activities—commuting and other resident travel. It is helpful that the Nationwide Personal Transportation Survey (NPTS), renamed the National Household Travel Survey (NHTS) and conducted in 2001 before reverting to its original name, covers roughly the same time period as the census. This permits consistent analysis of commuting in the context of other passenger travel demand. The NHTS indicates that work travel constitutes roughly 15% of all person trips, as seen in the first column of Table 1-1, indicating a significant decline in share from the 20% observed in 1990. (The fully comparable number between the surveys is more like 16%, however, because the 2001 survey, for the first time, separately identified trips made by children under 5 years of age; even when the child usually is accompanied by an adult, the trip is counted as part of total household travel activity.) The decline in share is not so much due to any decline in work travel but rather to a more rapid growth in other trip purposes. In the period from 1977-2001, work trips per capita rose 14% while personal business travel rose 114%, social/recreational travel rose 65%, and even school travel rose 27%, as is discernible from Figure 1-2. Absolute changes in work trips per capita can derive from changes in the frequency of work trips of workers or a shift in the proportion of workers in the population. Rising incomes are a major factor here. As incomes rise, total trip-making increases, but certain trip purposes rise faster than others. Figure 1-3 shows that as incomes rise work trip growth shows significant increases in the lower brackets but levels off at middle levels, as might be expected. The big rises in personal business travel and social/recreational travel help to explain the high growth rates for these purposes observed in the previous figure. A new, and close to exhaustive, list of 36 trip purposes used in the 2001 NHTS is shown in Table 1-2.

[2] *American Travel Survey*, Bureau of Transportation Statistics, US DOT, Washington, D.C., 1995.

column of Table 1-1.

When these activities are looked at on a modal level, the role of work travel expands. Work travel plays a far more significant role in public transportation than in transportation by private vehicle. For public transportation, 35% of all trips made on

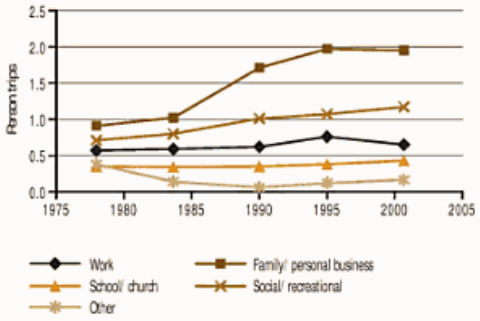
the dramatic growth in other activities rather than diminished work travel.

TABLE 1-1 Travel Shares by Purpose, 2001

Trip purpose	Person trips (%)	Person miles of travel (%)
To/ from work	14.9	18.1
Work-related business	2.9	8.1
Shopping	19.8	14.0
Family/ personal business	22.5	17.3
School/ church	9.8	5.9
Medical/ dental	2.2	2.3
Vacation	0.6	2.7
Visit friends/ relatives	7.9	11.6
Other social/ recreational	18.4	16.2
Other	0.9	3.8
All	**100.0**	**100.0**

Source: NHTS 2001

FIGURE 1-2 Daily Trips per Capita

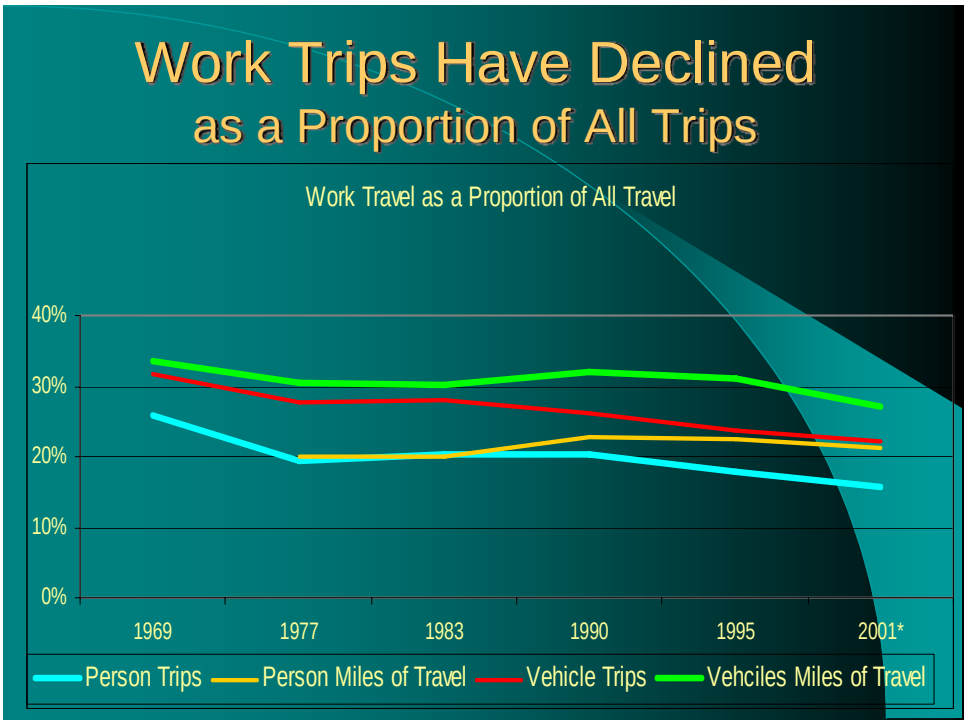


Source: Alan E. Pisarski, Commuting in America, 2006

NPTS (1990) Temporal Distribution of ALL trips

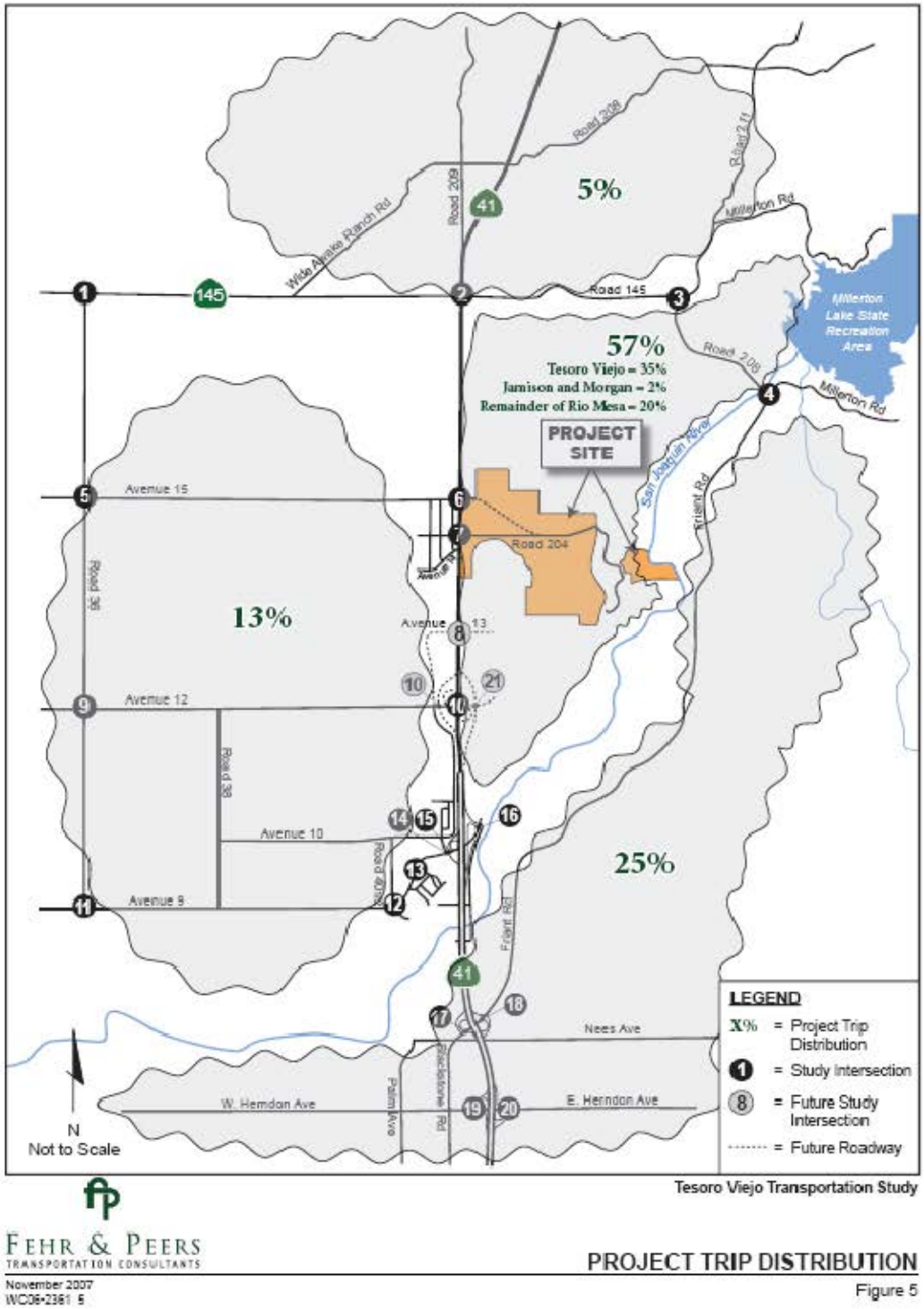
weekday			
	24-hour travel		
1am - 6am	3,788,584	2.26%	

6am - 9am	**30,390,381**	**18.16%**	**** am peak**
9am - 1pm	31,459,409	18.80%	
1pm - 4pm	36,261,855	21.67%	
4pm - 7pm	**40,924,240**	**24.46%**	**** pm peak**
7pm - 10pm	19,149,631	11.44%	
10pm - 1am	5,350,919	3.20%	
	167,325,019	100.00%	
		42.62%	**total am + pm peak periods**



Census Data for Transportation Planning Conference, May 2005
Nancy McGuckin, Travel Behavior Analyst
Nanda Srinivasan, Cambridge Systematics
Accessed online 11/4/09: http://ctpp.transportation.org/Future/slides/051105/mcguckin.ppt

APPENDIX 6-4A: DIRECTIONAL DISTRIBUTIONS IN TESORO VIEJO STUDY

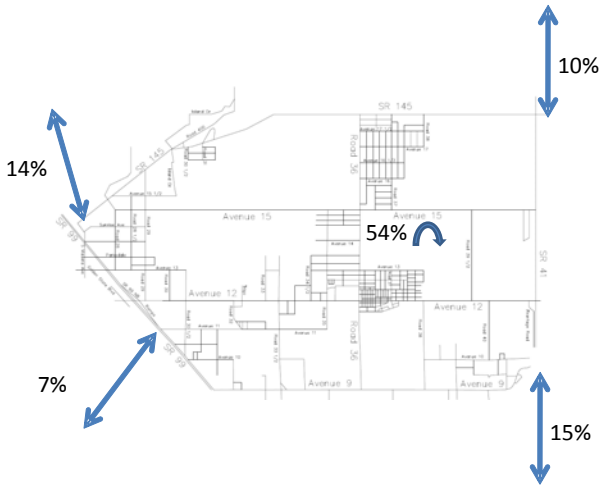


APPENDIX 6-4B: COMPARATIVE DIRECTIONAL DISTRIBUTIONS

Table Appendix 6-4b: Directional Distributions: Status Quo vs. Jobs-housing Balance Scenario

Direction	Status Quo (Bedroom Community)	Jobs-Housing Balance
Northwest (toward Madera)	**27%**	**14%**
Southwest (beyond Fresno)	**15%**	**7%**
Northeast (toward Yosemite)	**21%**	**10%**
Southeast (toward Fresno)	**30%**	**15%**
"Other" Internal	**7%**	**54%**
Total	100%	100%

Figure Appendix 6-4b: Directional Distribution with Job-Housing Balance



APPENDIX 7-1: JUSTIFICATION FOR ONSITE AND PASS-BY CAPTURE RATES

The "capture" reduction rates come from studies by the ITE.

Onsite Capture:

The table below shows a capture rate of 45% in the AM peak, 55% in the PM peak daily a daily rate of 51%. This study used 50% for long term planning.

On-Site Capture Data for Retail Uses, Brandermill Mixed Use Project, Richmond, VA
(Source: ITE *Trip Generation Manual*)

Trip Ends

	A.M. Peak Hour (7 - 9 A.M.)	P.M. Peak Hour (4 - 6 P.M.)	Daily
Total Generated	2,570	2,935	33,540
External	1,420	1,325	16,280
Captured	1,150 (45%)	1,610 (55%)	17,260 (51%)

Pass-By Capture:

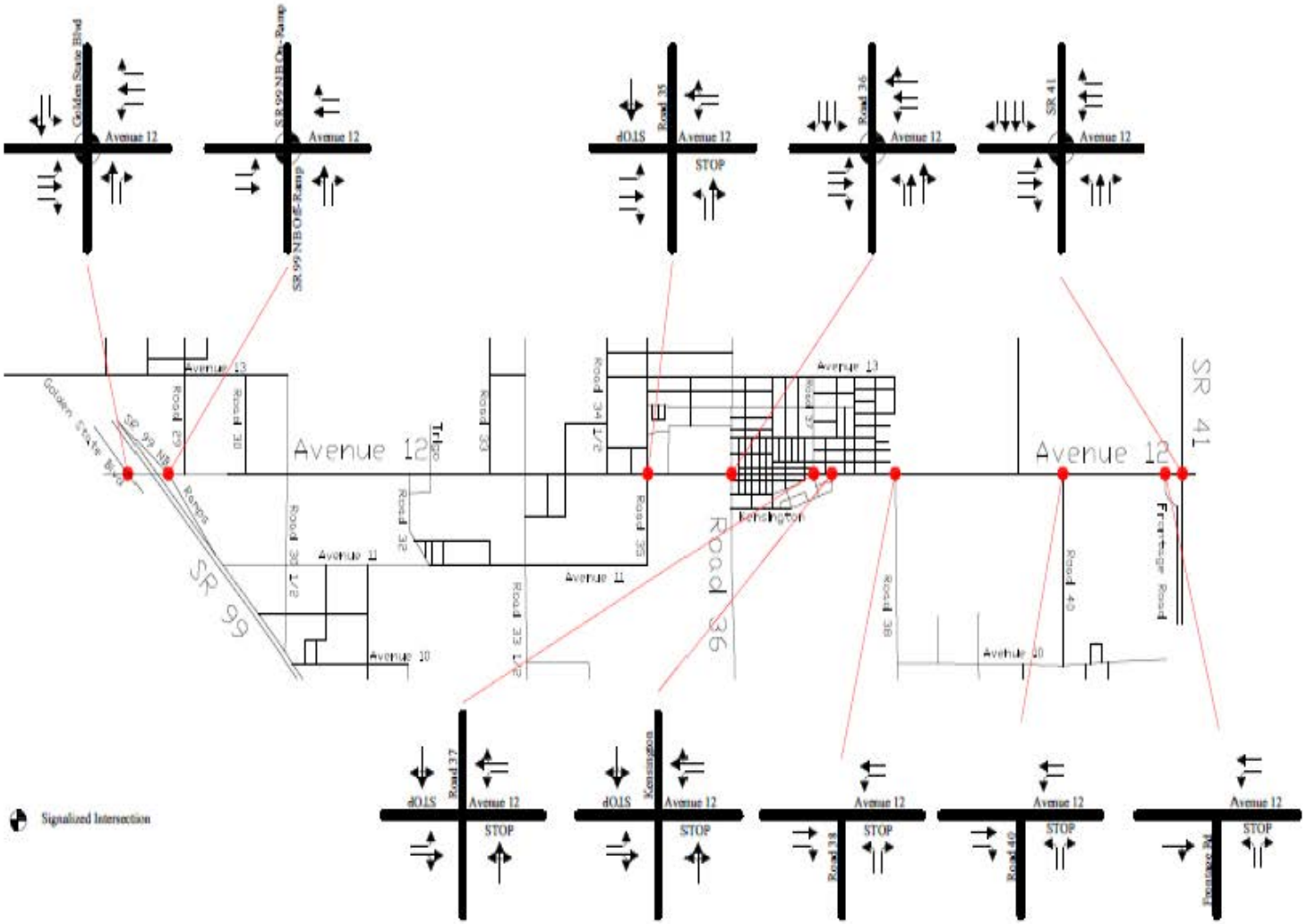
The table below shows a range of capture rates for the PM peak hour. Broward County in Florida, which has conditions closest to the Central Valley than the other cases, shows the highest rates with one at 55%. This is rounded off to 60% to be conservative with projected new trips and capture the idea of establishing highway and local serving commercial uses in proposed new developments.

Pass-By Trip Data for General Retail Projects in the United States
(Source: ITE *Trip Generation Manual*)

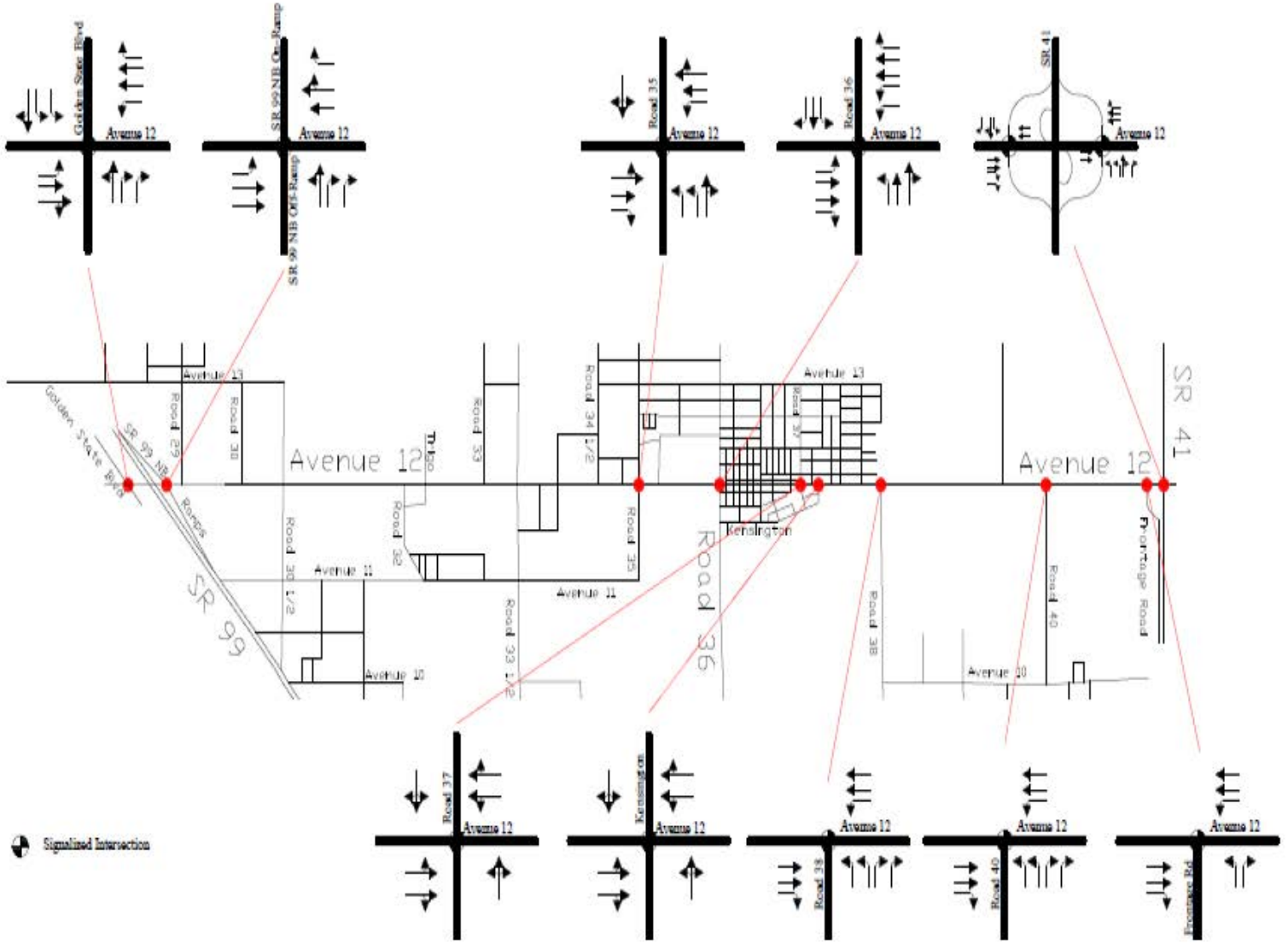
Name of Development	Size (1000 Sq. Feet GLA)	Location	Weekday Survey Date	No. of Inter-views	Time Period	Primary Trip (%)	Non-Pass-By (%)	Diverted Linked Trip (%)	Pass-By Trip (%)	ADT	Source
41. Greece Outlet Mall	256	Greece NY	6/10/88	120	4-6 P.M.	62			38	23,410	Sear Brown
42. Stone Ridge Plaza	160	Greece NY	6/10/88	78	4-6 P.M.	71			29	57,306	Sear Brown
43. Greece Towne Mall	550	Greece NY	6/10/88	117	4-6 P.M.	52			48	40,763	Sear Brown
44. Sun Center	51	Boca Raton FL	12/1/87	110	4-6 P.M.	33.5		33.6	32.7	42,225	Kimley-Horn and Associates
45. Ross Park Mall	1,090	Ross Twp. PA	7/22/88	411	2- 6 P.M.	55.5		10.2	34.3	51,500	Wilbur Smith and Associates
46. Dresherlown Plaza	97	Upper Dublin Twp. PA	Winter 1988/89	N/A	4-6 P.M.		59		41	34,000	McMahon Associates
47. Chesterbrook Village Center	118	Tredyffrin Twp. PA	Winter 1988/89	N/A	4-6 P.M.		76		24	10,000	Booz Allen & Hamilton
48. Lions Head Plaza	122	Lawnside NJ	Winter 1988/89	N/A	4-6 P.M.		63		37	20,000	Pennoni Associates
49. The Polo Club Shoppes	126	Boca Raton FL	Winter 1988/89	N/A	4-6 P.M.		57		43	40,000	McMahon Associates
50. Willow Grove Plaza	149,800	Willow Grove PA	Winter 1988/89	N/A	4-6 P.M.		61		39	26,000	Booz Allen & Hamilton
51. Broward County FL	153	Broward Cnty. FL	Winter 1988/89	N/A	4-6 P.M.		50		50	85,000	McMahon Associates
52. Northtowne Plaza	153,400	Arden DE	Winter 1988/89	N/A	4-6 P.M.		70		30	26,000	Orth Rodgers
53. Doylestown PA	154,400	Doylestown PA	Winter 1988/89	N/A	4-6 P.M.		68		32	29,000	Orth Rodgers
54. Langhorne Square Shopping Center	164,300	Middletown Twp. PA	Winter 1988/89	N/A	4-6 P.M.		67		33	25,000	Booz Allen & Hamilton
55. Westmont Plaza	166,100	Haddon Twp. NJ	Winter 1988/89	N/A	4-6 P.M.		80		20	6,000	Pennoni Associates
56. Broward County FL	205	Broward County FL	Winter 1988/89	N/A	4-6 P.M.		45		55	62,000	McMahon Associates
57. Princeton Market Fair	237	W. Windsor Twp. NJ	Winter 1988/89	N/A	4-6 P.M.		52		48	46,000	Booz Allen & Hamilton
58. Willow Grove Shopping Center	242	Willow Grove PA	Winter 1988/89	N/A	4-6 P.M.		63		37	26,000	McMahon Associates
59. Whitehall Square	297	Whitehall PA	Winter 1988/89	N/A	4-6 P.M.		67		33	26,000	Orth Rodgers
60. Broward County FL	360	Broward County FL	Winter 1988/89	N/A	4-6 P.M.		56		44	73,000	McMahon Associates

APPENDIX 8-0: INTERSECTION LANE USES INVESTIGATED — AVENUE 12

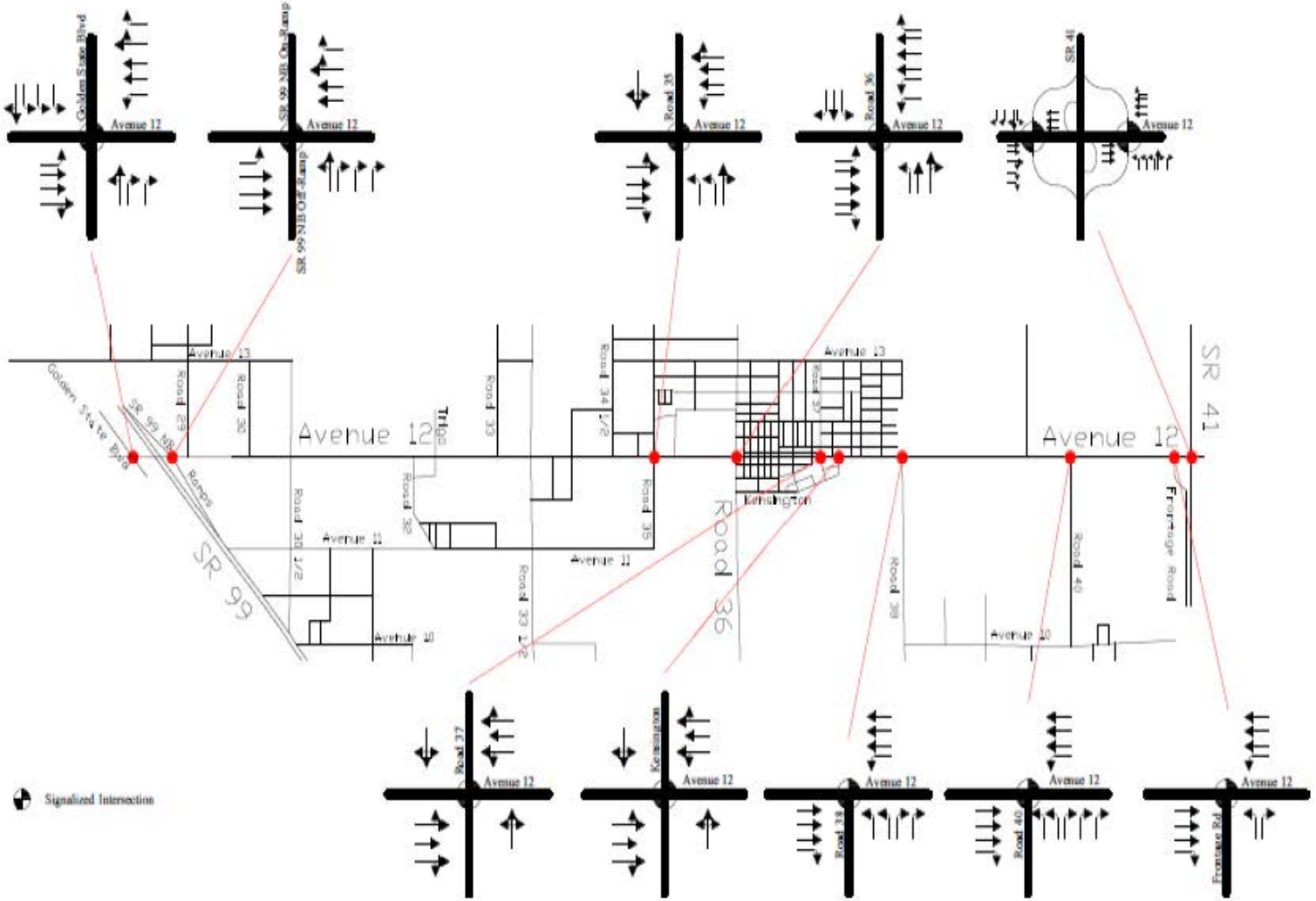
Future Lane Geometrics along Avenue 12 (3 Lanes)



Future Lane Geometrics along Avenue 12 (4 Lanes)



Future Lane Geometrics along Avenue 12 (6 Lanes)



APPENDIX 8-1: LEVEL OF SERVICE DETAILS— 4-LANE AVENUE 12, NO BYPASS

AM PEAK HOUR

HCM Signalized Intersection Capacity Analysis
19: Ave 12 & Road 35 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	2092	118	336	2439	0	231	388	0	0	99	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	15	12	12	15	12
Total Lost time (s)		3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97	1.00			1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00			1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3539	1583	1770	3539		3433	2049			2049	
Flt Permitted		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		3539	1583	1770	3539		3433	2049			2049	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	2135	120	343	2489	0	236	396	0	0	101	0
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2135	92	343	2489	0	236	396	0	0	101	0
Turn Type	Perm		Perm	Prot			Prot			Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4		4							6		
Actuated Green, G (s)		83.0	83.0	26.0	113.0		9.0	29.0			16.0	
Effective Green, g (s)		84.0	84.0	27.0	114.0		10.0	30.0			17.0	
Actuated g/C Ratio		0.56	0.56	0.18	0.76		0.07	0.20			0.11	
Clearance Time (s)		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	
Lane Grp Cap (vph)		1982	886	319	2690		229	410			232	
v/s Ratio Prot		c0.60		c0.19	0.70		c0.07	c0.19			0.05	
v/s Ratio Perm			0.06									
v/c Ratio		1.08	0.10	1.08	0.93		1.03	0.97			0.44	
Uniform Delay, d1		33.0	15.4	61.5	14.6		70.0	59.5			62.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		44.6	0.1	71.9	6.1		67.6	35.3			1.3	
Delay (s)		77.6	15.5	133.4	20.7		137.6	94.8			63.3	
Level of Service		E	B	F	C		F	F			E	
Approach Delay (s)		74.3			34.3			110.8			63.3	
Approach LOS		E			C			F			E	

Intersection Summary			
HCM Average Control Delay	58.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	155.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36

3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	2723	685	323	2397	0	332	20	0	124	44	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	3433	3539		1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539		1770	3539		1770	1863	1583
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	2960	745	351	2605	0	361	22	0	135	48	110
RTOR Reduction (vph)	0	0	114	0	0	0	0	0	0	0	0	44
Lane Group Flow (vph)	8	2960	631	351	2605	0	361	22	0	135	48	66
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	0.8	89.3	89.3	9.0	97.5		20.0	17.4		13.9	11.3	11.3
Effective Green, g (s)	1.8	90.3	90.3	10.0	98.5		21.0	18.4		14.9	12.3	12.3
Actuated g/C Ratio	0.01	0.62	0.62	0.07	0.68		0.14	0.13		0.10	0.08	0.08
Clearance Time (s)	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
Lane Grp Cap (vph)	22	2195	982	236	2394		255	447		181	157	134
v/s Ratio Prot	0.00	c0.84		c0.10	0.74		c0.20	0.01		0.08	0.03	
v/s Ratio Perm			0.40									c0.04
v/c Ratio	0.36	1.35	0.64	1.49	1.09		1.42	0.05		0.75	0.31	0.49
Uniform Delay, d1	71.3	27.6	17.5	67.8	23.5		62.3	55.9		63.5	62.6	63.7
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	9.9	159.9	1.4	240.5	47.4		208.6	0.0		15.3	1.1	2.8
Delay (s)	81.3	187.6	18.9	308.3	71.0		270.9	56.0		78.8	63.7	66.5
Level of Service	F	F	B	F	E		F	E		E	E	E
Approach Delay (s)		153.5			99.2			258.6			71.7	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	133.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	145.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	119.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2814	253	601	2056	371	661
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2842	256	607	2077	375	668
RTOR Reduction (vph)	0	45	0	0	0	490
Lane Group Flow (vph)	2842	211	607	2077	375	178
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	86.0	86.0	35.0	125.0	17.0	17.0
Effective Green, g (s)	87.0	87.0	36.0	126.0	18.0	18.0
Actuated g/C Ratio	0.58	0.58	0.24	0.84	0.12	0.12
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)	2053	918	425	2973	439	334
v/s Ratio Prot	c0.80		c0.34	0.59	c0.10	0.06
v/s Ratio Perm		0.13				
v/c Ratio	1.38	0.23	1.43	0.70	0.85	0.53
Uniform Delay, d1	31.5	15.3	57.0	4.6	64.7	62.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	176.0	0.1	205.9	0.7	14.9	1.6
Delay (s)	207.5	15.4	262.9	5.4	79.6	63.7
Level of Service	F	B	F	A	E	E
Approach Delay (s)	191.7			63.6	69.4	
Approach LOS	F			E	E	

Intersection Summary			
HCM Average Control Delay	122.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	131.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
37: Ave 12 & SR 41 SB

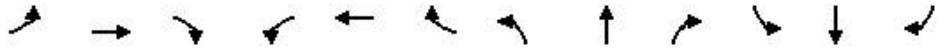
3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	490	1964	0	1570	0	0	0	0	90	0	1982
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	13	13	12	12	12	12	15
Total Lost time (s)		3.0	3.0		3.0					3.0		3.0
Lane Util. Factor		0.95	0.88		0.95					1.00		0.76
Frt		1.00	0.85		1.00					1.00		0.85
Flt Protected		1.00	1.00		1.00					0.95		1.00
Satd. Flow (prot)		3539	3158		3539					1770		3971
Flt Permitted		1.00	1.00		1.00					0.95		1.00
Satd. Flow (perm)		3539	3158		3539					1770		3971
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	538	2158	0	1725	0	0	0	0	99	0	2178
RTOR Reduction (vph)	0	0	1056	0	0	0	0	0	0	0	0	6
Lane Group Flow (vph)	0	538	1102	0	1725	0	0	0	0	99	0	2172
Turn Type			Prot							Prot		custom
Protected Phases		4	4		8					1		
Permitted Phases												6
Actuated Green, G (s)		53.0	53.0		53.0					59.0		59.0
Effective Green, g (s)		54.0	54.0		54.0					60.0		60.0
Actuated g/C Ratio		0.45	0.45		0.45					0.50		0.50
Clearance Time (s)		4.0	4.0		4.0					4.0		4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0		3.0
Lane Grp Cap (vph)		1593	1421		1593					885		1986
v/s Ratio Prot		0.15	0.35		c0.49					0.06		
v/s Ratio Perm												c0.55
v/c Ratio		0.34	0.78		1.08					0.11		1.09
Uniform Delay, d1		21.4	27.9		33.0					15.9		30.0
Progression Factor		1.00	1.00		1.00					1.00		1.00
Incremental Delay, d2		0.1	2.7		48.6					0.1		50.9
Delay (s)		21.5	30.6		81.6					15.9		80.9
Level of Service		C	C		F					B		F
Approach Delay (s)		28.8			81.6			0.0			78.1	
Approach LOS		C			F			A			E	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
33: Ave 12 & SR 41 NB 3/31/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	490	0	0	1570	180	930	930	810	0	0	0
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			
Lane Util. Factor		0.95			0.95	1.00	0.97	0.95	0.95			
Frt		1.00			1.00	0.85	1.00	0.99	0.85			
Flt Protected		1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)		3539			3539	1583	3433	1748	1504			
Flt Permitted		1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)		3539			3539	1583	3433	1748	1504			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	500	0	0	1602	184	949	949	827	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	2	110	0	0	0
Lane Group Flow (vph)	0	500	0	0	1602	129	949	1030	634	0	0	0
Turn Type						Perm	Prot		Perm			
Protected Phases		4			8		5	2				
Permitted Phases						8			2			
Actuated Green, G (s)		50.0			50.0	50.0	62.0	62.0	62.0			
Effective Green, g (s)		50.0			50.0	50.0	62.0	62.0	62.0			
Actuated g/C Ratio		0.42			0.42	0.42	0.52	0.52	0.52			
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)		1475			1475	660	1774	903	777			
v/s Ratio Prot		0.14			c0.45		0.28	c0.59				
v/s Ratio Perm						0.08			0.42			
v/c Ratio		0.34			1.09	0.19	0.53	1.14	0.82			
Uniform Delay, d1		23.8			35.0	22.2	19.4	29.0	24.2			
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1			50.5	0.1	0.3	76.5	9.2			
Delay (s)		23.9			85.5	22.4	19.7	105.5	33.5			
Level of Service		C			F	C	B	F	C			
Approach Delay (s)		23.9			79.0			55.9			0.0	
Approach LOS		C			E			E			A	

Intersection Summary			
HCM Average Control Delay	61.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

PM PEAK HOUR

HCM Signalized Intersection Capacity Analysis
19: Ave 12 & Road 35 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	2092	118	336	2439	0	231	388	0	0	99	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	15	12	12	15	12
Total Lost time (s)		3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97	1.00			1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00			1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3539	1583	1770	3539		3433	2049			2049	
Flt Permitted		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		3539	1583	1770	3539		3433	2049			2049	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	2135	120	343	2489	0	236	396	0	0	101	0
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2135	92	343	2489	0	236	396	0	0	101	0
Turn Type	Perm		Perm	Prot			Prot			Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4		4							6		
Actuated Green, G (s)		83.0	83.0	26.0	113.0		9.0	29.0			16.0	
Effective Green, g (s)		84.0	84.0	27.0	114.0		10.0	30.0			17.0	
Actuated g/C Ratio		0.56	0.56	0.18	0.76		0.07	0.20			0.11	
Clearance Time (s)		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	
Lane Grp Cap (vph)		1982	886	319	2690		229	410			232	
v/s Ratio Prot		c0.60		c0.19	0.70		c0.07	c0.19			0.05	
v/s Ratio Perm			0.06									
v/c Ratio		1.08	0.10	1.08	0.93		1.03	0.97			0.44	
Uniform Delay, d1		33.0	15.4	61.5	14.6		70.0	59.5			62.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		44.6	0.1	71.9	6.1		67.6	35.3			1.3	
Delay (s)		77.6	15.5	133.4	20.7		137.6	94.8			63.3	
Level of Service		E	B	F	C		F	F			E	
Approach Delay (s)		74.3			34.3			110.8			63.3	
Approach LOS		E			C			F			E	

Intersection Summary			
HCM Average Control Delay	58.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	155.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36

3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	2530	92	7	2881	138	175	114	0	179	13	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	1770	3539		1770	1863	1583
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)	91	2750	100	8	3132	150	190	124	0	195	14	137
RTOR Reduction (vph)	0	0	16	0	0	22	0	0	0	0	0	41
Lane Group Flow (vph)	91	2750	84	8	3132	128	190	124	0	195	14	96
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	5.0	107.5	107.5	0.8	103.3	103.3	12.0	13.3		12.0	13.3	13.3
Effective Green, g (s)	6.0	108.5	108.5	1.8	104.3	104.3	13.0	14.3		13.0	14.3	14.3
Actuated g/C Ratio	0.04	0.73	0.73	0.01	0.70	0.70	0.09	0.10		0.09	0.10	0.10
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)	71	2567	1148	41	2467	1104	154	338		154	178	151
v/s Ratio Prot	c0.05	0.78		0.00	c0.88		0.11	0.04		c0.11	0.01	
v/s Ratio Perm			0.05			0.08						c0.06
v/c Ratio	1.28	1.07	0.07	0.20	1.27	0.12	1.23	0.37		1.27	0.08	0.64
Uniform Delay, d1	71.8	20.5	6.0	73.2	22.6	7.5	68.3	63.4		68.3	61.6	65.2
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	199.9	40.4	0.0	2.3	124.6	0.0	148.8	0.7		161.1	0.2	8.5
Delay (s)	271.7	61.0	6.0	75.5	147.3	7.5	217.1	64.1		229.4	61.8	73.7
Level of Service	F	E	A	E	F	A	F	E		F	E	E
Approach Delay (s)		65.6			140.7			156.7			161.0	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	110.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	149.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

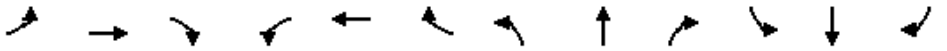
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2814	253	601	2056	371	661
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2842	256	607	2077	375	668
RTOR Reduction (vph)	0	45	0	0	0	490
Lane Group Flow (vph)	2842	211	607	2077	375	178
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	86.0	86.0	35.0	125.0	17.0	17.0
Effective Green, g (s)	87.0	87.0	36.0	126.0	18.0	18.0
Actuated g/C Ratio	0.58	0.58	0.24	0.84	0.12	0.12
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)	2053	918	425	2973	439	334
v/s Ratio Prot	c0.80		c0.34	0.59	c0.10	0.06
v/s Ratio Perm		0.13				
v/c Ratio	1.38	0.23	1.43	0.70	0.85	0.53
Uniform Delay, d1	31.5	15.3	57.0	4.6	64.7	62.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	176.0	0.1	205.9	0.7	14.9	1.6
Delay (s)	207.5	15.4	262.9	5.4	79.6	63.7
Level of Service	F	B	F	A	E	E
Approach Delay (s)	191.7			63.6	69.4	
Approach LOS	F			E	E	

Intersection Summary			
HCM Average Control Delay	122.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	131.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
37: Ave 12 & SR 41 SB

3/31/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	490	1964	0	1570	0	0	0	0	90	0	1982
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	16	12	12	13	13	12	12	12	12	15
Total Lost time (s)		3.0	3.0		3.0					3.0		3.0
Lane Util. Factor		0.95	0.88		0.95					1.00		0.76
Frt		1.00	0.85		1.00					1.00		0.85
Flt Protected		1.00	1.00		1.00					0.95		1.00
Satd. Flow (prot)		3539	3158		3539					1770		3971
Flt Permitted		1.00	1.00		1.00					0.95		1.00
Satd. Flow (perm)		3539	3158		3539					1770		3971
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	538	2158	0	1725	0	0	0	0	99	0	2178
RTOR Reduction (vph)	0	0	1056	0	0	0	0	0	0	0	0	6
Lane Group Flow (vph)	0	538	1102	0	1725	0	0	0	0	99	0	2172
Turn Type			Prot							Prot		custom
Protected Phases		4	4		8					1		
Permitted Phases												6
Actuated Green, G (s)		53.0	53.0		53.0					59.0		59.0
Effective Green, g (s)		54.0	54.0		54.0					60.0		60.0
Actuated g/C Ratio		0.45	0.45		0.45					0.50		0.50
Clearance Time (s)		4.0	4.0		4.0					4.0		4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0		3.0
Lane Grp Cap (vph)		1593	1421		1593					885		1986
v/s Ratio Prot		0.15	0.35		c0.49					0.06		
v/s Ratio Perm												c0.55
v/c Ratio		0.34	0.78		1.08					0.11		1.09
Uniform Delay, d1		21.4	27.9		33.0					15.9		30.0
Progression Factor		1.00	1.00		1.00					1.00		1.00
Incremental Delay, d2		0.1	2.7		48.6					0.1		50.9
Delay (s)		21.5	30.6		81.6					15.9		80.9
Level of Service		C	C		F					B		F
Approach Delay (s)		28.8			81.6			0.0			78.1	
Approach LOS		C			F			A			E	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
33: Ave 12 & SR 41 NB

3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↱	↰↰	↑	↱			
Volume (vph)	0	530	0	0	1270	160	1887	795	795	0	0	0
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			
Lane Util. Factor		0.95			0.95	1.00	0.97	0.95	0.95			
Frt		1.00			1.00	0.85	1.00	0.99	0.85			
Flt Protected		1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)		3539			3539	1583	3433	1746	1504			
Flt Permitted		1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)		3539			3539	1583	3433	1746	1504			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	541	0	0	1296	163	1926	811	811	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	103	0	4	65	0	0	0
Lane Group Flow (vph)	0	541	0	0	1296	60	1926	888	665	0	0	0
Turn Type						Perm	Prot		Perm			
Protected Phases		4			8		5	2				
Permitted Phases						8			2			
Actuated Green, G (s)		32.0			32.0	32.0	50.0	50.0	50.0			
Effective Green, g (s)		32.0			32.0	32.0	50.0	50.0	50.0			
Actuated g/C Ratio		0.36			0.36	0.36	0.56	0.56	0.56			
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)		1258			1258	563	1907	970	836			
v/s Ratio Prot		0.15			c0.37		c0.56	0.51				
v/s Ratio Perm						0.04			0.44			
v/c Ratio		0.43			1.03	0.11	1.01	0.92	0.80			
Uniform Delay, d1		22.1			29.0	19.4	20.0	18.1	15.9			
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.2			33.4	0.1	23.1	14.5	7.7			
Delay (s)		22.3			62.4	19.5	43.1	32.6	23.6			
Level of Service		C			E	B	D	C	C			
Approach Delay (s)		22.3			57.6			36.4			0.0	
Approach LOS		C			E			D			A	

Intersection Summary			
HCM Average Control Delay	40.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	212.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX 8-2: LEVEL OF SERVICE DETAILS— 6-LANE AVENUE 12, NO BYPASS

AM PEAK HOUR

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	2723	685	323	2397	0	332	20	0	124	44	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91		1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	5085	1583	3433	5085		1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	5085	1583	3433	5085		1770	3539		1770	1863	1583
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	2960	745	351	2605	0	361	22	0	135	48	110
RTOR Reduction (vph)	0	0	170	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	8	2960	575	351	2605	0	361	22	0	135	48	56
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	0.8	81.3	81.3	13.0	93.5		27.0	21.9		15.5	10.4	10.4
Effective Green, g (s)	1.8	82.3	82.3	14.0	94.5		28.0	22.9		16.5	11.4	11.4
Actuated g/C Ratio	0.01	0.56	0.56	0.09	0.64		0.19	0.16		0.11	0.08	0.08
Clearance Time (s)	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
Lane Grp Cap (vph)	22	2833	882	325	3253		336	549		198	144	122
v/s Ratio Prot	0.00	c0.58		c0.10	0.51		c0.20	0.01		0.08	0.03	
v/s Ratio Perm			0.36									c0.04
v/c Ratio	0.36	1.04	0.65	1.08	0.80		1.07	0.04		0.68	0.33	0.46
Uniform Delay, d1	72.4	32.7	22.7	66.8	19.6		59.8	53.1		63.1	64.6	65.2
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	9.9	30.1	1.7	72.9	1.5		70.3	0.0		9.3	1.4	2.7
Delay (s)	82.3	62.8	24.5	139.8	21.1		130.2	53.1		72.4	65.9	67.9
Level of Service	F	E	C	F	C		F	D		E	E	E
Approach Delay (s)		55.2			35.2			125.7			69.6	
Approach LOS		E			D			F			E	

Intersection Summary			
HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	147.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↱	↰	↑↑↑	↰↰	↱↱
Volume (vph)	2814	253	601	2056	371	661
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5085	1583	1770	5085	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5085	1583	1770	5085	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2842	256	607	2077	375	668
RTOR Reduction (vph)	0	65	0	0	0	588
Lane Group Flow (vph)	2842	191	607	2077	375	80
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	75.0	75.0	46.0	125.0	17.0	17.0
Effective Green, g (s)	76.0	76.0	47.0	126.0	18.0	18.0
Actuated g/C Ratio	0.51	0.51	0.31	0.84	0.12	0.12
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)	2576	802	555	4271	439	334
v/s Ratio Prot	c0.56		c0.34	0.41	c0.10	0.03
v/s Ratio Perm		0.12				
v/c Ratio	1.10	0.24	1.09	0.49	0.85	0.24
Uniform Delay, d1	37.0	20.8	51.5	3.2	64.7	59.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	53.0	0.2	66.3	0.1	14.9	0.4
Delay (s)	90.0	20.9	117.8	3.3	79.6	60.2
Level of Service	F	C	F	A	E	E
Approach Delay (s)	84.3			29.2	67.2	
Approach LOS	F			C	E	

Intersection Summary			
HCM Average Control Delay	60.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	108.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

PM PEAK HOUR

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36 — 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	2530	92	7	2881	138	175	114	0	179	13	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	5085	1583	3433	5085	1583	1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	5085	1583	3433	5085	1583	1770	3539		1770	1863	1583
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)	91	2750	100	8	3132	150	190	124	0	195	14	137
RTOR Reduction (vph)	0	0	31	0	0	45	0	0	0	0	0	60
Lane Group Flow (vph)	91	2750	69	8	3132	105	190	124	0	195	14	77
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	4.0	63.6	63.6	0.8	60.4	60.4	4.0	10.0		4.0	10.0	10.0
Effective Green, g (s)	5.0	64.6	64.6	1.8	61.4	61.4	5.0	11.0		5.0	11.0	11.0
Actuated g/C Ratio	0.05	0.68	0.68	0.02	0.65	0.65	0.05	0.12		0.05	0.12	0.12
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)	94	3480	1083	65	3307	1030	94	412		94	217	184
v/s Ratio Prot	c0.05	0.54		0.00	c0.62		0.11	0.04		c0.11	0.01	
v/s Ratio Perm			0.04			0.07						c0.05
v/c Ratio	0.97	0.79	0.06	0.12	0.95	0.10	2.02	0.30		2.07	0.06	0.42
Uniform Delay, d1	44.6	10.2	4.9	45.5	15.0	6.2	44.7	38.2		44.7	37.1	38.7
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	81.5	1.3	0.0	0.9	6.8	0.0	494.8	0.4		518.0	0.1	1.5
Delay (s)	126.1	11.5	4.9	46.4	21.9	6.2	539.5	38.6		562.7	37.2	40.3
Level of Service	F	B	A	D	C	A	F	D		F	D	D
Approach Delay (s)		14.8			21.2			341.7			334.6	
Approach LOS		B			C			F			F	

Intersection Summary				
HCM Average Control Delay	48.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	94.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	86.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2170	366	844	2692	401	595
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.91	1.00	1.00	0.91	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	5085	1583	1770	5085	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	5085	1583	1770	5085	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	2192	370	853	2719	405	601
RTOR Reduction (vph)	0	130	0	0	0	528
Lane Group Flow (vph)	2192	240	853	2719	405	73
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	53.0	53.0	59.0	116.0	16.0	16.0
Effective Green, g (s)	54.0	54.0	60.0	117.0	17.0	17.0
Actuated g/C Ratio	0.39	0.39	0.43	0.84	0.12	0.12
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)	1961	611	759	4250	445	338
v/s Ratio Prot	c0.43		c0.48	0.53	c0.11	0.03
v/s Ratio Perm		0.15				
v/c Ratio	1.12	0.39	1.12	0.64	0.91	0.22
Uniform Delay, d1	43.0	31.1	40.0	4.1	60.7	55.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	60.6	0.4	72.3	0.3	22.5	0.3
Delay (s)	103.6	31.5	112.3	4.4	83.3	55.8
Level of Service	F	C	F	A	F	E
Approach Delay (s)	93.2			30.2	66.9	
Approach LOS	F			C	E	

Intersection Summary			
HCM Average Control Delay	58.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	110.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX 8-3: LEVEL OF SERVICE DETAILS— AVENUE 12 WITH BYPASS

AM PEAK HOUR

4-lane Avenue 12

Lanes, Volumes, Timings
19: Ave 12 & Road 35 3/31/2010

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	692	118	336	1039	0	231	388	0	0	99	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	15	12
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850									
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	3539	1583	1770	3539	0	3433	2049	0	0	2049	0
Flt Permitted				0.950			0.950					
Satd. Flow (perm)	0	3539	1583	1770	3539	0	3433	2049	0	0	2049	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			120									
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1320			5320			1000			564	
Travel Time (s)		30.0			120.9			22.7			12.8	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	706	120	343	1060	0	236	396	0	0	101	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	706	120	343	1060	0	236	396	0	0	101	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	1.00	1.00	0.88	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm		Perm	Prot			Prot			Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4	3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	20.0	17.0	37.0	0.0	8.0	28.0	0.0	20.0	20.0	0.0
Total Split (%)	30.8%	30.8%	30.8%	26.2%	56.9%	0.0%	12.3%	43.1%	0.0%	30.8%	30.8%	0.0%

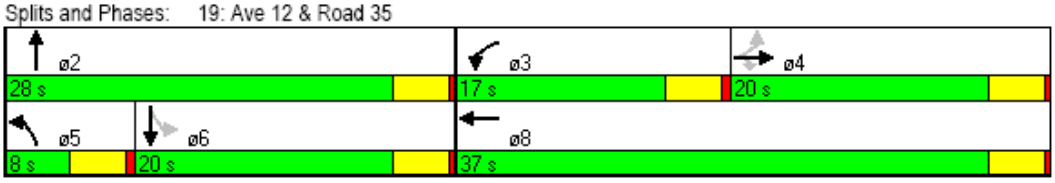
Lanes, Volumes, Timings
19: Ave 12 & Road 35

3/31/2010

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min		Min	Min	
Walk Time (s)	5.0	5.0	5.0		5.0			5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0			0		0	0	
Act Effct Green (s)		16.0	16.0	14.0	33.0		5.0	18.1			10.1	
Actuated g/C Ratio		0.28	0.28	0.25	0.58		0.09	0.32			0.18	
v/c Ratio		0.71	0.23	0.79	0.52		0.78	0.61			0.28	
Control Delay		23.9	5.5	38.1	8.9		48.0	21.2			22.5	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay		23.9	5.5	38.1	8.9		48.0	21.2			22.5	
LOS		C	A	D	A		D	C			C	
Approach Delay		21.2			16.0			31.2			22.5	
Approach LOS		C			B			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 65			
Actuated Cycle Length: 57.1			
Natural Cycle: 65			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 20.9		Intersection LOS: C	
Intersection Capacity Utilization 78.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 19: Ave 12 & Road 35



HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36

3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	1323	685	323	997	0	332	20	0	124	44	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	3433	3539		1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539		1770	3539		1770	1863	1583
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	1438	745	351	1084	0	361	22	0	135	48	110
RTOR Reduction (vph)	0	0	387	0	0	0	0	0	0	0	0	99
Lane Group Flow (vph)	8	1438	358	351	1084	0	361	22	0	135	48	11
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	0.8	36.3	36.3	8.0	43.5		16.0	13.2		10.4	7.6	7.6
Effective Green, g (s)	1.8	37.3	37.3	9.0	44.5		17.0	14.2		11.4	8.6	8.6
Actuated g/C Ratio	0.02	0.44	0.44	0.11	0.53		0.20	0.17		0.14	0.10	0.10
Clearance Time (s)	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
Lane Grp Cap (vph)	38	1573	704	368	1877		359	599		241	191	162
v/s Ratio Prot	0.00	c0.41		c0.10	0.31		c0.20	0.01		0.08	c0.03	
v/s Ratio Perm			0.23									0.01
v/c Ratio	0.21	0.91	0.51	0.95	0.58		1.01	0.04		0.56	0.25	0.07
Uniform Delay, d1	40.4	21.8	16.7	37.2	13.3		33.5	29.1		33.9	34.7	34.0
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	2.8	8.5	0.6	34.8	0.4		48.9	0.0		3.0	0.7	0.2
Delay (s)	43.1	30.3	17.3	72.0	13.8		82.4	29.2		36.9	35.4	34.2
Level of Service	D	C	B	E	B		F	C		D	D	C
Approach Delay (s)		26.0			28.0			79.3			35.6	
Approach LOS		C			C			E			D	

Intersection Summary				
HCM Average Control Delay	32.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	83.9	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	80.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1414	253	601	656	371	661
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	1428	256	607	663	375	668
RTOR Reduction (vph)	0	148	0	0	0	545
Lane Group Flow (vph)	1428	108	607	663	375	123
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	33.0	33.0	28.0	65.0	15.3	15.3
Effective Green, g (s)	34.0	34.0	29.0	66.0	16.3	16.3
Actuated g/C Ratio	0.39	0.39	0.33	0.75	0.18	0.18
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)	1363	610	581	2645	676	514
v/s Ratio Prot	c0.40		c0.34	0.19	c0.10	0.04
v/s Ratio Perm		0.07				
v/c Ratio	1.05	0.18	1.04	0.25	0.55	0.24
Uniform Delay, d1	27.1	17.9	29.6	3.5	32.7	30.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.9	0.1	49.5	0.1	1.0	0.2
Delay (s)	65.0	18.1	79.2	3.5	33.7	31.0
Level of Service	E	B	E	A	C	C
Approach Delay (s)	57.9			39.7	31.9	
Approach LOS	E			D	C	

Intersection Summary			
HCM Average Control Delay	45.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	88.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

3-lane Avenue 12

HCM Unsignalized Intersection Capacity Analysis
19: Ave 12 & Road 35 5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	692	118	336	1039	0	231	388	0	0	99	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	0	706	120	343	1060	0	236	396	0	0	101	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1060			827			2503	2452	706	2650	2572	1060
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1060			827			2503	2452	706	2650	2572	1060
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			57			0	0	100	0	0	100
cM capacity (veh/h)	657			804			0	18	436	0	15	272

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	0	706	120	343	1060	236	396	101
Volume Left	0	0	0	343	0	236	0	0
Volume Right	0	0	120	0	0	0	0	0
cSH	1700	1700	1700	804	1700	0	18	15
Volume to Capacity	0.00	0.42	0.07	0.43	0.62	Err	22.33	6.81
Queue Length 95th (ft)	0	0	0	54	0	Err	Err	Err
Control Delay (s)	0.0	0.0	0.0	12.8	0.0	Err	Err	Err
Lane LOS				B		F	F	F
Approach Delay (s)	0.0			3.1		Err		Err
Approach LOS						F		F

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	88.4%	ICU Level of Service	E	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36 5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	1323	685	323	997	0	332	20	0	124	44	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3539		1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3539		1770	3539		1770	1863	1583
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	1438	745	351	1084	0	361	22	0	135	48	110
RTOR Reduction (vph)	0	0	226	0	0	0	0	0	0	0	0	97
Lane Group Flow (vph)	8	1438	519	351	1084	0	361	22	0	135	48	13
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	0.8	39.3	39.3	4.0	42.5		4.0	7.3		4.0	7.3	7.3
Effective Green, g (s)	1.8	40.3	40.3	5.0	43.5		5.0	8.3		5.0	8.3	8.3
Actuated g/C Ratio	0.03	0.57	0.57	0.07	0.62		0.07	0.12		0.07	0.12	0.12
Clearance Time (s)	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
Lane Grp Cap (vph)	45	1063	904	125	2181		125	416		125	219	186
v/s Ratio Prot	0.00	c0.77		c0.20	0.31		c0.20	0.01		0.08	c0.03	
v/s Ratio Perm			0.33									0.01
v/c Ratio	0.18	1.35	0.57	2.81	0.50		2.89	0.05		1.08	0.22	0.07
Uniform Delay, d1	33.7	15.1	9.7	32.8	7.5		32.8	27.7		32.8	28.2	27.7
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	1.9	165.0	0.9	835.4	0.2		871.1	0.1		103.6	0.5	0.2
Delay (s)	35.6	180.1	10.6	868.2	7.7		903.9	27.7		136.4	28.7	27.9
Level of Service	D	F	B	F	A		F	C		F	C	C
Approach Delay (s)		122.0			218.2			853.6			78.0	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	216.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.45		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	122.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
25: Ave 12 & Road 37

5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	1551	0	1	1009	0	0	2	0	0	39	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	1686	0	1	1097	0	0	2	0	0	42	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1097			1686			2843	2822	1686	2823	2822	1097
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1097			1686			2843	2822	1686	2823	2822	1097
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			0	87	100	100	0	100
cM capacity (veh/h)	636			379			0	17	116	10	17	259

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	18	1686	1	1097	2	42
Volume Left	18	0	1	0	0	0
Volume Right	0	0	0	0	0	0
cSH	636	1700	379	1700	17	17
Volume to Capacity	0.03	0.99	0.00	0.65	0.13	2.46
Queue Length 95th (ft)	2	0	0	0	9	146
Control Delay (s)	10.8	0.0	14.5	0.0	242.2	1125.8
Lane LOS	B		B		F	F
Approach Delay (s)	0.1		0.0		242.2	1125.8
Approach LOS					F	F

Intersection Summary				
Average Delay	17.0			
Intersection Capacity Utilization	91.6%	ICU Level of Service	F	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
29: Ave 12 & Road 38 5/3/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1414	253	601	656	371	661
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	1428	256	607	663	375	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1684		3305	1428
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1684		3305	1428
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			0		0	0
cM capacity (veh/h)			380		0	165

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1428	256	607	663	375	668
Volume Left	0	0	607	0	375	0
Volume Right	0	256	0	0	0	668
cSH	1700	1700	380	1700	0	165
Volume to Capacity	0.84	0.15	1.60	0.39	Err	4.04
Queue Length 95th (ft)	0	0	874	0	Err	Err
Control Delay (s)	0.0	0.0	307.3	0.0	Err	Err
Lane LOS			F		F	F
Approach Delay (s)	0.0		146.9		Err	
Approach LOS					F	

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	138.3%	ICU Level of Service	H
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Ave 12 & Kensington

5/7/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	1505	0	3	810	0	0	35	0	0	50	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	5	1536	0	3	827	0	0	36	0	0	51	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	827			1536			2404	2379	1536	2396	2379	827
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	827			1536			2404	2379	1536	2396	2379	827
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			0	0	100	0	0	100
cM capacity (veh/h)	804			433			0	34	143	0	34	372

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	1536	3	827	36	51
Volume Left	5	0	3	0	0	0
Volume Right	0	0	0	0	0	0
cSH	804	1700	433	1700	34	34
Volume to Capacity	0.01	0.90	0.01	0.49	1.05	1.50
Queue Length 95th (ft)	0	0	1	0	94	139
Control Delay (s)	9.5	0.0	13.4	0.0	346.5	514.1
Lane LOS	A		B		F	F
Approach Delay (s)	0.0		0.0		346.5	514.1
Approach LOS					F	F

Intersection Summary				
Average Delay	15.7			
Intersection Capacity Utilization	89.2%	ICU Level of Service		E
Analysis Period (min)	15			

PM PEAK HOUR

4-lane Avenue 12

HCM Signalized Intersection Capacity Analysis
19: Ave 12 & Road 35 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	978	59	132	1281	0	200	121	0	0	32	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	15	12	12	15	12
Total Lost time (s)		3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97	1.00			1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00			1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3539	1583	1770	3539		3433	2049			2049	
Flt Permitted		1.00	1.00	0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)		3539	1583	1770	3539		3433	2049			2049	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	998	60	135	1307	0	204	123	0	0	33	0
RTOR Reduction (vph)	0	0	37	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	998	24	135	1307	0	204	123	0	0	33	0
Turn Type	Perm		Perm	Prot			Prot			Perm		
Protected Phases		4		3	8		5	2			6	
Permitted Phases	4		4							6		
Actuated Green, G (s)		17.8	17.8	3.8	25.6		4.0	14.4			6.4	
Effective Green, g (s)		18.8	18.8	4.8	26.6		5.0	15.4			7.4	
Actuated g/C Ratio		0.39	0.39	0.10	0.55		0.10	0.32			0.15	
Clearance Time (s)		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	
Lane Grp Cap (vph)		1386	620	177	1961		358	657			316	
v/s Ratio Prot		0.28		c0.08	c0.37		c0.06	c0.06			0.02	
v/s Ratio Perm			0.01									
v/c Ratio		0.72	0.04	0.76	0.67		0.57	0.19			0.10	
Uniform Delay, d1		12.4	9.0	21.0	7.6		20.5	11.8			17.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.9	0.0	17.5	0.9		2.1	0.1			0.1	
Delay (s)		14.2	9.0	38.6	8.4		22.6	11.9			17.6	
Level of Service		B	A	D	A		C	B			B	
Approach Delay (s)		13.9			11.3			18.6			17.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36 — 3/31/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	1130	92	7	1481	138	175	114	0	179	13	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	1770	3539		1770	1863	1583
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)	91	1228	100	8	1610	150	190	124	0	195	14	137
RTOR Reduction (vph)	0	0	41	0	0	67	0	0	0	0	0	98
Lane Group Flow (vph)	91	1228	59	8	1610	83	190	124	0	195	14	39
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)	4.0	47.5	47.5	0.8	44.3	44.3	10.0	8.5		10.0	8.5	8.5
Effective Green, g (s)	5.0	48.5	48.5	1.8	45.3	45.3	11.0	9.5		11.0	9.5	9.5
Actuated g/C Ratio	0.06	0.59	0.59	0.02	0.55	0.55	0.13	0.11		0.13	0.11	0.11
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)	107	2073	927	75	1936	866	235	406		235	214	182
v/s Ratio Prot	c0.05	0.35		0.00	c0.45		0.11	c0.04		c0.11	0.01	
v/s Ratio Perm			0.04			0.05						0.02
v/c Ratio	0.85	0.59	0.06	0.11	0.83	0.10	0.81	0.31		0.83	0.07	0.21
Uniform Delay, d1	38.5	10.9	7.4	39.7	15.6	9.0	34.9	33.6		35.0	32.7	33.3
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	44.0	0.5	0.0	0.6	3.2	0.0	18.2	0.4		20.9	0.1	0.6
Delay (s)	82.5	11.3	7.4	40.3	18.8	9.0	53.0	34.1		55.9	32.8	33.8
Level of Service	F	B	A	D	B	A	D	C		E	C	C
Approach Delay (s)		15.6			18.1			45.5			46.2	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Ave 12 & Road 38

3/31/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	770	366	844	1292	401	595
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	14	12
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	3662	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	3662	2787
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	778	370	853	1305	405	601
RTOR Reduction (vph)	0	287	0	0	0	493
Lane Group Flow (vph)	778	83	853	1305	405	108
Turn Type		Perm	Prot			Prot
Protected Phases	4		3	8	2	2
Permitted Phases		4				
Actuated Green, G (s)	19.0	19.0	43.0	66.0	15.0	15.0
Effective Green, g (s)	20.0	20.0	44.0	67.0	16.0	16.0
Actuated g/C Ratio	0.22	0.22	0.49	0.75	0.18	0.18
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)	795	356	875	2664	658	501
v/s Ratio Prot	c0.22		c0.48	0.37	c0.11	0.04
v/s Ratio Perm		0.05				
v/c Ratio	0.98	0.23	0.97	0.49	0.62	0.22
Uniform Delay, d1	34.3	28.2	22.0	4.3	33.7	31.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	26.4	0.3	24.2	0.1	1.7	0.2
Delay (s)	60.7	28.6	46.2	4.5	35.4	31.4
Level of Service	E	C	D	A	D	C
Approach Delay (s)	50.3			20.9	33.0	
Approach LOS	D			C	C	

Intersection Summary			
HCM Average Control Delay	31.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

3-lane Avenue 12

HCM Unsignalized Intersection Capacity Analysis
19: Ave 12 & Road 35 5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	937	59	132	1281	0	200	121	0	0	32	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	42	956	60	135	1307	0	204	123	0	0	33	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1307			1016			2633	2616	956	2678	2677	1307
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1307			1016			2633	2616	956	2678	2677	1307
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			80			0	0	100	0	0	100
cM capacity (veh/h)	529			682			0	18	313	0	16	195

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	42	956	60	135	1307	204	123	33
Volume Left	42	0	0	135	0	204	0	0
Volume Right	0	0	60	0	0	0	0	0
cSH	529	1700	1700	682	1700	0	18	16
Volume to Capacity	0.08	0.56	0.04	0.20	0.77	Err	6.90	2.00
Queue Length 95th (ft)	6	0	0	18	0	Err	Err	117
Control Delay (s)	12.4	0.0	0.0	11.6	0.0	Err	Err	947.6
Lane LOS	B			B		F	F	F
Approach Delay (s)	0.5			1.1		Err		947.6
Approach LOS						F		F

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	98.5%	ICU Level of Service	F	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
22: Ave 12 & Road 36 5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	1130	92	7	1619	0	175	114	0	179	13	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3539		1770	3539		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3539		1770	3539		1770	1863	1583
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)	91	1228	100	8	1760	0	190	124	0	195	14	137
RTOR Reduction (vph)	0	0	33	0	0	0	0	0	0	0	0	93
Lane Group Flow (vph)	91	1228	67	8	1760	0	190	124	0	195	14	44
Turn Type	Prot		Perm	Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)	3.1	40.9	40.9	0.7	38.5		4.0	8.1		4.0	8.1	8.1
Effective Green, g (s)	4.1	41.9	41.9	1.7	39.5		5.0	9.1		5.0	9.1	9.1
Actuated g/C Ratio	0.06	0.60	0.60	0.02	0.57		0.07	0.13		0.07	0.13	0.13
Clearance Time (s)	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
Lane Grp Cap (vph)	104	1120	952	43	2006		127	462		127	243	207
v/s Ratio Prot	c0.05	c0.66		0.00	0.50		0.11	c0.04		c0.11	0.01	
v/s Ratio Perm			0.04									0.03
v/c Ratio	0.88	1.10	0.07	0.19	0.88		1.50	0.27		1.54	0.06	0.21
Uniform Delay, d1	32.5	13.9	5.8	33.3	13.0		32.4	27.3		32.4	26.5	27.1
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	50.5	57.2	0.0	2.1	4.7		259.9	0.3		276.4	0.1	0.5
Delay (s)	83.1	71.1	5.8	35.4	17.7		292.3	27.6		308.7	26.6	27.6
Level of Service	F	E	A	D	B		F	C		F	C	C
Approach Delay (s)		67.3			17.8			187.8			186.0	
Approach LOS		E			B			F			F	

Intersection Summary				
HCM Average Control Delay	65.1	HCM Level of Service	E	
HCM Volume to Capacity ratio	0.96			
Actuated Cycle Length (s)	69.7	Sum of lost time (s)	9.0	
Intersection Capacity Utilization	89.4%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
25: Ave 12 & Road 37

5/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	1271	0	3	1773	0	0	7	0	0	34	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	1382	0	3	1927	0	0	8	0	0	37	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1927			1382			3371	3352	1382	3356	3352	1927
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1927			1382			3371	3352	1382	3356	3352	1927
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			99			0	0	100	0	0	100
cM capacity (veh/h)	306			496			0	7	176	0	7	83

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	18	1382	3	1927	8	37
Volume Left	18	0	3	0	0	0
Volume Right	0	0	0	0	0	0
cSH	306	1700	496	1700	7	7
Volume to Capacity	0.06	0.81	0.01	1.13	1.03	5.00
Queue Length 95th (ft)	5	0	0	0	43	Err
Control Delay (s)	17.5	0.0	12.3	0.0	972.6	Err
Lane LOS	C		B		F	F
Approach Delay (s)	0.2		0.0		972.6	Err
Approach LOS					F	F

Intersection Summary			
Average Delay	111.8		
Intersection Capacity Utilization	103.3%	ICU Level of Service	G
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Ave 12 & Road 38 5/3/2010

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	770	366	844	1292	401	595
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	778	370	853	1305	405	601
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1147		3788	778
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1147		3788	778
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			0		0	0
cM capacity (veh/h)			609		0	396

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	778	370	853	1305	405	601
Volume Left	0	0	853	0	405	0
Volume Right	0	370	0	0	0	601
cSH	1700	1700	609	1700	0	396
Volume to Capacity	0.46	0.22	1.40	0.77	Err	1.52
Queue Length 95th (ft)	0	0	968	0	Err	813
Control Delay (s)	0.0	0.0	209.7	0.0	Err	270.4
Lane LOS			F		F	F
Approach Delay (s)	0.0		82.9		Err	
Approach LOS					F	

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	119.5%	ICU Level of Service	H
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Ave 12 & Kensington 5/7/2010

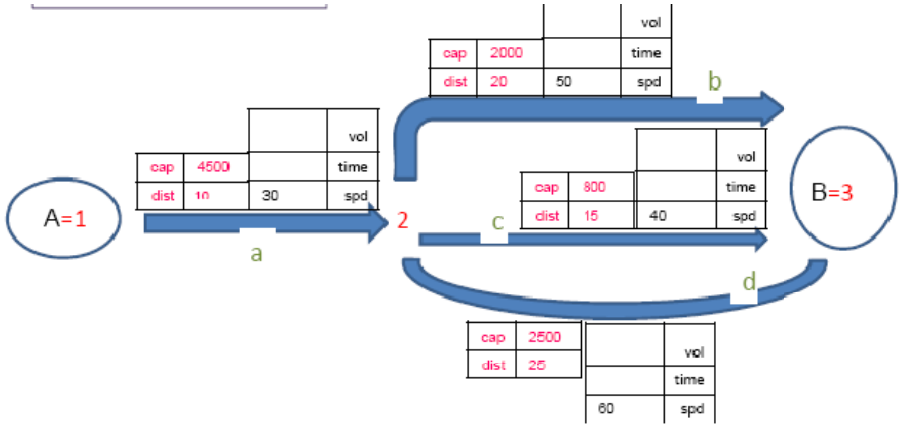
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	1210	0	10	1435	0	0	10	0	0	20	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	15	1235	0	10	1464	0	0	10	0	0	20	0
Pedestrians												
Lane Width (ft)												
Walking Speed (f/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1464			1235			2760	2750	1235	2755	2750	1464
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1464			1235			2760	2750	1235	2755	2750	1464
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			0	46	100	100	0	100
cM capacity (veh/h)	461			564			0	19	215	7	19	157

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	15	1235	10	1464	10	20
Volume Left	15	0	10	0	0	0
Volume Right	0	0	0	0	0	0
cSH	461	1700	564	1700	19	19
Volume to Capacity	0.03	0.73	0.02	0.86	0.54	1.08
Queue Length 95th (ft)	3	0	1	0	37	72
Control Delay (s)	13.1	0.0	11.5	0.0	3329	521.8
Lane LOS	B		B		F	F
Approach Delay (s)	0.2		0.1		3329	521.8
Approach LOS					F	F

Intersection Summary				
Average Delay	5.2			
Intersection Capacity Utilization	85.5%	ICU Level of Service	E	
Analysis Period (min)	15			

APPENDIX 8-4: DERIVATION OF BYPASS TRIPS

Bypass -- Trip Assignment



Link C = Avenue 12 with 4 lanes (2 lanes per direction) for capacity of 1600 vph @ 30 mph speed
Link D = Bypass with 2 lanes (1 lane per direction) for capacity of 2000 vph @ 60 mph speed

a
.
b
.

Formulas

Time = distance/speed

New Travel Time = use BPR Formula:

$$T_e = T_e^0\left(1+0.15\cdot\left(V_e/C_e\right)^4\right)$$

T_e = current travel time

T^0_e = free-flow tavel time

V_e = current volume

C_e = link capacity

1. Answer these Questions on the unassigned network:

	Link:	a	b	c	d		
4.1. What are link capacities?				1600	2000		
4.2. What are distances?				3	4		

4.3. What are link speeds?					30	60		
5.What are link travel times?					0.1000	0.0667		
	Route:				**c**	**d**		
6.What are route travel times?					0.10	0.07		

2. Assign 2400 trips to the network in 20% increments	2400				192	288		480 1

3. Answer these Questions on the assigned network:

	Link:	a	**b**	**c**	**d**		
1.What are assigned link volumes?				192	288		480
2.What are assigned link volumes as percent of link capacities?				12%	14%		
3.What are recalculated link travel times?				0.1000	0.0667		
	Route:			**c**	**d**		
4.What are route travel times?				0.10	0.07		

2. Assign 2400 trips to the network in 20% increments

2400 192 288 480 2

3. Answer these Questions on the assigned network:

1.What are assigned link volumes?

2.What are assigned link volumes as percent of link capacities?

3.What are recalculated link travel times?

4.What are route travel times?

Link:	a	b	c	d		
			384	576		960
			24%	29%		
			0.1000	0.0667		
Route:			**c**	**d**		
			0.10	0.07		

2. Assign 2400 trips to the network in 20% increments

2400 192 288 480 3

3. Answer these Questions on the assigned network:

1.What are assigned link volumes?

2.What are assigned link volumes as percent of link capacities?

3.What are recalculated link travel times?

4.What are route travel times?

Link:	a	b	c	d		
			576	864		1440
			36%	43%		
			0.1003	0.0670		
Route:			**c**	**d**		
			0.10	0.07		

2. Assign 2400 trips to the network in 20% increments

2400 192 288 480 4

3. Answer these Questions on the assigned network:

1.What are assigned link volumes?

2.What are assigned link volumes as percent of

Link:	a	b	c	d		
			768	1152		1920
			48%	58%		

link capacities?

3.What are recalculated link travel times?

4.What are route travel times?

			0.1008	0.0678		
Route:			**c**	**d**		
			0.10	0.07		

2. Assign 2400 trips to the network in 20% increments

2400 193 287 480 5

3. Answer these Questions on the assigned network:

1.What are assigned link volumes?

2.What are assigned link volumes as percent of link capacities?

3.What are recalculated link travel times?

4.What are route travel times?

Link:	a	**b**	**c**	**d**			
			961	1439			2400
			60%	72%			
			0.1020	0.0693			
Route:			**c**	**d**			
			0.10	0.07			