Draft
Environmental Impact Report
for
Machado Estates

Volume II
Appendices

SCH #2007052023

Prepared for:

City of Manteca
Community Development Department
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209/239-8427

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December 2007

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VOLUME II

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Appendix A

Initial Study/Notice of Preparation

Initial Study for Machado Estates

Prepared for:

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December 2005

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Chapter 1
Introduction

Purpose of this Document

This initial study (IS) is a public document that assesses the environmental effects of the proposed Machado Estates subdivision (the project), as required by the California Environmental Quality Act (CEQA) and in compliance with the State CEQA Guidelines (14 California Code of Regulations [CCR] 15000 et seq.). It serves as a preliminary environmental analysis to determine whether an environmental impact report (EIR) or negative declaration (ND) is needed. The City of Manteca (the City) is the state lead agency under CEQA and must evaluate the environmental impacts of the project when considering whether to approve the project.

Scope of this Document

This document evaluates the project's impacts on the following resource topics.

- aesthetics,
- agricultural resources,
- air quality,
- biological resources,
- cultural resources,
- geology and soils,
- hazards and hazardous materials,
- hydrology and water quality,
- land use planning,
- mineral resources,
- noise,
- population and housing,
- public services,

- recreation,
- transportation/traffic, and
- utilities and service systems.

Impact Terminology

The following terminology is used in this document to describe the levels of significance of impacts that would result from the project.

- The project is considered to have *no impact* if the analysis concludes the project would not affect a particular resource topic.
- An impact is considered *less than significant* if the analysis concludes the project would cause no substantial adverse change to the environment and impacts would not require mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concludes the proposed project would cause no substantial adverse change to the environment with the inclusion of mitigation measures to which the applicant has agreed.
- An impact is considered *potentially significant* if the analysis concludes the proposed project has the potential to cause substantial adverse change to the environment and adequate mitigation has not been identified to reduce the level of impact.

Organization of this Document

The content and format of this document, described below, are designed to meet the requirements of CEQA.

- Chapter 1, "Introduction," identifies the purpose, scope, and terminology of the document.
- Chapter 2, "Project Description," identifies the project location, describes the project in detail, including existing and proposed land uses and public services and utilities; identifies the permits and approvals required for the project; and identifies related projects.
- Chapter 3, "Environmental Checklist," presents the checklist responses for each resource topic. Setting information is included, on an as needed basis, within the checklist discussions. Checklist discussions identify the project's impacts on those resources topics.
- Chapter 4, "References Cited," identifies all printed references and personal communications cited in this report.
- Chapter 5, "List of Preparers," identifies the individuals involved in preparing this document and their areas of technical specialty.

Chapter 2
Project Description

Project Location

The proposed project is located in San Joaquin County (Figure 1) directly south of the Manteca city limits but within the City's primary urban service boundary (PUSA) (Figure 2). The Machado Estates site is located at the southwest corner of the Airport Way/Woodward Avenue intersection (Figure 3). The specific site plan is shown in Figure 4.

Proposed Project

Land Uses

Existing Land Uses

The project site is currently being used for agriculture (corn). Two rural dwellings that would be removed as part of the proposed project are located on the site.

Adjacent land uses include residential land to the north, agricultural land to the east and south, and fallow agricultural land to the west. The Terra Ranch development is proposed directly west of the site on currently fallow agricultural land.

Proposed Land Uses

The proposed project includes the construction of the Machado Estates subdivision. The project would subdivide 156.8 acres into 559 single-family residential lots. One existing ranch house would be removed. The project would also involve a General Plan amendment, annexation, prezoning, a development agreement, and a tentative map for residential development.

Public Services and Utilities

The project proponents propose that the project site connect to existing city public services and utilities, which are described below.

Gas and Electricity

The Pacific Gas & Electric Company currently provides natural gas and electric service to residents and businesses in Manteca.

Telephone

Verizon provides local telephone service for more than 45,000 customers in the Manteca area. The existing community is equipped with fiber optic lines. Digital data services include DSL, T-1, ISDN (BRI and PRI), Frame Relay, Centranet, and telephone services.

Water

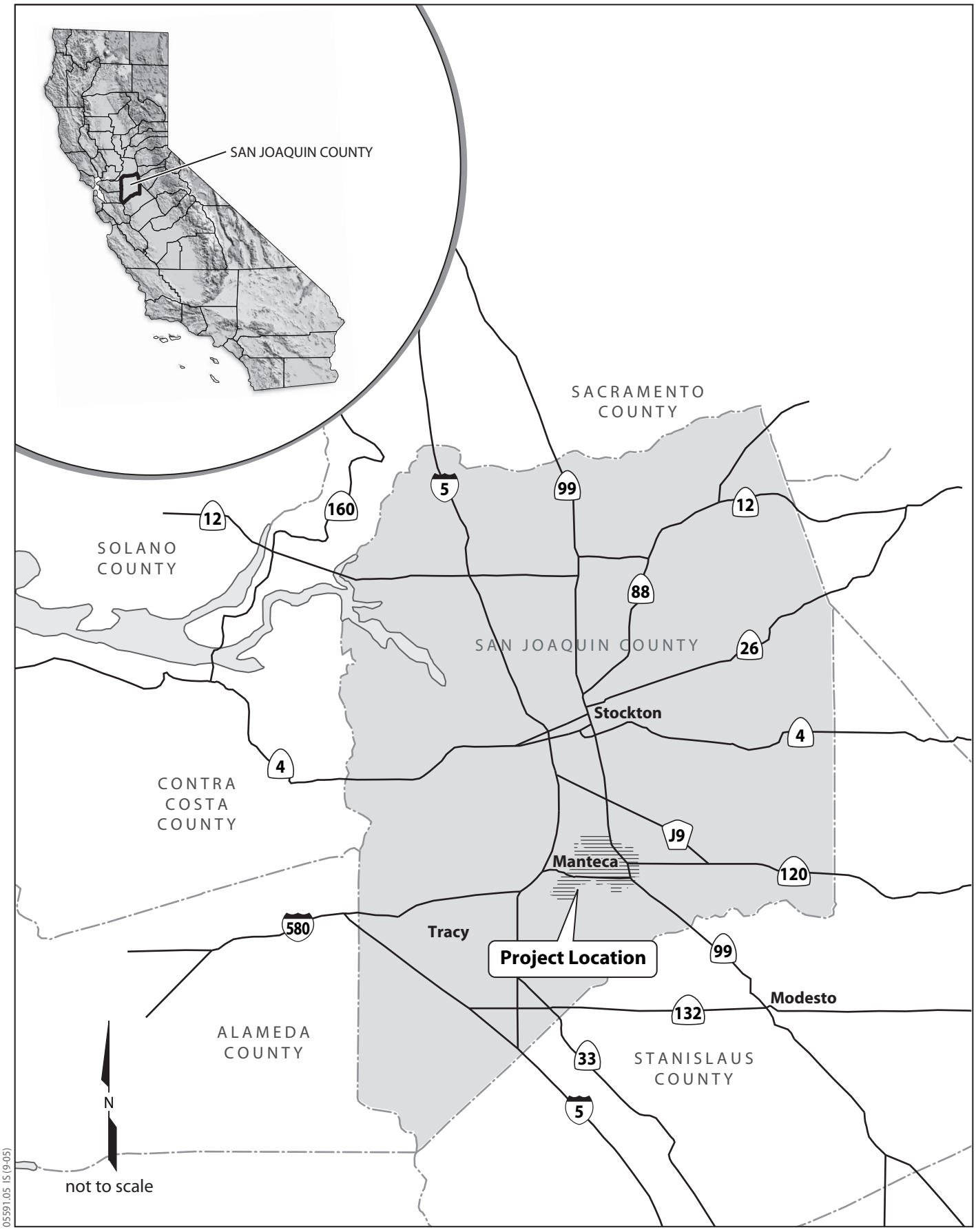
The City provides water service for the existing community. Approximately 15,000 connection customers are served, with an average use of 11 million gallons per day (mgd). An elevated water storage tank that holds 300,000 gallons augments the water supplied from groundwater wells. The City of Manteca, along with the Cities of Escalon, Tracy, and Lathrop, are participating in the South County Surface Water Supply Project (SCSWSP). This project was developed to address future water needs through construction of a water treatment plant, transmission mains, surface storage reservoirs, and booster pump stations. The surface water and groundwater are utilized in a conjunctive use program in which the surface water becomes the primary source of domestic water for the City. Manteca began receiving deliveries of water from SCSWSP in August 2005 (Jones & Stokes 2005).

Garbage

The City provides solid waste service for the Manteca area.

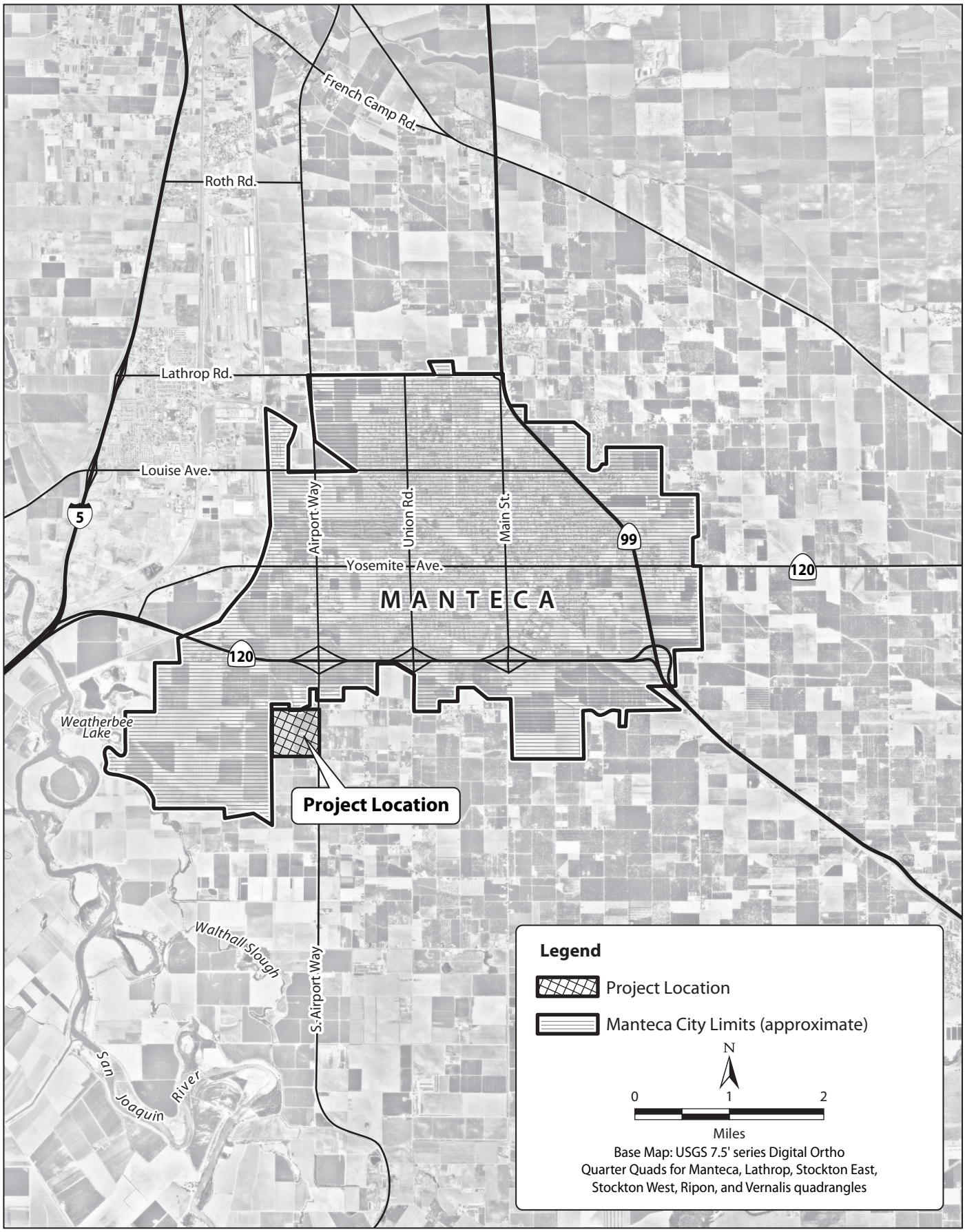
Sewer

The City's wastewater treatment plant (WWTP) serves Manteca, Lathrop, and Raymus Village in San Joaquin County. The plant currently treats 5.5 mgd of wastewater and has been rated with a capacity of approximately 7 mgd.



Jones & Stokes

Figure 1
Project Vicinity



05591.05 IS (9-05)

Jones & Stokes

Figure 2
Location of the Machado Estates Project



05591.05 IS (9-05)

Jones & Stokes

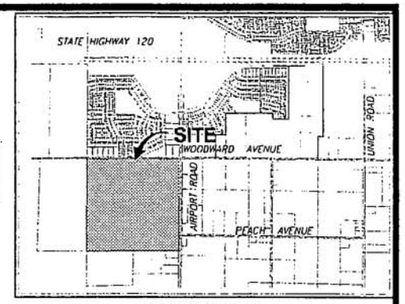
Figure 3
Aerial Photograph of the Machado Estates Location

TENTATIVE SUBDIVISION MAP
TRACT NO. 3420

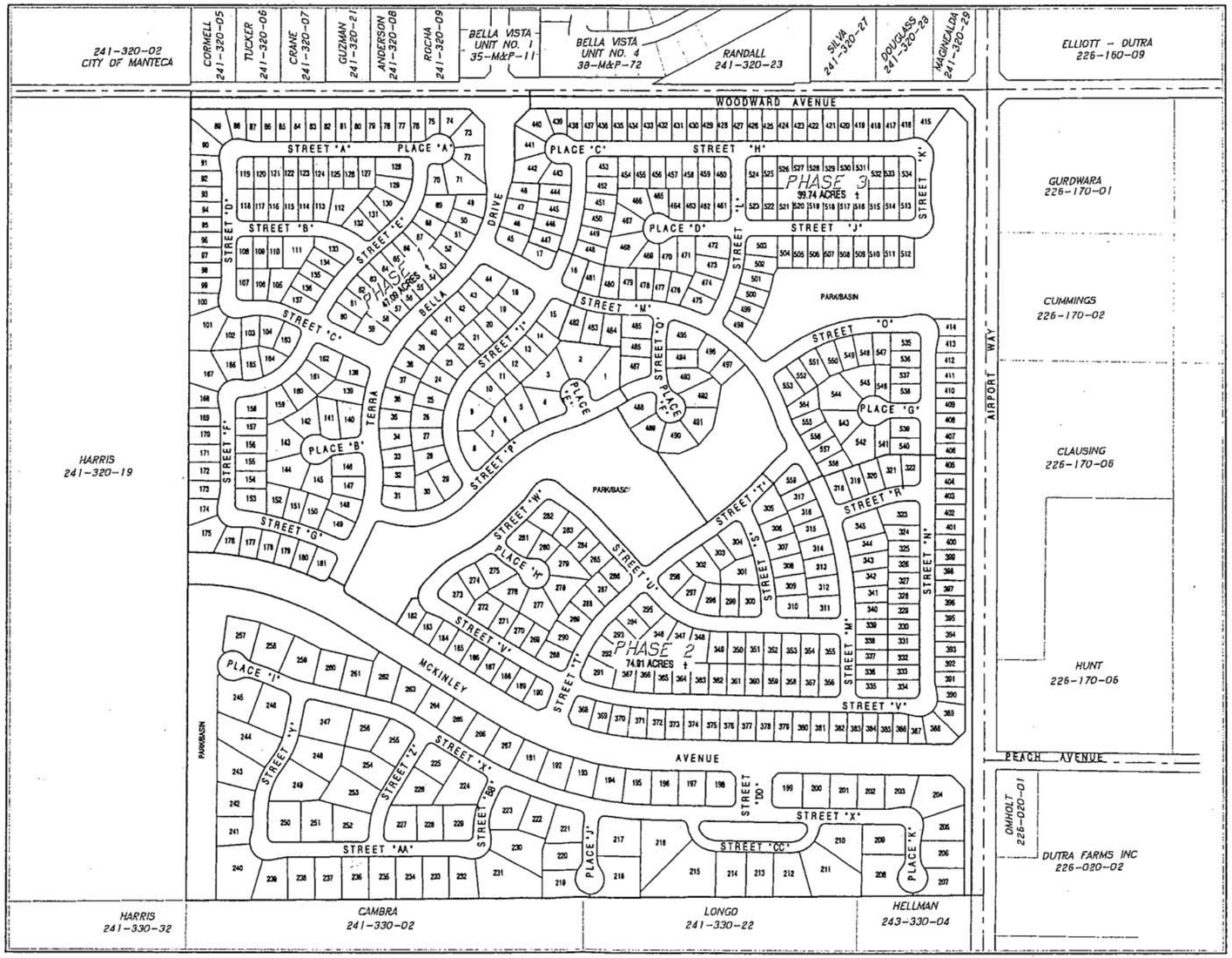
MACHADO ESTATES

A SINGLE FAMILY SUBDIVISION

BEING A PORTION OF THE SOUTHEAST QUARTER OF SECTION 12, T.2S., R.6E., M.D.B.M., CITY OF MANTECA, SAN JOAQUIN COUNTY, CALIFORNIA



VICINITY MAP
N.T.S.



SCALE 1" = 200'

LOT COUNT:

PHASE 1 = 181 LOTS TOTAL
LOTS 1-181

PHASE 2 = 224 LOTS TOTAL
LOTS 182-405

PHASE 3 = 154 LOTS TOTAL
LOTS 406-559

LEGEND:

- 8"W — PROPOSED WATER LINE
- 12"SD — PROPOSED STORM DRAIN
- 8"SS — PROPOSED SANITARY SEWER
- PROPOSED MANHOLE
- EXISTING WATER LINE
- EXISTING STORM DRAIN
- EXISTING SANITARY SEWER
- EXISTING MANHOLE

DEVELOPERS:

AIRPORT WOODWARD JOINT VENTURE
544 E. YOSEMITE AVE.
MANTECA, CA 95336

ENGINEER:

MCR ENGINEERING
322 SUN WEST PLACE
MANTECA, CA 95337
PHONE 239-6324

NOTES:

1. ALL IMPROVEMENTS TO CONFORM TO CITY OF MANTECA STANDARDS.
2. ALL UTILITIES TO BE UNDERGROUND
3. SEWAGE DISPOSAL BY CONNECTION TO CITY SEWER SYSTEM.
4. STORM DRAINAGE SHALL BE BY COLLECTION SYSTEM PER CITY OF MANTECA MASTER PLAN
5. DOMESTIC WATER BY CONNECTION TO CITY WATER SYSTEM.
6. PUBLIC UTILITY EASEMENT WILL BE PROVIDED ALONG ALL STREET FRONTAGES.
7. THIS SUBDIVISION CONTAINS 559 LOTS ON 160± ACRES.
8. THE SITE SHALL BE CLEARED OF ALL EXISTING STRUCTURES
9. THIS PROJECT MAY BE DEVELOPED IN PHASES. PARCEL MAPS MAY BE FILED ON PHASE BOUNDARIES FOR PURPOSE OF SALE OR FARMING.
10. THIS PROPERTY IS RELATIVELY FLAT AT EL. 20±.
11. BOUNDARY LINES ARE BASED ON ASSESSORS MAP AND ARE SUBJECT TO CHANGE

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SHEET	DESCRIPTION
1	COVER SHEET
2	CROSS SECTIONS
3	BOUNDARY AND TOPOGRAPHIC SURVEY PLAN
4	UTILITY PLAN (NORTH)
5	UTILITY PLAN (SOUTH)
6	DIMENSION PLAN (NORTH)
7	DIMENSION PLAN (SOUTH)
8	DEVELOPMENT PLAN (NORTH)
9	DEVELOPMENT PLAN (SOUTH)

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Jones & Stokes

Figure 4
Machado Estates Site Plan

Storm Drainage

The City operates and maintains a storm drain system that serves the existing community. The system consists of approximately 170 miles of pipeline, 36 pump stations, and 35 detention basins. Runoff from rainfall flows through the system, into South San Joaquin Irrigation District (SSJID) drains and laterals, and eventually into the San Joaquin River.

Required Permits and Approvals

The proposed project would require general plan amendment, annexation, prezoning, a development agreement, and a tentative map for residential development.

Related Projects

The City's Community Development Department has identified 25 residential developments throughout or directly outside Manteca that are slated for construction or are tentatively proposed and pending environmental review. These projects are listed on Table 1. They range in size from smaller projects such as the Westport development (5.27 acres, 24 total lots) to larger ones such as the Union Ranch development (356 acres, 1,960 total lots). Additionally, 12 residential development projects of various sizes have been completed in the past 4 years.

Table 1. Other Approved, Pending, and Proposed Development Projects

Development Name	Tentative Date	Final Date	Status	Total Lots	Acreage	Builder/Developer/Engineer/ Owner Contact Information
Bella Vista	12-1-97	11-12-03	Final	113	66.8	J.C. Williams P.O. Box 4900 Modesto, CA 209/574-1080
Dutra Farms S.E. (DA)	8-5-91	9-26-02	Final	272	76.9	Meritage Homes 2300 Contra Costa Boulevard Pleasant Hill, CA 925/288-3000
Eagle Estates	12-6-99	11-24-01	Final	17	5	Edward Machado 11708 Moncure Road Ripon, CA 209/599-2565
Gomes Estates	8-5-03	3-3-04	Final	15	3.68	Ed Bassi 636 E. Edison Street Manteca, CA 209/823-2311
Jasmine Hollow	8-5-02	5-19-03	Final	236	61.4	Atherton Boyce Development P.O. Box 871 Manteca, CA 209/239-4014
Morse Estates	10-15-01	4-29-03	Final	23	5.5	Richard Hoogendoom P.O. Box 568 Ripon, CA 209/599-4655
Paseo (include R-4 site)	8-5-02	7-17-03	Final	124	26.3	Woodward West Associates P.O. Box 871 Manteca, CA 209/239-4014
Primavera Estates Vesting	12-15-97	7-17-02	Final	500	126	Raymus Real Estate 544 E. Yosemite Avenue Manteca, CA 209/823-3148
Sierra Creek	5-18-98	2-27-02	Final	85	33.5	MCR Engineering 310 Sun West Place Manteca, CA 209/239-6229
Woodward West (DA)	8-7-01	3-22-04	Final	116	38.4	Woodward West Associates P.O. Box 871 Manteca, CA 209/239-4014
Primavera #7	12-15-03	6-9-04	Final	7	0.84	Raymus Real Estate 544 E. Yosemite Avenue Manteca, CA 209/823-3148
Erdman Property (Multi Family)	4-1-02	12-9-04	Final	8	2.36	Mike Erdman 425 N. Walnut Avenue Manteca, CA 209/239-4241

Development Name	Tentative Date	Final Date	Status	Total Lots	Acreage	Builder/Developer/Engineer/ Owner Contact Information
Jasmine Hollow #4	11-27-02		Final	9	0.58	Atherton Boyce Development P.O. Box 871 Manteca, CA 209/239-4014
Westport	10-2-00		Tentative	24	5.27	Aldo Brocchini 6926 E. Woodward Avenue Manteca, CA 209/823-4624
Terra Bella	4-24-03		Tentative	158	42.3	Bright Development 1620 N. Carpenter Road Modesto, CA 209/426-8242
Tesoro	12-23-03		Tentative	485	128	Atherton Boyce Development P.O. Box 871 Manteca, CA 209/239-4014
Dutra Estates	6-17-04		Tentative	426	77.3	Florsheim Land Co. 1701 W. March Lane Stockton, CA 209/473-1106
Shadowbrook	7-15-04		Tentative	497	122	Shadowbrook Joint Venture 544 E. Yosemite Avenue Manteca, CA 209/823-3148
Antigua	7-21-04		Tentative	120	3.33	Atherton Boyce Development P.O. Box 871 Manteca, CA 209/239-4014
Paseo West	6-8-04		Tentative	191	50.8	Anderson Homes P.O. Box 1237 Lodi, CA 209/367-7600
Villa Ticino West Vesting	11-1-04		Tentative	711	127	Andrew Rossi 611 N. Main Street Manteca, CA 209/824-4000
Ken Hill Estates	4-18-05		Tentative	12	4.73	Jerry Parker 2355 Oakland Road San Jose, CA 408/953-9918
Union Ranch	Pending		Tentative	1,960	356	RLC Associates 250 Cherry Lane, #208 Manteca, CA 209/239-5030
Milner Estates	Pending		Tentative	215	59.9	Anderson Homes P.O. Box 1237 Lodi, CA 209/367-7600

Development Name	Tentative Date	Final Date	Status	Total Lots	Acreage	Builder/Developer/Engineer/ Owner Contact Information
Rodoni Estates	6-6-05		Tentative	99	28.2	D.R. Horton 1210 Central Boulevard Brentwood, CA 925/634-6023
Evans Estates	Pending		Tentative	586	159	MCR Engineering 322 Sun West Place Manteca, CA 209/239-6229
Crivello Estates	Pending		Tentative	62	18.8	MCR Engineering 322 Sun West Place Manteca, CA 209/239-6229
Sundance	Pending		Tentative	451	110	FCB Homes 3247 W. March Lane Stockton, CA 209/957-8112
Sundance 2 (Med. Density)	Pending		Tentative	79	7.53	FCB Homes 3247 W. March Lane Stockton, CA 209/957-8112
Oleander Estates	Pending		Tentative	544	112	Raymus Homes 250 Cherry Lane, #116 Manteca, CA 209/824-3080
Tara Park	Pending		Tentative	583	160	Beck Properties 3114 W. Hammer Lane Stockton, CA 209/957-0331
Pillsbury Estates	Pending		Tentative	275	80	Brocchini Family Ptp. 6926 E. Woodward Avenue Manteca, CA 209/239-1303
Terra Ranch	Pending		Tentative	269	74.8	Atherton Boyce Development P.O. Box 1870 Manteca, CA 209/239-4014
Lundbom Estates	Pending		Tentative	21	5	RLC Associates 250 Cherry Lane, #208 Manteca, CA 209/239-5030
Dutra Estates West	Pending		Tentative	188	23.1	Florsheim Land Co. 1701 W. March Lane Stockton, CA 209/473-1106
Yosemite Park	Pending		Tentative	253	29.5	Kimball Hill Homes 10535 E. Stockton Boulevard Elk Grove, CA 916/714-1153

Chapter 3
Environmental Checklist

1. **Project Title:** Machado Estates

2. **Lead Agency Name and Address:** City of Manteca
Community Development Department
1001 W. Center Street
Manteca, CA 95337

3. **Contact Person and Phone Number:** Benjamin Cantu
209/239-8427

4. **Project Location:** Directly south of the City of Manteca city limits, within the City's Primary Urban Service Boundary, at the southwest corner of Airport Way and Woodward Avenue

5. **Project Sponsor's Name and Address:** Airport Woodward Joint Venture
Attn: Toni Marie Raymus
250 Cherry Lane, Suite 116
Manteca, CA 95337

6. **General Plan Designation:** LDR, Low Density Residential

7. **Zoning:** AG-40, General Agriculture, 40 acre parcel minimum

8. **Description of Project:** The proposed project includes the construction of the Machado Estates subdivision. The project would subdivide 156.8 acres into single-family residential uses, consisting of 559 single-family homes. The project would include the removal of two existing rural dwellings. The project would also involve General Plan amendment, annexation, prezoning, a development agreement, and a tentative map for residential development.

9. **Surrounding Land Uses and Setting:** Adjacent land uses include residential to the north, agriculture to the east and south, and fallow agricultural land to the west. The Terra Ranch development is proposed for the land directly west of the site (currently fallow agricultural land).

10. **Other Public Agencies whose Approval Is Required:** San Joaquin County Local Agency Formation Commission

Environmental Factors Potentially Affected:

The environmental factors checked below would potentially be affected by this project (i.e., the project would involve at least one impact that is a "Potentially Significant Impact"), as indicated by the checklist on the following pages.

☐ Aesthetics	☒ Agricultural Resources	☒ Air Quality
☐ Biological Resources	☒ Cultural Resources	☒ Geology/Soils
☒ Hazards and Hazardous Materials	☒ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☒ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☒ Transportation/Traffic
☒ Utilities/Service Systems	☒ Mandatory Findings of Significance	

Determination: (to be completed by the lead agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have an impact on the environment that is "potentially significant" or "potentially significant unless mitigated" but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards and (2) has been addressed by mitigation measures based on the earlier analysis, as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

Signature _____ Date _____

Printed Name _____ For _____

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
I.	**AESTHETICS.** Would the project:				
a.	Have a substantial adverse effect on a scenic vista?	❑	❑	■	❑
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings along a scenic highway?	❑	❑	❑	■
c.	Substantially degrade the existing visual character or quality of the site and its surroundings?	❑	❑	■	❑
d.	Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	❑	❑	■	❑

Impact Discussion

a. **Existing Visual Character:** As noted in the project description (Chapter 2), the project site is currently being used for agriculture as row crops (corn). One single-family ranch house is located on the site. The proposed project would include the demolition of this house.

Machado Estates is located at the southwest corner of Airport Way and Woodward Avenue (Figure 3). Adjacent land uses include residential to the north, agriculture to the east and south, and fallow agricultural land to the west. The Terra Ranch development is proposed for the land directly west of the site (currently fallow agricultural land), and the Dutra Estates development is planned for the graded land to the northwest.

Viewer Groups: Single-family lots and an existing residential development are located directly to the north of the project site. Residents in these homes currently have views of the existing row crops on the project site.

Motorists, bicyclists, and pedestrians traveling along Woodward Avenue and Airport Way for travel and recreational use have views of the site as they pass through the area.

The proposed project would convert agricultural land to a single-family residential development. Although this would change the current view of the site for residents, motorists, bicyclists, and pedestrians, the views would be consistent with views in the surrounding areas. Therefore, the proposed project would not substantially affect the visual character or quality of existing scenic views for viewer groups in the area. Projects consistent with the City's community design policies and standards are not considered to degrade the aesthetics of the site, the

surroundings, or the community. Implementation of City standards will therefore ensure that this impact would be less than significant. No mitigation is required.

b. There are no designated scenic highways within Manteca. One designated scenic highway (Interstate 580) is located in San Joaquin County. This scenic highway is more than 10 miles from the proposed project site, and the proposed project will not have an effect on this highway (California Department of Transportation 1999). There would be no impact.

c. The proposed project site is an agricultural area consisting of row crops (corn). The land is characteristically flat, with no hills or other significant vertical elements in the viewshed. Elements of the proposed project are consistent with existing visual elements in the area (adjacent residential developments) and would not substantially change the character of the area. In addition, the proposed project, which will be visible from the existing homes along the perimeter of the project site, as well as by motorists, bicyclists, and pedestrians, will be similar in character to the other new housing developments in the area that make up existing views. Projects consistent with the City's community design policies and standards are not considered to degrade the aesthetics of the site, the surroundings, or the community. Implementation of City standards will therefore ensure that this impact would be less than significant. No mitigation is required.

d. The proposed project will create new sources of nighttime lighting and daytime glare. This project will increase new light from within the homes, glare from the windows, streetlights on the roads, and other new sources of lighting where no light currently exists. Although the project would contribute light to the area, the increase would not be considered substantial or highly noticeable because it is comparable to the adjacent areas that have already been developed. This impact is less than significant. No mitigation is required.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
II.	**AGRICULTURAL RESOURCES.** In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation. Would the project:				
a.	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	■	❑	❑	❑
b.	Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract?	❑	❑	❑	■
c.	Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	■	❑	❑	❑

Impact Discussion

a. The entire proposed project site has been identified by the California Department of Conservation as Farmland of Statewide Importance and Prime Farmland, as defined by the California Farmland Mapping and Monitoring Program (California Department of Conservation 2002). More than 75% of the land is Farmland of Statewide Importance, and the remaining land is Prime Farmland. The proposed project would result in the direct conversion of the 156.8 acres of important farmland to residential use. This impact is potentially significant. Mitigation included in the General Plan EIR (City of Manteca 2003b) (described below) in combination with Mitigation Measure AG-1, will reduce the impact, but not to a less-than-significant level. The impact would remain potentially significant.

> **Mitigation Measure AG-1: Require Conservation Fee.** Until the City adopts a farmland conservation fee, the project applicant shall deposit appropriate mitigation funds into an escrow account for the loss of Prime and Important Farmlands. Once a farmland conservation fee has been adopted by the City and/or a designated land trust organization is selected, these funds shall be transferred to the designated land trust organization for use in purchasing farmland.

General Plan EIR Mitigation Measure AG-1.1: The Land Use Element of the General Plan 2023 provides the following policy (P) and implementation (I) measures intended to protect important farmland within the Study Area:

- **LU-P-41:** The City shall encourage the continuation of agricultural uses on lands within the Primary and Secondary Urban Services Boundary lines pending their development as urban uses consistent with the General Plan.
- **LU-I-1:** The City shall maintain a growth management system that provides a mechanism for the annual allocation of the amount of residential, commercial, and industrial development that may occur. The growth management system shall have the following objectives:
  - Conserve viable agricultural and open space lands.

The Resources Conservation Element of the proposed General Plan 2023 provides the following goal and policies (P) intended to conserve agricultural resources within the Study Area:

- **Goal RC-9:** To promote the continuation of agricultural uses in the Manteca area and to discourage the premature conversion of agricultural land to non-agricultural uses, while providing for the urban development needs of Manteca.
- **RC-P-18:** The City shall support the continuation of agricultural uses on lands designated for urban use, until urban development is imminent.
- **RC-P-19:** The City shall provide an orderly and phased development pattern so that farmland is not subjected to premature development pressure.

General Plan EIR Mitigation Measure AG-1.2: The Land Use Element of the proposed General Plan 2023 directs the major growth area, as defined by the Primary Urban Service boundary, in a manner that avoids Prime Farmlands where feasible. Some areas of Prime Farmlands are within existing urban areas. Figure 4-4 [of the General Plan EIR] illustrates the location of Prime Farmlands relative to the Primary Urban Service boundary.

Cumulative Impact: The General Plan EIR concluded that buildout of the General Plan would result in the conversion of 5,912.8 acres of Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance to nonagricultural uses (City of Manteca 2003b). This was considered to be a potentially significant impact, and mitigation measures were identified to reduce this impact (see mitigation measures described above). The General Plan EIR concluded that the mitigation measures reduced the impact, but not to a less-than-significant level and that the impact was therefore considered to be significant and unavoidable. The proposed project would contribute 156.8 acres of conversion of important farmland to this cumulative impact.

b. The proposed project site is currently zoned AG-40, which is a General Agriculture zone. The minimum parcel size for this zone is 40 acres. None of the project site is identified as land currently under a Williamson Act contract (California Department of Conservation 2005). The existing San Joaquin County (County) agricultural zoning would be replaced with City urban zoning consistent with the General Plan upon annexation. There would be no impact.

c. Conversion of the project site and other agricultural lands in the area will result in increased conflict between agricultural and urban uses, as well as reduction in agricultural support services, resulting in pressures for conversion of other agricultural lands to be removed from farming. This is a significant impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
III.	**AIR QUALITY.** When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a.	Conflict with or obstruct implementation of the applicable air quality plan?	■	❑	❑	❑
b.	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	■	❑	❑	❑
c.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	■	❑	❑	❑
d.	Expose sensitive receptors to substantial pollutant concentrations?	■	❑	❑	❑
e.	Create objectionable odors affecting a substantial number of people?	❑	❑	■	❑

Setting

Ambient air quality is affected by the climate, topography, and type and amount of pollutants emitted. The proposed location for the project is subject to a combination of topographical and climatic factors that result in high potential for regional and local accumulation of pollutants. The following discussion describes climatic and topographic characteristics of the San Joaquin Valley Air Basin (SJVAB), relevant air quality standards, and existing air quality conditions within the basin.

Climate and Topography

The project site is located in the SJVAB. The mountain ranges bordering the air basin near the proposed project site (the Coast Ranges to the west and Sierra Nevada to the east) influence wind directions and speeds and atmospheric inversion layers in the San Joaquin Valley. These mountain ranges channel

winds through the valley, affecting both the climate and dispersion of air pollutants.

Because of the mountain ranges bordering the air basin, temperature inversions occur frequently in the valley. Inversions occur when the upper air is warmer than the air beneath it, thereby trapping pollutant emissions near the surface and not allowing them to disperse upward. Inversions occur frequently throughout the year in the San Joaquin Valley, although they are more prevalent and of a greater magnitude in late summer and fall.

Air Quality Standards and Attainment Status

The federal and state governments have established ambient air quality standards for seven criteria pollutants: ozone, carbon monoxide (CO), nitrous oxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM10), particulate matter less than or equal to 2.5 microns in diameter (PM2.5), and lead. Ozone, PM10, and PM2.5 are generally considered regional pollutants because they or their precursors affect air quality on a regional scale. Pollutants such as CO, NO_2, SO_2, and lead are considered local pollutants that tend to accumulate in the air locally. PM10 and PM2.5 are considered both localized and regional pollutants. In the area where the proposed project site is located, PM10, PM2.5, and ozone are of particular concern.

The State of California has classified the SJVAB as being in severe nonattainment for ozone and in nonattainment for PM10. The San Joaquin Valley Air Pollution Control District (SJVAPCD) has adopted an air quality improvement plan that addresses oxides of nitrogen (NO_x) and reactive organic gases (ROG), both of which are ozone precursors and contribute to the secondary formation of PM10 and PM2.5. The plan specifies that regional air quality standards for ozone and PM10 concentrations can be met through the use of additional source controls and trip reduction strategies. It also establishes emission budgets for transportation and stationary sources. Those budgets, developed through air quality modeling, reveal how much air pollution can occur in an area before national ambient air quality standards are violated.

Impact Discussion

a. The California Clean Air Act (CCAA) requires nonattainment districts with severe air quality problems to provide for a 5% reduction in nonattainment emissions per year. The SJVAPCD prepared an air quality attainment plan (AQAP) for the SJVAB in compliance with the requirements of the CCAA. The SJVAPCD encourages local jurisdictions to design all developments in ways that reduce air pollution from vehicles. The *Guide to Assessing and Reducing Air Quality Impacts* promulgated by the SJVAPCD (2002) lists various land uses and design strategies that reduce air quality impacts of new development. The General Plan provides some strategies and requirements to reduce air pollutant emissions. However, because the Machado project would require a general plan

amendment and zone change, it was not addressed within the current General Plan and is therefore not considered by the current AQAP. This impact is considered potentially significant. A detailed evaluation of consistency with the AQAP, local ordinances, and General Plan, based on the number of housing units proposed as a part of the project, will need to be provided to determine the level of significance of this impact.

b. The proposed project could generate substantial emissions, which may violate air quality standards. Emissions associated with project construction equipment exhaust, fugitive dust emissions, energy consumption emissions, and mobile source emissions could exceed thresholds established by the SJVAPCD. Impacts are considered potentially significant. Further analysis would be required to quantify emissions from the project and determine whether actual emissions would exceed the significance threshold. This analysis would include project trip generation calculations and emission modeling using the URBEMIS program to determine both direct and indirect project emissions. A detailed evaluation of air quality impacts using this methodology will need to be prepared to support a determination of the level of significance of this impact. Detailed site plans and a traffic study will be necessary to perform this analysis.

c. The San Joaquin Valley is in nonattainment for two criteria pollutants: ozone and PM10. The *Guide for Assessing and Mitigating Air Quality Impacts* under CEQA defines cumulative impacts as two or more individual effects that when considered together are considerable or that compound or increase other environmental impacts. Other past, present, and reasonably foreseeable development projects are located within the project vicinity that may contribute to cumulatively considerable effects. The project may increase the level of pollutants (ROG and NO_x) beyond the level of significance as defined by the SJVAPCD. Recent CEQA case law decisions have also lowered the threshold for when a project has a considerable contribution to a cumulative impact. In a nonattainment area, the project would have to fully mitigate all emission increases to be able to demonstrate that the project is not contributing to a cumulative impact. The SJVAPCD is in the process of developing programs to provide mechanisms to mitigate development projects' direct and indirect impacts. The developer may choose to contract with the SJVAPCD to pay fees to a mitigation program that will fully mitigate the project's impacts and thereby also eliminate a considerable contribution to the cumulative impact. The cumulative air quality effects and the applicability of fee-based mitigation measures will need to be evaluated in detail to support a determination of the level of significance of this impact and determine appropriate mitigation measures. Detailed site plans and a traffic study will be necessary to perform this analysis. This impact is considered potentially significant.

d. Sensitive receptors include land uses, such as schools, day care centers, medical facilities, recreational facilities, and others that could contain young children, elderly persons, or people with existing respiratory health problems. The proposed project could result in significant air pollutant emissions, which could expose sensitive receptors to substantial pollutant concentrations. This is considered potentially significant. An analysis of potential impacts to nearby sensitive receptors will need to be conducted for CO concentrations using the

CALINE model to determine the actual pollutant concentrations and evaluate the significance of the impact. This analysis will need to be performed to support a determination of the level of significance of this impact and develop appropriate mitigation measures. Detailed site plans and a traffic study will be necessary to perform this analysis.

e. Residential uses are generally not considered to be a source of offensive odors. The proposed project is not likely to generate odors or expose receptors to offensive odors. This is considered a less-than-significant impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IV.	**BIOLOGICAL RESOURCES.** Would the project:				
a.	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	■	❑	❑
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	■	❑	❑■
c.	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?	❑	■	❑	❑
d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	❑	❑	❑	■
e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	❑	■	❑	❑
f.	Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?	❑	■	❑	❑

Setting

Methodology

Jones & Stokes biologists reviewed existing information and conducted a field survey to identify biological resource issues on the project site. The following information was reviewed:

- a California Natural Diversity Database (CNDDB) records search of the Manteca, Stockton West, Stockton East, Peters, Avena, Lathrop, Salida, Vernalis, and Ripon U.S. Geological Survey (USGS) 7.5-minute quadrangles (California Natural Diversity Database 2005);
- the California Native Plant Society's (CNPS's) 2005 online *Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2005);
- a U.S. Fish and Wildlife Service (USFWS) list of endangered, threatened, and proposed species for the Manteca and Lathrop quadrangles obtained from the USFWS website (U.S. Fish and Wildlife Service 2005);
- the San Joaquin County General Plan (San Joaquin County Community Development Department 1992);
- the San Joaquin County Multi Species Habitat Conservation Plan (SJMSCP) (San Joaquin County Community Development Department 2000);
- published and unpublished reports; and
- Jones & Stokes file information.

This information was used to develop lists of special-status species and other sensitive biological resources that could be present in the project area.

A Jones & Stokes botanist/wetland ecologist and wildlife biologist conducted a field survey on August 31, 2005. The survey was conducted by driving around the perimeter of the project area and along agricultural access roads through the project area. The biologists stopped at regular intervals to survey and document habitat types.

The general purpose of the biological field survey was to:

- characterize biological communities and their associated wildlife habitat uses;
- determine whether suitable habitat is present for special-status species that have the potential to occur in the project region; and
- identify potential waters of the United States (including wetlands).

Existing Conditions

The project site encompasses 156.8 acres and is located within a mostly agricultural setting southwest of Manteca. The site is bordered by Woodward Avenue to the north, Airport Way to the east, and agricultural lands to the south and west.

The site itself consists primarily of cornfields, and it contains one private residence on its northeast corner (Figure 3). Several large trees surround the residence and include black locust, willow, and eucalyptus. The vegetative composition along the edges of the cornfields consists mostly of ruderal species dominated by sorghum, ripgut brome, and wild oats. An underground irrigation system forms a berm that runs north-south and divides the project site.

An open agricultural ditch extends east from the center of this berm and divides the eastern portion of the project site. A pump station with a regularly spaced series of irrigation gate valve abutments is located on the north-south portion of the irrigation system atop the berm. The ditch is approximately 700 feet long, approximately 20 feet wide from top of bank to top of bank, and 6 feet wide at the ditch bottom (Figure 3). The ditch is unlined and contains areas of open water (water was present throughout drainage and was flowing westwardly) and supports non-native annual grassland species along the banks, while wetland species occur in the ditch bottom. Although there are no apparent surface hydrologic connections to waters of the United States, the presence of wetland vegetation has potential to be considered a jurisdictional wetland by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act.

Dominant species found on the banks of the ditch include wild oat and sorghum, and the wetter area supports wetland vegetation such as tall flatsedge. No other potential waters of the United States or nonjurisdictional wetlands occur on the project site.

A list of plant species observed during the field visit was compiled and is shown in Table 2.

Table 2. Plant Species Observed in the Project Area

Common Name	Scientific Name
Amaranthus	*Amaranthus* sp.
Wild oats	*Avena fatua*
Ripgut brome	*Bromus diandrus*
Bermuda grass	*Cynodon dactylon*
Tall flatsedge	*Cyperus eragrostis*
Cut-leaved filaree	*Erodium cicutarium*
Eucalyptus	*Eucalyptus* sp.
Meadow barley	*Hordeum murinum* ssp. *leporinum*
Prickly lettuce	*Lactuca serriola*
Cheeseweed	*Malva neglecta*
Narrowleaf plantain	*Plantago lanceolata*
Black locust	*Robinia pseudoacacia*
Willow	*Salix* sp.
Field sowthistle	*Sonchus arvensis*
Sorghum	*Sorghum halapense*
Vulpia	*Vulpia myuros*

Special-Status Species

Special-status species are plants and animals that are legally protected under the California Endangered Species Act (CESA), the federal Endangered Species Act (ESA), or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing. For the purposes of this IS, special-status species include:

- species listed or proposed for listing as threatened or endangered under ESA (50 Code of Federal Regulations [CFR] 17.12 [listed plants], 50 CFR 17.11 [listed animals], and various notices in the Federal Register [FR] [proposed species]);
- species that are candidates for possible future listing as threatened or endangered under ESA (69 FR 24876, May 11, 2005);
- species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 CCR 670.5);
- species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380);
- plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.);
- plants considered by CNPS to be “rare, threatened, or endangered in California” (Lists 1B and 2, California Native Plant Society 2005);

- plants listed by CNPS as plants about which more information is needed to determine their status, and plants of limited distribution (Lists 3 and 4, California Native Plant Society 2005), which may be included as special-status species on the basis of local significance or recent biological information;
- animal species of special concern to the California Department of Fish and Game (DFG) (Remsen 1978 [birds], Williams 1986 [mammals], and Jennings and Hayes 1994 [amphibians and reptiles]); and
- animals fully protected in California (California Fish and Game Code Sections 3511 [birds], 4700 [mammals], and 5050 [amphibians and reptiles]).

Special-Status Plants

A CNDDB search (2005) indicated that the following three special-status plants have documented occurrences within an approximately 5-mile radius of the project site:

- Slough thistle (*Cirsium crassicaule*)—federal species of concern/CNPS List 1B
- Delta button-celery (*Eryngium racemosum*)—federal species of concern/state endangered/CNPS List 1B
- Wright's trichocoronis (*Trichocoronis wrightii* var. *wrightii*)—CNPS List 2

All of these species have specific microhabitat requirements (e.g., riparian scrub, marshes, swamps) that are not present within the developed habitats onsite and are therefore unlikely to occur.

Special-Status Wildlife

Based on a review of existing information (including a search of the CNDDB [2005]), species lists obtained from the USFWS, and species distribution and habitat requirements data), the following eight special-status wildlife species were identified as having the potential to occur in the project vicinity. Non-special-status migratory birds, including raptors, also have the potential to nest on the project site. Although these species are not considered special-status wildlife species, their occupied nests and eggs are protected under either California Fish and Game Code Section 3503 or 3503.5 and the Migratory Bird Treaty Act (MBTA).

- Valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*)—federally threatened
- Vernal pool fairy shrimp (*Branchinecta lynchi*)—federally threatened
- Vernal pool tadpole shrimp (*Lepidurus packardi*)—federally endangered
- California tiger salamander (*Ambystoma californiense*)—federally threatened

- Western pond turtle (*Clemmys mamorata*)—DFG species of special concern
- Cooper's hawk (*Accipiter cooperi*)—DFG species of special concern
- Swainson's hawk (*Buteo swainsoni*)—state threatened
- White-tailed kite (*Elanus leucurus*)—DFG fully protected species
- Western burrowing owl (*Athene cunicularia hypugea*)—DFG species of special concern

No elderberry shrubs, the host plant for VELB, were located during the August 31, 2005 field survey; therefore, VELB would not occur on the project site.

No vernal pools or other seasonal pools exists on or near the project site; therefore, vernal pool fairy shrimp and vernal pool tadpole shrimp would not occur on the project site.

One occurrence for California tiger salamander exists approximately 0.8 mile northwest of the project site (California Natural Diversity Database 2005). This occurrence was recorded in 1996 in a seasonal pond on the south side of State Route (SR) 120. The agricultural ditch on the project site drains stormwater and agricultural runoff. Within the Central Valley of California, California tiger salamander aquatic breeding sites consist of vernal pools and seasonal ponds, in addition to stock ponds for cattle, sheep, and horses (U.S. Fish and Wildlife Service 2003). Drainage canals do not provide suitable breeding habitat for California tiger salamander because these resources frequently conduct heavy water flows during storm events. Therefore, the agricultural ditch on the project site would not provide suitable aquatic breeding habitat for California tiger salamanders.

Western pond turtles require a permanent to semi-permanent water source. Because of the variability in the duration and intensity of water flow and the lack of suitable basking sites, agricultural ditches typically do not provide suitable aquatic habitat for western pond turtle. No pond turtles were observed during the August 31, 2005, field survey.

Cooper's hawk and white-tailed kite nest along riparian corridors or within wooded areas. These habitats do not occur on or adjacent to the project site; therefore, Cooper's hawk and white-tailed kite would not be affected by the proposed project.

Cornfields and residential areas on the project site do not provide suitable habitat (annual grasslands) used by breeding and wintering burrowing owls. Burrowing owls are not expected to occur on the project site.

Swainson's hawk and other non-special-status migratory birds and raptors could potentially nest in trees located around the private residence in the northeastern corner of the project site (Figure 3). No potential raptor nests were identified in any of the trees present on the project site. In addition to trees surrounding the residences, orchards attract foraging and roosting migratory birds such as western scrub-jay (*Aphelocoma californica*) and mourning dove (*Zenaida macroura*).

Swainson's hawk and other migratory birds and raptors are listed as covered species within the SJMSCP (adopted November 2000). The SJMSCP defines habitat for Swainson's hawk as large trees along permanent waterways or otherwise isolated with nearby grasslands or agricultural lands for foraging. Although cornfields and developed areas on the project site do not provide suitable foraging habitat for Swainson's hawk, suitable foraging habitat is present in grasslands and agricultural fields (including alfalfa and row crops) that occur in the vicinity (10-mile radius) of the project site. The closest known nest site for Swainson's hawk is located approximately 1.0 mile north of the project site (California Natural Diversity Database 2005).

San Joaquin County Multi-Species Habitat and Open Space Conservation Plan

The SJMSCP has been prepared by the County and its cities (including City of Manteca) to provide a regional approach to mitigating development impacts on the 100 listed and nonlisted plant, fish, and wildlife species covered by the SJMSCP, compensating for the conversion of open space to non-open-space uses. In addition, the SJMSCP provides some compensation to offset the impacts of open space land conversions on other beneficial open space uses, such as recreation, agriculture, scenic values, educational purposes, flood control, and use by common plant, fish, and wildlife species that are not included in the list of SJMSCP-covered species. The plan allows a development impact fee to be paid by project applicants whose projects would cause the loss of biological resources or conversion of habitats.

For the purpose of determining the appropriate fees and mitigation ratios, habitat types have been divided into the following three categories (as of 2005):

- multipurpose open space,
- agriculture and natural land, and
- vernal pools (including upland habitat and wetted habitat).

As development occurs and participants choose to mitigate through the SJMSCP, development fees are charged and used in most cases to preserve large contiguous areas of plant and wildlife habitat. Conversion of multipurpose open space lands does not result in incidental take and does not require compensation in the form of preserve acquisition. Instead, compensation for multipurpose open space land is triggered by the requirement to assist in financing the SJMSCP preserve system by supporting a portion of the enhancement, management, and administration costs associated with the preserve system. The fees are paid to the San Joaquin Council of Governments (SJCOG) and adjusted annually.

Impact Discussion

This section describes mitigation measures to reduce potentially significant impacts on biological resources to a less-than-significant level. Avoidance, minimization, and compensation measures identified for SJMSCP-covered species and open space are consistent with the SJMSCP and would fully mitigate effects on SJMSCP-covered species and removal of open space.

a. **Special-Status Plants:** Because the special-status plants that grow in the project region require habitats not present at the project site, there is minimal potential for the project to cause impacts on special-status plants. There would be no impact.

Special-Status Wildlife: Development of the project site could affect, either directly or through habitat modifications, the state-threatened Swainson's hawk and other non-special-status migratory birds and raptors. Tree removal, grading, or other construction activities during the nesting season (generally March 1 through August 15) could remove or cause abandonment of active nests of Swainson's hawk and other migratory birds and raptors if they are found nesting on or adjacent to the project site. Suitable bird and raptor nesting habitat (trees) was identified on the project site.

Impacts on a state-listed species (Swainson's hawk) and species protected under the MBTA and California Fish and Game Code are considered potentially significant. Implementation of Mitigation Measure BIO-1 (consistent with the SJMSCP) would reduce this impact to a less-than-significant level.

> **Mitigation Measure BIO-1: Conduct Tree Removal Activities during the Nonbreeding Season for Swainson's Hawk and Non-Special-Status Migratory Birds and Raptors or Retain a Qualified Biologist to Conduct a Nesting Bird Survey before Tree Removal Activities.** To avoid removing any active Swainson's hawk or other non-special-status bird and raptor nests, tree removal activities will be conducted during the nonbreeding season for these species (generally August 16 through February 28) or after a qualified biologist determines that fledglings have left the nest, as described in the SJMSCP (Sections 5.2.3.1[G], 5.2.4.11, 5.2.4.18, and 5.2.4.19).
>
> If tree removal activities will be conducted before August 16 and after February 28, a qualified biologist will be retained to survey for nesting birds in all trees that will be removed and any tree located within 100 feet of construction activities, including grading. The nesting bird survey will be conducted at most 48 hours before tree removal activities. If the biologist determines that the area surveyed does not contain any active nests, then tree removal activities can commence without any further mitigation. If active nests are found, construction will not occur until nesting activities have ceased (after a qualified biologist determines that fledglings have left the nest).

b. The agricultural ditch located in the project area could support seasonal wetland habitat that would be considered a sensitive natural community. This impact is considered potentially significant. Implementation of Mitigation Measure BIO-4 (described below under "c" for waters of the United States) would reduce this impact to a less-than-significant level.

c. Development of the project site could result in direct and indirect impacts (placement of fill) in the agricultural ditch located in the center of the eastern portion of the site.

The agricultural ditch may be considered waters of the United States and could be regulated under the federal Clean Water Act. It is assumed that as part of proposed development, the portion of the agricultural ditch located on the project site would be filled or piped. This impact is considered potentially significant. Implementation of Mitigation Measure BIO-2 would reduce this impact to a less-than-significant level.

Indirect impacts on water quality downstream of the agricultural ditch could result from sedimentation during construction of the proposed development. Because project construction would result in the disturbance of an area larger than 1 acre, the project developer would be required to comply with the State Water Resources Control Board's general permit for construction activities, including the filing of a notice of intent and a storm water pollution prevention plan (SWPPP) with the Regional Water Quality Control Board (RWQCB), as described in the "Hydrology and Water Quality" section below, which would reduce this impact to a less-than-significant level.

> **Mitigation Measure BIO-2: Have a Wetlands Delineation for the Site Performed and Obtain and Comply with State, Federal, and Local Permits.** Before construction begins, the City will require that a delineation of waters of the United States within the project area be conducted and a report and map of the results be submitted to the Corps for verification. If the Corps determines that the ditch is not waters of the United States, the applicant will not need to obtain a Clean Water Act Section 404 permit. If the Corps decides that the ditch is waters of the United States, and therefore is under its jurisdiction, the City will require that the applicant obtain a Section 404 permit from the Corps for placement of fill within waters of the United States and a Section 401 certification from the RWQCB.
>
> In addition, the extent of the ditch that is within jurisdiction of DFG will be identified for the purpose of obtaining a California Fish and Game Code Section 1602 streambed alteration agreement. All conditions that are attached to the state and federal permits would be implemented as part of the project. The conditions would be clearly identified in the construction plans and specifications and monitored during and after construction to ensure compliance.

d. The proposed project would not interfere substantially with the movement of any native resident or migratory species or with established native resident or

migratory wildlife corridors, or impede the use of native wildlife nursery sites. There would be no impact.

e The General Plan (Chapter 8, Section 8.10) contains the following policies to protect biological resources:

- **RC-P-3 1:** Minimize impact of new development on native vegetation and wildlife.
- **RC-P-33:** Discourage the premature removal of orchard trees in advance of development, and discourage the removal of other existing healthy mature trees, both native and introduced.
- **RC-P-34:** Protect special status species and other species that are sensitive to human activities.

Implementation of Mitigation Measure BIO-1 would ensure that the proposed project is consistent with the General Plan policies and would reduce this potential impact to a less-than-significant level.

f. The project site is located within the incorporated City of Manteca. The City is a signatory to the SJMSCP. Potential impacts to SJMSCP-covered species (Swainson's hawk and migratory birds) are addressed above under "a." In addition, implementation of the proposed project would result in the conversion of approximately 157 acres of agricultural habitat lands (non-orchard crops) to residential development. These lands provide habitat for a variety of common plant, wildlife species and could provide habitat for SJMSCP-covered species. Implementation of Mitigation Measure BIO-1 (described above) and Mitigation Measure BIO-3 (described below) would ensure that the proposed project does not conflict with the SJMSCP and would reduce this potential impact to a less-than-significant level.

> **Mitigation Measure BIO-3: Compensate for the Loss of Agricultural Habitat Lands as Outlined in the SJMSCP.** The City will provide compensation for the conversion of approximately 157 acres of agricultural habitat lands (i.e., fund acquisition of preserve lands) at a ratio of 1:1 (acres acquired to acres lost), as outlined in the SJMSCP (Section 4.1.2[A]). For 2005, the cost to provide 1 acre of compensation for agricultural habitat lands is $1,819. The final cost to fulfill project compensation requirements will be determined during coordination with SJCOG. Compensation fees must be paid before any ground-disturbing activities, including grading (SJMSCP Section 5.3.2.3[A]).

Cumulative Impacts

Numerous development projects have been approved or are in the process of being approved within Manteca. A brief description of these projects is provided in Chapter 2. Cumulative development within the Manteca city limits could affect wetland communities (agricultural ditches and canals) and sensitive

wildlife species (Swainson's hawk and other migratory birds) and their habitats. The proposed project would incrementally affect these biological resources. Implementation of the proposed Mitigation Measures BIO-1 and BIO-2 (described above) would reduce the project's incremental contribution to cumulative impacts to a less-than-cumulatively-considerable level, offset temporary losses incurred in the study area, and ensure the continued existence of habitat value in the study area. The project would not make a considerable contribution to adverse effects on biological resources.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
V.	**CULTURAL RESOURCES.** Would the project:				
a.	Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	■	❑	❑	❑
b.	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	■	❑	❑	❑
c.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	❑	■	❑	❑
d.	Disturb any human remains, including those interred outside of formal cemeteries?	❑	■	❑	❑

Setting

This section analyzes the proposed project's effects on cultural resources. Key sources of data used in the preparation of this section include the following:

- the Manteca General Plan (City of Manteca 2003a),
- the Manteca General Plan EIR (City of Manteca 2003b),
- the San Joaquin County General Plan (San Joaquin County Community Development Department 1992),
- a records search conducted at the Central California Information Center (CCIC) of the California Historical Resources Information System,
- contacts with the Native American Heritage Commission (NAHC), and
- a reconnaissance visit to the project area.

A records search was conducted at the CCIC at California State University, Stanislaus, on August 31, 2005. The state's database of previous studies and recorded cultural resources was consulted, as well as pertinent historical inventories and historic maps. The records search indicated that two previous studies have been conducted within or immediately adjacent to the project area (Baloian et al. 2004; Napton 1993). Both of these studies were sensitivity analyses, and neither included pedestrian inventories. No recorded cultural resources are located within the project area. Napton indicates that portions of the current project area along Union Road and Woodward Avenue are sensitive

for historic-period cultural resources. A review of historic maps and historical inventories did not indicate any resources within the project area.

A search of the NAHC sacred lands database and list of potentially interested Native American representatives was requested on August 30, 2005. The NAHC responded on September 2, 2005, stating that the search of its sacred lands database had failed to indicate the presence of Native American cultural resources in the immediate project area, and providing a list of one Native American representative. A contact letter explaining the project and indicating the project location was sent to the Native American representative on September 6, 2005. As of November 22, 2005, no responses have been received.

Jones & Stokes architectural historians David S. Byrd and Kathryn Haley, who both meet or exceed the Secretary of the Interior's Professional Standards for Historian and Architectural Historian, carried out a windshield survey of the project area on September 6, 2005. The survey consisted of driving the project area and noting any buildings that appeared to be at least 50 years old. The windshield survey revealed two properties within the project area with buildings that appear to date to the 1940s. Additionally, one property directly adjacent to the project area includes the Rustic School. Constructed in 1921, the school operated until 1963.

Background research indicates that prior to European contact, the project area was occupied by the Northern Valley Yokuts and therefore prehistoric resources that may be encountered will likely be associated with this group. Northern Valley Yokuts villages were usually located on the tops of low mounds or along major watercourses. The villages consisted of small, lightly constructed, semi-subterranean and large and earth-covered structures. The cultural material of the Northern Valley Yokuts included implements of stone, bone, and wood, as well as more-perishable materials.

Historic resources located within the project area are likely to be associated with early ranching, farming, and settlement. In the mid- and late nineteenth century, the Manteca region developed as an agriculturally based community. In the following decade, Manteca began as a flag stop on the Southern Pacific Railroad known as "Cowell's Station." By 1896, the developing town was named Manteca. Continued growth in the area during the early twentieth century led to the formal incorporation of the City of Manteca on May 28, 1918. During the twentieth century, growth in city remained slow but steady. At one point, the community was known as the "Dairy Center of California." Local farmers also produced watermelons, sugar beets, tomatoes, and sunflower seeds. Over the past few years, the city has become a bedroom community for the San Francisco Bay Area.

Impact Discussion

a. The project may result in substantial adverse change to built environment historical resources (building and structures) within the project area.

No inventory or evaluation effort to identify built environment historical resources (buildings and structures) has been conducted as part of this study. The windshield survey revealed two properties within the project area with buildings that appear to date to the 1940s. Additionally, one property directly adjacent to the project area includes the Rustic School. Constructed in 1921, the school operated until 1963. Given the age of these buildings, it is possible that they are historically significant and eligible for listing in the California Register of Historical Resources (CRHR) or locally designated historic resources. Construction in the project area may lead to physical demolition, destruction, relocation, or alteration of buildings, which would result in a substantial adverse change to historical resources. The impact on built-environment historical resources could be significant, and further studies are required to determine the level of significance of this impact. The City will ensure that an inventory and evaluation is conducted for the three properties that contain buildings located in the project area potentially eligible for listing in the in the CRHR as indicated in Implementation Measure RC-I-41 of the General Plan (City of Manteca 2003a). The inventory and evaluation would include conducting a visual inspection of the buildings, background research on the history of the project area, and property-specific research. Based on this research, the significance of built environment historical resources located in the project area would be evaluated using criteria for listing in the CRHR. Additionally, the buildings would be recorded on the appropriate California Department of Parks and Recreation (DPR) 523 forms, photographed, and mapped. The DPR forms would be produced and forwarded to the CCIC.

If the project results in the demolition or destruction of a built-environment historic resource (building or structure), it cannot be mitigated to a less-than-significant impact and subsequent CEQA analysis may be necessary to make such a finding.

b. The project may result in substantial adverse change to archaeological resources within the project area. Though no known archeological resources are located within the project area, this may a result of the absence of any inventory data for the area. Archaeological resources are generally not visible from a distance and are only located as a result of an intensive pedestrian survey. It is possible that significant archaeological resources, both with and without surface manifestations, are present within the project area. Project activities that may affect such resources include grading, excavation, and vegetation clearing. Any impact on these resources would be a significant impact.

No pedestrian surveys to identify archeological resources have been conducted as part of this study. The records search conducted on August 31, 2005, indicates that no previous studies have been conducted within the project area. It is possible that significant archaeological resources may be located within the project area and that they may be affected, directly or indirectly, by the construction activities associated with the project, such as excavation, clearing, and grading. These ground-disturbing activities may result in direct impacts on significant archaeological resources if they are located within the project area, and further studies are required to determine the level of significance of this impact. The City will ensure that an archaeological inventory of the project area

is conducted as indicated in Implementation Measure RC-I-39 of the General Plan (City of Manteca 2003a). This study would include contacting Native American representatives and other interested parties, conducting background research, and conducting a pedestrian inventory of the project area. All resources located as a result of a survey would be recorded on the appropriate DPR 523 forms, photographed, and mapped. Archaeological resources would be plotted on a USGS 7.5-minute topographic map using data collected with a global positioning system receiver. Site records would be produced and forwarded to the CCIC. The significance of resources would be evaluated using criteria for listing in the CRHR. Impacts on historical resources located as a result of a survey would be analyzed and mitigated if they cannot be avoided. Mitigation measures may include archaeological excavation or monitoring.

Even if no archaeological resources are identified as a result of a pedestrian inventory, it is possible that significant buried archaeological materials are present within the project area. Disturbance or destruction of these resources may result from ground-disturbing activities associated with construction associated with the project. This impact would be significant, but implementation of the following mitigation measure would reduce this impact to a less-than-significant level.

Mitigation Measure CR-1: Stop Work in Case of Accidental Discovery of Buried Archeological Resources. If buried archeological resources, such as chipped or ground stone, historic debris, building foundations, or human bone, are inadvertently discovered during ground-disturbing activities, work would stop in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find and, if necessary, develop appropriate treatment measures in consultation with the City and other appropriate agencies (see also Implementation Measure RC-I-46 of the General Plan [City of Manteca 2003a]).

If human remains of Native American origin are discovered during project construction, it is necessary to comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the NAHC (Public Resources Code Section 5097). If any human remains are discovered or recognized in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- the coroner of the county has been informed and has determined that no investigation of the cause of death is required; and
- if the remains are of Native American origin,
  - the descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or

- ❑ the NAHC was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours after being notified by the commission.

According to California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100), and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC.

c. Methods used in the preparation of this IS conform to the guidelines of the Society of Vertebrate Paleontology (SVP) (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995), which were developed in response to a recognized need for standardized methods to assess and mitigate impacts on paleontological resources[1] and are now widely accepted as an industry standard.

Because many fossil materials are buried in subsurface geologic units rather than exposed at the ground surface, a lead agency often cannot be certain until project earthwork has made substantial progress whether any such resources will actually be encountered. Therefore, impact analysis for paleontological resources operates based on probabilities of impact, with the goal of developing flexible strategies to support adaptive management based on information that may quite literally "come to light" during project construction. Consistent with these uncertainties, the SVP guidelines delineate a two-phase process, as follows.

1. Assess the likelihood that the project's area of potential effect contains significant nonrenewable paleontological resources that could be directly or indirectly impacted, damaged, or destroyed as a result of the project. This is referred to as an area's *paleontological sensitivity* or *sensitivity for paleontological resources*.
2. Based on the identified degree of sensitivity, formulate and implement measures to mitigate potential adverse impacts.

Table 3 defines the SVP's sensitivity categories for paleontological resources and summarizes SVP's recommended treatments to avoid adverse impacts in each sensitivity category.

[1] *Paleontological resources* refers to the fossilized remains of vertebrate and invertebrate organisms, fossil tracks and trackways, and plant fossils.

Table 3. Society of Vertebrate Paleontology's Recommended Treatment for Paleontological Resources, by Sensitivity Category

Sensitivity Category	Definition	Recommended Treatment
High potential (High sensitivity)	Areas underlain by geologic units from which vertebrate or significant invertebrate fossils or suites of plant fossils have been recovered.	▪ Preliminary survey and surface salvage before construction begins. ▪ Monitoring and salvage during construction. ▪ Specimen preparation; identification, cataloging, curation, and storage of materials recovered. ▪ Preparation of final report describing finds and discussing their significance. ▪ All work should be supervised by a professional paleontologist who maintains the necessary collecting permits and repository agreements.
Undetermined potential (Undetermined sensitivity)	Areas underlain by geologic units for which little information is available.	▪ Preliminary field surveys by a qualified vertebrate paleontologist to assess project area's sensitivity ▪ Design and implementation of mitigation if needed, based on results of field survey
Low potential (Low sensitivity)	Areas underlain by geologic units that are not known to have produced a substantial body of significant paleontologic material.	Protection and salvage are generally not required. However, a qualified paleontologist should be contacted if fossils are discovered during construction, in order to salvage finds and assess the need for further mitigation.

Source: Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995.

As used in Table 3, the term *significant* refers to paleontological resources that fulfill one or more of the following criteria (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995).

- Provides important information shedding light on evolutionary trends and/or helping to relate living organisms to extinct organisms.
- Provides important information regarding the development of biological communities.
- Demonstrates unusual circumstances in the history of life.
- Represents a rare taxon or a rare or unique occurrence; is in short supply and in danger of being destroyed or depleted.
- Has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- Provides important information used to correlate strata for which it may be difficult to obtain other types of age dates.
- Paleontological resources considered significant in California typically include vertebrate remains but may also include invertebrate fossils and plant fossils in some areas.

Much of the Manteca area is underlain either immediately or at depth by terrestrial sedimentary rocks assigned to the Modesto Formation of Late Pleistocene (Rancholabrean) age. Because it is known to contain vertebrate fossils, including remains of mammoth, bison, rodents, and reptiles, the Modesto Formation is considered highly sensitive for paleontological resources. The paleontological sensitivity of overlying Holocene sand dune deposits is unknown and is probably lower than that of the Modesto Formation, although sand dune deposits may preserve terrestrial faunas.

Depending on final project design, there is some potential for earthwork required to construct the proposed residential developments to involve the Modesto Formation. If disturbance of the Modesto Formation is required, the potential for significant impacts on paleontological resources is considerable, based on the unit's identified sensitivity. If all disturbance is confined to Holocene materials, the potential for significant impacts would be somewhat lower, but, depending on site-specific characteristics, significant impacts could still occur. In either case, impacts on paleontological resources would be reduced to a less-than-significant level by implementation of the Mitigation Measures CR-4 and CR-5

Mitigation Measure CR-2: Conduct Site-Specific Evaluation of Paleontological Sensitivity and Potential for Impacts. The City will require that the project site's paleontological sensitivity be assessed in a report prepared by a state-licensed geologist (California PG) or a qualified professional paleontologist. The paleontological evaluation may be included as a portion of the site-specific geotechnical investigation or may be presented as a separate report. If the paleontological evaluation determines that any of the geologic units that would be affected by project construction meets the SVP's criteria for high sensitivity for paleontological resources, the following additional measures will also be implemented.

- **CR-2a: Conduct Preconstruction Survey, Salvage, and Protection.** Before site preparation (including vegetation clearing) and project earthwork begin, the City will require the applicant to retain a qualified professional paleontologist as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (1995) to conduct a surface survey and salvage operation. The goal of the operation will be to ensure that paleontological materials exposed at the surface are recovered and properly prepared and curated, or protected from damage using exclusion fencing or other appropriate means. Protection will be designed and installed in consultation with the City and the project engineering consultant to ensure that it is appropriate and effective but does not unduly impede construction activities.
- **CR-2b: Retain a Qualified Professional Paleontologist to Monitor during Ground-Disturbing Activities.** The City will require the applicant to retain a qualified professional paleontologist as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (1995) to monitor during any activities with the potential

to disturb substrate units identified as highly sensitive for paleontological resources.

Mitigation Measure CR-3: Stop Work if Vertebrate Remains are Encountered during Construction. If vertebrate fossils are discovered during construction, all work on the site will stop immediately until a qualified professional paleontologist as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (1995) can assess the nature and importance of the find and recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may also include preparation of a report for publication describing the finds. The City will be responsible for ensuring that the recommendations of the paleontological monitor regarding treatment and reporting are implemented by the applicant.

d. No known human remains are present within the project area. However, no archaeological resources inventory has been conducted. Additionally, it is possible that buried human remains would not be located as a result of a pedestrian inventory.

It is possible that human remains, particularly those outside a designated cemetery, may be encountered during ground-disturbing activities associated with project construction. Further studies are required to determine the level of significance of this impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VI.	**GEOLOGY AND SOILS.** Would the project:				
a.	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
	1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	❑	❑	■	❑
	2. Strong seismic groundshaking?	❑	■	❑	❑
	3. Seismic-related ground failure, including liquefaction?	■	❑	❑	❑
	4. Landslides?	❑	■	❑	❑
b.	Result in substantial soil erosion or the loss of topsoil?	❑	■	❑	❑
c.	Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	❑	■	❑	❑
d.	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	❑	❑	■	❑
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?	❑	❑	❑	■

Setting

San Joaquin Valley Geologic Framework

The San Joaquin Valley is a deep, structurally controlled trough flanked by the Coast Ranges uplift on the west and by the Sierra Nevada on the east (e.g., Norris and Webb 1990).

The San Joaquin Valley is floored by a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock allied to the plutons of the Sierra Nevada; to the west, basement rocks are believed to be Franciscan metasediments and/or mélange. Mesozoic sedimentary rocks now in the subsurface record marine deposition. They are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary fluvial and alluvial strata recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (e.g., Norris and Webb 1990).

To the west, the Coast Ranges geomorphic province is characterized by en echelon northwest-trending mountain ranges formed over the past 10 million years or less by active uplift related to complex tectonics of the San Andreas fault/plate boundary system (e.g., Norris and Webb 1990, Buising and Walker 1995, Atwater and Stock 1998). The eastern rangefront is defined by faults that have been interpreted as contractile features associated with shortening along an axis approximately normal to the rangefront (e.g., Wong et al. 1988, Sowers et al. 1992, Unruh et al. 1992; see also Jennings 1977 for regional mapping), but may also locally accommodate a right-lateral component of motion (e.g., Richesin 1996).

East of the San Andreas fault, the Coast Ranges are broadly antiformal. The core of the uplift consists primarily of metasedimentary rocks and mélange of the Mesozoic Franciscan Complex (e.g., Jennings 1977). Outcrops of mafic and ultramafic units belonging to the Jurassic Coast Range Ophiolite are also locally present and are particularly well developed along the Ortigalita fault in the vicinity of Del Puerto Canyon (Wagner et al. 1990, Evarts et al. 1999). Mesozoic ultramafic rocks are also well exposed in the vicinity of San Benito Mountain. The eastern Coast Ranges rangefront is flanked by a generally eastward-younging sequence of Cretaceous through Quaternary clastic sedimentary strata. The lower portion of this sequence, where it is present, typically records deep marine deposition, while the upper portion reflects progressive growth and erosional dissection of the Coast Ranges uplift (Unruh et al. 1992, Richesin 1996). Quaternary alluvial strata accumulated on essentially modern topography buttress against the rangefront and are locally folded and/or faulted, particularly along the southern portion of the rangefront. Active alluvium and older Quaternary terrace deposits are present in the larger active stream valleys throughout the eastern portion of the Coast Ranges (e.g., Jennings, 1977, Wagner et al. 1990, Richesin 1996).

To the east of the San Joaquin Valley, the Sierra Nevada preserve the dissected remnants of a Mesozoic volcanic arc system similar to the modern Andes. The core of the range consists of plutonic rocks representing the roots of the arc. It is bordered on the eastern margin of the action area by generally westward-younging metavolcanic and metasedimentary rocks ranging in age from Paleozoic to Mesozoic. These strata are in turn overlain by Miocene through Quaternary fluvial and alluvial sediments that pass laterally into valley floor strata and reflect erosional dissection of the progressively uplifting Sierran massif (Jennings 1977, Bartow 1991).

Manteca Area Geology and Paleontology

The City and surrounding area are immediately underlain by sedimentary units of Quaternary age, including the Modesto Formation of probable Late Pleistocene (Rancholabrean) age and overlying deposits of Holocene age (Bartow 1985, Wagner et al. 1990, Turlock Irrigation District 2004).

The Modesto Formation consists of poorly indurated and sorted brown sandstone and siltstone with interbeds of pebble to cobble conglomerate, and has been interpreted as recording alluvial/fluvial deposition (Turlock Irrigation District 2004). It has yielded vertebrate fossils at a number of localities outside the immediate project vicinity, including remains of the extinct giant ground sloth (*Megalonyx jeffersonii*), Columbian mammoth (*Mammuthus columbi*), and giant Ice Age bison (*Bison latifrons*), as well as a variety of rodents and at least one species of snake (University of California Berkeley, Museum of Paleontology 2005). Because of its potential to contain vertebrate fossils, the Modesto Formation is considered highly sensitive for paleontological resources.

The Modesto Formation is overlain by sandy deposits interpreted as recording sand dune deposition. No fossil finds have been reported from Holocene units in San Joaquin County (University of California Berkeley, Museum of Paleontology 2005). Therefore, the paleontological sensitivity of the dune sands is unknown, but it is probably lower than that of the Modesto Formation.

Soils

The proposed project site is located on soils assigned to the Bisgani loamy coarse sand, partially drained, 0–2% slopes; Veritas fine sandy loam, 0–2% slopes; Delhi loamy sand, 0–2% slopes; and Galt clay, 0–2% slopes (McElhiney 1992).

The Bisgani loamy coarse sand, partially drained, 0–2% slopes formed on nearly level low-elevation alluvial fan surfaces. The parent material was alluvium derived from granitic source rocks. The surface layer typically consists of approximately 11 inches of gray loamy coarse sand overlying approximately 49 inches of mottled light gray and light brownish gray loamy coarse sand. Locally, the surface layer comprises loamy sand. The mottled texture suggests that the Bisgani loamy coarse sand was poorly drained under natural conditions, but levee

and reclamation projects have improved drainage. Permeability in this soil is rapid, runoff is very slow, and water erosion hazard is slight, although wind erosion hazard is high. Shrink-swell potential is low (McElhiney 1992).

The Veritas fine sandy loam, 0–2% slopes is a deep soil formed on nearly level low-elevation alluvial fan terraces. The parent material was alluvium derived from a variety of types of source rocks. The surface layer typically consists of approximately 15 inches of grayish brown fine sandy loam. This overlies a subsoil consisting of approximately 25 inches of pale brown and light brownish gray fine sandy loam. Below the subsoil is a hardpan deposit 20 to 30 inches thick. The Veritas fine sandy loam is well drained. Permeability is moderately rapid, with a local perched water table developing above the hardpan following heavy rainfall or irrigation. Runoff is slow, and water erosion hazard is slight. Shrink-swell potential is low (McElhiney 1992).

The Delhi loamy sand, 0–2% slopes is also a very deep soil formed on nearly level and gently sloping surfaces of former sand dunes complexes, in aeolian sediment derived from granitic sources. The surface layer typically consists of grayish brown and light brownish gray loamy sand approximately 16 inches deep overlying approximately 10 inches of grayish brown loamy sand, which in turn overlies approximately 34 inches of pale brown sand. The surface layer locally consists of loamy fine sand or fine sand. Like the Delhi fine sand, the Delhi loamy sand is somewhat excessively drained. Permeability is rapid, runoff is slow, and water erosion hazard is slight. Shrink-swell potential is low (McElhiney 1992).

The Galt clay, 0–2% slopes is a moderately deep soil formed on nearly level basin and basin rim surfaces. The surface layer typically consists of approximately 25 inches of grayish brown and dark grayish brown clay, overlying a subsoil consisting of approximately 9 inches of dark grayish brown clay. The subsoil in turn overlies a hardpan approximately 26 inches thick. The Galt clay, 0–2% slopes is moderately well drained. Permeability is slow, with a perched water table developing above the hardpan for brief periods following heavy rainfall or irrigation. Runoff is slow, and water erosion hazard is slight. Shrink-swell hazard is high (McElhiney 1992).

Geologic Hazards

Primary Seismic Hazards—Surface Fault Rupture and Groundshaking

The project site is not located within any Earthquake Fault Zone delineated by the State of California pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Hart and Bryant 1997), and it is not traversed by any faults recognized by the Uniform Building Code as active (International Conference of Building Officials 1997). The project site is therefore considered unlikely to undergo surface fault rupture.

However, a number of active faults are present in the Coast Ranges and Bay Area to the west of the site, close enough that the site and surrounds are likely to experience substantial seismic groundshaking during the lifespan of the proposed project. Although not zoned by the State of California, the San Joaquin fault and allied structures that demarcate the east margin of the Coast Ranges may be active (e.g., Unruh et al. 1992, Sowers et al. 1998). Farther west, state-zoned structures known to pose a groundshaking hazard for the site include, from east to west, the Ortigalita, Greenville, Calaveras, Hayward, and San Andreas faults.

Recent studies estimate a 62% probability of at least one earthquake with a magnitude of 6.7 or greater (Richter scale) occurring on one of the faults of the greater Bay Area in the next 30 years and a 10% probability of a magnitude 7.0 or greater event during the same timeframe (U.S. Geological Survey Working Group on California Earthquake Probabilities 2003). Table 4 summarizes current information on earthquake recurrence intervals and maximum credible earthquake for key structures west of the project site. The City, including the proposed project site, is located in the Uniform Building Code's Seismic Zone 3 (International Conference of Building Officials 1997).

Table 4. Maximum Credible Earthquake and Recurrence Interval for Principal Active Faults West of the Proposed Project Site

Fault	Magnitude of Maximum Credible Earthquake	Approximate Recurrence Interval
Ortigalita	6.5–6.75[b], 6.9[a]	2,000–5,000 years[b]
Greenville	6.9[a]	Southern segment: 623 years[c]
		Northern segment: 644 years[c]
Calaveras (southern)	6.2[a]	75 years[c]
Hayward	Entire fault: 7.1[a]	Entire fault: 330 years[a]
	Southern segment: 6.5[a]–6.9[c]	Southern segment: 161[c]–167[b] years
San Andreas	7.0–7.9[a]	210–400[a]

[a] Source: International Conference of Building Officials 1997.

[b] Source: Anderson et al. 1982.

[c] Source: U.S. Geological Survey Working Group on California Earthquake Probabilities 2003.

Secondary Seismic Hazards—Liquefaction and Ground Failure

Secondary seismic hazards refers to liquefaction[2] and related types of ground failure, as well as seismically induced landsliding. The State of California maps areas subject to secondary seismic hazards pursuant to the Seismic Hazards

[2] *Liquefaction* is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapidly applied loading. Liquefaction and related types of ground failure are of greatest concern in areas where well-sorted sandy unconsolidated sediments are present in the subsurface and the water table is comparatively shallow.

Mapping Act of 1990. However, seismic hazards maps have not been issued for the USGS 7.5-minute Manteca quadrangle, where the City (including the proposed project site) is located, and no such mapping is planned in the immediate future (California Geological Survey 2005). Detailed evaluation of liquefaction hazard is outside the scope of this IS. Broadly speaking, however, liquefaction is likely to be a substantial concern in parts of the San Joaquin Valley where soils and sediments are sandy and groundwater is shallow.

Landslide and Other Slope Stability Hazards

The City, including the proposed project site, is located on very gentle valley floor topography. Consequently, the existing potential for slope failure, including seismically induced landsliding, is considered minimal to low. Landslide risk may be substantially greater in the Coast Ranges foothills to the west, where rugged topography is underlain by Franciscan rocks that are typically prone to various types of failures.

Impact Discussion

a1. The project site is not located within any Earthquake Fault Zone delineated by the State of California pursuant to the Alquist-Priolo Earthquake Fault Zoning Act, and it is not traversed by any faults recognized as active by the Uniform Building Code (Hart and Bryant 1997, International Conference of Building Officials 1997). Accordingly, the risk of surface fault rupture at the project site is considered low, and the potential for impacts related to surface fault rupture is evaluated as less than significant. No mitigation is required.

a2. The project site could be subject to strong seismic groundshaking as a result of earthquakes on a number of active faults located at varying distances to the west of the site, including the Ortigalita, Greenville, Calaveras, Hayward, and San Andreas faults. The principal concern related to seismic groundshaking is the potential for structural damage and related hazards to life and safety; this represents a potentially significant impact. Implementation of Uniform Building Code requirements in combination with Mitigation Measure GEO-1 will ensure that these impacts would be reduced to a less-than-significant level.

> **Mitigation Measure GEO-1: Implement Recommendations of Site-Specific Geotechnical Investigation Prepared by State-Licensed Personnel.** As part of the project design process, the project proponent will retain qualified (state-licensed) professionals to conduct a site-specific geotechnical investigation consistent with all applicable standards of professional engineering geologic/geotechnical practice. The purpose of the investigations will be to provide a geologic basis for the development of appropriate project design. Investigations will address bedrock and Quaternary geology; geologic structure, including primary and secondary seismic hazards as defined by the State of California; soils; slope stability; previous history of excavation and fill

placement; earthwork recommendations; and any other topics identified by the City, design engineer(s), geotechnical engineer, or project engineering geologist as relevant. The results of the study will be presented to the City in the form of an engineering geology/geotechnical report. The City will be responsible for ensuring that the recommendations and requirements of the site-specific geotechnical investigation are correctly implemented by the applicant.

a3. As discussed above, the project site could be subject to strong seismic groundshaking during the lifespan of the proposed project. The potential for seismic ground failure such as liquefaction is uncertain but if liquefaction were to occur, structural damage and corollary risks to public safety could be substantial. The site-specific geotechnical study described above would be necessary to determine the specific risks and to identify available mitigation measures to reduce hazards to a less-than-significant level. Implementation of Uniform Building Code requirements in combination with Mitigation Measure GEO-1 is required.

a4. Topography at and surrounding the project site is very gentle, and the existing risk of landslide at the site is considered minimal. Impacts would be reduced to a less-than-significant level with implementation of Uniform Building Code requirements in combination with Mitigation Measure GEO-1.

b. Soil erosion can accelerate the delivery of sediment to surface waters, degrading water quality. It can also contribute to loss of topsoil resources. However, at approximately 155 acres, the Machado site is large enough that the project proponent will be required to prepare and implement a storm water pollution prevention plan (SWPPP) that provides best management practices to control soil erosion during project construction. Compliance with Uniform Building Code standards regarding finished site contouring and drainage is expected to effectively manage postconstruction (operational) runoff to avoid excessive erosion once the proposed development is in use. Consequently, project-related increases in soil erosion are expected to be less than significant.

There are two principal concerns related to loss of topsoil: (1) topsoil is a key component of a healthy, functional ecosystem, and (2) topsoil is an essential resource to support agriculture. In the case of the Machado site, which is currently under cultivation and has been cultivated for some time, the most apparent loss would be topsoil as an agricultural resource. However, maintaining a site's soil profile intact retains the maximum flexibility of options in terms of future land uses; removing topsoil substantially hinders any future use as natural open space, so the loss of topsoil as an ecosystem resource is also important for this site. The proposed project would result in the conversion of some 155 undeveloped acres to developed uses. Depending on final project design, the project site's existing topsoil resource would be removed during project earthwork, although it may be redistributed onsite. Removal of topsoil would represent a substantial loss of topsoil resources and is a significant impact. The impact would be reduced to a less-than-significant level by implementation of the following mitigation measure.

Mitigation Measure GEO-2: Stockpile Excavated Topsoil for Onsite Reuse. The proponent will require the contractor(s) retained for project construction and landscaping to stockpile excavated topsoil so it can be reused for revegetation and landscaping on the project site.

c. Earthwork during project construction would temporarily create slopes that could be unstable if improperly designed or constructed. However, impacts related to the potential for project construction to cause or increase instability are expected to be less than significant with implementation of Uniform Building Code requirements in combination with Mitigation Measure GEO-1.

d. Based on preliminary literature investigations, none of the site soils has been identified as expansive. Impacts related to expansive soils are therefore expected to be less than significant, and no mitigation is required.

e. The proposed Machado development is planned to connect to City sewer service and storm drains. There would be no impact related to septic system or alternative wastewater disposal needs. No mitigation is required.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VII.	**HAZARDS AND HAZARDOUS MATERIALS.** Would the project:				
a.	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	❑	■	❑	❑
b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	❑	■	❑	❑
c.	Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	❑	❑	❑	■
d.	Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	■	❑	❑	❑
e.	Be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?	❑	❑	❑	■
f.	Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?	❑	❑	❑	■
g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	❑	■	❑	❑
h.	Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	❑	❑	■	❑

Impact Discussion

a, b. Construction of the proposed project could expose construction workers, the public, or the environment to hazardous materials through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Small quantities of potentially toxic substances (e.g., petroleum and other chemicals used to operate and maintain construction equipment) would be used and disposed of at the project site and transported to and from the site during construction. Accidental releases of small quantities of these substances could contaminate soils and degrade the quality of surface water and groundwater, resulting in a public safety hazard.

In addition, construction of the proposed project site requires excavation and movement of soils. Although the General Plan EIR (City of Manteca 2003b) indicated that no Superfund or Cortese sites are present within Manteca, it is possible that potentially hazardous sites are located within the PUSA, within which the project site is included. No hazardous records searches have been performed for the project site. Unknown hazardous sites have the potential to create a significant hazard to construction workers, the public, and the environment if they are encountered during construction of the proposed project.

Additionally, hazardous levels of agricultural chemicals may be present on the site as the site is currently in agricultural production. Agricultural chemicals have the potential to significantly impact construction workers on these projects. This impact is potentially significant. Mitigation Measures HAZ-1a to 1d and HAZ-2 will reduce these impacts to a less-than than-significant level.

Mitigation Measure HAZ-1a: Follow Manteca Fire Department and Other Guidelines for Storage and Handling of Hazardous Materials. The City shall require that contractors transport, store, and handle hazardous materials required for construction in a manner consistent with relevant regulations and guidelines, including those recommended and enforced by the Manteca Fire Department (MFD).

Mitigation Measure HAZ-1b: Immediately Contain Spills, Excavate Spill-Contaminated Soil, and Dispose of It at an Approved Facility. In the event of a spill of hazardous materials in an amount reportable to the MFD (as established by MFD guidelines), the contractor shall immediately control the source of the leak and contain the spill. If required by the MFD or other regulatory agencies, contaminated soils will be excavated and disposed of offsite at a facility approved to accept such soils.

Mitigation Measure HAZ-1c: Perform Hazards Records Search Prior to Development of Project Site and Implement Necessary Remediation. Prior to development of project site, the City will perform hazardous records searches to determine whether the site is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could create a significant hazard to the

public or the environment. If any hazardous sites are discovered, the City will implement necessary remediation actions as required by law before developing the site.

Mitigation Measure HAZ-1d: Screen Surface Soils in the Project Area for Residuals from Agricultural Chemicals (Fertilizers and Pesticides). To reduce the potential for human exposure to potentially harmful pesticide and fertilizer residues, surface soils in the area shall be sampled or field screened by a qualified hazardous materials consultant for residuals from agricultural chemicals (fertilizers and pesticides) during construction. The San Joaquin County Environmental Health Department shall review the results of soils sampling or screening and shall identify appropriate handling in accordance with the department's guidelines.

In the event that soil sampling or field screening indicates the presence of hazardous concentrations of agricultural chemicals, then the following measures shall apply. Project activities shall not be performed within lands where agricultural chemicals have been applied until completion of the restricted access period. The use of appropriate personal protective gear shall be required when working within or adjacent to agricultural lands during the 30 days following the application of agricultural chemicals.

Mitigation Measure HAZ-2: Develop and Implement Plans to Reduce Exposure of People and the Environment to Hazardous Conditions during Construction Activities. The City shall require the applicant to develop plans to prevent the pollution of surface water and groundwater and to promote the health and safety of workers and other people in the project vicinity. These programs shall include an operations and maintenance plan, a site-specific safety plan, and a fire prevention plan, in addition to the SWPPP required for hydrology impacts. The programs are required by law and shall require approval by several responsible agencies. Required approvals are as follows: the SWPPP shall be approved by the Regional Water Quality Control Board; the site-specific safety plan and the operations and maintenance plan shall be approved by the California Occupational Safety and Health Administration (Cal-OSHA). The fire safety plan shall be approved by the MFD.

The City shall also require the applicant to develop and implement a hazardous materials management plan that addresses public health and safety issues by providing safety measures, including release prevention measures; employee training, notification, and evacuation procedures; and adequate emergency response protocols and cleanup procedures.

Finally, the City shall require the applicant and its designated contractors to comply with Cal-OSHA and federal standards, for the storage and handling of fuels, flammable materials, and common construction-related hazardous materials and for fire prevention. Cal-OSHA requirements can be found in the

California Labor Code, Division 5, Chapter 2.5. Federal standards can be found in Occupational Safety and Health Administration Regulations, Standards (29 CFR).

c. A new school is proposed across Airport Way within 500 feet south of Peach Avenue, but the project, a residential development, would not involve the handling of hazardous materials or the creation of hazardous emissions. There would be no impact.

d. As noted in checklist discussion "a, b," although the General Plan EIR indicated that no Superfund or Cortese sites are present within Manteca, it is possible that potentially hazardous sites are located within the PUSA, within which the project is included. No hazardous records searches have been performed for the project site. Locating the project on a listed site would be a potentially significant impact. Performance of such a search as required in Mitigation Measure HAZ-1c would allow determination of whether there is a significant impact.

e, f. The project site is not located within 2 miles of any public airports or private airstrips, and does not fall within an airport land use plan area. There would be no impacts. No mitigation is required.

g. The proposed project is not expected to result in long-term modifications to existing circulation. Short-term lane closures or slight detours during project construction may be required, which have the potential to interfere with the implementation of emergency response or evacuation plans. This impact is potentially significant. Mitigation Measure HAZ-3 would reduce the impact to a less-than-significant level.

> **Mitigation Measure HAZ-3: Incorporate Emergency Access Routes during Construction.** The MFD shall have oversight on emergency access during construction of the program elements. The MFD will verify that adequate emergency access throughout the program area continues during project construction. The MFD and other emergency service providers will be notified of lane closures and detours at least 1 week in advance of the closure so that adequate alternate routes can be determined.

h. The proposed project site is currently agricultural land. No wildlands are located within or adjacent to the project site. Fires due to the presence of agricultural lands represent a less-than-significant impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VIII.	**HYDROLOGY AND WATER QUALITY.** Would the project:				
a.	Violate any water quality standards or waste discharge requirements?	❑	■	❑	❑
b.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	❑	❑	■	❑
c.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?	❑	❑	■	❑
d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?	❑	❑	■	❑
e.	Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	■	❑	❑	❑
f.	Otherwise substantially degrade water quality?	❑	■	❑	❑
g.	Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	❑	❑	❑	■
h.	Place within a 100-year flood hazard area structures that would impede or redirect floodflows?	❑	❑	❑	■
i.	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	❑	❑	■	□

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
j.	Contribute to inundation by seiche, tsunami, or mudflow?	❑	❑	☐	■

Setting

Surface Water Hydrology

The San Joaquin River is the major drainage feature in the area and flows approximately 1 mile to the west. Manteca is located on the relatively higher ground between Lone Tree Creek to the north, the Stanislaus River to the south, and the San Joaquin River to the southwest and west. The SSJID operates drainage facilities that pass through Manteca and carry a portion of the City's drainage. Because of topography, drainage facilities generally follow along an east-to-west alignment. Storm drainage is gravity discharged from the project area north to French Camp Canal. The Sacramento River–San Joaquin River Delta is the ultimate destination of drainage carried by French Camp Slough.

Groundwater Hydrology

The proposed project lies within the Eastern San Joaquin Subbasin, which is part of the San Joaquin Valley Groundwater Basin. The Eastern San Joaquin Subbasin has a surface area of 707,000 acres, or 1,110 square miles (California Department of Water Resources 2003). Groundwater level trends have seen a decline over the last 40 years of monitoring. Data shows that levels have declined at an average rate of 1.7 feet per year and have dropped as much as 100 feet in some areas (California Department of Water Resources 2003). According to California Department of Water Resources (DWR) Bulletin 118 (2003), overdraft over the last 40 years has reduced storage by as much as 2 million acre-feet. Manteca contains areas of locally high groundwater, with shallow groundwater encountered in certain locations at depths of 2 to 10 feet below ground surface (California Department of Water Resources 2005).

Surface Water Quality

Surrounding land uses largely affect surface water quality, with both point-source and non-point-source discharges contributing contaminants to surface waters. Water quality impacts from construction sites are of particular concern. Grading for construction activity removes vegetation and exposes soil to wind and water erosion. The erosion can result in sedimentation that ultimately flows into

surface waters. Other contaminants in urban runoff include hydrocarbons, metals, pesticides, bacteria, and trash. Runoff from agricultural areas is characterized by constituents such as fertilizers, herbicides, and pesticides and often contains bacteria, high nutrient content, and dissolved solids.

Groundwater Quality

In the Manteca area, groundwater wells produce water that generally meets or exceeds all Title 22 primary drinking water standards. Some wells have exhibited taste and odor problems as a result of high iron and manganese levels. In addition, one well in the eastern portion of Manteca has produced water containing dibromochlorophropoane (DBCP), an agricultural pesticide; however, a wellhead treatment system has been installed on this well such that it meets state drinking water standards. Finally, recent changes in federal drinking water standards have lowered the maximum contaminant level for arsenic from 50 micrograms per liter (µg/l) to 10 µg/l; Manteca's wells average about 12.4 µg/l and will require additional treatment.

Flooding

The Federal Emergency Management Agency categorizes flood-prone areas based on the frequency of occurrence. The proposed project site is not located in the 100-year flood zone. Most, if not all, of the site is located in the 500-year flood zone. Section 8589.5 of the California Government Code requires local jurisdictions to adopt emergency procedures for the evacuation of populated inundation areas identified by dam owners. The San Joaquin County Office of Emergency Services has prepared a dam failure plan. This plan includes a description of dams, direction of floodwaters, responsibilities of local jurisdictions, and evacuation plans.

Water Supply

The City receives its water supply from two sources: groundwater from local wells and surface water supplied by SSJID. The local groundwater basin is considered to be subject to "critical conditions of overdraft" (California Department of Water Resources 2003). SSJID's surface water supplies are obtained from the Stanislaus River through pre-1914 water rights and post-1914 appropriative rights for direct diversion and diversion to storage. SSJID operates a water treatment plant near SSJID's Woodward Reservoir; treated water is then conveyed to Manteca through a series of pipelines.

Historically, the City has relied upon groundwater as it sole source of potable water supply. Groundwater has provided a safe, reliable, and sustainable supply for decades. However, as growth has continued, the groundwater basin has exhibited overdraft, resulting in declining water tables throughout San Joaquin County. SSJID, in conjunction with the Cities of Manteca, Tracy, Lathrop, and

Escalon, has undertaken construction of a surface water supply project, including a new water treatment plant and transmission infrastructure to address the basin overdraft.

Construction of the SSJID project was initiated in 2004, and initial surface water deliveries to the City began in August 2005. All future City water supply scenarios include a conjunctive use balance of groundwater and treated surface water based on groundwater extraction limited to 1 acre-foot per acre per year. The SSJID project will provide the additional supply required to meet City demands. The SSJlD project will provide supplies to address groundwater overdraft and provide a sustainable water supply as follows:

- 13,790 acre-feet/year of sustainable groundwater supply,
- 15,550 acre-feet/year in the PUSA area and 3,000 acre-feet/year exceeding the 53% contribution of surface water supply, and
- 32,340 acre-feet/year of total water supply.

The SSJlD water treatment plant will have the capacity to deliver the full allotment of Phase 1 water.

Tables 5 to 7 below (Tables 4-2, 4-3, and 4-8 from the water supply assessment included in the Manteca Draft Water Management Plan [Kennedy/Jenks Consultants 2004]) summarize the balance of groundwater and surface water supplies for the planning periods through buildout of the PUSA. Adequate water is available to serve all development planned under the General Plan (City of Manteca 2003a), which includes the proposed project.

Table 5. Existing Water Supply Versus Demand

2005 Demand Criteria	Surface Water (mgd)	Groundwater (mgd)	Storage[a] (mgd)	Total (mgd)
Average Day Demand (13.83 mgd)	7.33	6.5	–	13.83
Maximum Day Demand (27.66 mgd)	8.06	19.61	–	27.67
Peak Hour Demand (38.72 mgd)	8.06	19.61	11.06	38.73
Redundancy (15% Groundwater)	–	2.94	–	2.94

[a] Storage may be supplied from tanks or groundwater wells.

Table 6. 2010 Water Supply Versus Demand

2010 Demand Criteria	Surface Water (mgd)	Groundwater (mgd)	Storagea (mgd)	Total (mgd)
Average Day Demand (16.34 mgd)	8.67	7.68	–	16.35
Maximum Day Demand (32.69 mgd)	9.53	23.17	–	32.69
Peak Hour Demand (45.77 mgd)	9.53	23.17	13.08	45.78
Redundancy (15% Groundwater)	–	3.48	–	3.40

[a] Storage may be supplied from tanks or groundwater wells.

Table 7. Buildout Water Supply Versus Demand

Buildout Demand Criteria	Surface Water (mgd)	Groundwater (mgd)	Storage[a] (mgd)	Total (mgd)
Average Day Demand (43.65 mgd)	18.17	25.48	–	43.65
Maximum Day Demand (87.30 mgd)	18.17	69.13	–	87.30
Peak Hour Demand (122.22 mgd)	18.17	69.13	34.92	122.22
Redundancy (15% Groundwater)	–	10.37	–	10.37

[a] Storage may be supplied from tanks or groundwater wells.

Impact Discussion

a. The proposed project will be implemented in accordance with all applicable water quality standards and waste discharge requirements, which will ensure that the quality and quantity of surface water flowing from the site would not be substantially affected. The project involves residential development, which would not discharge any hazardous materials into surface or subsurface water bodies. Household hazardous wastes would be disposed of in accordance with local waste requirements and programs. Implementation of Mitigation Measure HAZ-2 will ensure that this impact is less than significant.

b. The City has prepared a draft water management plan, containing a water supply assessment, as summarized above. With improvements under construction and planned in the future, including increased access to surface water, the City has adequate water supplies to serve all planned development under the General Plan, which includes the proposed project, without contributing to the overdraft of the regional acquifer. There will be no significant impact.

c. As noted in the "Geology and Soils" section of this chapter, soil erosion can accelerate the delivery of sediment to surface waters, degrading water quality. It can also contribute to loss of topsoil resources. However, at approximately 155 acres, the Machado site is large enough that the project proponent will be required to prepare and implement a SWPPP that provides best management practices to control soil erosion during project construction. Compliance with Uniform Building Code standards regarding finished site contouring and drainage is expected to effectively manage postconstruction (operational) runoff to avoid excessive erosion once the proposed development is in use. Consequently, project-related increases in soil erosion are expected to be less than significant.

d. The proposed project would result in a substantial increase in impervious surfaces from streets and homes. Because of this, the project has the potential to substantially increase the rate or amount of surface runoff in a manner that could result in flooding onsite or offsite. This impact is potentially significant. Detailed drainage plans will need to be provided by the applicant and evaluated

before a significance determination can be made and appropriate mitigation measures, if required, can be developed.

e. The project site is currently agricultural land and contains permeable soils. The proposed project would substantially increase the amount of impermeable surfaces on the project site through development of the proposed project. The project would contribute to increased sources of polluted runoff during wet weather conditions from urban pollutants that are collected and transported to local drainage infrastructure, including trash, debris, rubber, greases, oils, and other vehicular fluids that leak on surface parking areas. This impact is potentially significant. Detailed drainage plans will need to be provided by the applicant and evaluated before a significance determination can be made and appropriate mitigation measures, if required, can be developed.

f. The proposed project would not otherwise substantially degrade water quality. Implementation of Mitigation Measure HAZ-2, requiring the project applicant to conform with all applicable water quality standards and waste discharge requirements relative to construction activities and runoff from parking lots or other onsite facilities, will ensure that this impact is less than significant. No other potential sources would contribute to water quality degradation.

g, h. The proposed project site is not located within a 100-year flood zone. There would be no impacts.

i. The proposed project site is not located in the 100-year flood zone. Most, if not all, of the site is located in the 500-year flood zone. Section 8589.5 of the California Government Code requires local jurisdictions to adopt emergency procedures for the evacuation of populated inundation areas identified by dam owners. The San Joaquin County Office of Emergency Services has prepared a dam failure plan. This plan includes a description of dams, direction of floodwaters, responsibilities of local jurisdictions, and evacuation plans. As a result of measures already in place, this impact would be less than significant.

j. The project site is not located near any significantly sized enclosed body of water or coastal area and is therefore not susceptible to a seiche or tsunami. The site is not located at the foot of any significant topographical feature with the potential to be subject to a mudflow. There would be no impact.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IX.	**LAND USE AND PLANNING.** Would the project:				
a.	Physically divide an established community?	❑	❑	❑	■
b.	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	❑	❑	■	❑
c.	Conflict with any applicable habitat conservation plan or natural community conservation plan?	❑	■	❑	❑

Impact Discussion

a. The proposed project is located at the edge of the current urban development in Manteca. The project is located directly adjacent to an existing residential development, and construction of the project would extend the existing community. The project would not physically divide an established community. There would be no impact. No mitigation is required.

b. The proposed project site is currently zoned as AG-40 (General Agriculture, 40 acre parcel minimum). The land is designated as A/G, General Agriculture. This designation applies to areas suitable for agriculture outside areas planned for urban development where the soils are capable of producing a wide variety of crops or supporting grazing, parcel sizes are generally large enough to support commercial agricultural activities, and there exists a commitment to commercial agriculture in the form of Williamson Act contracts or capital investments. The proposed project would not be consistent with the existing land use designation or zoning. The project proponents propose to rezone the land to R-1 (Residential). With the proposed prezoning, this impact is less than significant.

c. The project site is located within the PUSA of the City. The City is a signatory to the SJMSCP (San Joaquin County Community Development Department 2000). Potential impacts on SJMSCP-covered species (Swainson's hawk and migratory birds) are addressed in section IV, "Biological Resources," of this chapter. The project would therefore not conflict with the habitat conservation plan**.**

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
X.	**MINERAL RESOURCES.** Would the project:				
a.	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	❑	❑	❑	■
b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	❑	❑	❑	■

Impact Discussion

a, b. The California Geological Survey classifies Manteca, including the proposed project area, as Mineral Resource Zone 1. This classification indicates areas where adequate information indicates that no significant mineral deposits are present (California Division of Mines and Geology 1988). For this reason, there would be no impacts on mineral resources.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XI.	**NOISE.** Would the project:				
a.	Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?	■	❑	❑	❑
b.	Expose persons to or generate excessive groundborne vibration or groundborne noise levels?	❑	❑	■	❑
c.	Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	■	❑	❑	❑
d.	Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	■	❑	❑	❑
e.	Be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■
f.	Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■

Setting

The project site comprises agricultural land, with scattered residences. Sources of noise in the area include traffic on adjacent roadways, agricultural activities, and wildlife. Sensitive receptors in the area of the proposed project include existing residences. Future proposed residences would also be sensitive receptors for noise.

Impact Discussion

a, c. The proposed project could potentially expose receptors to significant noise. Existing residential receptors would be exposed to noise increases associated with traffic increases from the proposed project, and future residents could potentially be impacted by noise from major arterial roadways adjacent to the

proposed residential development and other surrounding noise sources. The noise increases would need to be quantified using modeling based on project-specific trip generation rates to determine whether the project related noise would violate the applicable standards and to determine appropriate mitigation measures if required. These impacts are considered potentially significant.

b. The proposed project would not be expected to result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. No sources of groundborne noise, such as pile driving, are proposed as part of the project. Standard construction activities, such as grading, excavation, and site preparation, are not expected to generate significant vibration or groundborne noise. No significant impacts are anticipated.

d. Temporary noise impacts could occur from construction of the project. A project of this magnitude would require extensive construction activities onsite for several months at a time. Although there are not any noise-sensitive receptors currently in close proximity to the proposed project, as construction progresses, future residents may be exposed to ongoing construction activities. A detailed noise study will need to be conducted to evaluate noise impacts from the project and to determine appropriate mitigation measures if required. This impact is considered potentially significant.

e. The proposed project is not located within an airport land use plan or within 2 miles of a public use airport. Therefore, the project would not have the potential to expose people to excessive noise levels from aircraft. No impacts would occur.

f. The proposed project is not located within the vicinity of the private airstrip. Therefore, the project would not have the potential to expose people to excessive noise levels. No impacts would occur.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XII.	**POPULATION AND HOUSING.** Would the project:				
a.	Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	❑	❑	■	❑
b.	Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere?	❑	❑	■	❑
c.	Displace a substantial number of people, necessitating the construction of replacement housing elsewhere?	❑	❑	■	❑

Impact Discussion

a. The proposed project would represent an increase of 559 single-family homes in the area. This would represent an additional 1,716 people total to Manteca, using the average household size of 3.07 people cited in the General Plan (City of Manteca 2003a) multiplied by 559 residential units. The General Plan designates the project area for Low Density Residential, and the project implements planned growth as planned for in the General Plan. Surrounding areas are also designated as Low Density Residential, and applications have been filed for development of some of these lands. Therefore, the proposed project will not induce additional population growth by itself. This impact is considered less than significant on a project level. The General Plan and General Plan EIR provide for and address future growth in the City's sphere of influence. The project would be consistent with the City's growth plans and would not result in substantial growth above and beyond what is planned for in the General Plan.

b, c. The proposed project calls for the demolition of the two existing structures located in the project area. Although these residences would be removed, it alone does not qualify as a substantial displacement of either housing units or people. Consequently, these impacts are considered less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIII.	**PUBLIC SERVICES.** Would the project:				
a.	Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:				
	Fire protection?	❑	❑	■	❑
	Police protection?	❑	❑	■	❑
	Schools?	❑	■	❑	❑
	Parks?	❑	❑	■	❑
	Other public facilities?	❑	❑	■	❑

Impact Discussion

a1. The MFD serves Manteca, including the project area (City of Manteca 2005a). The Insurance Services Office has rated Manteca as a Class 3 on a scale of 9. Manteca shares the second-best rating in the county and is rated in the top 15% of fire departments in San Joaquin County.

The MFD responds to emergencies and calls for service from three fire stations located within the City limits. It is also the responsibility of the MFD to provide emergency medical services to customers. To maintain a standard level of care, all fire personnel are trained and certified Emergency Medical Technician-1 (EMT) and EMT-D.

MFD goals are to maintain a 5-minute response time for all emergencies and to keep all engine and ladder companies staffed with a minimum of three personnel (City of Manteca 2003a). Fire Station 242, located at Union Road, approximately 0.25 mile north of SR 120, would provide the first response to emergencies in the proposed project area. The response time will be less than 5 minutes, and no additional fire station is needed. This impact is less than significant.

a2. The Manteca Police Department (MPD) serves Manteca, including the project area, with more than 70 sworn officers, 30 civilian staff members, and volunteer

workers (City of Manteca 2005b). The MPD provides crime prevention for the residents of Manteca through community policing, neighborhood watch, proactive enforcement, and citizen involvement.

The only Manteca police station is located 2.8 miles northeast of the proposed project area. The MPD has tentative plans for the construction of a new station near the intersection of South Main Street and SR 120 within the next 18 months to 5 years. This facility would replace the existing police station. Police response times are less related to the location of the station, however, and more related to the location of officers during their daily patrols. There are no known issues with officers responding in a timely manner to calls south of SR 120 and the proposed project area (Halford pers. comm.).

a3. Within the urban area of Manteca, the Manteca Unified School District (MUSD) contains three high schools, 20 elementary schools, one adult education school, and two continuation high schools. The closest high school to the project area is Sierra High School, located 1.7 miles to the northeast. Veritas Elementary School is located 1 mile east of the proposed project site (Manteca Unified School District 2005). Projected increases in enrollment of these schools is based on an average number of students per residential unit in the proposed project area, as shown in Table 8.

Table 8. Projected School Enrollment

Grade Level	Calculation		Subtotal
K–6	0.534 students x 559 single-family residences	=	299
7–8	0.147 students x 559 single-family residences	=	82
9–12	0.267 students x 559 single-family residences	=	149
Total	0.948 students x 559 single-family residences	=	**530**

According to the General Plan EIR, the MUSD will select the location of additional new schools based on the location of new residential developments in the area. Implementation of the following mitigation measure will ensure that this impact is less than significant.

> **Mitigation Measure PUB-1: Require Payment of School Development Fees.** The project proponent shall pay the required school development fees.

a4, a5. The City's Parks and Recreation Department operates and maintains 275 acres of neighborhood and community parks, along with the Tidewater Bike Way, skate park, and senior center. It also oversees the operations of the 18-hole municipal golf course and library services for the City. The closest existing park facility to the proposed project area is Bella Vista Park, located approximately 0.25 mile to the north (City of Manteca 2005c).

To offset the demands placed on existing recreational and other public facilities in the City, the proposed project includes the development of a 16.61-acre linear park/detention basin within the housing development. With a projected

population of 1,716, using the average household size of 3.07 people cited in the General Plan multiplied by 559 residential units, this maintains the City policy of 5 acres of parkland for every 1,000 residents (General Plan Policy PF-P-49). In addition, according to Chapter 3.20, "Park Acquisition and Improvements Fees," of the City's Municipal Code, all new developers will pay the City a park acquisition and improvement fee to finance systemwide improvements. As a result, these impacts are considered less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIV.	**RECREATION.** Would the project:				
a.	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	❑	■	❑	❑
b.	Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	❑	❑	■	❑

Impact Discussion

a, b. The City's Parks and Recreation Department operates and maintains 275 acres of neighborhood and community parks, along with the Tidewater Bike Way, skate park, and senior center. It also oversees the operations of the 18-hole municipal golf course and library services for the City. The closest existing park facility to the proposed project area is Bella Vista Park, located approximately 0.25 mile to the north (City of Manteca 2005c). The projected population for the proposed project area is 1,716 people, using the average Manteca household size of 3.07 people as cited in the General Plan (City of Manteca 2003a) multiplied by 559 residential units. The population growth associated with the proposed project would increase the use of existing park facilities in the area.

To offset the demands placed on existing recreational facilities in the City, the proposed project includes the development of a 16.61-acre park/detention basin within the housing development. In addition implementation of the following mitigation measure will ensure that these impacts are less than significant.

Mitigation Measure REC-1: Pay Park Acquisition and Improvement Fee. The project applicants shall comply with Policy PF-P-53 of the General Plan, which requires payment of a park acquisition and improvement fee to fund systemwide improvements.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XV.	**TRANSPORTATION/TRAFFIC.** Would the project:				
a.	Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	■	❑	❑	❑
b.	Cause, either individually or cumulatively, exceedance of a level-of-service standard established by the county congestion management agency for designated roads or highways?	■	❑	❑	❑
c.	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	❑	❑	❑	■
d.	Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	❑	■	❑	❑
e.	Result in inadequate emergency access?	❑	■	❑	❑
f.	Result in inadequate parking capacity?	❑	■	❑	❑
g.	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	❑	❑	❑	■

Setting

The project site is located adjacent to the south city limits and is bordered by Woodward Avenue to the north, South Airport Way to the east, and agricultural land to the south and west. The study area for the transportation analysis includes South Airport Way and East Woodward Avenue at the proposed project site, and other roadways in the project vicinity that could potentially be affected by construction traffic or operations traffic generated by the completed project.

Methodology

Level of Service

Level of service (LOS) is a quantitative measure and is the primary measure used to determine the operating condition of a roadway segment or intersection. LOS is calculated by comparing the volume of vehicles using the facility to its capacity (i.e., volume-to-capacity ratio [V/C]) or by the average delay experienced by vehicles on the facility. The Highway Capacity Manual (Transportation Research Board 2000) is the recognized source for the techniques used to measure transportation facility performance. Using Highway Capacity Manual procedures, the quality of traffic operation is graded into one of six levels of service: A to F. LOS A and B represent the best traffic operation. LOS C and D represent intermediate operation. LOS E means a facility is approaching capacity. LOS F represents high levels of traffic congestion.

The General Plan (City of Manteca 2003a) establishes LOS procedures for both roadway segments and intersections. Roadway segment LOS is based on traffic volume reference charts developed by the authors of the Highway Capacity Manual for the Florida Department of Transportation that have been determined to be transferable to other states and accepted by the California Department of Transportation. These charts employ assumptions regarding signal spacing, peak-hour to daily volume ratios, roadway width, presence of turn lanes, and other factors that affect roadway operations. The resulting LOS thresholds for arterial roadway segments are shown in Table 9.

Table 9. Arterial Roadway Segment Level of Service Standards (Daily Volumes)

Number of Lanes	LOS C	LOS D	LOS E
2	9,100	14,600	15,600
4	21,400	31,100	32,900
6	33,400	46,800	49,300

Source: City of Manteca 2003a.

At signalized intersections, traffic conditions are evaluated using Highway Capacity Manual methods. The operations analysis uses various intersection characteristics such as traffic volumes, lane geometry, and signal phasing to estimate the average delay experienced by motorists traveling through an intersection. Table 10 summarizes the relationship between delay and LOS for signalized intersections.

Table 10. Signalized Intersection Level of Service Criteria

LOS	Description	Average Control Delay (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	<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 delay due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	>35.0 to 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered the limit of acceptable delay.	>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: City of Manteca 2003a.

Level of Service Standard

LOS standards are used to evaluate the transportation impacts of long-term growth. To monitor roadway operations, cities and counties adopt standards by which the minimum acceptable roadway operating conditions are determined and deficiencies may be identified.

The City has adopted a standard of LOS C for average citywide transportation operations and a minimum of LOS D at any individual location (City of Manteca 2003a).

Thresholds of Significance

The following traffic characteristics were examined to determine the level of significance of impacts that may be generated by the proposed project:

- **Traffic Volume and Level of Service:** Traffic increases are considered significant if they result in violation of the City's LOS standard.
- **Safety:** Safety impacts are considered significant if design elements of the project or project construction would result in conditions that would increase the risk of accidents, either for vehicular or nonmotorized traffic. Elements that could result in safety impacts include poor sight distance, sharp curves, or substantial speed differentials.
- **Emergency Access and Circulation:** Adequate emergency access routes must be maintained at all times during construction and after the project is

completed. A significant impact would occur if the project failed to maintain emergency access and circulation at all times or caused an increase in response times.

- **Parking:** A significant impact would occur if construction worker vehicles or equipment encroached on existing privately owned parking spaces (unless the owner has expressly agreed to allow such use) or if the completed project causes an increase in demand for parking that cannot be accommodated with parking supply under project conditions.
- **Alternative Transportation:** A significant impact would occur if the project results in conflicts with alternative transportation policies, plans, or programs that have been adopted by the City.

Existing Conditions

Roadway System

The proposed project is located at the southwest quarter of the Woodward Avenue/Airport Way intersection. SR 120 is located to the north of the project site, running parallel to Woodward Avenue, and provides the most immediate access to the regional freeway system, with ramps located at South Airport Way. Table 11 shows the average annual daily traffic (AADT) of the freeways.

Table 11. Regional Freeways and Average Annual Daily Traffic

Freeway	Location	AADT
SR 120	Airport Way	59,000
SR 120	Main Street	51,000
Source: California Department of Transportation 2005.		

Arterial roadways in the vicinity of the project site include Airport Way to the east and Woodward Avenue to the north. Table 12 summarizes the traffic volumes and LOS of these roadways. As shown in Table 12, Airport Way segments operate below City's roadway LOS standards.

Table 12. Roadway Traffic Volumes and Level of Service

Roadway	Location	Existing Lanes	2001 Daily Traffic Counts	V/C Ratio	LOS
Airport Way	Wawona to SR 120	2	9,300	0.60	D
Woodward Avenue	Union to Main	2	3,700	0.24	C
Source: City of Manteca 2003b.					

In the General Plan, the City identifies five major intersections for LOS analysis:

- Lathrop Road/Airport Way
- Louise Avenue/Union Road
- Louise Avenue/Main Street
- Yosemite Avenue/Union Road
- Yosemite Avenue/Main Street

All are currently shown to operation at LOS C (City of Manteca 2003b).

Parking

Parking supply for the limited existing development in the project vicinity is primarily provided on-street or on private property. Field observation indicates that under existing conditions, parking supply in the project vicinity is sufficient to meet demand.

Transit

Transit service in Manteca is provided by the San Joaquin Regional Transit District (RTD) and Altamont Commuter Express (ACE).

RTD's Intercity Route 26 connects Manteca with Lathrop, Stockton, Ripon, Tracy, and Lodi. Hopper Routes 91 and 95 connects Manteca to French Camp, Lathrop, and Escalon. These three routes are served by the bus stop closest to the project site, located on South Main Street north of the SR 120 westbound ramps (San Joaquin Regional Transit District 2005).

ACE provides commuter rail service between Stockton and San Jose. The ACE Lathrop/Manteca Station is located near the intersection of Yosemite Avenue and McKinley Avenue. Connections are available at this station to the RTD bus routes and Modesto ACE Express bus systems (Altamont Commuter Express 2005).

Nonmotorized Transportation

Sidewalks and crosswalks are provided along most major streets within the City (City of Manteca 2003b). Currently, the project area primarily consists of agricultural and undeveloped land with no pedestrian facilities within the site. A Class II bike lane runs along Airport Way, along the east side of the project site (City of Manteca 2003c). The City's Bicycle Master Plan identifies additional future planned Class II bike lanes between Airport Way and Austin Road, south of Woodward Avenue in the general vicinity of the project site (City of Manteca 2003c).

Air Travel

No aviation facility is located within Manteca. The nearest commercial aviation facility is Stockton Metropolitan Airport, which is 11 miles north of Manteca (City of Manteca 2005d).

Rail

For rail freight, Manteca is served by the Union Pacific Railroad system. In addition to the ACE commuter rail described above, Amtrak provides passenger service from nearby stations in Stockton and Modesto (City of Manteca 2005d).

Impact Discussion

Potential transportation impacts and corresponding mitigation measures were considered for project construction and for operational conditions once the project construction is completed and the proposed development occupied.

a, b. **Construction:** Construction activities would generate construction-related traffic, which could create a temporary increase in localized traffic. Additionally, construction-related traffic could disrupt or reduce pedestrian, bicycle, and vehicular accessibility in the area along South Airport Way, East Woodward Avenue, and other neighborhood streets during construction hours.

The impact of construction-generated traffic on area traffic volumes and LOS is considered potentially significant, but can be reduced to a less-than-significant level with implementation of the following mitigation measure.

> **Mitigation Measure TRF-1: Develop and Implement a Traffic Control and Safety Plan for Project Construction.** The contractor shall mitigate the proposed project's construction-related traffic impacts by developing and implementing a traffic control plan as part of the overall construction management plan, in accordance with City policies. The traffic control plan will be implemented throughout the course of project construction and will include, but may not be limited to, the following elements:
>
> - Provide a plan for communicating construction plans with RTD, emergency service providers, residences located in the project vicinity, and anyone else who may be affected by project construction.
> - Identify roadway segments or intersections that are at or approaching LOS that exceeds local standards and provide for construction-generated traffic to avoid these locations at the peak periods, either by traveling different routes or by traveling at non-peak times of day.

- Maintain vehicular access to existing residences in the area at all times.
- Maintain existing nonmotorized access or provide detour and warning signs in construction area.
- Provide for adequate parking for construction trucks and equipment within the designated staging areas throughout the construction period.
- Provide adequate parking for construction workers within the designated staging areas.
- Restrict delivery of construction materials to between the hours of 9:00 a.m. and 3:00 p.m. to avoid more-congested morning and evening hours.
- Construction warning signs should be posted in accordance with local standards or those set forth in the Manual on Uniform Traffic Control Devices (Federal Highway Administration 2001) in advance of the construction area and at any intersection that provides access to the construction area.
- Require that written notification be provided to contractors regarding appropriate routes to and from the construction site, and the weight and speed limits on local roads used to access the construction site.
- Specify that a sign be posted at all active construction areas, giving the name and telephone number or email address of the City staff person designated to receive complaints regarding construction traffic.

Operation: The proposed development consists of 519 additional single-family homes. Traffic volumes expected to result from the proposed development were estimated using standard average trip generation rates for single-family detached housing development (Institute of Transportation Engineers 2003). Table 13 summarizes the estimated total vehicle trips generated by the proposed development in the AM peak hour, in the PM peak hour, and in a typical 24-hour period.

Table 13. Estimated Vehicle Trip Generation of Single-Family Detached Housing

	AM Peak Hour	PM Peak Hour	Daily (24-Hour)
Net increase in houses		559	
Trip Rate (trips per house)[a]	0.75	1.01	9.57
Total Generated Trips	**419**	**565**	**5,350**
Number of Trips In (percent of total)[a]	140 (25%)	356 (63%)	2,675 (50%)
Number of Trips Out (percent of total)[a]	279 (75%)	209 (37%)	2,675 (50%)

[a] Source: Institute of Transportation Engineers 2003, Single-Family Detached Housing (Land Use Code 210).

The table shows that the projected development would generate new vehicle trips that would increase traffic on the surrounding street system and potentially

degrade the roadway and intersection operations to exceed LOS standards. Therefore, operational traffic volume impacts are considered potentially significant.

The magnitude of operational traffic impact would be most adequately assessed through the preparation of a traffic impact analysis, which in addition to the specific development plan and associated trip generation estimates would take into account:

- the cumulative impact of project-generated traffic with traffic generated by other regional development; and
- future programmed roadway improvements that are independent of the proposed project.

A traffic impact analysis should be prepared that takes these factors into account for the year of project buildout, as well as the City's long-range planning horizon as defined by the current General Plan (currently 2023). This will allow the transportation impacts resulting from the proposed project to be identified, as well as any roadway improvements needed to mitigate those impacts.

c. Neither construction nor completion of the project is expected to have any effect on air traffic patterns. No impact is anticipated.

d. **Construction:** No obstacles to sight distance are expected to result from project construction. No sharp roadway curves currently exist in the project area, and no such curves would be created by the project. The maneuvering of construction-related vehicles and equipment among the general-purpose traffic on Airport Way and Woodward Avenue could cause safety hazards. This impact is considered potentially significant, but can be reduced to a less-than-significant level with implementation of Mitigation Measure TRF-1, described above.

Operation: Site design should ensure that City standards are met with regard to roadway widths, intersection sight distance, roadway curves, and adequate separation of vehicular and nonvehicular traffic. Therefore, no operational impact related to safety is anticipated.

e. **Construction:** Construction-related traffic could disrupt emergency response vehicles along Airport Way, Woodward Avenue, and other neighborhood streets during construction hours. This impact is considered potentially significant, but can be reduced to a less-than-significant level with implementation of Mitigation Measure TRF-1, described above.

Operation: The site will include multiple access points so that travelers accessing the site and emergency service providers will have numerous ways for access to and egress from the site. Therefore, no operational impact related to emergency access is anticipated.

f. **Construction:** The parking needs of construction trucks and commute trips for construction workers would increase the demand for parking in the study area

during construction. This impact is considered potentially significant, but can be reduced to a less-than-significant level with implementation of Mitigation Measure TRF-1, described above.

Operation: The City requires that all new development provide an adequate number of off-street parking spaces to accommodate the parking demand typical of the development type (City of Manteca 2003a). It is expected that the proposed development will comply with this policy. Therefore, no operational impacts on parking are anticipated.

g. This project would not conflict with alternative transportation policies, plans, or programs within the City. Because fixed-route transit service does not run adjacent to the project site, construction-related traffic is not expected to interfere with transit operations. Sidewalks completed as part of the project will be utilized by nonmotorized travelers, and if future planned Class II bike lanes are completed in the project vicinity, they will further support bicycle travel associated with the new development. Therefore, no impact on alternative transportation is anticipated.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVI.	**UTILITIES AND SERVICE SYSTEMS.** Would the project:				
a.	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	■	❑	❑	❑
b.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	■	❑	❑	❑
c.	Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	■	❑	❑	❑
d.	Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?	■	❑	❑	❑
e.	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	■	❑	❑	❑
f.	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	❑	❑	■	❑
g.	Comply with federal, state, and local statutes and regulations related to solid waste?	❑	❑	■	❑

Impact Discussion

a, b, e. The City's Wastewater Quality Control Facility (WQCF) is a 6.95-mgd rated, combined biofilter-activated sludge plant. Secondary effluent is land-applied during spring and summer (flood irrigation for alfalfa) and discharged into the San Joaquin River during fall and winter. Improvements to increase the capacity of the treatment facility to 10 mgd are slated for completion by December 2005. Ultimately, the City has plans to expand the WQCF to the capacity of 25 mgd. Future expansions will also bring higher treatment standards that will produce treated wastewater suitable for landscape irrigation.

The proposed project calls for sewage disposal to be connected to the City sewer system. The wastewater from the proposed project will flow by gravity to a pump station located north of Woodward Avenue, then be pumped to the WQCF. The infrastructure for the proposed project will include purple pipe for the distribution of treated wastewater to landscaped areas along Woodward Avenue.

The City has not provided a "will serve" letter or performed the studies required to determine whether the system will have adequate capacity to handle project flows. Determination of the significance of this impact cannot be made without the results of this study.

c. The City operates and maintains the storm drainage system, which serves the existing community. The system consists of approximately 170 miles of pipeline, 36 pump stations, and 35 detention basins. The SSJID operates drainage facilities that pass through Manteca and carry a portion of the City's drainage. Water from the SSJID, along with drainage pumped by the City, flows west into French Camp Canal, which eventually flows into French Camp Slough. Storm drainage is gravity-discharged from the project area north to French Camp Canal.

City policy requires construction of detention or retention basins to handle all onsite drainage in a new development (City of Manteca 2003a). Typically, 7% to 10% of the land area is required for onsite detention. The proposed project calls for a 16.61-acre park/detention basin to be constructed in the new development. A detailed site drainage study will be required to determine whether onsite facilities will be sufficient and whether the SSJID system has the capacity to handle site flows. Determination of the significance of this impact cannot be made without the results of this study.

d. The City provides water service for the existing community. Approximately 15,000 connection customers are served, with an average daily usage of 11 million gallons.

The City of Manteca, along with the Cities of Escalon, Tracy, and Lathrop, are participating in the SCSWSP. This project was developed to address future water needs through construction of a water treatment plant, transmission mains, surface storage reservoirs, and booster pump stations (Jones & Stokes 2005). The surface water and groundwater will be utilized in a conjunctive use program in which the surface water becomes the primary source of domestic water for the City. Groundwater will then be allowed to naturally recharge and replenish the groundwater basin. Wells will be operated only for ongoing maintenance and to augment the surface water supply during peak demand periods, although some new supplemental wells will be needed in developing areas (Kennedy/Jenks Consultants 2004). Manteca began receiving deliveries of water from SCSWSP in August 2005 (Jones & Stokes 2005). Further discussion of water supply is found in the "Hydrology and Water Quality" section of this checklist above.

To provide service to the growth planned for in the General Plan, including the proposed project area, the existing City water distribution system will be required to be extended. The proposed development will be connected to the Manteca

water system using 12- and 16-inch water distribution main pipelines along a grid of approximately 0.5- to 1-mile blocks (Kennedy/Jenks Consultants 2004). A water supply assessment will be required for this project. Determination of the significance of this impact cannot be made without the results of this study.

f. Solid waste is collected throughout the city by the City's Solid Waste Division and dumped at the Lovelace Solid Waste Transfer Station. Recyclable materials are sorted there, and green waste is delivered to the Austin Road/Forward Landfill. This landfill has a closure date of 2053 and has a remaining capacity of 1,608,752 cubic yards, which is adequate to serve the solid waste removal need of the project area (City of Manteca 2003b). This impact is less than significant.

g. The proposed project calls for the building of residential and park uses only; therefore, solid waste generated by the project will be limited to construction waste and household wastes. This waste is collected by the City and deposited at the Lovelace Solid Waste Transfer Station. Recyclable materials are sorted there, and green waste is delivered to the Austin Road/Forward Landfill. Single-family residences should not produce hazardous materials therefore, the project will comply with all federal, state, and local statutes and regulations related to solid waste. This impact is less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVII.	**MANDATORY FINDINGS OF SIGNIFICANCE.**				
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	■	❑	❑	❑
b.	Does the project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	■	❑	❑	❑
c.	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	■	❑	❑	❑

Impact Discussion

a. The proposed project could have potentially significant impacts that cannot be reduced to a less-than-significant level through mitigation measures identified in this document in the following areas: cultural resources and hazards.

b. The proposed project will have a cumulatively considerable contribution to significant cumulative impacts related to conversion of important farmland to urban uses.

c. In the following areas, additional study needs to be done to evaluate the significance of the potential impacts and development mitigation measures, if necessary and available:

- **Air Quality:** AQAP conformity study, URBEMIS modeling, CALINE modeling, and evaluation of conformance with SJVAPCD thresholds for contribution to cumulative impacts related to emissions of ROG and NO_X
- **Cultural Resources:** historical and archaeological resource studies

- **Geology:** site-specific geotechnical study
- **Hydrology and Hazards:** site drainage study
- **Noise:** construction and traffic noise study following completion of traffic impact study
- **Public Services:** wastewater and drainage studies, water supply assessment
- **Transportation:** traffic impact study

Chapter 4
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Personal Communications

Halford, Charles M. Chief of Police, City of Manteca Police Department, Manteca, CA. September 15, 2005—telephone conversation with John Jarecki, Jones & Stokes.

Chapter 5
List of Preparers

Name, Title	Role	Education	Experience
Jones & Stokes			
Sally Zeff, AICP Senior Planner	Project Director	M.U.P., Urban Planning B.A., Medieval Studies	24 years
Ellen Turpin-Dennig, Environmental Specialist	Project Manager, Section Author—Aesthetics, Agricultural Resources, Hazards/Hazardous Materials, Hydrology and Water Quality, Land Use and Planning	B.A., Integrative Biology	2 years
Angela Alcala, Biologist	Section Author—Biological Resources	B.S., Wildlife, Fisheries, Conservation Biology	7 years
Shahira Ashkar, Archaeologist	Section Author—Cultural Resources	M.A., Anthropology B.A., Anthropology	18 years
Jennifer Barnes, Environmental Scientist	Section Author—Transportation and Traffic	M.S., Civil Engineering B.S., Civil Engineering	15 years
Anna Buising, Environmental Specialist	Section Author—Geology and Soils, Paleontology	Ph.D., Geology B.S., Geology	19 years
Susan Bushnell, Senior Environmental Scientist	Senior Peer Review—Biological Resources	B.S., Conservation and Resource Studies	15 years
David S. Byrd, Architectural Historian	Section Author—Cultural Resources	M.A., History B.A., History	12 years
Jessica Cook Environmental Specialist	Section Author—Biological Resources	M.S., Botany and Plant Pathology B.S., Biology	6 months
Kathryn Haley, Historian	Section Author—Cultural Resources	M.A., Public History B.A., History (Public History)	2 years
Tim Messick, Graphic Artist	Preparation of Graphics and Figures	M.A., Biology B.A., Botany	23 years
Chris Small, Technical Editor	Technical Editing, Word Processing	B.A., English and Economics	6 years
Lynn Wall, Environmental Scientist	Section Author—Air Quality, Noise	B.S., Environmental Engineering	11 years

Name, Title	Role	Education	Experience
Taryn Wise-Harthorn, Environmental Specialist	Section Author—Mineral Resources, Population and Housing, Public Services, Recreation, Utilities and Service Systems	M.A., Anthropology B.S., Anthropology	2 years

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH
STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

May 3, 2007

To: Reviewing Agencies

Re: Machado Estates
SCH# 2007052023

Attached for your review and comment is the Notice of Preparation (NOP) for the Machado Estates draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

David HanHam
City of Manteca
1001 W. Center Street
Manteca, CA 95366

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Senior Planner, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2007052023
Project Title Machado Estates
Lead Agency Manteca, City of

Type NOP Notice of Preparation

Description The proposed project includes the Annexation, Prezoning, Development Agreement, Tentative Map, a planned unit development, and construction of the Machado Estates Subdivision. The project would subdivide approximately 158 acres into 575 single family lots. The project would include the removal of a single family home from the site.

Lead Agency Contact

Name David HanHam
Agency City of Manteca
Phone (209) 329-8463 **Fax**
email
Address 1001 W. Center Street
City Manteca **State** CA **Zip** 95366

Project Location

County San Joaquin
City Manteca
Region
Cross Streets South Airport Way and Woodward Avenue
Parcel No. 241-320-018
Township **Range** **Section** **Base**

Proximity to:

Highways SR 120
Airports
Railways Union Pacific
Waterways
Schools Sierra High School, Veritas Elementary
Land Use AU-40, General Agriculture on 40-acre parcel minimum, (San Joaquin County Zoning Code, LDR, Low Density Residential (City of Manteca General Plan Designation)

Project Issues Agricultural Land; Air Quality; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Noise; Septic System; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Water Quality; Growth Inducing; Cumulative Effects

Reviewing Agencies Resources Agency; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 2; Native American Heritage Commission; California Highway Patrol; Department of Housing and Community Development; Caltrans, District 10; Department of Toxic Substances Control; Regional Water Quality Control Bd., Region 5 (Sacramento)

Date Received 05/03/2007 **Start of Review** 05/03/2007 **End of Review** 06/01/2007

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: San Joaquin

SCH# 2007052023

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  David Johnson
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Gerald R. Zimmerman
- [ ] **Dept. of Conservation**
  Roseanne Taylor
- [ ] **California Energy Commission**
  Paul Richins
- [ ] **Dept. of Forestry & Fire Protection**
  Allen Robertson
- [ ] **Office of Historic Preservation**
  Wayne Donaldson
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **Reclamation Board**
  DeeDee Jones
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou
- [ ] _____
  Conservancy

Fish and Game

- [ ] **Depart. of Fish & Game**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Game Region 1**
  Donald Koch
- [ ] **Fish & Game Region 1E**
  Laurie Harnsberger
- [x] **Fish & Game Region 2**
  Banky Curtis
- [ ] **Fish & Game Region 3**
  Robert Floerke
- [ ] **Fish & Game Region 4**
  Julie Vance
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Gabrina Getchel
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Robert Sleppy
  Environmental Services Section
- [ ] **Dept. of Health Services**
  Veronica Malloy
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Debby Eddy
- [ ] **Office of Emergency Services**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Ken Lewis
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [ ] **State Lands Commission**
  Jean Sarino
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics**
  Sandy Hesnard
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [x] **California Highway Patrol**
  Shirley Kelly
  Office of Special Projects
- [x] **Housing & Community Development**
  Lisa Nichols
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Jeff Pulverman
- [ ] **Caltrans, District 4**
  Tim Sable
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Marc Birnbaum
- [ ] **Caltrans, District 7**
  Cheryl J. Powell
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [x] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Mario Orso
- [ ] **Caltrans, District 12**
  Bob Joseph

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
- [ ] Transportation Projects
  Ravi Ramalingam
- [ ] Industrial Projects
  Mike Tollstrup
- [ ] **California Integrated Waste Management Board**
  Sue O'Leary
- [ ] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [x] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [x] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** _____

Last Updated on 01/11/07

Form A

Notice of Completion & Environmental Document Transmittal

SCH # 2007052023

Mail to: State Clearinghouse, P. O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

Project Title: Machado Estates

Lead Agency: City of Manteca | Contact Person: David Hanham, Senior Planner
Mailing Address: 1001 W. Center Street | Phone: (209) 825-2346
City: Manteca, CA 95336 | Zip: 95366 | County: San Joaquin

Project Location:

County: San Joaquin | City/Nearest Community: Manteca, CA 95336 | Total Acres: 158
Cross Streets: South Airport Way and Woodward Ave | Zip Code: 95336
Assessor's Parcel No. 241-320-018 | Section: | Twp. | Range: | Base:
Within 2 Miles: State Hwy #: St Route 120 | Waterways:
Airports: | Railways: Union Pacific Railroad | Schools: Sierra High School, Veritas Elem School

Document Type:

CEQA: ☒ NOP ☐ Draft EIR
☐ Early Cons ☐ Supplement to EIR (Note prior SCH # below)
☐ Neg Dec ☐ Subsequent EIR (Note prior SCH # below)
☐ Mit Neg Dec ☐ Other

NEPA: ☐ NOI ☐ Other ☐ Joint Document
☐ EA ☐ Final Document
☐ Draft EIS ☐ Other
☐ FONSI

RECEIVED
MAY 03 2007
STATE CLEARING HOUSE

Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☒ Annexation
☐ General Plan Amendment ☐ Master Plan ☒ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☒ Land Division (Subdivision, etc.) ☐ Other

Development Type:

☐ Residential: Units 575 Acres 158
☐ Office: Sq.ft. Acres Employees
☐ Commercial: Sq.ft. Acres Employees
☐ Industrial: Sq.ft. Acres Employees
☐ Educational
☐ Recreational

☐ Water Facilities: Type MGD
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type MW
☐ Waste Treatment: Type MGD
☐ Hazardous Waste: Type
☐ Other:

Project Issues Discussed in Document:

☐ Aesthetic/Visual ☒ Fiscal ☐ Recreation/Parks ☐ Vegetation
☒ Agricultural Land ☒ Flood Plain/Flooding ☐ Schools/Universities ☒ Water Quality
☒ Air Quality ☐ Forest Land/Fire Hazard ☒ Septic Systems ☐ Water Supply/Groundwater
☐ Archeological/Historical ☒ Geologic/Seismic ☒ Sewer Capacity ☐ Wetland/Riparian
☐ Biological Resources ☐ Minerals ☒ Soil Erosion/Compaction/Grading ☒ Growth Inducement
☐ Coastal Zone ☒ Noise ☒ Solid Waste ☐ Land Use
☒ Drainage/Absorption ☐ Population/Housing Balance ☒ Toxic/Hazardous ☒ Cumulative Effects
☐ Economic/Jobs ☐ Public Services/Facilities ☒ Traffic/Circulation ☐ Other

Present Land Use/Zoning/General Plan Designation:

AU-40, General Agriculture on 40-acre parcel minimum, (San Joaquin County Zoning Code, LDR, Low Density Residential (City of Manteca General Plan Designation),

Project Description: *(please use a separate page if necessary)*

The proposed project includes the Annexation, Prezoning, Development Agreement, Tentative Map, a planned unit development, and construction of the Machado Estates Subdivision. The project would subdivide approximatly 158 acres into 575 single family lots. The project would include the removal of a single family home from the site.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

continued

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X". If you have already sent your document to the agency please denote that with an "S".

_____Air Resources Board
_____Boating & Waterways, Department of
_____California Highway Patrol
_____Caltrans District #_____
_____Caltrans Division of Aeronautics
_____Caltrans Planning
_____Coachella Valley Mountains Conservancy
_____Coastal Commission
_____Colorado River Board Commission
_____Conservation, Department of
_____Corrections, Department of
_____Delta Protection Commission
_____Education, Department of
_____Office of Public School Construction
_____Energy Commission
_____Fish & Game Region # _____
_____Food & Agriculture, Department of
_____Forestry & Fire Protection
_____General Services, Department of
_____Health Services, Department of
_____Housing & Community Development
_____Integrated Waste Management Board
_____Native American Heritage Commission
_____Office of Emergency Services
_____Office of Historic Preservation
_____Parks & Recreation
_____Pesticide Regulation, Department of
_____Public Utilities Commission
_____Reclamation Board
_____Regional WQCB #_____
_____Resources Agency
_____S.F. Bay Conservation & Development Commission
_____San Gabriel & Lower Los Angeles Rivers & Mountains Conservancy
_____San Joaquin River Conservancy
_____Santa Monica Mountains Conservancy
_____State Lands Commission
_____SWRCB: Clean Water Grants
_____SWRCB: Water Quality
_____SWRCB: Water Rights
_____Tahoe Regional Planning Agency
_____Toxic Substances Control, Department of
_____Water Resources, Department of

_____Other _____
_____Other _____

Local Public Review Period (to be filled in by lead agency)

Starting Date May 1, 2007 Ending Date May 30, 2007

Lead Agency (Complete if applicable):

Consulting Firm: Jones and Stokes
Address: 2600 V Street
City/State/Zip: Sacramento, CA 95818
Contact: Wendy Johnson, Project Manager
Phone: (916) 737-3000

Applicant: Joe and Lillian Machado
Address: 24916 Manteca Road
City/State/Zip: Manteca, CA 95336
Phone: (209) 836-2035

Signature of Lead Agency Representative _____ Date 4/30/07

Authority cited: Section 21083 and 21087, Public Resources Code. Reference: Section 21161, Public Resources Code.

Notice of Preparation

To: State Clearinghouse, Responsible Agencies, Trustee Agencies, Intersested Parties

(Address)

From: City of Manteca
1001 W. Center Street
Manteca, CA 95336
(Address)

Subject: Notice of Preparation of a Draft Environmental Impact Report

The City of Manteca Community Development Department will be the Lead Agency and will prepare an environmental impact report for the project identified below. We need to know the views of your agency as to the scope and content of the environmental information which is germane to your agency's statutory responsibilities in connection with the proposed project. Your agency will need to use the EIR prepared by our agency when considering your permit or other approval for the project.

The project description, location, and the potential environmental effects are contained in the attached materials. A copy of the Initial Study (☒ is ☐ is not) attached.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but not later than 30 days after receipt of this notice.

Please send your response to David Hanham, Senior Planner at the address shown above. We will need the name for a contact person in your agency.

Project Title: Machado Estates

Project Applicant, if any: Joe and Lillian Machado, 24916 Manteca Rd. Manteca, CA, 95337

Date April 30, 2006

Signature

Title Senior Planner

Telephone (209) 825-2346

Reference: California Code of Regulations, Title 14, (CEQA Guidelines) Sections 15082(a), 15103, 15375.

Appendix B

Initial Study/Notice of Preparation Comment Letters

DEPARTMENT OF CONSERVATION

DIVISION OF LAND RESOURCE PROTECTION

801 K STREET • MS 18-01 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 324-0850 • **FAX** 916 / 327-3430 • **TDD** 916 / 324-2555 • **WEBSITE** conservation.ca.gov

May 24, 2007

Mr. David HanHam
City of Manteca
Community Development Department
1001 W. Center Street
Manteca, CA 95337

Subject: Machado Estates Notice of Preparation (NOP) for a Draft Environmental Impact Report (DEIR) – SCH# 2007052023, San Joaquin County

Dear Mr. HanHam:

The Department of Conservation's (Department) Division of Land Resource Protection (Division) has reviewed the NOP for the referenced project. The Division monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act and other agricultural land conservation programs. We offer the following comments and recommendations with respect to the project's impacts on agricultural land and resources.

Project Description

The project is the subdivision of 156.8 acres into 575 single-family lots and the construction of the Machado Estates. The project includes a General Plan amendment, annexation, pre-zoning, development agreement and tentative map. The land is currently producing corn and is over 75% Farmland of Statewide Importance with the balance Prime Farmland according to the Department's Important Farmland Map (IFM) for San Joaquin County (County). Land to the north is residential and to the east, south and west is agricultural. The NOP states that the land is not restricted by Williamson Act contract according to the 2005 Williamson Act Map for the County. The project site is located directly south of the City of Manteca (City) within the City's primary urban services boundary at the southwest corner of the Airport Way/Woodward Avenue intersection.

Agricultural Setting of the Project

The DEIR should describe the project setting in terms of the actual and potential agricultural productivity of the land. The Division's Important Farmland Map (IFM) for the County should be utilized to identify agricultural land not only within the project site

significance, and the search for replacement lands conducted regionally or statewide, and not limited strictly to lands within the project's surrounding area.

The Department also has available listing of approximately 30 "conservation tools" that have been used to conserve or mitigate project impacts on agricultural land. This compilation report may be requested from the Division at the address or phone number below.

Thank you for the opportunity to comment on this NOP. If you have questions on our comments or require technical assistance or information on agricultural land conservation, please contact Bob Blanford at 801 K Street, MS 18-01, Sacramento, California 95814; or, phone (916) 327-2145.

Sincerely,

Brian Leahy
Assistant Director

cc: State Clearinghouse

San Joaquin County Resource Conservation District

but also within the surrounding area that may be impacted. Acreages for each land use designation should be identified for both areas.

In addition, we recommend including the following items of information to characterize the agricultural land resource setting of the project.

- Current and past agricultural use of the project area. Include data on the types of crops grown, crop yields and farm gate sales values.
- To help describe the full agricultural resource value of the soils of the site, we recommend the use of economic multipliers to assess the total contribution of the site's potential or actual agricultural production to the local, regional and state economies. State and Federal agencies such as the UC Cooperative Extension Service and USDA are sources of economic multipliers.

Project Impacts on Agricultural Land

The NOP considers the direct conversion of important farmland, its contribution to cumulative impacts and the conflict between agricultural and urban uses to be potentially significant impacts.

The Department recommends that the following also be included in the DEIR in the analysis of project impacts.

- Type, amount, and location of farmland lost to project implementation.
- Growth-inducing impacts, including whether leapfrog development is involved.

Mitigation Measures

The NOP proposes Mitigation Measure AG-1, which requires the applicant to deposit appropriate funds into an escrow account for the loss of Prime and important farmland until the City adopts a farmland conservation fee. Upon adoption of such a fee, the funds will be transferred to a designated land trust to purchase farmland. The Department recommends that this measure be updated and detailed in the DEIR.

The Department encourages the use of agricultural conservation easements on land of at least equal quality and size as partial compensation for the direct loss of agricultural land. If a Williamson Act contract is terminated, or if growth inducing or cumulative agricultural impacts are involved, we recommend that this ratio be increased.

Mitigation using agricultural conservation easements can be implemented by at least two alternative approaches: the outright purchase of easements or the donation of mitigation fees to a local, regional or statewide organization or agency whose purpose includes the acquisition and stewardship of agricultural conservation easements. The conversion of agricultural land should be deemed an impact of at least regional

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
P.O. BOX 2048 STOCKTON, CA 95201
(1976 E. CHARTER WAY/1976 E. DR. MARTIN LUTHER KING JR. BLVD. 95205)
TTY: California Relay Service (800) 735-2929
PHONE (209) 941-1921
FAX (209) 948-7194

RECEIVED
MAY 22 2007
Community Development Department

Flex your power!
Be energy efficient!

May 22, 2007

10-SJ-SR-120-PM3
SCH2007052023 (NOP)
Machado Estates

David HanHam
City of Lathrop
Department of Planning
390 Towne Centre Drive
Lathrop, CA 95330

Dear Mr. HanHam:

The California Department of Transportation (Department) appreciates the opportunity to have reviewed the Initial Study-Notice of Preparation (IS-NOP) application for the proposed 575 single family lots near State Route (SR-120). The Department has the following comments:

- The Project proposes to construct 575 single family homes and remove one existing ranch house as stated on page 2-1 of the IS-NOP. Page 3-53 states there will be an increase of 559 single family homes, while page 3-64 states that the development consists of 519 additional single family homes. This appears to be a minor calculation error but could have an impact on the total number of vehicle trips per day. Please clarify.

- There appears to be a calculation error in Table 13, page 3-64 in the AM Peak Hour number of trips. The total number of trips generated is 419, 140 trips in is 33% and 270 trips out is 66% instead of 25% and 75%.

- The proposed project could generate as many as 575 peak hour trips. The project-generated trips could have significant impacts to SR 120 at the Airport Road interchange. A Traffic Impact Study (TIS) is needed to assess the project-related impacts to the State Highway system and appropriate mitigation measures. Please have the preparer of the traffic study reference the "Caltrans Guide for the Preparation of Traffic Impact Studies" (Guide), dated December 2002, and send the scope of the TIS to the Department before the traffic study is conducted. The Guide, while advisory, contains Best Practices and gives insight into the Department's expectations when reviewing a traffic study. If the traffic consultant has any issues or concerns regarding the use of the Guide or its interpretation, please contact us so resolution can be reached.

- This proposed development should pay a "traffic impact mitigation fee". The cumulative impacts of this and other existing and proposed land use development, in this area, will contribute to the degradation of the level of service on the State Highway System. This degradation will eventually require improvements to accommodate the increase in traffic volumes to the SR-120 mainline, as well as the associated intersections mentioned above. Therefore, the Department recommends that the City of Manteca collect a transportation impact mitigation fee on a "proportional share" basis from the developer to hold until the fee can be contributed towards the local portion of funding for future improvements to these State Highway facilities.

- The Department will not be held responsible for any noise impacts to this development, including from the configuration of the Ultimate Transportation Concept (UTC) for SR-120. A noise study should be completed to analyze federal requirements and be based on 20-year traffic projections and the UTC of the State facility. If there is a noise impact, the developer has the responsibility to provide the mitigation.

- We suggest that the city continue to coordinate and consult with the Department to identify and address potential cumulative transportation impacts that may occur from this project and other developments near this geographical location. This will assist us in ensuring that traffic safety and quality standards are maintained for the traveling public on existing and future state transportation facilities.

If you have any questions or would like to discuss our comments in more detail, please contact Kathy Selsor at (209) 948-7142 (e-mail: kathy_selsor@dot.ca.gov) or me at (209) 941-1921.

Sincerely,

Kathy Selsor
for

TOM DUMAS, CHIEF
OFFICE OF METROPOLITAN PLANNING

c: Scott Morgan CA Office of Planning and Research

STATE OF CALIFORNIA
FACSIMILE COVER
10-2A-0049 (NEW 10/92)

ATTENTION:	FROM:	
David HanHam	**Kathy Selsor** **Department of Transportation** **1976 East Charter Way** **Stockton, CA 95205**	
UNIT/COMPANY: City of Manteca Community Development Department 1001 West Center Street Manteca, CA 95366	DATE: 5/22/07	TOTAL PAGES (Including Cover Page) 4
	FAX # (Include Area Code) (209) 948-7194	ATSS FAX 8-423-7194
DISTRICT/CITY	PHONE # (& Area Code) (209) 948-7190	ATSS 8-423-7190
PHONE # (& Area Code) FAX # (& Area Code) (209) 239-8427 **(209) 825-2349**	ORIGINAL DISPOSITION: Destroy ☐ Return ☐ Call for Pickup ☐	

COMMENTS:

SJ-State-Route 120-PM 3.3
SCH 2007052023 (NOP)
Machado Estates

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

May 3, 2007

To: Reviewing Agencies

Re: Machado Estates
SCH# 2007052023

Attached for your review and comment is the Notice of Preparation (NOP) for the Machado Estates draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

David HanHam
City of Manteca
1001 W. Center Street
Manteca, CA 95366

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Senior Planner, State Clearinghouse

RECEIVED
MAY 8 2007
Community Development Department

Attachments
cc: Lead Agency

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

SAN JOAQUIN
LOCAL AGENCY FORMATION COMMISSION

LAFCo

1860 E. HAZELTON AVENUE ☐ STOCKTON, CA 95205

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OF SUPERVISORS

EXECUTIVE OFFICER
JAMES E. GLASER

COUNSEL
MICHAEL MC GREW

ANALYST
ELIZABETH CONTRERAS

COMMISSION CLERK
LINDA LUND

May 29, 2007

David Hanham, Senior Planner
City of Manteca Community
Development Department
1001 West Center Street
Manteca, CA 95337

RE: IS/NOP for the Machado Estates

Dear Mr. Hanham:

Thank you for the opportunity to review the Initial Study and Notice of Preparation for the Machado Estates project. LAFCo will be a Responsible Agency and has the following comments to offer:

The project will require annexation of 156.8 acres to the City in order to receive City services for the development of the Machado Estates. Under the provisions of the Cortese Knox Hertzberg Local Government Reorganization Act of 2000 (C-K-H Act) the annexing territory must be contiguous to the City boundaries. The subject territory's western boundary is contiguous to the City and, therefore, meets this requirement. However, Government Code §56744 and Commission policy, restricts annexation of land to a City if the annexation will result in unincorporated territory to be completely surrounded by that City. In order to avoid the creation of an island, the City's annexation request should include the rural residential properties located north of Woodward Road and the properties west of Airport Way. The EIR must include an assessment of these properties.

The subject territory is not within the Manteca Sphere of Influence and an amendment to the City's sphere would be required. The Commission is considering a revision of its policies and requirements related to sphere of influence updates and amendments that may have an affect on this proposal. Prior to submittal of an application for annexation and a sphere amendment, the City should contact LAFCo for its current policies.

The project will convert 156.8 acres of Prime Farmland to urban uses. The project should address the effect of the proposal on maintaining the physical and economic integrity of agricultural lands as defined in §56016. C-K-H requires that the Commission consider the policies and priorities as set forth in §56377. The City should provide a statement that addresses those policies and priorities and include such assessment in the EIR.

The Machado Estates project consists of the development of 575 single-family dwelling units. The project should address the extent to which this proposal will assist the City in achieving their fair share of the regional housing needs §56668(l).

A plan for providing City services to the Machado Estates will need to be submitted to LAFCo with the City's annexation request. The required contents of the City's service plan can be found in Gov. Code §56653. The EIR should address these areas including the availability and timing of services. Project phasing should be addressed in the EIR.

Prior to the City's submittal of an application to LAFCO, it is suggested that a meeting be scheduled to discuss the project proposal and other LAFCo requirements.

Sincerely,

James E. Glaser

James E. Glaser
Executive Officer

MUSD
Manteca Unified School District
Sandy Dwyer, Director of Facilities Planning

May 16, 2007

RECEIVED
MAY 16 2007
Community Development Department

Mr. David Hanham, Senior Planner
City of Manteca
Community Development Department
1001 W. Center Street
Manteca, CA 95337

Subject:IS/NOP for the Machado Estates

Dear Mr. Hanham:

Manteca Unified School District (MUSD) is in receipt of the Initial Study-Notice of Preparation for the Machado Estates project.

In reviewing the NOP in the area where schools are referenced, specifically page 3-55, a3. on the second line, MUSD recommends the change from three high schools to four high schools, also referencing two adult education schools not one. Another amendment would be Table 8. Projected School Enrollment as follows per Manteca Unified School District's Needs Analysis, dated June 2006, calculations should be as follows:

K-6	0.429 students x 559 single-family residences	=	240
7-8	0.111 students x 559 single-family residences	=	62
9-12	0.199 students x 559 single-family residences	=	111
Total	**0.739 students x 559 single-family residences**	**=**	**413**

Manteca Unified School District would appreciate the City of Manteca keeping the school district informed of the draft EIR. Should you have questions I can be contacted at (209) 825-3200, extension 758 or by e-mail sdwyer@musd.net.

Sincerely,

Sandy Dwyer

Sandy Dwyer
Director of Facilities Planning

P.O. Box 32
Manteca, CA 95336
2901 East Louise Avenue, Lathrop

Phone (209) 825-3200
Fax (209) 825-3295
sdwyer@sjcoe.net

CITY OF MANTECA

COMMUNITY DEVELOPMENT
DEPARTMENT

RECEIVED
MAY 14 2007
FACILITIES PLANNING

April 30, 2007

To All Interested Parties.

SUBJECT: **IS/NOP for the Machado Estates**

Enclosed please find one copy of the Initial Study – Notice of Preparation for the Machado Estates project.

The scoping comment period is May 1, 2007 through May 31, 2007. In addition to accepting written comments during this period, the City will hold a meeting for key agencies and the public at 2:00 p.m. on May 16, 2007, to solicit comments/concerns on the scope of the EIR. The scoping meeting will be held in the Manteca City Council Chambers, located at City Hall, 1001 West Center Street in Manteca, California.

Sincerely,

David Hanham,
Senior Planner

1001 W. CENTER ST. • MANTECA, CA 95337 • (209) 239-8427 • FAX (209) 825-2349

San Joaquin County
Environmental Health Department
600 East Main Street
Stockton, California 95202-3029

Website: www.sjgov.org/ehd
Phone: (209) 468-3420
Fax: (209) 464-0138

DIRECTOR
Donna Heran, REHS

ASSISTANT DIRECTOR
Laurie Cotulla, REHS

PROGRAM COORDINATORS
Carl Borgman, REHS
Mike Huggins, REHS, RDI
Margaret Lagorio, REHS
Robert McClellon, REHS
Jeff Carruesco, REHS, RDI
Kasey Foley, REHS

May 30, 2007

David Hanham
Senior Planner
City of Manteca Community Development Department
1001 West Center Street
Manteca, California 95337

RE: IS-NOP, MACHADO ESTATES

The San Joaquin County Environmental Health Department has the following comments regarding the preparation of a draft environmental impact report for the above project:

The existing homes are being served by onsite sewage disposal systems and individual wells for domestic and irrigation purposes. The Environmental Health Department recommends that as a part of developing these properties, the existing wells and septic systems shall be destroyed under permit and inspection with the Environmental Health Department. Existing residences that will remain shall be connected to public sewer and public water.

Should you have any questions or need further assistance please call Rod Estrada, Lead Senior R.E.H.S., at (209) 468-0331.

Donna Heran, R.E.H.S., Director

Rod Estrada for

Mike Huggins, Program Coordinator, R.E.H.S., R.D.I.
Environmental Health Department

MH:tl

CITY OF MANTECA

COMMUNITY DEVELOPMENT
DEPARTMENT

2007 MAY -2 PM 1:44

SAN JOAQUIN COUNTY
ENVIRONMENTAL
HEALTH DEPARTMENT

April 30, 2007

To All Interested Parties.

SUBJECT: **IS/NOP for the Machado Estates**

Enclosed please find one copy of the Initial Study – Notice of Preparation for the Machado Estates project.

The scoping comment period is May 1, 2007 through May 31, 2007. In addition to accepting written comments during this period, the City will hold a meeting for key agencies and the public at 2:00 p.m. on May 16, 2007, to solicit comments/concerns on the scope of the EIR. The scoping meeting will be held in the Manteca City Council Chambers, located at City Hall, 1001 West Center Street in Manteca, California.

Sincerely,

David Hanham,
Senior Planner

5/21/07 Site visit by JV

1001 W. CENTER ST. • MANTECA, CA 95337 • (209) 239-8427 • FAX (209) 825-2349
Email: planning@ci.manteca.ca.us

Hanham, David

From: Andrea Vallejo [avallejo@sjgov.org]
Sent: Wednesday, May 30, 2007 2:40 PM
To: Hanham, David
Cc: Mark Hopkins
Subject: Machado Estates

David,
In order for our comments to reach you by the deadline of May 31, please see the following text. A hard copy will be mailed to you shortly.

San Joaquin County Public Works has reviewed the above mentioned document and has the following comments:

1) The project's fair share costs for specific impacts to County roadways shall be identified in the project's traffic study and collected by the City of Manteca. All impacts to County roadways shall be mitigated to the County's Level of Service (LOS) standard and the County's requirements.
2) A County Encroachment Permit will be required for any work or traffic control in the County's right of way. All final construction staging, lane closure, highway closure, advanced warning signage, and detour plans affecting County roadways shall be submitted with the Encroachment Permit application to Public Works at least 60 days prior to the start of construction for review and approval.
3) The project is subject to the Regional Transportation Impact Fee (RTIF). The City of Manteca shall collect this fee from the applicants.
4) If any project related improvements will be located within the unincorporated County, the City shall enter a cooperative agreement with the County specifying the planning, engineering, construction, and maintenance of such improvements within the unincorporated County shall be the responsibility of the City of Manteca and/or the developer(s).
5) The County requests inclusion in the discussions regarding project impacts to roadways and intersections in the area, as there will likely be impacts to County roadways and intersections.
6) All construction traffic control plans involving detours and road closures should be routed to San Joaquin County Department of Public Works Traffic Engineer for review and approval. Please allow a minimum of four weeks for review prior to implementation.
7) The traffic impact study should include the following intersections:
    a. Woodward/Union
    b. Woodward/Main
    c. Peach/Airport
    d. Peach/Oleander
    e. Peach/Union
    f. Airport/West Ripon
    g. Union/West Ripon

Thank you for the opportunity to comment; should you have any questions, please contact me at 468-8494, or Mark Hopkins at 468-3085 after June 6, 2007.

Andrea Vallejo
Associate Planner
SJC Public Works
209.468.8494
avallejo@sjgov.org

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

May 17, 2007

RECEIVED

MAY 21 2007

Community Development Department

David Hanham
City of Manteca
Community Development
1001 W. Center St.
Manteca, CA 95337

Project: IS/NOP For The Machado Estates

Subject: CEQA comments regarding the Notice of Preparation for the development of 575 dwelling units and a project on 156.8 acres at the southwest corner of Airport Way and Woodward Avenue.

District Reference No: 200700827

Dear Mr. Hanham:

The San Joaquin Valley Unified Air Pollution Control District (District) has reviewed the project referenced above and concurs with the findings in the Air Quality section of the Initial Study/Notice of Preparation. This project may have a significant impact on air quality.

The entire San Joaquin Valley Air Basin is designated non-attainment for ozone and particulate matter (PM10 and PM2.5). This project would contribute to the overall decline in air quality due to construction activities in preparation of the site, and ongoing traffic and other operational emissions.

The District recommends that the air quality section of the Environmental Impact Report (EIR) have four main components:

1. **A description of the regulatory environment and existing air quality conditions impacting the area.** This section should be concise and contain information that is pertinent to analysis of the project. The District has several sources of information available to assist with the existing air quality and regulatory environment section of the EIR. The District's "*Guide for Assessing and Mitigating Air Quality Impacts, 2002 Revision*" (GAMAQI) contains discussions regarding the existing air quality conditions and trends of the San Joaquin Valley Air Basin (SJVAB), including those pollutants of particular concern: ozone, PM10, and carbon monoxide.

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
2700 M Street, Suite 275
Bakersfield, CA 93301-2373
Tel: (661) 326-6900 FAX: (661) 326-6985

www.valleyair.org

2. **Estimates of existing emissions and projected pollutant emissions related to the increase in project source emissions and vehicle use, along with an analysis of the effects of these increases.** The EIR should include the methodology, model assumptions, inputs and results for pollutant emissions. The cumulative impact analyses should consider current existing and planned development both within the project area and in surrounding areas. The EIR needs to address the short term and long term local and regional adverse air quality impacts associated with the operation of construction equipment (ROG, NOx, carbon monoxide [CO], and PM10) and emission generated from stationary and mobile sources. The EIR should identify the components and phases of the project. The EIR should provide emissions projections for the project at the build out of each phase (including ongoing emissions from each previous phase). The most current URBEMIS program may be used to quantify these emissions.

   Ozone Precursors – The District recommends using the regional transportation model to quantify mobile source emissions, but in some cases it may be possible to use the most current URBEMIS program to calculate project area and operational emissions. The San Joaquin Council Of Governments may be able to provide assistance with the regional transportation model. The District recommends using the most current URBEMIS program to calculate project area and operational emissions and to identify mitigation measures that reduce impacts. URBEMIS can be downloaded from http://www.urbemis.com/ or the South Coast Air Quality Management District's website at http://www.aqmd.gov/ceqa/urbemis.html. If the analysis reveals that the emissions generated by this project will exceed the District's thresholds, this project may significantly impact the ambient air quality if not sufficiently mitigated. The project applicant or consultant is encouraged to consult with District staff for assistance in determining appropriate methodology and model inputs.

   Toxic Air Pollutants –The air analysis should discuss any District or State regulations for identifying and reducing toxic pollutants and should describe how the City of Manteca would address future projects with sensitive receptors near existing sources that emit toxic pollutants and the citing of new sources of toxic pollutants in the plan area. Potential sources that emit toxic pollutants include project operations, and vehicles (the ARB has designated diesel particulate emissions as a toxic air contaminant). If the project is near sensitive receptors, or if existing sources are near the project area, the District should be contacted to determine if the project developer should perform a Health Risk Assessment (HRA). An HRA should include a discussion of the toxic risk associated with the proposed project, including project equipment, operations, and vehicles.

The GAMAQI defines the significance levels for toxic impacts as a cancer risk greater than 10 in a million and/or a hazard index (HI) of 1.0 or greater for chronic non-carcinogenic or acute risks.

HRA guidelines promulgated by the California Office of Environmental Health Hazard Assessment (OEHHA) and OEHHA toxicity criteria must be used. In addition, the applicant should also refer to the "*Guidance for Air Dispersion Modeling*" document found on the District's web page for additional guidance. This document can be found at http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm.

The District recommends use of the latest version of the Hot Spots Analysis and Reporting Program (HARP) released by ARB for an HRA because it is the only software that is compliant with the OEHHA guidelines.

The project consultant should contact the District to review the proposed modeling approach before modeling begins. For more information on HAPs analyses, please contact Mr. Leland Villalvazo, Supervising Air Quality Specialist, at (559) 230-6000 or hramodeler@valleyair.org.

Odor Analysis – The proposed project should be analyzed to see if it is considered near a location of sensitive receptors (including residences) and if odor is a concern.

3. **Identify and discuss all existing District regulations that apply to the project.** The EIR should identify and discuss all existing District regulations that apply to the project. It would be appropriate to discuss proposed rules that are being developed that would apply to the proposed project. Current rules and regulations are available on the District's website at http://www.valleyair.org/rules/1ruleslist.htm. District rules and regulations are periodically revised, and new regulations are promulgated. The District advises the City of Manteca to contact the District for any rule updates and new rules when the project development begins. Current District rules and regulations applicable to the proposed project are requirements. The project may be subject to the following District rules:

Regulation VIII (Fugitive PM10 Prohibitions) Rules 8011-8081 are designed to reduce PM10 emissions (predominantly dust/dirt) generated by human activity, including construction and demolition activities, road construction, bulk materials storage, paved and unpaved roads, carryout and track out, landfill operations, etc. The District's compliance assistance bulletin for construction sites can be found at www.valleyair.org/busind/comply/PM10/Reg VIII CAB.pdf.

Rule 4102 (Nuisance) This rule applies to any source operation that emits or may emit air contaminants or other materials. In the event that the project or construction of the project creates a public nuisance, it could be in violation and be subject to District enforcement action.

Rule 4103 (Open Burning) This rule regulates the use of open burning and specifies the types of materials that may be open burned. Agricultural material shall not be burned when the land use is converting from agriculture to non-agricultural purposes (e.g., commercial, industrial, institutional, or residential uses). Section 5.1 of this rule prohibits the burning of trees and other vegetative (non-agricultural) material whenever the land is being developed for non-agricultural purposes. In the event that the project applicant burned or burns agricultural material, it would be in violation of Rule 4103 and be subject to District enforcement action.

Rule 4601 (Architectural Coatings) This rule limits volatile organic compounds from architectural coatings by specifying architectural coatings storage, clean up and labeling requirements and applies to any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating.

Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations) If asphalt paving will be used, then paving operations of this project will be subject to Rule 4641. This rule applies to the manufacture and use of cutback asphalt, slow cure asphalt and emulsified asphalt for paving and maintenance operations.

Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) This rule limits PM10 and PM2.5 emissions from residential development. Construction plans for residential developments may be affected by section 5.3, specifically:

- 5.3.1 – No person shall install a wood burning fireplace in a new residential development with a density greater than two (2) dwelling units per acre.
- 5.3.2 – No person shall install more than two (2) EPA Phase II Certified wood burning heaters per acre in any new residential development with a density equal to or greater than three (3) dwelling units per acre.
- 5.3.3 – No person shall install more than one (1) wood burning fireplace or wood burning heater per dwelling unit in any new residential development with a density equal to or less than two (2) dwelling units per acre.

Rule 9510 (Indirect Source Review) This rule was adopted to reduce the impacts of growth in emissions from all new development in the San Joaquin Valley. Rule 9510 requires applicants subject to the rule to provide information that enables the District to quantify construction, area and operational PM10 and NOx emissions, and potentially mitigate a portion of those emissions. Rule 9510 requires construction exhaust emissions to be reduced by 20 percent for NOx and 45 percent for PM10 when compared to the statewide fleet average or to pay an in lieu mitigation fee. The rule is applicable to any applicant (any person or entity that undertakes a development project), which upon full build out for <an industrial warehouses is 25,000 square feet or more>. An application must be filed with the District no later than concurrent with application with a local agency for the final discretionary approval. For more information and instruction, please contact the District's ISR staff by phone at (559) 230-5800 or by email at ISR@valleyair.org.

4. **Identify and discuss all feasible measures that will reduce air quality impacts generated by the project.** "Feasible" means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors: (California Code of Regulations (CCR § 15364)). CEQA requires that EIRs "describe measures which could minimize significant adverse impacts" (CCR §15126(c)). Additionally, the CCR requires that "a public agency should not approve a project as proposed if there are feasible alternatives or mitigation measures that would substantially lessen any significant effects that the project would have on the environment " (CCR § 15021(a)(2)). For each potential adverse impact, mitigation measures should be identified to reduce impacts below air quality threshold levels of significance. Therefore, the EIR should identify which mitigation measures will be included in the project, and how each mitigation measure will be implemented. The reduction of air quality impacts from implementation of mitigation measures should be quantified to the extent possible. If a measure cannot be quantified a qualitative discussion should be provided explaining the benefits of the proposed mitigation measure. The EIR should discuss how project design modifications could reduce project impacts

   This section should provide an analysis of existing mass transit/bicycle access to or near the site, and discuss if additional infrastructure will be needed. The section should identify which mitigation measures will be included in the project, and how each mitigation measure will be implemented. Site design, equipment alternatives, construction and operational measures that would reduce emissions should be identified. It should also analyze opportunities to mitigate urban heat island effects.

   The reduction of air quality impacts from implementation of mitigation measures should be quantified when possible. The EIR should discuss how the project design would encourage alternative transportation (including car pool parking), pedestrian and bicycle access/infrastructure, smart growth design, energy efficient project and building design, reduce urban heat island impacts, and include business programs that further reduce air pollution in the valley (such as carpooling). Mitigation measures must be included in the EIR that reduce the emissions of reactive organic gases, nitrogen oxides, and PM10 to the fullest extent possible. Site design and building construction measures that would reduce air quality impacts should be included. The Districts GAMAQI describes these features. The Local Government Commission (LGC) website, found at www.lgc.org/, contains valuable information and resources on subjects from street design to energy efficiency. The use of the principles of the document Landscape of Choice is encouraged to reduce air quality impacts.

District staff is available to meet with you and/or the applicant to further discuss the regulatory requirements that are associated with this project. If you have any questions or require further information, please call Debbie Johnson at (559) 230-5817 and provide the reference number at the top of this letter.

Sincerely,

David Warner
Director of Permits Services

For Arnaud Marjollet
Permit Services Manager

DW:dj

cc: File

CITY OF MANTECA COMMUNITY DEVELOPMENT APPLICATION FORM

Planning Division, 1001 W. Center Street, Manteca, CA 95337, (209) 239-8427 Fax (209) 825-2349

File Number/s: SPA-07-02 & DEV-07-02

Type of Application		
☐ Annexation	☐ Site Plan Res. 5+ units	☐ Minor Subdivision Map (1-4 lots)
☐ General Plan Amendment	☐ Site Plan Commercial/Industrial	☐ Major Subdivision Map (5 and over)
☐ Specific Plan	☐ Site Plan PUD/Condo	☐ Vested Subdivision Map
☐ Specific Plan Amendment	☐ Lot Line Adjustment	☐ Tentative Map Extension
☐ Rezone	☐ Minor Zone Modification	☐ Development Agreement
☐ PUD Overlay District	☐ Minor Plan Modification	☐ Preliminary Staff Review
☐ PUD Modification	☐ Minor Use Permit	☐ Sign Permit
☐ Condo Conversion	☐ Major Use Permit	☐ Major Sign Permit
☐ Variance	☐ Appeal Administrative Decision	☐ Municipal Code Amendment
☐ Site Plan Res. 2-4 units	☐ Appeal Planning Commission Dec.	☐ Other:

Project Detail

Project Name: EDS PLACE

Property Address: GRANT AVE APN:

Project Description (submit separate attachment if necessary) (e.g. Expansion of existing use, establishment of a new use or new construction, etc.)

BARE LAND WOULD LIKE TO BUILD A 12 UNIT APARTMENT BUILDING

Property Owner:

Name: MACHADO / LARSON
Contact: ED MACHADO
Address: 11708 MONCURE RD
City, Zip: RIPON CA 95366
Phone: 209-858-8073
Fax: 209 599 3887
E-mail: EAM1020@AOL.COM

Applicant

Name: BMW DEVELOPMENT
Contact: BRUCE BARBER
Address: 11708 MONCURE RD
City, Zip: RIPON CA 95366
Phone: 209-456-0190
Fax: 209-823-1466
E-mail:

Fees

Fees	Account Number	Application Type	Fees	Account Number	Application Type
4000	001-353-01	DEV. AG.			
2500	001-353-04	RES. SITE PLAN			
175-	001-353-02	ENV. QUEST.			
60-	001-353-04	AD			
75-		Mailing			

RECEIVED
JUN 13 2007
Community Development Department

Receipt Number 24225 Date 6/14/07 Accepted by

Other Contact Information

Name: _____
Address: _____
City, Zip: _____
Phone: _____
Fax: _____
email: _____

Name: _____
Address: _____
City, Zip: _____
Phone: _____
Fax: _____
email: _____

Miscellaneous

General Plan Designation: _____ Proposed General Plan Designation: _____

Zoning: R-3 Proposed Zoning: R3

Property Dimensions: _____

Land Use: Undeveloped/Vacant ☑ Developed ☐

Acres/Square Feet: _____

Hazardous Waste Affidavit

Government Code Section 65962.5 requires each applicant for any development project to consult the State Hazardous Waste and Substance Sites List. Based on this list (available from the Planning Division of the Community Development Department) the applicant is required to submit a signed statement to the City of Manteca indicating whether the project is located on a site which is included on the list before the City accepts the application as complete. If the project site is listed by the State as a hazardous waste or substance site, the applicant must fully describe the nature of the attached hazard and potential impacts in the Initial Study, Part I. In either situation, the applicant must complete and sign the Affidavit in the space below.

I have been informed by the City of Manteca of my responsibilities pursuant to Section 65962.5 to notify the City as to whether the site for which a development application has been submitted is located within an area which has been listed as the location of a Hazardous Waste or substance Site by the Office of Planning and Research, State of California.

☐ The project site is located in an area listed as a Hazardous Waste or Substance Site.

☑ The project site is **not** in an area listed as a Hazardous Waste or Substance Site.

I declare under penalty of perjury of the laws of the State of California that the foregoing is true and correct.

Applicant Signature: _____ Date: 4-30-07

Agreement and Representations of Applicant

This application is not complete, and processing of this application will not begin, until all initials and signatures are provided:

1. Applicant(s) acknowledge and agree that by making this application, and under the authority of Government Code Section 65105, that in the performance of their functions, City staff may enter upon the subject property and make examinations and surveys, provided that the entries, examinations and surveys do not unreasonably interfere with the use of the land by those persons lawfully entitled to the possession thereof. BB (Initial)
2. Applicant(s) certify under penalty of perjury that the signature(s) provided below is/are that of the legal owner(s) (all individual owners must sign as they appear on the deed to the land), Corporate Officer(s) empowered to sign for the corporation, Owner's Legal Agent having power of Attorney (a notarized Power of Attorney document must accompany this application), or the owner's authorized representative (include a notarized consent form from the owner). BB (Initial)
3. Applicant(s) acknowledge and agree that all of the required items have been submitted and understands that missing items may result in delaying the processing of my application. I further acknowledge and agree that by signing this document I accept the posting of public notices regarding the proposed project at the project site. BB (Initial)
4. Applicant(s) agree to defend, indemnify and hold harmless the City of Manteca ("City") and its agents, officers, consultants, independent contractors and employees ("City's Agents") from any and all claims, actions or proceedings against the City or the City's Agents to attack, set aside, void, or annul an approval by the City, or the City's Agents concerning the Project (collectively "Claim"). The City shall promptly notify the Applicant of any Claim and the City shall cooperate fully in the defense. If the City fails to promptly notify the Applicant of any Claim or if the City fails to cooperate fully in the defense, the Applicant shall not thereafter be responsible to defend, indemnify, or hold harmless the City. Nothing in this paragraph shall obligate the City to defend any Claim and the City shall not be required to pay or perform any settlement arising from any such Claim not defended by the City, unless the settlement is approved in writing by the City. Nothing contained in this paragraph shall prohibit the City from independently defending any Claim, and if the City does decide to independently defend a Claim, the City shall bear its own attorney's fees, expenses of litigation and costs for that independent defense. The Applicant may agree to reimburse the City for attorney's fees, expenses of litigation and costs for that independent defense. Should the City decide to independently defend any Claim, the Applicant(s) shall not be required to pay or perform any settlement arising from any such Claim unless the settlement is approved by the Applicant. BB (Initial)
5. This Application will be a public record. BB (Initial)
6. This Application is made under, and shall in all respects be interpreted, enforced, and governed by, the laws of the State of California. In the event of a dispute concerning the terms of this Application, the venue for any legal action shall be with the appropriate court in the County of San Joaquin, State of California. Should legal proceedings of any type arise out of this Agreement, the prevailing party shall be entitled to costs, attorney's fees, and legal expenses, including but not limited to expert fees and costs. BB (Initial)

IT IS SO AGREED:

BMW Development (Bruce Barber)	BRUCE BARBER	4-30-07
Applicant Signature	Print Name	Date
Ed Machado	Ed Machado	4/30/07
Property Owner Signature	Print Name	Date
Barbara Larsen	Barbara Larsen	4/30/07
Property Owner Signature	Print Name	Date

CITY OF MANTECA
COMMUNITY DEVELOPMENT DEPARTMENT

LETTER OF AUTHORIZATION

This document shall serve to notify the City of Manteca that the undersigned are the legal owner(s) of the property described in the attached application and do hereby authorize the person/firm identified below to file and represent my/our interest in the application(s) listed below.

Authorized Person:

Name/Firm: BMW DEVELOPMENT

Address: 11708 MONCURE RD

City/State/Zip: RIPON CA 95366

Phone: 209-599-2565

Applications:

Legal Owners:

The undersigned are the legal owner(s) of the said property; have read the foregoing letter of authorization and know the contents thereof; and do hereby certify that the same is true of my/our own knowledge. I/we certify (or declare) under penalty of perjury under the laws of the State of California that the information contained in the above referenced application(s) is true and correct.

Signature	Print Name	Date
Applicant Signature	BRUCE BARBER	4-30-07
Property Owner Signature	Ed Machado	4/30/07
Property Owner Signature	Barbara Larsen	4/30/07

EDWARD A. MACHADO
LORIE MACHADO
11708 E. MONCURE ROAD
RIPON, CA 95366-9630
PH. (209) 599-2565

EXPLANATION	AMOUNT	
Grant App.		

150

90-103-1211

PAY AMOUNT OF _____ DOLLARS

DATE	TO THE ORDER OF	DESCRIPTION	CHECK NUMBER	CHECK AMOUNT
12/13/07	City of Manteca		1503	$ 6810.0

111013

Security Features Included. Details on Back.

Bank of Stockton
MANTECA OFFICE
P.O. Box 1417, 660 N. Main St., Manteca, CA 95336

Lorie Machado

⑈001503⑈ ⑆121101037⑆ 1250002530⑈

CITY OF MANTECA, CALIFORNIA
Official Receipt

242255

DATE 12/11/07

RECEIVED FROM E.A. Machado

THE SUM OF $ 6810 — DOLLARS

FOR Grant match for new police vehicle

REVENUE ACCOUNT _____ DEPARTMENT _____

NO. _____

REF _____ BY _____

Revised April 29, 1999

RECEIVED
JUN
Community Development Department

ENVIRONMENTAL QUESTIONNAIRE

(To Be Completed by Applicant)

This document will assist the Community Development Department in evaluating the proposed project and it's potential environmental impacts. Complete and accurate information will facilitate the environmental assessment, review, and minimize future requests for additional information. Please contact the Community Development Department if there are any questions concerning environmental issues or zoning.

STATEMENT OF INTENT (General project description): BARE LAND I WOULD LIKE TO BUILD A 12 UNIT APARTMENT BUILDING

PROJECT NAME: ED'S PLACE

Variance, conditional use or rezoning application required? Explain why: NO

GENERAL INFORMATION:

Property Owner's Name: ED MACHADO, BARBARA LARSON E-mail: EAM1020@AOL.com

Mailing Address: 11708 MONCURE RD RIPON CA 95366

Telephone: Business (209) 858-8073 Home (209) 599-2565 Fax (209) 599-3887

Applicant's Name: BMW DEVELOPMENT Contact Person: BRUCE BARBER

Mailing Address: 11708 MONCURE RD RIPON CA 95366 E-mail

Telephone: Business (209) 456-0190 Home (209) 823-1466 Fax (209) 823-1466

PROJECT SITE INFORMATION:

Site Address or Location: GRANT AVE

Property Dimensions: Assessor's Parcel Number(s):

Property Area: Acreage Project Area: Acreage Square Feet Property Elevation:

Site Land Use: Undeveloped/Vacant UNDEVELOPED Developed

Existing Zoning of Project Site: Proposed Zoning (if applicable):

Existing General Plan of Project Site: Proposed General Plan (if applicable):

If property is under Williamson Act Contract, the contact expire on: Property Soil is of "Farmland or Statewide Importance"

DESCRIBE ADJACENT ZONING AND EXISTING LAND USE WITHIN 300 FEET OF PROJECT SITE:

	Zoning	General Plan	Existing land use type (i.e. residential, commercial, industrial)
North			APARTMENT APARTMENT, DUPLEX
East			HOUSE, HOUSE
South			HOUSE DUPLEX
West			FIELD

SITE CHARACTERISTICS

Describe the project site as it exists before the project, including information on topography, soil stability, plants and animals, any cultural, historical or scenic aspects (if applicable) and photographs: BARE LAND

Mature trees, bushes, or shrubs on the site? NO Are any to be removed? _____ Oak trees on site? NO Are any to be removed? _____

If yes, explain and attach a site plan indicating location, size and type of all existing trees, bushes and shrubs and those proposed for removal.

Will the project change any bodies of water, pools or marsh areas; effect ground water quality or quantity; alter existing drainage patterns; expose people and structures to flooding? _____ If yes, explain: _____

Project site is located in a in-fill urban area? _____ Project site is adjacent to what agriculture uses: NONE

If there are structures on the project site, attach a site plan indicating location of structures and provide the following information:

Present use of existing structure(s): _____ Number of floors: _____

Proposed use of existing structure(s): _____

Any structures over 50 years old? _____ Are any structures to be moved or demolished? _____ If yes, indicate on site plan which structures that are over 50 years old and structures that are proposed to be moved or demolished. Describe Age, Condition, Size and Architectural Style of all existing on-site structures (include photos): OPEN FIELD

Any existing septic systems and water wells? NO If yes, indicate on site plan the location of existing septic systems and water wells.

PROPOSED BUILDING CHARACTERISTICS

Size of new structure(s) or building addition(s) in gross square feet: _____

Height of building(s) in feet (measured from ground to highest point): _____

Height of other appurtenances, excluding buildings, measured from ground to highest point (i.e. antennas, mechanical equipment, light poles, etc.): _____

Project Site Coverage:

Building Coverage:	_____ Sq. Ft.	_____ %
Landscaped Area:	_____ Sq. Ft.	_____ %
Paved Surface Area:	_____ Sq. Ft.	_____ %
Total:	_____ Sq. Ft.	_____ %

Exterior building materials: _____

Exterior building colors: _____ Roof materials: _____

Total number of on-site parking spaces: Employee _____ Customer _____ Number of floors: Above grade _____ Below grade _____

Type of exterior lighting proposed for project (height, intensity): Building _____ Parking _____

Estimated construction starting date: _____ Estimated completion date: _____ Project phased? _____

If the proposal is a component of an overall larger project, describe phases and show them on the site plan: _____

Indicate any federal or state agencies for which approvals and/or permits are required: _____

RESIDENTIAL PROJECTS

Total number of lots: _____ Total acreage: _____ Net Density/Acre: _____ Gross Density/Acre: _____

	Single Family	Two Family Duplex	Multiple Family Apartments	Multiple Family Condominiums
Number of Structures			2	
Number of Units			12	
Square Feet/Unit			1102SF	
For Sale or Rent			RENT	
Price Range				
Type of Units:			2BED 2½BATH	
Studio				
1 Bedroom				
2 Bedroom			X	
3 Bedroom				
4+Bedroom				

COMMERCIAL, INDUSTRIAL, MANUFACTURING, OR OTHER PROJECT

Type of use(s): _____ Expected influence: Regional ____ Citywide ____ Neighborhood ____

Describe operation and processes involved, loading and unloading facilities: _____

_____

_____

_____

Occupancy/capacity of building(s): _____ Number of fixed seats: _____ Number of employees: _____ Number of shifts: _____

Number of employees per shift: _____ Anticipated number of visitors/customers on site at any one time: _____

Square footage of: Office Area _____ Warehouse/Storage Area _____ Manufacturing Area _____ Sales Area: _____

Odors and/or noise emitted? _____ If yes, explain_____

Number of truck trips per day: Incoming_____ Outgoing_____ Number of rail deliveries per week: _____ Fire suppression system?_____

Other Occupants (if applicable): _____

Involve any toxic or hazardous materials or waste? _____ If yes, explain types and quantities, their storage and transportation, and any emissions:

_____

_____

NOTE; IF THE PROJECT SITE IS ON OR NEAR A HISTORICAL SITE, ARCHAEOLOGICAL SITE, LANDFILL SITE, RIVER, FLOODPLAIN, FREEWAY, RAILROAD, OR AIRPORT, THEN SPECIFIC TECHNICAL STUDIES MAY BE REQUIRED. APPLICANTS ARE ENCOURAGED TO CONTACT THE COMMUNITY DEVELOPMENT DEPARTMENT AT THE EARLIEST POSSIBLE OPPORTUNITY TO DETERMINE THE NEED AND SCOPE OF SUCH STUDIES.

AS THE APPLICANT/AGENT FOR THIS PROPOSAL I HEREBY STATE THAT, TO THE BEST OF MY KNOWLEDGE, THE ABOVE ANSWERS AND STATEMENTS ARE TRUE AND COMPLETE.

_____ _____

Signature of Applicant/Agent Date

_____ _____

Print Name and Title of Applicant/Agent Phone Number



BP100I04

City of Manteca
Land Master File Inquiry

6/15/07
11:20:39

Parcel Number
223-141-03
Assesors Parcel Number 223-141-03
Location ID nbr . . . : 3986
Street address . . . : 655 N LINCOLN AV
MANTECA CA 95336

Acreage . . . . . : 1.4600
Property use code . . . . . :
Undivided interest percent . :
Commissioner district . . . : NOT APPLICABLE
Jurisdiction/district . . . : CITY OF MANTECA
Inside/outside . . . . . : CITY OF MANTECA
Inspection area . . . . . :

Bottom

Press Enter to continue.
F3=Exit F4=Appl inq F8=Misc info F10=Legal desc F12=Cancel
F13=Disp sections F15=Valuations F17=User defined

BP100I01

City of Manteca
Land Master File Inquiry

6/15/07
11:20:15

Parcel Number
223-141-03
Assesors Parcel Number 223-141-03
Location ID nbr . . . : 3986
Street address . . . : 655 N LINCOLN AV
MANTECA CA 95336

Current owner . . . : MACHADO, EDWARD & LORI TR ETAL Person/Company P
11708 E MONCURE RD Phone

RIPON CA 95366

Plat/Book/Page . . . :
Zoning . . . . . : R3 LIMITED MULTIPLE FAMILY
Variance . . . . . :
Fire zone . . . . . :

More...

Press Enter to continue.
F3=Exit F4=Appl inq F8=Misc info F10=Legal desc F12=Cancel
F13=Disp sections F15=Valuations F17=User defined

Appendix C

URBEMIS Model Output

URBEMIS 2002 For Windows 8.7.0

File Name: G:\LGT-Air&Noise\Air\Manteca Machado Estates EIR 61192.06 (SJVAPCD)\Urbemis\Manteca Machado Estates.urb
Project Name: Manteca Machado Estates
Project Location: San Joaquin Valley
On-Road Motor Vehicle Emissions Based on EMFAC2002 version 2.2

DETAIL REPORT
(Tons/Year)

Construction Start Month and Year: September, 2008
Construction Duration: 60
Total Land Use Area to be Developed: 158 acres
Maximum Acreage Disturbed Per Day: 39.5 acres
Single Family Units: 575 Multi-Family Units: 0
Retail/Office/Institutional/Industrial Square Footage: 0

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (tons/year)

Source *** 2008***	ROG	NOx	CO	SO2	PM10 TOTAL	PM10 EXHAUST	PM10 DUST
Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	17.38	-	17.38
Off-Road Diesel	4.77	30.55	39.32	-	1.15	1.15	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.05	0.08	1.38	0.00	0.01	0.00	0.00
Total tons/year	4.82	30.63	40.70	0.00	18.53	1.15	17.38
Phase 3 - Building Construction							

Bldg Const Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Bldg Const Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total all phases tons/yr	4.82	30.63	40.70	0.00	18.53	1.15	17.38

*** 2009***

Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	11.30	-	11.30
Off-Road Diesel	3.10	19.30	25.83	-	0.67	0.67	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.03	0.05	0.92	0.00	0.00	0.00	0.00
Total tons/year	3.13	19.35	26.75	0.00	11.97	0.67	11.30
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	2.54	17.50	20.22	-	0.74	0.74	0.00
Bldg Const Worker Trips	0.20	0.11	2.55	0.00	0.07	0.00	0.07
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	2.74	17.61	22.77	0.00	0.81	0.74	0.07
Total all phases tons/yr	5.87	36.96	49.52	0.00	12.78	1.41	11.37

*** 2010***

Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.25	21.14	26.69	-	0.84	0.84	0.00
Bldg Const Worker Trips	0.25	0.16	3.38	0.00	0.09	0.00	0.08
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	3.50	21.30	30.07	0.00	0.92	0.84	0.08
Total all phases tons/yr	3.50	21.30	30.07	0.00	0.92	0.84	0.08

*** 2011***

Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.25	21.14	26.69	-	0.84	0.84	0.00
Bldg Const Worker Trips	0.24	0.13	3.08	0.00	0.09	0.00	0.08
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	3.49	21.27	29.77	0.00	0.92	0.84	0.08
Total all phases tons/yr	3.49	21.27	29.77	0.00	0.92	0.84	0.08

*** 2012***

Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	3.25	21.14	26.69	-	0.84	0.84	0.00
Bldg Const Worker Trips	0.24	0.13	3.08	0.00	0.09	0.00	0.08
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-

Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-

Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	3.49	21.27	29.77	0.00	0.92	0.84	0.08
Total all phases tons/yr	3.49	21.27	29.77	0.00	0.92	0.84	0.08

*** 2013***

Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	2.16	14.09	17.79	-	0.56	0.56	0.00
Bldg Const Worker Trips	0.16	0.08	2.00	0.00	0.06	0.00	0.06
Arch Coatings Off-Gas	8.41	-	-	-	-	-	-
Arch Coatings Worker Trips	0.10	0.05	1.24	0.00	0.04	0.00	0.04
Asphalt Off-Gas	0.05	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.26	1.52	2.23	-	0.04	0.04	0.00
Asphalt On-Road Diesel	0.01	0.19	0.05	0.00	0.01	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Total tons/year	11.15	15.93	23.33	0.00	0.70	0.60	0.10

Total all phases tons/yr	11.15	15.93	23.33	0.00	0.70	0.60	0.10

Phase 1 - Demolition Assumptions: Phase Turned OFF

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Sep '08
Phase 2 Duration: 6.6 months
On-Road Truck Travel (VMT): 0
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
20	Crawler Tractors	143	0.575	8.0
4	Graders	174	0.575	8.0
12	Off Highway Trucks	417	0.490	8.0
8	Rubber Tired Loaders	165	0.465	8.0
4	Scrapers	313	0.660	8.0
8	Tractor/Loaders/Backhoes	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Mar '09
Phase 3 Duration: 53.4 months
Start Month/Year for SubPhase Building: Mar '09
SubPhase Building Duration: 53.4 months
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
12	Other Equipment	190	0.620	8.0

Start Month/Year for SubPhase Architectural Coatings: Mar '13
SubPhase Architectural Coatings Duration: 5.3 months
Start Month/Year for SubPhase Asphalt: Jun '13
SubPhase Asphalt Duration: 2.7 months
Acres to be Paved: 40
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
4	Pavers	132	0.590	8.0
4	Rollers	114	0.430	8.0

AREA SOURCE EMISSION ESTIMATES (Tons per Year, Unmitigated)

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.10	1.31	0.56	0.00	0.00
Hearth	2.20	0.35	17.63	0.06	2.88
Landscaping	0.20	0.03	1.58	0.01	0.01
Consumer Prdcts	5.13	-	-	-	-
Architectural Coatings	0.84	-	-	-	-
TOTALS (tpy, unmitigated)	8.47	1.69	19.77	0.07	2.88

UNMITIGATED OPERATIONAL EMISSIONS

	ROG	NOx	CO	SO2	PM10
Single family housing	5.91	6.80	70.05	0.08	7.02
TOTAL EMISSIONS (tons/yr)	5.91	6.80	70.05	0.08	7.02

Includes correction for passby trips.
Does not include double counting adjustment for internal trips.

OPERATIONAL (Vehicle) EMISSION ESTIMATES

Analysis Year: 2015 Season: Annual

EMFAC Version: EMFAC2002 (9/2002)

Summary of Land Uses:

Unit Type	Acreage	Trip Rate	No. Units	Total Trips

Single family housing	158.00	9.57 trips/dwelling unit	575.00	5,503.00

Sum of Total Trips	5,503.00
Total Vehicle Miles Traveled	51,474.67

Vehicle Assumptions:

Fleet Mix:

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.13	0.40	99.40	0.20
Light Truck < 3,750 lbs	22.46	0.70	98.00	1.30
Light Truck 3,751- 5,750	16.44	0.60	98.80	0.60
Med Truck 5,751- 8,500	6.42	0.00	98.60	1.40
Lite-Heavy 8,501-10,000	0.16	0.00	81.80	18.20
Lite-Heavy 10,001-14,000	0.03	0.00	66.70	33.30
Med-Heavy 14,001-33,000	0.72	0.00	20.00	80.00
Heavy-Heavy 33,001-60,000	0.52	0.00	0.00	100.00
Line Haul > 60,000 lbs	0.00	0.00	0.00	100.00
Urban Bus	0.10	0.00	50.00	50.00
Motorcycle	1.26	50.00	50.00	0.00
School Bus	0.01	0.00	0.00	100.00
Motor Home	0.75	0.00	93.30	6.70

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip Speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			

Changes made to the default values for Land Use Trip Percentages

The Trip Rate and/or Acreage values for Single family housing
 have changed from the defaults 9.57/191.67 to 9.570434783/158

Changes made to the default values for Construction

Changes made to the default values for Area

The wood stove percentage changed from 67 to 55.
The natural gas fireplace percentage changed from 33 to 45.
The homes per acre changed from 3.0 to 3.639.
The landscape year changed from 2006 to 2015.

Changes made to the default values for Operations

The pass by trips option switch changed from off to on.
The operational emission year changed from 2006 to 2015.

Appendix D

Carbon Monoxide Modeling

APPENDIX D. AIR QUALITY TECHNICAL INFORMATION

Carbon Monoxide Modeling

Dispersion Modeling

Predicting the ambient air quality impacts of pollutant emissions requires an assessment of the transport, dispersion, chemical transformation, and removal processes that affect pollutant emissions after their release from a source. Gaussian dispersion models are frequently used for such analyses. The term "Gaussian dispersion" refers to a general type of mathematical equation used to describe the horizontal and vertical distribution of pollutants downwind from an emission source.

Gaussian dispersion models treat pollutant emissions as being carried downwind in a defined plume, subject to horizontal and vertical mixing with the surrounding atmosphere. The plume spreads horizontally and vertically with a reduction in pollutant concentrations as it travels downwind. Mixing with the surrounding atmosphere is greatest at the edge of the plume, resulting in lower pollutant concentrations outward (horizontally and vertically) from the center of the plume. This decrease in concentration outward from the center of the plume is treated as following a Gaussian ("normal") statistical distribution. Horizontal and vertical mixing generally occur at different rates. Because turbulent motions in the atmosphere occur on a variety of spatial and time scales, vertical and horizontal mixing also vary with distance downwind from the emission source.

The CALINE4 Model

The ambient air quality effects of traffic emissions were evaluated using the CALINE4 dispersion model (Benson 1989). CALINE4 is a Gaussian dispersion model specifically designed to evaluate air quality impacts of roadway projects. Each roadway link analyzed in the model is treated as a sequence of short segments. Each segment of a roadway link is treated as a separate emission source producing a plume of pollutants which disperses downwind. Pollutant concentrations at any specific location are calculated using the total contribution from overlapping pollution plumes originating from the sequence of roadway segments.

When winds are essentially parallel to a roadway link, pollution plumes from all roadway segments overlap. This produces high concentrations near the roadway (near the center of the overlapping pollution plumes), and low concentrations well away from the roadway (at the edges of the overlapping pollution plumes). When winds are at an angle to the roadway link, pollution plumes from distant roadway segments make essentially no contribution to the pollution concentration observed at a receptor location. Under such cross-wind situations, pollutant concentrations near the highway are lower than under parallel wind conditions (fewer overlapping plume contributions), while pollutant concentrations away from the highway may be greater than would occur with parallel winds (near the center of at least some pollution plumes).

The CALINE4 model employs a "mixing cell" approach to estimating pollutant concentrations over the roadway itself. The size of the mixing cell over each roadway segment is based on the width of the traffic lanes of the highway (generally 12 feet per lane) plus an additional turbulence zone on either side (generally 10 feet on each side). Parking lanes and roadway shoulders are not counted as traffic lanes. The height of the mixing cell is calculated by the model.

Pollutants emitted along a highway link are treated as being well mixed within the mixing cell volume due to mechanical turbulence from moving vehicles and convective mixing due to the temperature of vehicle exhaust gases. Pollutant concentrations downwind from the mixing cell are calculated using horizontal and vertical dispersion rates which are a function of various meteorological and ground surface conditions.

Modeling Procedures

Roadway and Traffic Conditions. Traffic volumes and operating conditions used in the modeling were obtained from the traffic analysis prepared for this project by Fehr & Peers. CO emissions were modeled for existing year (2006) and future year (2015) with and without project conditions. Free flow traffic speeds were adjusted to a speed of 1.0 miles per hour (mph) for vehicles entering intersection segments, and 10 mph for vehicles exiting intersection segments to represent a worst-case scenario. CO modeling was conducted at the Yosemite Avenue/Airport Way, Daniels Street/Airport Way, and SR 120 EB On/Off Ramps/Airport Way intersections, as they represent intersections with the worst LOS and delay and highest traffic volumes of any intersections analyzed in the project area.

Vehicle Emission Rates. Vehicle emission rates were determined using the California Air Resources Board's EMFAC2007 (version 2.3) emission rate program. EMFAC2007 modeling procedures followed the guidelines recommended by Caltrans (California Department of Transportation 2003). The program assumed San Joaquin County regional traffic data, operating during the winter months. A mean January temperature of 38 degrees Fahrenheit and humidity of 30% were assumed.

Receptor Locations. CO concentrations were estimated at 4 receptor locations located at each of the intersections analyzed, for a total of 28 receptors. The receptors were placed 35.4 feet from the center of each intersection diagonal, 25 feet from the roadway centerline, and 3 feet from the boundary of the mixing zone to represent a worst-case scenario. Receptor heights were set at 5.9 feet.

Meteorological Conditions. Meteorological inputs to the CALINE4 model were determined using methodology recommended in Air Quality Technical Analysis Notes (California Department of Transportation 1988). The meteorological conditions used in the modeling represent a calm winter period. Worst-case wind angles were modeled to determine a worst-case concentration for each receptor. The meteorological inputs include: 0.5 meters per second wind speed, ground-level temperature inversion (atmospheric stability class G), wind direction standard deviation equal to five degrees, ambient temperature of 3.3 degrees centigrade, and a mixing height of 1,000 meters.

Background Concentrations and Eight-Hour Values. To account for sources of CO not included in the modeling, a background concentration of 4.1 ppm was added to the modeled cumulative 1-hour values, while a background concentration of 2.5 ppm was added to the modeled cumulative 8-hour values. Background concentration data for 1- and 8-hour values were obtained from the EPA's Air Data webpage (U.S. Environmental Protection Agency 2007). Maximum 1- and 8-hour values for the years 2004-2006 were averaged to obtain a background concentration. Eight-hour modeled values were calculated from the 1-hour values using a persistence factor of 0.6. Background concentrations for future year (2015) conditions were assumed to be the same as those for the current year. Actual 1- and 8-hour background concentrations in future years would likely be lower than those used in the CO modeling analysis because the trend in CO emissions and concentrations is decreasing because of continuing improvements in engine technology and the retirement of older, higher-emitting vehicles.

References:

Benson, P. E. 1989. CALINE4---a dispersion model for predicting air pollution concentrations near roadways. California Department of Transportation. Sacramento, CA.

California Department of Transportation. 1988. Air Quality Technical Analysis Notes. Sacramento, CA.

California Department of Transportation. 2003. Draft Use of EMFAC 2002 to Replace CT-EMFAC: A Users Guide. February 27

U.S. Environmental Protection Agency. 2007. *Air Data.* Last Revised: May 1, 2007. Available: <http://www.epa.gov/air/data/reports.html>. Accessed: May 18, 2007.

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Manteca Machado Estates Existing
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	38. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	5. DEGREES	TEMP=	3.3 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (M) X1	Y1	X2	Y2	* TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Link A	*	-3150	6000	-3000	6000	* AG	725	13.2	.0	13.2
B. Link B	*	-2850	6000	-3000	6000	* AG	1105	12.1	.0	13.2
C. Link C	*	-3000	6150	-3000	6000	* AG	890	12.6	.0	13.2
D. Link D	*	-3000	5850	-3000	6000	* AG	880	12.3	.0	13.2
E. Link I	*	5850	-3000	6000	-3000	* AG	165	11.8	.0	13.2
F. Link J	*	6150	-3000	6000	-3000	* AG	195	11.8	.0	13.2
G. Link K	*	6000	-2850	6000	-3000	* AG	985	12.5	.0	13.2
H. Link L	*	6000	-3150	6000	-3000	* AG	1175	12.6	.0	13.2
I. Link U	*	1350	1500	1500	1500	* AG	475	14.4	.0	13.2
J. Link V	*	1650	1500	1500	1500	* AG	255	10.5	.0	13.2
K. Link W	*	1500	1650	1500	1500	* AG	1025	12.3	.0	13.2
L. Link X	*	1500	1350	1500	1500	* AG	835	12.1	.0	13.2

JOB: Manteca Machado Estates Existing
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. R1	-3008	6008	1.8
2. R2	-2993	6008	1.8
3. R3	-2993	5993	1.8
4. R4	-3008	5993	1.8
5. R9	5993	-2993	1.8
6. R10	6008	-2993	1.8
7. R11	6008	-3008	1.8
8. R12	5993	-3008	1.8
9. R17	1493	1508	1.8
10. R18	1508	1508	1.8
11. R19	1508	1493	1.8
12. R20	1493	1493	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1	97.	2.8	.0	2.0	.7	.0	.0	.0	.0	.0
2. R2	187.	2.6	.0	.8	.0	1.7	.0	.0	.0	.0
3. R3	353.	2.6	.0	.8	1.7	.0	.0	.0	.0	.0
4. R4	83.	2.7	.0	2.0	.0	.7	.0	.0	.0	.0
5. R9	173.	2.4	.0	.0	.0	.0	.1	.0	.0	2.2
6. R10	187.	2.5	.0	.0	.0	.0	.0	.1	.0	2.2
7. R11	187.	2.4	.0	.0	.0	.0	.0	.0	.0	2.4
8. R12	173.	2.4	.0	.0	.0	.0	.0	.0	.0	2.4
9. R17	173.	2.1	.0	.0	.0	.0	.0	.0	.0	.0
10. R18	353.	2.1	.0	.0	.0	.0	.0	.0	.0	.0
11. R19	353.	2.2	.0	.0	.0	.0	.0	.0	.0	.0
12. R20	7.	2.4	.0	.0	.0	.0	.0	.0	.0	.0

JOB: Manteca Machado Estates Existing
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	*	CONC/LINK (PPM) I	J	K	L
1. R1	*	.0	.0	.0	.0
2. R2	*	.0	.0	.0	.0
3. R3	*	.0	.0	.0	.0
4. R4	*	.0	.0	.0	.0
5. R9	*	.0	.0	.0	.0
6. R10	*	.0	.0	.0	.0
7. R11	*	.0	.0	.0	.0
8. R12	*	.0	.0	.0	.0
9. R17	*	.4	.0	.0	1.6
10. R18	*	.0	.0	2.1	.0
11. R19	*	.0	.2	1.9	.0
12. R20	*	.4	.0	1.9	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Manteca Machado Estates Existing With Pr
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	38. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	5. DEGREES	TEMP=	3.3 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Link A	-3150	6000	-3000	6000	AG	725	13.2	.0	13.2
B. Link B	-2850	6000	-3000	6000	AG	1122	12.1	.0	13.2
C. Link C	-3000	6150	-3000	6000	AG	919	12.7	.0	13.2
D. Link D	-3000	5850	-3000	6000	AG	926	12.3	.0	13.2
E. Link I	5850	-3000	6000	-3000	AG	176	11.9	.0	13.2
F. Link J	6150	-3000	6000	-3000	AG	206	11.9	.0	13.2
G. Link K	6000	-2850	6000	-3000	AG	1037	12.6	.0	13.2
H. Link L	6000	-3150	6000	-3000	AG	1249	12.6	.0	13.2
I. Link U	1350	1500	1500	1500	AG	658	14.4	.0	13.2
J. Link V	1650	1500	1500	1500	AG	320	10.5	.0	13.2
K. Link W	1500	1650	1500	1500	AG	1317	12.4	.0	13.2
L. Link X	1500	1350	1500	1500	AG	1375	12.1	.0	13.2

JOB: Manteca Machado Estates Existing With Pr
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. R1	-3008	6008	1.8
2. R2	-2993	6008	1.8
3. R3	-2993	5993	1.8
4. R4	-3008	5993	1.8
5. R9	5993	-2993	1.8
6. R10	6008	-2993	1.8
7. R11	6008	-3008	1.8
8. R12	5993	-3008	1.8
9. R17	1493	1508	1.8
10. R18	1508	1508	1.8
11. R19	1508	1493	1.8
12. R20	1493	1493	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1	97.	2.8	.0	2.1	.7	.0	.0	.0	.0	.0
2. R2	187.	2.7	.0	.8	.0	1.8	.0	.0	.0	.0
3. R3	353.	2.7	.0	.8	1.8	.0	.0	.0	.0	.0
4. R4	83.	2.8	.0	2.1	.0	.7	.0	.0	.0	.0
5. R9	173.	2.6	.0	.0	.0	.0	.1	.0	.0	2.4
6. R10	187.	2.6	.0	.0	.0	.0	.0	.2	.0	2.4
7. R11	187.	2.5	.0	.0	.0	.0	.0	.0	.0	2.5
8. R12	173.	2.5	.0	.0	.0	.0	.0	.0	.0	2.5
9. R17	173.	3.2	.0	.0	.0	.0	.0	.0	.0	.0
10. R18	187.	2.8	.0	.0	.0	.0	.0	.0	.0	.0
11. R19	353.	2.7	.0	.0	.0	.0	.0	.0	.0	.0
12. R20	7.	3.1	.0	.0	.0	.0	.0	.0	.0	.0

JOB: Manteca Machado Estates Existing With Pr
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. R1	.0	.0	.0	.0
2. R2	.0	.0	.0	.0
3. R3	.0	.0	.0	.0
4. R4	.0	.0	.0	.0
5. R9	.0	.0	.0	.0
6. R10	.0	.0	.0	.0
7. R11	.0	.0	.0	.0
8. R12	.0	.0	.0	.0
9. R17	.6	.0	.1	2.5
10. R18	.0	.2	.1	2.5
11. R19	.0	.2	2.4	.1
12. R20	.6	.0	2.4	.1

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Manteca Machado Estates Future No Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	38. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	5. DEGREES	TEMP=	3.3 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Link A	-3150	6000	-3000	6000	AG	1520	5.2	.0	13.2
B. Link B	-2850	6000	-3000	6000	AG	1700	4.8	.0	13.2
C. Link C	-3000	6150	-3000	6000	AG	2020	5.0	.0	13.2
D. Link D	-3000	5850	-3000	6000	AG	1900	5.2	.0	13.2
E. Link I	5850	-3000	6000	-3000	AG	2340	5.2	.0	13.2
F. Link J	6150	-3000	6000	-3000	AG	1340	5.3	.0	13.2
G. Link K	6000	-2850	6000	-3000	AG	2110	4.9	.0	13.2
H. Link L	6000	-3150	6000	-3000	AG	3050	5.0	.0	13.2
I. Link U	1350	1500	1500	1500	AG	1320	5.7	.0	13.2
J. Link V	1650	1500	1500	1500	AG	770	4.4	.0	13.2
K. Link W	1500	1650	1500	1500	AG	2790	4.9	.0	13.2
L. Link X	1500	1350	1500	1500	AG	3180	5.0	.0	13.2

JOB: Manteca Machado Estates Future No Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. R1	-3008	6008	1.8
2. R2	-2993	6008	1.8
3. R3	-2993	5993	1.8
4. R4	-3008	5993	1.8
5. R9	5993	-2993	1.8
6. R10	6008	-2993	1.8
7. R11	6008	-3008	1.8
8. R12	5993	-3008	1.8
9. R17	1493	1508	1.8
10. R18	1508	1508	1.8
11. R19	1508	1493	1.8
12. R20	1493	1493	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1	173.	1.9	.5	.0	.0	1.4	.0	.0	.0	.0
2. R2	187.	2.0	.0	.5	.0	1.4	.0	.0	.0	.0
3. R3	353.	2.0	.0	.5	1.4	.0	.0	.0	.0	.0
4. R4	7.	2.0	.5	.0	1.4	.0	.0	.0	.0	.0
5. R9	173.	2.8	.0	.0	.0	.0	.7	.0	.0	2.0
6. R10	187.	2.5	.0	.0	.0	.0	.0	.4	.0	2.0
7. R11	277.	2.6	.0	.0	.0	.0	1.7	.0	.0	.9
8. R12	8.	2.3	.0	.0	.0	.0	.7	.0	1.4	.1
9. R17	173.	2.6	.0	.0	.0	.0	.0	.0	.0	.0
10. R18	187.	2.3	.0	.0	.0	.0	.0	.0	.0	.0
11. R19	188.	2.2	.0	.0	.0	.0	.0	.0	.0	.0
12. R20	8.	2.4	.0	.0	.0	.0	.0	.0	.0	.0

JOB: Manteca Machado Estates Future No Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. R1	.0	.0	.0	.0
2. R2	.0	.0	.0	.0
3. R3	.0	.0	.0	.0
4. R4	.0	.0	.0	.0
5. R9	.0	.0	.0	.0
6. R10	.0	.0	.0	.0
7. R11	.0	.0	.0	.0
8. R12	.0	.0	.0	.0
9. R17	.5	.0	.0	2.0
10. R18	.0	.2	.0	2.0
11. R19	.0	.0	.0	2.2
12. R20	.5	.0	1.8	.1

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Manteca Machado Estates 2015 With Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 38. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 5. DEGREES TEMP= 3.3 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Link A	-3150	6000	-3000	6000	AG	1520	5.2	.0	13.2
B. Link B	-2850	6000	-3000	6000	AG	1706	4.8	.0	13.2
C. Link C	-3000	6150	-3000	6000	AG	2032	5.0	.0	13.2
D. Link D	-3000	5850	-3000	6000	AG	1918	5.2	.0	13.2
E. Link I	5850	-3000	6000	-3000	AG	2357	5.2	.0	13.2
F. Link J	6150	-3000	6000	-3000	AG	1357	5.3	.0	13.2
G. Link K	6000	-2850	6000	-3000	AG	2134	4.9	.0	13.2
H. Link L	6000	-3150	6000	-3000	AG	3108	5.0	.0	13.2
I. Link U	1350	1500	1500	1500	AG	1485	5.7	.0	13.2
J. Link V	1650	1500	1500	1500	AG	835	4.4	.0	13.2
K. Link W	1500	1650	1500	1500	AG	3055	5.0	.0	13.2
L. Link X	1500	1350	1500	1500	AG	3675	5.0	.0	13.2

JOB: Manteca Machado Estates 2015 With Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. R1	-3008	6008	1.8
2. R2	-2993	6008	1.8
3. R3	-2993	5993	1.8
4. R4	-3008	5993	1.8
5. R9	5993	-2993	1.8
6. R10	6008	-2993	1.8
7. R11	6008	-3008	1.8
8. R12	5993	-3008	1.8
9. R17	1493	1508	1.8
10. R18	1508	1508	1.8
11. R19	1508	1493	1.8
12. R20	1493	1493	1.8

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. R1	173.	2.0	.5	.0	.0	1.4	.0	.0	.0	.0
2. R2	187.	2.0	.0	.5	.0	1.4	.0	.0	.0	.0
3. R3	353.	2.0	.0	.5	1.4	.0	.0	.0	.0	.0
4. R4	7.	2.0	.5	.0	1.4	.0	.0	.0	.0	.0
5. R9	173.	2.8	.0	.0	.0	.0	.7	.0	.0	2.0
6. R10	187.	2.5	.0	.0	.0	.0	.0	.4	.0	2.0
7. R11	277.	2.7	.0	.0	.0	.0	1.7	.0	.0	.9
8. R12	8.	2.3	.0	.0	.0	.0	.7	.0	1.4	.1
9. R17	173.	2.9	.0	.0	.0	.0	.0	.0	.0	.0
10. R18	187.	2.6	.0	.0	.0	.0	.0	.0	.0	.0
11. R19	188.	2.5	.0	.0	.0	.0	.0	.0	.0	.0
12. R20	8.	2.6	.0	.0	.0	.0	.0	.0	.0	.0

JOB: Manteca Machado Estates 2015 With Proj
RUN: CALINE4 RUN (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L
1. R1	.0	.0	.0	.0
2. R2	.0	.0	.0	.0
3. R3	.0	.0	.0	.0
4. R4	.0	.0	.0	.0
5. R9	.0	.0	.0	.0
6. R10	.0	.0	.0	.0
7. R11	.0	.0	.0	.0
8. R12	.0	.0	.0	.0
9. R17	.5	.0	.0	2.3
10. R18	.0	.2	.0	2.3
11. R19	.0	.0	.0	2.5
12. R20	.5	.0	1.9	.1

Appendix E

SJVAPCD Regulation VIII Fugitive PM10 Prohibitions Dust Control Plan

San Joaquin Valley
Air Pollution Control District

San Joaquin Valley Air Pollution Control District
Regulation VIII – Fugitive PM10 Prohibitions
Dust Control Plan

Rule 8021 – *Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities* requires the owner or operator of a construction project to submit a Dust Control Plan to the District if at anytime the project involves:

- Residential developments of ten (10) or more acres of disturbed surface area,
- Non-residential developments of five (5) or more acres of disturbed surface area, or
- Relocation of more than 2,500 cubic yards per day of materials on at least three (3) days of the project.

A Dust Control Plan identifies the fugitive dust sources at the construction site and describes all of the fugitive dust control measures that will be implemented before, during, and after any dust generating activity for the duration of the project. One Dust Control Plan may cover a single project or multiple projects at different sites where construction will commence within the following 12 months.

The District will review and approve, conditionally approve, or disapprove the Dust Control Plan within 30 days of submittal. **Construction activities shall not commence until the Dust Control Plan has been approved or conditionally approved.** An owner or operator must also provide written notification to the District via fax or mail within 10 days prior to the commencement of earthmoving activities. A copy of the approved Dust Control Plan must be retained at the project site and made available upon request by a District inspector.

At least one key individual representing the owner or operator, or any person who prepares a Dust Control Plan must complete a Dust Control Training Course presented by the District. Please contact the District to find out when courses are being offered.

Regardless of whether a District-approved Dust Control Plan is in place or not, the owner or operator is required to comply with all requirements of the applicable rules under Regulation VIII and the District's Rules and Regulations at all times.

Submit the Dust Control Plan to the District's Compliance Division at the office listed below:

For San Joaquin, Stanislaus, and Merced Counties:	**Northern Region Office** 4230 Kiernan Avenue, Suite 130 Modesto, CA 95356 (209) 557-6400 FAX (209) 557-6475
For Madera, Fresno, and Kings Counties:	**Central Region Office** 1990 East Gettysburg Avenue Fresno, CA 93726 (559) 230-5950 FAX (559) 230-6062
For Tulare County and the valley portion of Kern County	**Southern Region Office** 2700 "M" Street, Suite 275 Bakersfield, CA 93301 (661) 326-6900 FAX (661) 326-6985

www.valleyair.org

Dust Control Plan
Section 1 – General Information – Page 1

1-A Project Name and Location

Project Name: _____

Project Address: _____

Major X-Streets: _____

City: _____ County: _____

Section(s): _____ Township: _____ Range: _____

Expected Construction Start Date: _____ End Date: _____

1-B Contacts

Report the names, addresses, and phone numbers of persons and owners or operators responsible for the preparation, submittal, and implementation of the Dust Control Plan and responsible for the dust generating operation and dust control applications. (Rule 8021 Sec. 6.3.6.1)

Property Owner: _____

Address: _____

City / State / Zip: _____

Phone: _____ Fax: _____

Developer: _____

Address: _____

City / State / Zip: _____

Contact Person: _____

Phone: _____ Fax: _____

General Contractor: _____

Address: _____

City / State / Zip: _____

Contact Person: _____

Phone: _____ Fax: _____

This Dust Control Plan was prepared by:

Name: _____

Title: _____

Company Name: _____

Address: _____

City / State / Zip: _____

Phone: _____ Fax: _____

Date training completed: _____ Training Location: _____

Section 1 – General Information – Page 2

Project Name: _____

1-C Contractors

Provide the names, addresses, and phone numbers of the contractors involved in dust generating activities **or** performing dust control as part of this project. (Rule 8021 Sec. 6.3.6.1)

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

1-D Who will have the primary responsibility for implementing this Dust Control Plan?

(Rule 8021 Sec 6.3.6.1)

☐ **Property Owner** ☐ **Developer** ☐ **General / Prime Contractor**

☐ **Sub-Contractor(s)** ☐ **Other:** _____

Primary Project Contact: _____

Title: _____

Company Name: _____

Address: _____

City / State / Zip: _____

On-Site Phone: _____ Fax: _____

Mobile Phone: _____ Pager: _____

1-E Provide a brief description of the Project's Operations.

_____

_____

_____

_____

_____

Dust Control Plan
Section 2 – Plot Plan – Page 1

Project Name: _____

2-A Plot Plan

A plot plan identifies the type and location of each project. Attach appropriately sized maps with the project boundaries outlined or use the space in sections 2-B or 2-C to draw a plot plan. Attached maps may include tract maps, site maps, and topographic maps. Use the checklist below to make sure all areas have been identified on the plot plan. (Rule 8021 Sec. 6.3.6.2 & 6.3.6.5)

Identify the relative locations of actual and potential sources of fugitive dust emissions.

- ☐ Bulk material handling and storage areas.
- ☐ Paved and unpaved access roads, haul roads, traffic areas, and equipment storage yards.
- ☐ Exit points where carryout and trackout onto paved public roads may occur.
- ☐ Water supply locations if water application will be used for controlling visible dust emissions.

Identify the relative locations of sensitive receptors within ¼ mile of the project. (Rule 4102 Sec. 4.1)

- ☐ No sensitive receptors within ¼ mile of the project.
- ☐ Residential areas, schools, day care, churches, hospitals, nursing facilities, commercial, retail, etc.
- ☐ Freeways, roads, or traffic areas that may be affected by the dust generating activities.
- ☐ Other: _____

2-B Draw Plot Plan (if one is not attached)

May use the back of this form
Include a North Arrow

☐ Plot plan is attached (Skip to 3-A).

Section 2 – Plot Plan – Page 2

Project Name: _____

2-C **Draw Plot Plan** (if one is not attached) Include a North Arrow

Dust Control Plan
Section 3 – Fugitive PM10 Sources – Page 1

Project Name: _____

3-A Disturbed Surface Area

Report the total area of land surface to be disturbed, the daily throughput volume of earthmoving in cubic yards, and the total area in acres of the entire project site. (Rule 8021 Sec. 6.3.6.3)

Total area of land surface to be disturbed: _____ Acres

Daily maximum throughput volume of earthmoving: _____ Cubic Yards

Daily average throughput volume of earthmoving: _____ Cubic Yards

Total area of entire project site: _____ Acres

Total disturbed areas that will be left inactive for more than seven days: _____ Acres

3-B Dust Generating Activity Dates

The expected start and completion dates of **dust generating activities and soil disturbance activities** to be performed on site. For phased projects, it may be necessary to report expected start and completion dates separately. (Rule 8021 Sec. 6.3.6.4)

Expected start date: _____ **Completion Date**: _____

Phase Project Start – A: _____ Completion – A: _____

Phase Project Start – B: _____ Completion – B: _____

Phase Project Start – C: _____ Completion – C: _____

3-C Other Locations

Identify whether any other locations should be included with this plan that are involved with this project. An example may include listing any site where materials will be imported from or exported to. (Rule 8021 Sec. 6.3.2)

☐ No other locations are included with this project. (Skip to 3-D)

Location 1: _____

☐ No Dust Control Plan Required ☐ Included with this plan ☐ Included with another plan

Location 2: _____

☐ No Dust Control Plan Required ☐ Included with this plan ☐ Included with another plan

Location 3: _____

☐ No Dust Control Plan Required ☐ Included with this plan ☐ Included with another plan

Section 3 – Fugitive PM10 Sources – Page 2

Project Name: _____

3-D Sources of Fugitive Dust

This section describes the minimum requirements for limiting visible dust emissions from activities that cause fugitive dust emissions. (Rule 8021 Sec. 6.3.6.5) **Check at least one box under each category**.

Structural Demolition. (Rule 8021 Sec. 5.1, 6.3.3, & 6.3.6.5)

- ☐ No demolitions are planned for this project.
- ☐ Asbestos NESHAP notification and fees have been submitted to the District. (Rule 3050 and Rule 4002).
- ☐ Water will be applied to the following areas for the duration of the demolition activities:
  - Building exterior surfaces;
  - Unpaved surface areas where equipment will operate;
  - Razed building materials; and
  - Water or dust suppressants will be applied to unpaved surface areas within 100 feet of structure during demolition.

Pre-Activity. (Rule 8021 Sec. 5.2)

- ☐ Not applicable for this project (Please explain why in Section 3-F).
- ☐ The site will be pre-watered and work will be phased to reduce the amount of disturbed surface area at any one time (Complete Section 4-A).

Active Operations. (Rule 8021 Sec. 5.2)

- ☐ Water will be applied to dry areas during leveling, grading, trenching, and earthmoving activities (Complete Section 4-A).
- ☐ Wind barriers will be constructed and maintained, and water or dust suppressants will be applied to the disturbed surface areas (Complete Sections 4-A or 4-B, and 4-C).

Inactive Operations, including after work hours, weekends, and holidays. (Rule 8021 Sec. 5.2)

- ☐ Not applicable for this project (Please explain why in Section 3-F).
- ☐ Water or dust suppressants will be applied on disturbed surface areas to form a visible crust, and vehicle access will be restricted to maintain the visible crust. (Complete Section 4-A or 4-B, and 4-C)

Temporary stabilization of areas that remain unused for seven or more days. (Rule 8021 Sec. 5.2)

- ☐ Not applicable for this project (Please explain why in Section 3-F)
- ☐ Vehicular access will be restricted and water or dust suppressants will be applied and maintained at all un-vegetated areas (Complete Section 4-A or 4-B, and 4-C).
- ☐ Vegetation will be established on all previously disturbed areas (Complete Section 4-C).
- ☐ Gravel will be applied and maintained at all previously disturbed areas (Complete Section 4-C).
- ☐ Previously disturbed areas will be paved (Complete Section 4-C).

Unpaved Access and Haul Roads, Traffic and Equipment Storage Areas. (Rule 8021 Sec. 5.2 and 5.3)

- ☐ Not applicable for this project (Please explain why in Section 3-F)
- ☐ Apply water or dust suppressants to unpaved haul and access roads (Complete Section 4-A or 4-B)
- ☐ Post speed limit signs of not more than 15 miles per hour at each entrance, and again every 500 feet. (Complete Section 4-C)
- ☐ Water or dust suppressants will be applied to vehicle traffic and equipment storage areas (Complete Section 4-A or 4-B).

Wind Events. (Rule 8021 Sec. 5.4)

- ☐
  - Water application equipment will apply water to control fugitive dust during wind events, unless unsafe to do so.
  - Outdoor construction activities that disturb the soil will cease whenever visible dust emissions cannot be effectively controlled.

Section 3 – Fugitive PM10 Sources – Page 3

3-E Bulk Materials (Rule 8021 Sec. 6.3.6.6 and Rule 8031)

Outdoor Handling of Bulk Materials. (Rule 8031 Sec. 5.0 A)

- ☐ No bulk materials will be handled during this project.
- ☐ Water or dust suppressants will be applied when handling bulk materials.
- ☐ Wind barriers with less than 50 percent porosity will be installed and maintained, and water or dust suppressants will be applied.

Outdoor Storage of Bulk Materials. (Rule 8031 Sec. 5.0 B)

- ☐ No bulk materials will be stored during this project.
- ☐ Water or dust suppressants will be applied to storage piles.
- ☐ Storage piles will be covered with tarps, plastic, or other suitable material and anchored in such a manner that prevents the cover from being removed by wind action.
- ☐ Wind barriers with less than 50 percent porosity will be installed and maintained around the storage piles, and water or dust suppressants will be applied.
- ☐ A three-sided structure (< 50% porosity) will be used that is at least as high as the storage piles.

On-Site Transporting of Bulk Materials. (Rule 8031 Sec. 5.0 C)

- ☐ No bulk materials will be transported on the project site.
- ☐ Vehicle speed will be limited on the work site.
- ☐ All haul trucks will be loaded such that the freeboard is not less than six inches when transported across any paved public access road.
- ☐ A sufficient amount of water will be applied to the top of the load to limit visible dust emissions.
- ☐ Haul trucks will be covered with a tarp or other suitable cover.

Off-Site Transporting of Bulk Materials. (Rule 8031 Sec. 5.0 D)

- ☐ No bulk materials will be transported to or from the project site.
- ☐ The following practices will be performed: (complete Section 5-B)
  - The interior of emptied truck cargo compartments will be cleaned or covered before leaving the site.
  - Spillage or loss of bulk materials from holes or other openings in the cargo compartment's floor, sides, and tailgates will be prevented.
  - Haul trucks will be covered with a tarp or other suitable cover or will be loaded such that the freeboard is not less than six inches when transported on any paved public access road to or from the project site and a sufficient amount of water will be applied to the top of the load to limit visible dust emissions.

Outdoor Transport using a Chute or Conveyor. (Rule 8031 Sec. 5.0 E)

- ☐ No chutes or conveyors will be used.
- ☐ Chute or conveyor will be fully enclosed.
- ☐ Water spray equipment will be used to sufficiently wet the materials.
- ☐ Transported materials will be washed or screened to remove fines (PM10 or smaller).

3-F Comments

Dust Control Plan
Section 4 – Dust Control Methods – Page 1

Project Name: _____

4-A Water Application

Complete this section if water application will be used as a control method for limiting visible dust emissions and stabilizing surface areas. Check and answer everything that applies to this project.
(Rule 8021 Sec. 6.3.6.6)

Water Application Equipment:

☐ Sprinklers: Describe the activities that will utilize sprinklers:

_____

Minimum treated area: _____ ☐ Square Feet ☐ Acres

Maximum treated area: _____ ☐ Square Feet ☐ Acres

Minimum water flow rate: Duration: _____

☐ Water Truck, ☐ Water Trailer, ☐ Water Wagon, ☐ Other: _____

Describe the activities that will utilize this equipment:

_____

Number of application equipment available: _____

Application equipment capacity: _____

Application frequency: _____

Application rate: _____ Gallons per acre per application

Hours of operation: _____

Water application equipment is available to operate after normal working hours, on weekends, and holidays.

After-hours contact: _____ Phone No.: _____

After-hours contact: _____ Phone No.: _____

Water Supply: Include the relative locations of these sources on the plot plan in Section 2.

☐ Fire hydrants

Number of hydrants available On-Site: _____ Off-Site: _____

Approval granted by the owner or public agency to use their fire hydrants for this project.

Owner or Agency: _____

Contact: _____ Phone No.: _____

☐ Storage tanks Number and capacity: _____

☐ Wells Number and flow rate: _____

☐ Canal, River, Pond, Lake, etc. Describe: _____

Approval granted by the owner or public agency to use their water source for this project.

Owner or Agency: _____

Contact: _____ Phone No.: _____

☐ Other: _____

Section 4 – Dust Control Methods – Page 2

Project Name: _____

4-B Dust Suppressant Products

Complete this section if a dust suppressant product will be used. These materials include, but are not limited to: hygroscopic suppressants (road salts), adhesives, petroleum emulsions, polymer emulsions, and bituminous materials (road oils). (Rule 8021 Sec. 6.3.6.6)

Copy this page if more than one dust suppressant product will be used.

☐ **Not Applicable.** Only water application will be the control method used. **Skip to 4-C.**

Application Area: _____

Product Name: _____

Contractor's Name: _____ Phone No: _____

Application Rate: _____ Gallons of undiluted material per ☐ mile or ☐ acre treated.

Application Frequency: _____ Applications per ☐ week, ☐ month, ☐ year

Application Equipment: _____

Number of Application Equipment Available: _____

Application Equipment Capacity: _____

Attach each of the following information that fully describes this product. Use the checklist below to make sure all information is submitted with this plan.

- ☐ Product Specifications (MSDS, Product Safety Data Sheet, etc.)
- ☐ Manufacturer's Usage Instructions (method, frequency, and intensity of application)
- ☐ Environmental impacts and approvals or certifications related to the appropriate and safe use for ground application.

Section 4 – Dust Control Methods – Page 3

Project Name: _____

4-C Other Dust Control Methods

Check below the other types of dust control methods that will be employed at the construction site. (Rule 8021 Sec. 5.2)

☐ Physical barriers for restricting unauthorized vehicle access:
- ☐ Fences ☐ Gates ☐ Posts ☐ Berms ☐ Concrete Barriers
- ☐ Other: _____

☐ Wind barriers Describe: _____

☐ Posted speed limit signs meet State and Federal Department of Transportation standards. (Rule 8021 Sec. 5.3)
- ☐ Posted at 15 miles per hour, ☐ Posted at _____ miles per hour (less than 15 MPH)

☐ Re-establish vegetation for temporarily stabilizing previously disturbed surfaces.
- Explain: _____

☐ Apply and maintain gravel:
- ☐ On haul roads ☐ On access roads ☐ At equipment storage yards
- ☐ At vehicle traffic areas ☐ For temporarily stabilizing previously disturbed areas.
- Explain: _____

☐ Apply pavement:
- Explain: _____

☐ Other: _____

4-D Contingencies

Contingencies to be implemented if application equipment becomes inoperable, more equipment is needed to effectively control fugitive dust emissions during active and inactive periods, accessibility limitations occur at the water sources, or staff is not available to operate the application equipment. Describe the contingencies that will be in place and when they will be implemented. Attach any additional information if needed. (Rule 4102 and Rule 8021 Sec. 6.3.6.6)

_____

_____

_____

_____

_____

4-E Record keeping (Rule 8011 Sec. 6.2)

Records and any other supporting documents for demonstrating compliance must be maintained, but only for those days when a control measure is implemented. The District has developed record keeping forms that may be used for complying with this requirement. Check one or both below:

☐ Records will be maintained using the forms developed by the District.

☐ Records will be maintained using documents or forms developed by the owner or operator.

Explain and include copies: _____

Dust Control Plan
Section 5 – Carryout and Trackout – Page 1

Project Name: _____

5-A Treatments for Preventing Trackout

Select the control devices that will be used for preventing trackout from occurring onto paved public roads. Trackout is any material that adheres to vehicle tires and is deposited onto a paved public road or the paved shoulder of a paved public road. Check one or a combination that will apply to this project.

☐ **Grizzly:** Rails, pipes, or grates used to dislodge debris off of vehicles before exiting the site. Extends from the intersection with the paved public road surface for the full width of the unpaved exit surface for a distance of at least 25 feet. (Rule 8041 Sec. 5.9.1)

Describe: _____

☐ **Gravel Pad:** A layer of washed gravel at least one (1) inch or larger in diameter, three (3) inches deep, and extends from the intersection with the public paved road surface for the full width of the unpaved exit surface for a distance of at least 50 feet. (Rule 8041 Sec. 5.9.2)

Gravel Size: _____ Inches

Pad Width: _____ Feet Length: _____ Feet Depth: _____ Inches

☐ **Paved Surface:** Extends from the intersection with the paved public road surface for the full width of the unpaved access road for at least 100 feet to allow mud and dirt to drop off of vehicles before exiting the site. (Rule 8041 Sec. 5.9.3)

Width: _____ Feet Length: _____ Feet

Mud and dirt deposits accumulating on paved interior roads will be removed with sufficient frequency, but not less frequently than once per workday. Cleanup will commence within ½ hour of generating any carryout and trackout. (Rule 8041 Sec. 5.8.2 and 5.9.3)

Clean-up Frequency: _____

☐ **Wheel Washer:** Uses water to dislodge debris from tires and vehicle undercarriage. (Rule 8011 Sec. 3.73)

Describe: _____

☐ **Other:** (Rule 8041 Sec. 5.8.1.2) _____

5-B Treatments for Preventing Carryout

Report the required treatments that will be used for preventing carryout from occurring on paved public roads. Carryout occurs when materials from emptied or loaded haul trucks, vehicles, or trailers falls onto a paved public road or paved shoulder of a paved public road.

☐ No haul trucks will be routinely entering or leaving the project site.

Emptied Haul Trucks: (Rule 8031 Sec 5.0)

☐ Interior cargo compartments will be cleaned before leaving the project site.

☐ Cargo compartment will be covered with a tarp or suitable cover before leaving the project site.

Loaded Haul Trucks: Spillage or loss of materials from holes or other opening in the cargo compartment will be prevented when material is transported onto any paved public access road. (Rule 8031 Sec 5.0)

Select one or both of the required applications:

☐ Haul trucks will be loaded such that the freeboard is not less than six inches with water applied to the top of the load before leaving the project site.

☐ Cargo compartment and load will be covered with a tarp or suitable cover before leaving the project site.

☐ **Other:** _____

Section 5 – Carryout and Trackout – Page 2

Project Name: _____

5-C Cleaning up Carryout and Trackout

Check and report below the methods and frequency for cleaning up carryout and trackout from the surface and paved shoulders of paved public roads.

The use of blower devices, or dry rotary brushers or brooms, for removal of carryout and trackout from paved public roads is prohibited. (Rule 8041 Sec. 5.0).

In the event the control device becomes ineffective due to an accumulation of mud and dirt, material must be removed within ½ hour of the generation of carryout and trackout. (Rule 8041 Sec. 5.8.2.)

The project is located in:

☐ An **Urban Area,** within an incorporated city boundary or an unincorporated area surrounded by a city.

Minimum cleanup frequency will be at the end of the workday and removed immediately if carryout and trackout extends beyond 50 feet. (Rule 8041 Sec. 5.4)

☐ A **Rural Area,** located within an unincorporated area and not surrounded by an incorporated city.

- ☐ The construction project is less than 10 acres in size: minimum cleanup frequency is at the end of the workday. (Rule 8041 Sec. 5.1)
- ☐ Construction projects 10 or more acres in size: minimum cleanup frequency is end of the workday and immediately if carryout and trackout extends beyond 50 feet. (Rule 8041 Sec. 5.5)

Clean up Method: Check the method below that will be used for cleaning carryout and trackout.

☐ Manually sweeping and picking up. (Rule 8041 Sec. 5.7.1)

☐ Mechanical sweeping with a rotary brush or broom accompanied or preceded by water. (Rule 8041 Sec. 5.7.2)

Describe the types of equipment that will used:

_____

☐ Operating a PM10-efficient street sweeper. (Rule 8041 Sec. 5.7.3)

Make and Model: _____

☐ Flushing with water: allowed if: (Rule 8041 Sec. 5.7.4)

- No curbs or gutters are present.
- Using water will not result as a source of trackout and carryout.
- Using water will not result in adverse impacts on storm water drainage systems.
- Using water will not violate any National Pollutant Discharge Elimination System permit program.

5-D Record keeping for Cleanup of Carryout and Trackout (Rule 8011 Sec. 6.2)

Records and any other supporting documents for demonstrating compliance must be maintained. The District has developed a record keeping form specific for cleaning carryout and trackout from paved public roads and may be used for complying with this requirement. Check one or both below:

☐ Records will be maintained using the form developed by the District.

☐ Records will be maintained using documents or forms developed by the owner or operator.

Explain and include copies: _____

Dust Control Plan
Section 6 – Certification

Project Name: _____

6-A Certification

I certify that all information contained herein and information submitted in the attachments to this documents are true and correct.

Print Name	Title
Signature	Date

Phone Number	Fax Number	Cell Number

Appendix F

Cultural Resources Inventory and Evaluation Report for the Machado Development Project, San Joaquin County, California

Draft
Cultural Resources Inventory and Evaluation Report for the Machado Development Project, San Joaquin County, California

Prepared for:

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916/737-3000

August 2007

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Acronyms and Abbreviations

CCIC	Central California Information Center
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
City	City of Manteca
CPRR	Central Pacific Railroad
CRHR	California Register of Historical Resources
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
PRC	Public Resources Code
PUSA	primary urban service boundary
SPRR	Southern Pacific Railroad
SSJID	South San Joaquin Irrigation District

INTRODUCTION

Jones & Stokes has contracted with the City of Manteca (City) to conduct environmental studies in conjunction with the proposed Machado Development project. The proposed project is the construction of the Machado Development subdivision into single-family residential lots. The proposed project is located in San Joaquin County (Figure 1) directly south of the Manteca city limits but within the City's primary urban service boundary (PUSA) (Figure 2). The Machado Development site is located at the southeast corner of the Airport Way/Woodward Avenue intersection (Figure 3).

Project Characteristics

The project site is currently used primarily for agriculture. Residential tracts are located north of the project site while land to the east, south, and west consists of agricultural land and residential development.

The proposed project will result in the construction of the Machado Estates subdivision. The project will subdivide approximately 156.80 acres into 559 single-family residential lots. One existing residence on the property would be removed. The project proponents propose that the project site connect to existing city public services and utilities. The proposed project would require annexation, prezoning, a development agreement, and a tentative map for residential development. The project will provide additional housing for an expanding population in Manteca.

REGULATORY SETTING

California Register of Historical Resources

The California Environmental Quality Act (CEQA) requires that public or private projects financed or approved by public agencies be assessed to determine the effects of the projects on historical resources and unique archaeological resources. CEQA uses the term *historical resources* to include buildings, sites, structures, objects, or districts, each of which may have historical, pre-historical, architectural, archaeological, cultural, or scientific importance. The term *unique archaeological resource* refers to an archaeological artifact or site that does not meet the criteria for "historical resource" but does meet criteria set forth in Section 21083.2.

CEQA states that if implementation of a project results in significant effects on historical resources, then alternative plans or mitigation measures must be considered; however, only significant historical resources need to be addressed (California Code of Regulations [CCR]

15064.5, 15126.4). Therefore, before impacts and mitigation measures can be identified, the significance of historical resources must be determined.

CEQA guidelines define three ways that a property may qualify as a historical resource for the purposes of CEQA review:

- if the resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR),

- if the resource is included in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of section 5024.1(g) of the Public Resources Code unless the preponderance of evidence demonstrates that it is not historically or culturally significant, or

- the lead agency determines the resource to be significant as supported by substantial evidence in light of the whole record (CCR, Title 14, Division 6, Chapter 3, section 15064.5(a)).

Each of these ways of qualifying as an historical resource for the purpose of CEQA is related to the eligibility criteria for inclusion in the CRHR (Public Resources Code [PRC] 5020.1(k), 5024.1, 5024.1(g)). A historical resource may be eligible for inclusion in the CRHR if it meets any of the following criteria.

1. The resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

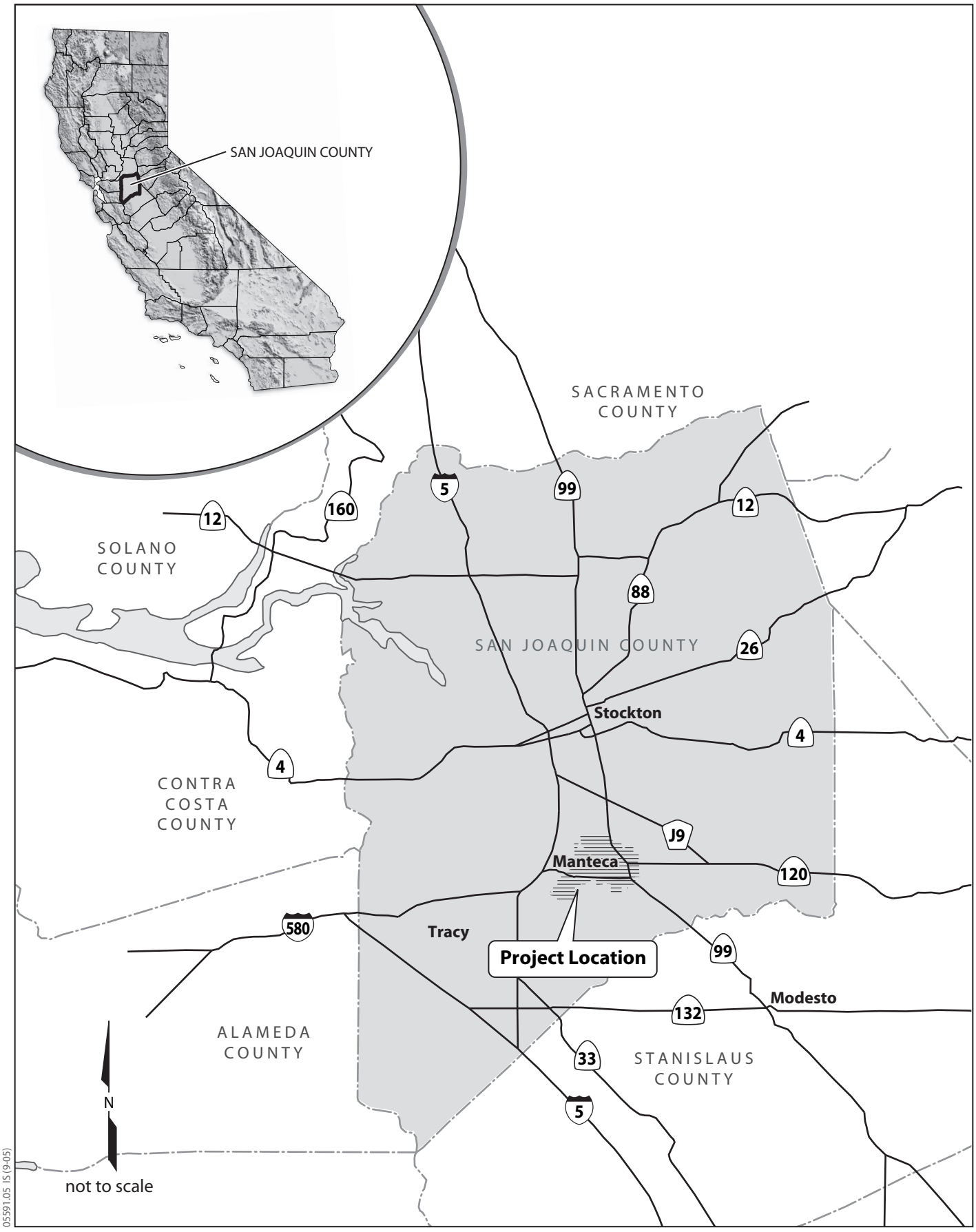
2. The resource is associated with the lives of persons important in our past.

3. The resource embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

4. The resource has yielded, or may be likely to yield, information important in prehistory or history.

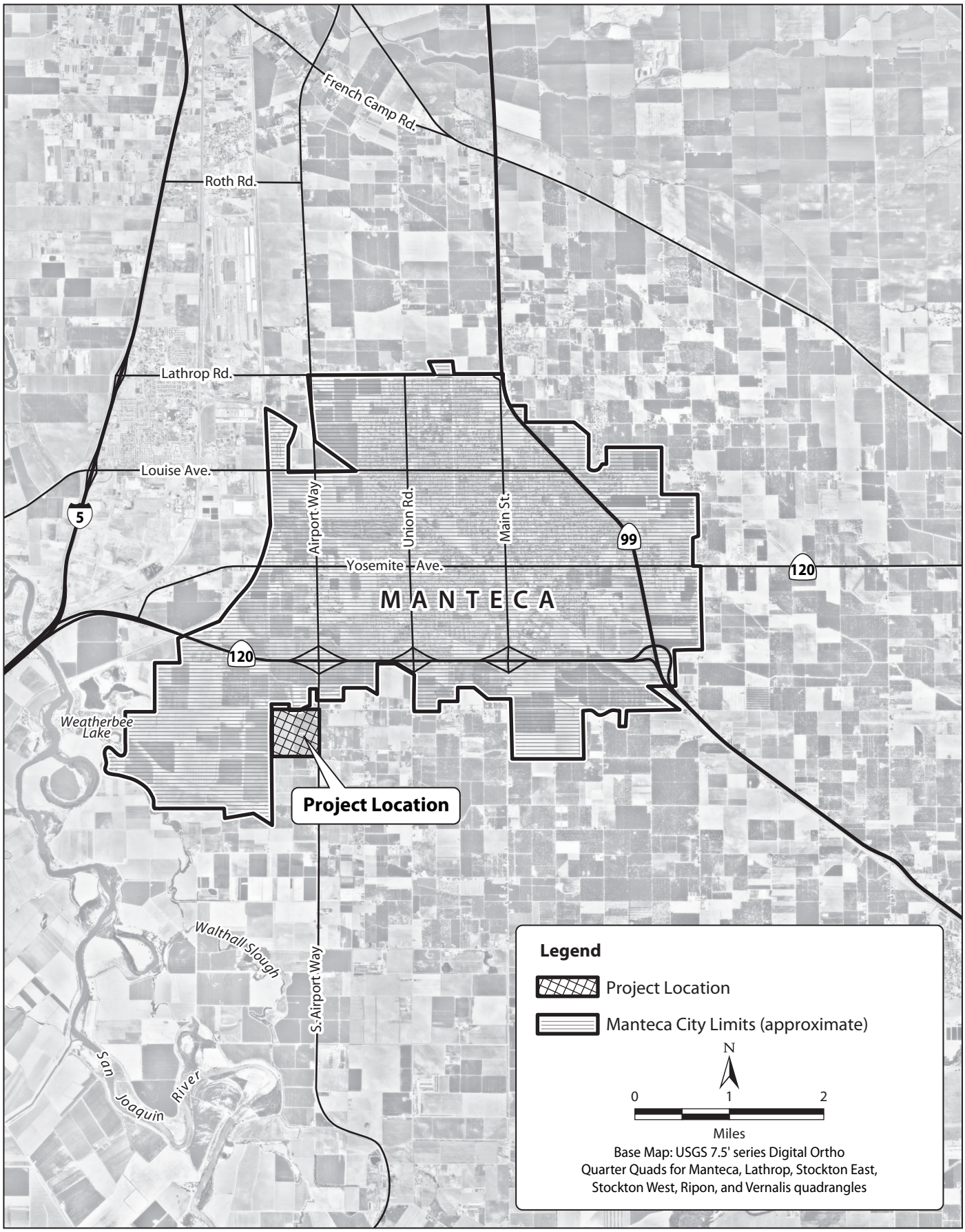
Properties that are listed in or eligible for listing in the National Register of Historic Places (NRHP) are considered eligible for listing in the CRHR, and thus are significant historical resources for the purpose of CEQA (PRC 5024.1(d)(1)).

According to CEQA guidelines, effects on important or unique archaeological resources must be addressed as well. A *unique archaeological resource* is an artifact or site that, more than adding to the current body of knowledge, has the potential to meet any of the following criteria.



Jones & Stokes

Figure 1
Project Vicinity



05591.05 IS (9-05)

Jones & Stokes

Figure 2
Location of the Machado Estates Project



05591.05 IS (9-05)

Jones & Stokes

Figure 3
Aerial Photograph of the Machado Estates Location

1. The resource contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

2. The resource has a special and particular quality such as being the oldest of its type or the best available example of its type.

3. The resource is directly associated with a scientifically recognized important prehistoric or historic event or person. (PRC 21083.2)

CULTURAL SETTING

Prehistoric Setting

It is probable that humans have inhabited the Sacramento-San Joaquin Valley for the last 10,000 years. However, evidence for early occupation is likely buried deep under alluvial sediments deposited during the late Holocene. Although rare, archaeological remains of the early period have been identified in and around the Central Valley (Johnson 1967; Peak & Associates 1981; Treganza and Heizer 1953), but to date none have been located in the West Sacramento area. Early archaeological manifestations are categorized as the Farmington Complex, which is characterized by core tools and large, reworked percussion flakes (Treganza and Heizer 1953). The economy of this early period was likely based on the exploitation of large game.

Later periods are better understood because of more abundant representation in the archaeological record. Fredrickson (1973) identified three general patterns of cultural manifestations for the period between 4500 B.P. and 3000 B.P.: the Windmiller, Berkeley, and Augustine Patterns.

The Windmiller Pattern (4500–3000 B.P.) shows evidence of a mixed economy consisting of the generalized hunting of game, fishing, and use of wild plant foods. Settlement strategies during the Windmiller period reflect seasonal occupation of valleys during the winter and the foothills during the summer (Moratto 2004).

Cultural changes are manifested in the Berkeley Pattern (3500–2500 B.P.). Technological changes in groundstone from handstones and milling slabs to the mortar and pestle indicate a greater dependence on acorns, and the presence of a wide variety of projectile points and atlatls indicate hunting was still an important activity (Fredrickson 1973).

The Berkeley Pattern was superseded by the Augustine Pattern around 1500 B.P., and reflects a change in subsistence and land use patterns similar to those of the ethnographically known people of the proto-historic era. This pattern exhibits a great elaboration of ceremonial and social organization, including the development of social stratification. Elaborate exchange

systems, further reliance on acorns, and a wide variety of artifacts (flanged tubular smoking pipes, harpoons, clamshell disc beads, and an especially elaborate baked clay industry, which included figurines and pottery vessels called Cosumnes Brownware) are associated with the Augustine Pattern. Increased village sedentism, population growth, and an incipient monetary economy are also hallmarks of this pattern (Moratto 2004).

Ethnographic Setting

The project area was aboriginally inhabited by the Northern Valley Yokuts. Ethnographic work with this group is lacking in comparison to other groups within California. Because of the early decimation of the aboriginal populations in the lower San Joaquin Valley, most information regarding this group is gleaned from accounts of Spanish military men and missionaries. A summary of these sources has been compiled by W. J. Wallace (1978), and it is upon this work that this brief ethnographic setting is based.

Northern Valley Yokuts territory is defined roughly by the crest of the Diablo Range on the west, and the foothills of the Sierra Nevada on the east. The southern boundary is approximately where the San Joaquin River bends northward, and the northern boundary is roughly halfway between the Calaveras and Mokelumne Rivers. The Yokuts may have been fairly recent arrivals in the San Joaquin Valley, perhaps being pushed out of the foothills about 500 years ago.

Population estimates for the Northern Valley Yokuts vary from 11,000 to more than 31,000 individuals. Populations were concentrated along waterways and on the more hospitable east side of the San Joaquin River. Villages, or clusters of villages, made up "miniature tribes" (tribelets) lead by headmen. The number of tribelets is estimated at 30 to 40; each tribe spoke their own dialect of the Yokuts language. Combined with the Southern Valley Yokuts and the Foothill Yokuts dialects, these tongues formed the Yokutsan linguistic family of the Penutian Stock (Shipley 1978).

Principal settlements were located on the tops of low mounds, on or near the banks of the larger watercourses. Settlements were composed of single-family residences, sweathouses, and ceremonial assembly chambers. Residences were small and lightly constructed, semi-subterranean and oval. The public structures were large and earth covered. Sedentism was fostered by the abundance of riverine resources in the area.

Subsistence among the Northern Valley Yokuts revolved around the waterways and marshes of the lower San Joaquin Valley. Fishing with dragnets, harpoons, and hook and line, yielded salmon, white sturgeon, river perch, and other species of edible fish. Waterfowl and small game attracted to the water also provided a source of protein. The contribution of big game to the diet was probably minimal. Vegetal staples included acorns, tule roots, and seeds.

Goods not available locally were obtained through trade. Paiute and Shoshone groups on the eastern side of the Sierra were suppliers of obsidian. Shell beads and mussels were obtained from Salinan and Ohlone groups. Trading relations with Miwok groups yielded baskets and bows and arrows. Overland transport was facilitated by a network of trails, and tule rafts were used for water transport.

Most Northern Valley Yokuts groups had their first contact with Europeans in the early 1800s, when the Spanish began exploring the Sacramento-San Joaquin river delta. The gradual erosion of Yokuts culture began during the mission period. Escaped neophytes brought foreign (European and Native American) habits and tastes, and Spanish expeditions to recover escapees. Epidemics of European diseases played a large role in the decimation of the native population. With the secularization of the mission and the release of neophytes, tribal and territorial adjustments were set in motion. Many former neophytes returned to their ancestral homeland only to find populations greatly diminished and sometimes gone. Because of this, many Native Americans chose to band together with people from other groups, and a number of polyglot "tribes" were formed. The final blow to the aboriginal population came with the Gold Rush and its aftermath. In the rush to the southern mines, native populations were pushed out of the way, and out of their territories. Ex-miners settling in the fertile valley applied further pressure to the native groups, and altered the landforms and waterways of the valley. Many Yokuts resorted to wage labor on farms and ranches. Others were settled on land set aside for them on the Fresno and Tule River Reserves. (Wallace 1978.)

Historic Setting

Early History: Exploration and Settlement

The study area is located in San Joaquin County, just south of the City of Manteca. Established with statehood in 1850, San Joaquin County was one of California's original 27 counties. The county takes its name from the San Joaquin River, which was named by Gabriel Moraga for Saint Joachim in 1813. The City of Stockton, which lies north of Manteca but is centrally located within the county, has been the county seat since its inception (Hoover et al. 1990:348, 350).

Although Spanish and Mexican settlers generally confined their settlements to the coastal region of California, early explorers did venture into the Sacramento–San Joaquin Delta on several occasions. Eighteenth-century explorers of the area included Pedro Fages (1772), Juan Bautista de Anza (1776), and Francisco Eliza (1793). Between 1806 and 1817, expeditions led by Gabriel Moraga (1806, 1808), Father Ramon Abella (1811), Jose Antonio Sanchez (1811), and Father Narciso Duran (1817) surveyed the region for potential mission sites (Hoover et al. 1990:285-286, 348–349).

The first European-American to traverse the area was likely Jedediah Strong Smith, who opened the Sacramento Trail in the late 1820s. Smith reported the quantity and quality of furs

available in California to the Hudson's Bay Company and, in 1828; the company sent its first trapping expedition into the region. Trappers working for Hudson's Bay Company established the settlement of French Camp south of the modern location of Stockton and north of the modern location of Manteca. The camp was occupied from 1832 to 1845. (Thompson 1980:94; Thompson and West 1968:10–11; Hoover et al. 1990:349.)

The American annexation of California, the discovery of gold in 1848, the resulting Gold Rush, and California statehood in 1850 all contributed to a change in the area that would come to be known as Manteca in the mid-and late-nineteenth century. During the Gold Rush, many Argonauts (as the gold seekers were called) turned their attention to the verdant soil of the Central Valley, preferring the typically more stable income provided by agricultural endeavors. The rich farmlands of the Central Valley, including around Manteca, assured the continued growth of the region during the post-Gold Rush era. Prominent early Manteca-area agriculturalists and ranchers—John McMullin (longtime landowner in the study area), George Wetherbee, Benjamin Goodwin, Joshua Cowell, and Cutler Salmon—established productive farms and ranches. (Thompson 1980:28–34, Stockton Savings and Loan Association n.d.:8.)

Agricultural and Irrigation Development

What is now the City of Manteca was once a small farming community populated by a few families whose homes sat on large tracts of land scattered throughout the area. One prominent early settler, Joshua Cowell, considered the "Father of Manteca," farmed much of the land currently occupied by downtown Manteca, while another settler, John McMullin, a veteran of the Mexican-American War, ran a lucrative cattle ranching operation south of the city. Although cattle ranching was popular in the region for a short time, due to a drought in the early 1860s, many ranchers turned to farming. These early farmers initially grew wheat and barley, but later, after the introduction of irrigation in 1885, switched to almonds, alfalfa, melons, and grapes. Dairy farming also became prominent after the introduction of irrigation. As a result, by the turn of the twentieth century, grain was no longer the staple crop of the region. (Thompson 1980:28–34, 94, 140; Thompson and West 1968:104–105; Stockton Savings and Loan Association n.d.:3.)

Irrigation was first introduced to the Manteca region in 1846, when Mormon settlers dug a small ditch along the Stanislaus River; however, its impact on the agricultural development of the area was negligible. In 1885, Joshua Cowell and his brother attempted to build an irrigation ditch near the Stanislaus River. Their efforts to establish an irrigation system were thwarted, however, when farmers refused to pay them for water. Another attempt was made in 1889, when the San Joaquin Land and Water Company was formed to construct an irrigation system for the Manteca area. Soon after the company began work on a diversion dam on the Stanislaus River, construction was halted due to disagreements among the company's principals. Eventually, the company reorganized into the Stanislaus and San Joaquin Water Company, and in 1895 it began work on a system of ditches that stretched from Knight's Ferry to Manteca. When completed in 1905, the system, known as the Tulloch System, was able to irrigate 3000 acres. While the system contributed to growth of the dairy industry and the successful planting of alfalfa in the

Manteca area, farmers in the south San Joaquin region believed it was inadequate and formed a local farm bureau to advocate for an irrigation district. Ultimately, their efforts were successful when on May 11, 1909, the South San Joaquin Irrigation District (SSJID), which included the towns of Manteca, Ripon, Oakdale, and Escalon in its borders, was formed. (Thompson 1980:94, 124–125; Adams 1915:67.)

Over the next five years, flumes, dams, and ditches were constructed throughout the south San Joaquin region to bring the waters of the Stanislaus to farmers. As of September 1915, an estimated 22,000 acres was being irrigated. Crops growing as a result of irrigation included approximately 10,928 acres of alfalfa, 3,136 acres of vines, 1,547 acres of sunflowers, 1,322 acres of beans, 2,909 acres of corn, as well as smaller acreages of melons, beets, and tomatoes. By 1927, the amount of irrigated land had increased to approximately 53,000 acres, though by this time, tomatoes and almonds were some of the most popular crops grown in the south San Joaquin region. While tomato production faltered in the San Joaquin region after the onset of World War II, after the war farmers continued to grow them as well as crops such as almonds. Indeed, by 1980, almonds were the staple crop of the Manteca region. Likewise, irrigation continued to expand after the World War II, and by 2007 SSJID was delivering water to farmers in the Manteca region from waters stored behind by the New Melones, Tulloch, Beardsley, Goodwin, and Donnell dams. (Thompson 1980:126, 143; Adams 1915:70; Adams 1929:169; South San Joaquin Irrigation District 2005.)

The City of Manteca

The City of Manteca proper began as flag stop on the Southern Pacific Railroad (SPRR). In 1869, the Central Pacific Railroad (CPRR) established a line that passed through the region. The SPRR successor to the CPRR continued to operate in the area until the twentieth century. Known as Cowell's Station, the flag stop was originally a discarded boxcar located near the junction of the railroad line and Yosemite Avenue (Thompson 1980:94).

Around 1896, local dairymen and farmers established a cooperative skimming station for raw milk at the stop. To differentiate the station from another stop also called Cowell's Station located on the same railroad alignment, at the request of residents, and perhaps because of the recently established creamery, the railroad renamed it "Monteca," an adaptation of the Spanish word for butter, *manequilla.* Nevertheless, the railroad misprinted the name as "Manteca," Spanish for lard, on the first tickets produced for the stop. Thus, it was by error that the City of Manteca received its name (Thompson 1980:95, 122).

After the establishment of the creamery, Manteca began to grow. Between 1905 and 1911, locals established a winery, a telephone exchange, a post office, and a two-story hotel. City officials set up a board of trade in 1909, and Joshua Cowell, a longtime booster of local irrigation, pushed for the establishment of the SSJID. The following year, a branch library and a lumberyard opened. Electricity came to the settlement in 1911. Other improvements to the town that year included the construction of a bank, a larger train depot, a pair of two-story brick buildings, and concrete sidewalks. By 1914, local businessmen, Achille Baccilieri, T.A. Nelson,

F.M. Cowell, and Louis Vistica recognized that the agricultural products produced in the Manteca region could support the creation of a local cannery; consequently, they opened the Manteca Canning Company. That same year a large plant for dairy products also opened in city. Over the next several years, three more canneries went into operation in the town. In 1916, the Board of Trade succeeded in bringing a Spreckel's sugar factory to Manteca, which opened in 1918. This development caused the town to swell from 371 residents in 1915 to 567 in 1916. On May 28 of that same year, the City of Manteca was formally incorporated. Within two decades, Manteca had grown from a small railroad stop to a full-fledged city complete with public services and manufacturing facilities. (Thompson 1980:96, 98, 101, 103, 110, 125, 129, 130, 133, 135–136, 142, 143.)

In the early 1920s, insect-infested crops, along with a significant drop in sugar prices, caused Spreckles Sugar Refinery to close. Manteca was also not immune from the economic downturn of the Great Depression of the 1930s, which was felt in communities nationwide. In a joint effort to revive Manteca's local economy, the United States Department of Agriculture and Spreckles Sugar Refinery produced a more disease-resistant sugar beet seed, and the local refinery reopened in 1931. The reopening of the sugar refinery, combined with the opening of a Kraft Foods cheese factory, served to boost the local economy during the mid 1930s and into the early 1940s. During World War II, the Spreckles Sugar Refinery closed once again and the company's machine shop was used by the United States Navy to store supplies. The sugar production facility re-opened in 1946 and remained a profitable enterprise throughout the twentieth century. (Hillman and Covello 1985:62–63.)

Manteca, along with the nation as a whole, enjoyed a period of prosperity following the end of the World War II. During the 1950s, commuters moved to the city because of its proximity to Tracy, Modesto, and Stockton. At the end of the 1960s, the influx of people brought more prosperity to the town, as the downtown commercial district expanded to support the needs of Manteca's 16,000 residents. Traffic improvements to solve the problem of road congestion in the growing community began in the late 1960s, including a major bypass between Interstate 5 and Highway 99 completed in 1979. The City of Manteca remains a community primarily based in agriculture, with a number of other industries including manufacturing. Overall growth has been relatively slow however, in recent years; the city has seen an influx of residential development. (Stockton Savings and Loan Association n.d.:4, Hillman and Covello 1985:67.)

Development of the Study Area

The study area is located south of Lathrop and West Manteca along the southwestern corner of the intersection of Woodward Avenue and South Airport Avenue (Durham Ferry Road). Over time, several property owners have been associated with the study area. One of the earliest such property owners was J. M. Barber, who acquired the rural property sometime prior to 1870 (Wallace 1870). Barber held the land until 1895, when H. B. Knight became associated with the land (Reid 1883). The study area remained in the Knight family for the early part of the twentieth century, passing from L. Knight to R. N. Knight by 1917 (Budd & Widdows 1917,

Quail 1905, Quail 1912). Records indicate that a residence was sited on the property during this period (U.S. Geological Survey 1915). While little is known of the property owners after Knight, it appears that by 1952 two additional structures were located in the study area. Development of the parcel continued until the late 1980s (U.S. Geological Survey 1952, PR 1968, PR 1976, and PR 1987).

METHODS AND RESULTS

Records Search

A records search was conducted at the Central California Information Center (CCIC) at California State University, Stanislaus, on August 31, 2005. The state's database of previous studies and recorded cultural resources was consulted, as well as pertinent historical inventories and historic maps. The records search indicated that two previous studies have been conducted within or immediately adjacent to the project area (Baloian et al. 2004, Napton 1993). Both of these studies were sensitivity analyses, and neither included pedestrian inventories. No recorded cultural resources are located within the project area. Napton indicates that portions of the current project area along Union Road and Woodward Avenue are sensitive for historic-period cultural resources. An 1854 GLO plat map depicts an unnamed road that traversed the northern portion of the project area.

Native American Correspondence and Other Interested Party Contacts

A search of the Native American Heritage Commission (NAHC) sacred lands database and list of potentially interested Native American representatives was requested on August 30, 2005. The NAHC responded on September 2, 2005, stating that the search of its sacred lands database had failed to indicate the presence of Native American cultural resources in the immediate project area and providing a list of one Native American representative. A contact letter explaining the project and indicating the project location was sent to the Native American representative on September 6, 2005. A telephone call was made to the Native American representative on April 9, 2007 and a message was left asking for a return call if there were any issues or concerns about the current project. As of September 5, 2007, no response has been received.

On June 29, 2007, Jones & Stokes sent letters to the Manteca Historical Society and Museum and the San Joaquin County Historical Society and Museum. The letters briefly described the proposed project and requested information about cultural resources near the study area. As of July 10, 2007, Jones & Stokes has not received any responses. Copies of letters sent and received from interested parties are located in Appendix A.

Historical Research

A Jones & Stokes architectural historian conducted archival research at the California Room, California State Library; the Government Publications Section, California State Library; and the City of Manteca Public Library. In addition, Jones & Stokes contacted the San Joaquin County Assessor's Office for information. The purpose of this research was to identify important historic people, events, and architectural trends that may have been associated with the study area.

Field Survey

Archaeological Resources

On March 28, 2007, Jones & Stokes archaeologists conducted an intensive pedestrian survey of the study area. Transects were spaced no wider than 15-meters to ensure maximum ground coverage. Ground visibility ranged from excellent to good (75% to 100%) throughout the study area. No indication of the road shown on the 1854 GLO could be located within the project area. No archaeological resources were located as a result of the survey.

Architectural Resources

On March 20, 2007, a Jones & Stokes architectural historian conducted a field survey of the entire study area (see Figure 3). As part of the field process, buildings and structures 50 years old or older were inspected, photographed, and documented using written notes.

Resource Description and Evaluation

Archaeological Resources

No known archaeological resources are present in the project area.

Architectural Resources

A total of six architectural resources and/or linear features (two residences, two outbuildings, and a pump and ditch) that are 50 years old or older are located in the study area. The resources are located on one parcel (APN 24132018). All of the aforementioned resources were evaluated for the CRHR as part of this project and the Department of Parks and Recreation 523 forms for these resources are located in Appendix B.

Description

The property (APN 24132018) located on the southwest corner of the intersection of Woodward Avenue and Airport Way features two residential residences, two outbuildings, a pump, and a ditch. The two residences have different addresses, but all resources are located on the 156.80-acre parcel (San Joaquin Assessor's Office). The residences and outbuildings are clustered together in the southern portion of the northeastern quarter of the parcel along its eastern boundary. They are located in a landscaped area, featuring trees, a lawn, animal pens, and temporary structures. The ditch, located south of the residences and the outbuildings, runs from the parcel's eastern boundary to its approximate center through the center of a vacant field. The pump is centrally located on parcel's northern boundary, adjacent to some power lines and a dirt access road that runs south through the center of the parcel. It appears that the pump and the ditch are connected to an irrigation system that runs through the center of the property.

20329 S. Airport Way (Residence 1)

The residence located at 20329 S. Airport Way (Residence 1) is a simple plan single-family one-story hall-and-parlor Folk-style residence of wood frame construction. It rests upon a concrete foundation. The residence has a side gabled roof with composite shingles and wide eaves with exposed rafters. The north and south elevations feature attic vents below each gable. The exterior walls of the residence are clad in plaster while single-hung one-over-one wood and aluminum sash sliding fenestration is prominent on the east, west, and north elevations. An air-conditioning unit is located in a window on the north elevation. The east elevation features a porch with a gabled roof supported by two rough hewn wooden supports that shelters the front entrance. The south elevation features an enclosed wood frame porch addition with flush shiplap siding and wood framed openings protected by screens. The porch addition also features a gabled roof with composite shingles.

20333 S. Airport Way (Residence 2)

Approximately 25 feet to the south of Residence 1 is another residence, located at 20333 S. Airport Way (Residence 2). A complex plan structure, this restrained Craftsman-style residence is of wood frame construction and rests upon a raised concrete foundation. The side gabled roof features composite shingles and wide eaves with exposed rafters. The exterior is clad in plaster and all elevations include sliding and single one-over-one hung sash aluminum fenestration with wood surrounds framing. The façade features a half-width inset porch with rough hewn wood supports and a simple wood balustrade. Two vents are located below the porch line on the eastern elevation of the building. The rear (north elevation) features a shed roof addition with composite shingles, wide eaves, and exposed rafters. It is clad in plaster and includes sliding and one-over-one single hung sash aluminum fenestration set in wood framing.

Outbuilding 1

Two outbuildings (Outbuilding 1 and Outbuilding 2) are situated between Residences 1 and 2. Approximately 15 feet to the rear (south) of Residence 1 is Outbuilding 1.

Architecturally similar to Residence 1, Outbuilding 1 is a simple plan wood frame structure with a gabled roof, composite shingles**,** wide eaves, and exposed rafters. Its exterior is clad in plaster, while the east elevation features a wood framed window opening covered with plywood. An entrance to the building is located on the south elevation and the entire structure rests on a concrete foundation.

Outbuilding 2

To the rear (north) and immediately adjacent to Outbuilding 1 is a wood framed outbuilding, Outbuilding 2. It features a wooden gambrel roof with batten joints and an exterior clad in board-and-batten siding. The north elevation features sliding doors, while the structure itself rests on a wood foundation.

Irrigation Pump and Ditch

Approximately 100 yards south of the Residences 1 and 2 and Outbuildings 1 and 2 is an earthen ditch. The ditch is approximately 5 feet deep, 10 feet wide, and 50 yards long. Set amidst a vacant field, it begins at Airport Way and stretches west to a point in the center of the parcel.

A pump is located northwest of the residences and outbuildings and at the center of the parcel's northern boundary. The pump is rectangular in shape and constructed of concrete. A protective metal grill rests atop the pump and a wheel as well as a metal balustrade project from the top of it. The pump is approximately 5 feet in height and 5 feet long on all sides.

Evaluation

Residences and Outbuildings

Little is known about the history of the buildings, though based on research it appears Residence 1 was constructed circa 1915, Residence 2 circa 1920, Outbuilding 1 circa 1916, and Outbuilding 2 circa 1950. Map research indicates that L. Knight constructed Residence 1 before the property passed to R. N. Knight around 1917 (U.S. Geological Survey 1915, Budd & Widdows 1917). Because it bares a close architectural resemblance to Residence 1, with its gabled roof, composite shingles**,** wide eaves, exposed rafters, and plaster exterior, Outbuilding 1 appears to have been constructed about the same time as Residence 1. Residence 2 was likely constructed circa 1920, as it is representative of the Craftsman style that was commonly constructed during this period. Based on building materials used and building style, Outbuilding 2 was likely constructed circa 1950.

It is unclear how long the R. N. Knight family retained custody of the property. By 1970, however, new individuals were associated with it. In 1970, Manuel Munoz, a laborer, and his wife, occupied Residence 1, while Darl De Ruyter, another laborer, and his wife, occupied Residence 2 (R. L. Polk 1970: 49, 135). It is not known who occupied the buildings during the remaining period of the 1970s, but by 1981 Residence 1 was vacant and Residence 2 was

associated with Robert Hagen (R. L. Polk 1981:12). Hagen continued to be associated with Residence 2 until 1983, while Mrs. Gloria J. Diehr occupied Residence 1 (R. L. Polk 1983:11). The current owner of the property is Joe Machado (San Joaquin County Assessor's Office 2002).

The residences and outbuildings do not appear to meet the criterion for listing in the CRHR. The buildings are not known to be associated with any significant persons or events related to the Manteca area, San Joaquin County, or the state, overall. Research also did not reveal any substantive information about the Knight family and subsequent individuals known to be associated with the property. Additionally, as one of many agricultural properties found throughout California's Central Valley, it appears not to be associated with any significant local, state, or national events. As a result, the property does not appear to meet CRHR Criterion 1 or 2. Moreover, the residences and outbuildings are modest buildings that do not embody distinctive characteristics of a type, period, or method of construction or architectural style. Both Residence 1 and Residence 2 feature alterations from the time they were originally constructed, such as aluminum replacement windows and additions. The two outbuildings are typical utility buildings common to agricultural properties in the San Joaquin region and California overall. Consequently, the residences and outbuildings do not appear to meet CRHR Criterion 3. In summary, lacking historical and architectural significance as well as integrity, the buildings located at APN 24132018 do not appear to meet the criteria for listing in the CRHR.

Irrigation Ditch and Pump

The ditch and the pump do not appear to meet the criterion for listing in the CRHR. Map evidence indicates the pump was constructed circa 1952 (U. S. Geological Service 1952). The ditch was likely constructed about the same time as the pump circa 1952. The pump appears to be a late addition to the SSJID, which was organized on May 11, 1909. Located on an agricultural parcel in an agricultural area, both the pump and the ditch appear to have been designed to convey water to areas within the parcel and beyond for crop production. It is possible that they were constructed to facilitate tomato production, which went into decline after World War II, but was still ongoing on a limited basis in the Manteca region (Thompson 1980:143). Overall, research revealed little information on the pump and the ditch and both resources are not known to be associated with any significant events or people. As a result, they do not appear to meet Criterion 1 or 2 of the CRHR. Similarly, the pump and the ditch do not appear to meet CRHR Criterion 3. While both features appear to retain integrity, similar irrigation features are found throughout California's Central Valley and in other agricultural regions of the state. Consequently, they do not represent distinctive characteristics of type, period, or method of construction. Thus, for the forgoing reasons, the ditch and the pump located on APN 24132018 do not appear to meet the criterion for listing in the CRHR.

RECOMMENDATIONS

Archaeological Resources

No archaeological resources were located within the project area. However, there is always the possibility that archaeological deposits may be unearthed during project construction. If buried cultural resources, such as chipped or ground stone, historic debris, building foundations, or human bone, are inadvertently discovered during ground-disturbing activities, work will stop in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find and, if necessary, develop appropriate treatment measures in consultation with appropriate agencies.

If human remains of Native American origin are discovered during project construction, it would be necessary to comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the NAHC (PRC Section 5097). If any human remains are discovered or recognized in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

a. The coroner of the county has been informed and has determined that no investigation of the cause of death is required; and

b. if the remains are of Native American origin,

    1. The descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or

    2. The Native American Heritage Commission was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours after being notified by the commission.

According to California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100) and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC.

Architectural Resources

One property containing six architectural resources and/or linear features (two residences, two outbuildings, and a pump and ditch) 50 years old or older is located in the study area. None of the six resources identified appears to meet the criteria for listing in the CRHR.

Because the cultural resources identified as a result of this study are recommended as ineligible for listing in the CRHR, the proposed project does not appear to have the potential to affect significant cultural resources.

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Appendix G

Water Supply Assessment/Verification

PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION

Memo

To: **David Hanham**

From: **Keith Conarroe**

CC: **Mike Brinton, Frederic Clark**

Date: **May 12, 2007**

Re: **Machado Estates Water Supply Assessment/Verification**

Introduction

This memorandum presents the water supply assessment and verification for the Machado Estates Development. A water supply assessment and verification is required to comply with water supply planning requirements of the California Water Code and Government Code. Water supply assessments and verifications are required for developments that exceed 500 dwelling units. The Machado Estates Development has a proposed development of 575 single-family homes (See Attachment 1).

The water supply assessment evaluates the ability of the City of Manteca to meet the water supply demand associated with the proposed land uses of the Machado Estates Development. The Machado Estates water supply assessment was prepared in accordance with requirements of Section 10910, et seq, of the Water Code, which requires a water supply assessment as part of the environmental review process for new development projects. A project is defined in the California Water Code as any proposed residential development having more than 500 dwelling units.

California Government Code Section 66473.7 requires completion of a water supply verification for approval of a residential project Tentative Map. The water supply verification documents the availability of a sufficient supply of water to serve the project. A residential project is defined as 500 or more dwelling units.

The conditions and requirements for the Water Supply Assessment and Water Supply Verification are similar. As the conditions and requirements are similar this document will serve as both the Water Supply Assessment and Water Supply Verification for the Machado Estates Development.

The water supply assessment and verification evaluates the water demand of the proposed Machado Estates development and sufficiency of the water supply for the next 20 years to meet the demands of the project, existing users and other future users in normal, single and multiple dry year conditions. The City of Manteca 2005 Urban Water Management Plan includes information required in the water supply assessment and verification. Additional information is contained in the City of Manteca Water Master Plan. Both documents have used in the completion of this water supply assessment and verification.

Water Demand

The Machado Estates Development water demand consists of potable and landscape irrigation demands. The estimated peak-hour demand plus a 15 percent redundancy for the development is 875 gallons per minute. The water will be supplied by the City of Manteca water system.

The water demand is based on a gross residential demand of 0.474 gallons per minute per dwelling unit. The gross demand is based on the City of Manteca's historical per capita water demand of 214 gallons per day and includes commercial and industrial demand. The actual water demand for residential use is 168 gallon per capita per day. The use of the gross demand in the residential water supply planning allocates water for commercial, institutional and industrial uses. A peak to average demand ratio of 2.8 is applied to the average demand to determine the peak hour demand. The peak hour demand is increased by 15 percent for water supply reliability.

Water Supply Assessment

The California Water Code requires a water supply assessment on the sufficiency of the water supply for a 20-year planning period. The water supply assessment requires documentation on existing water sources and quantities used and future water supplies and quantities. The water supply assessment must evaluate the adequacy of these supplies to meet the demands for the development as well as existing and other future uses during the 20-year planning period. The assessment must include normal, single and multiple dry years. Where groundwater is used, a description of the aquifer must be provided and along with information regarding the overdraft of the basin aquifer. The governing body must also approve the water supply assessment.

Water Supply Verification

The California Government Code requires a written water supply verification that finds there is or will be a sufficient water supply during single and multiple dry years within a 20 year planning period to meet the water demand projected for the development in addition to the existing and planned future uses. The water supply verification must consider the following:

- Historical record of at least 20 years
- Urban Water Shortage Contingency Analysis
- Supply Reduction for specific use sectors per supplier's resolution, ordinance or contract
- Amount of water that can be reasonably relied upon from specified water supply projects

Water Supply Sufficiency

Water demand assessment for development of the Machado Estates showed that there is an adequate supply of water consisting of surface water from the South County Water Supply Project and City of Manteca groundwater. Additional development of groundwater and distribution system is required for delivery of the water to the Machado Estates Development. Improvements include the construction of a groundwater well or storage tank and pump station capable of providing the required peak hour water supply to the development. A one million gallon storage tank and 3,000 gpm booster pump station is required for the Sundance and Oleander Developments. The storage tank and booster pump station will have capacity for the Silva Estates and Machado Estates. Specific water distribution system improvements required for the development can only be determined when tentative maps are submitted for approval.

Water Supply Planning

The City Manteca water supply planning is documented in the Water Master Plan and the 2005 Urban Water Management Plan. The City limits the number of new residential sewer connections to 3.9 percent per year. A lower growth rate for water demand of 3.4 percent is used in both the Water Master Plan and the 2005 Urban Water Management Plan to project future water demand. Both the Water Master Plan and 2005 Urban Water Management Plan include local groundwater and the South County Surface Water Supply Project as sources of water for the City of Manteca.

The 2005 Urban Water Management Plan was adopted in December of 2005. The 2005 Urban Water Management Plan includes water supply and demand

comparisons through 2030 assuming a 3.4% growth in water demand. During the planning period water is supplied by groundwater from City wells and surface water from the South County Water Supply Project. The 2005 Urban Water Management Plan also contains the single and multiple dry year water demand-supply comparisons and the water supply shortage contingency planning. The water supply and demand comparisons from the 2005 Urban Water Management Plan are included in Attachment 2. The comparisons show the water supply should exceed projected demand through the 20 year planning period. The increase in future water supplies is provided by the planned increase in surface water deliveries and drilling of new wells to meet peak water demands.

The water supply planning in the 2005 Urban Water Management Plan and Water Master Plan include future developments such as Machado Estates.

Groundwater Supply. The City of Manteca draws groundwater from the Eastern San Joaquin County Groundwater Basin (ESJCGB), which is a subbasin of the San Joaquin Valley Groundwater Basin. The California Department of Water Resources identified the ESJCGB as a basin in a state of overdraft in DWR Bulletin 160-98. The basin is described in the 2005 Urban Water Management Plan and is included in Attachment 2.

The Water Master Plan includes the construction of wells 24, 25, 26 and 27 in its capital improvement plan. These wells provide water for planned developments. Wells 24 and 25 were completed in 2005 and have capacities of 2,000 and 2,500 gallons per minute, respectively. The Union Ranch developer drilled well 27 in the initial phase of the development. Well 26 will be constructed the future. Well 26 includes the construction of a 1-million gallon storage tank and 3,000 gallon per minute booster pump. The storage tank and booster pump station will be constructed before Well 26 and will provide peak hour capacity necessary for the Machado Estates and other planned developments. Well 27 may also include construction of a future storage tank for additional peak capacity.

Additional wells would be required for other future development. The developers are required to fund construction of new wells and distribution system improvements to provide water to their development. The wells and water distribution system become part of the City water system. Anticipated groundwater requirements by 2027 are 13,790 acre-feet per year. Existing wells and new wells constructed to support future growth will provide the required amount of groundwater.

Agricultural and some industrial water users located in the Manteca planning area also use locally produced groundwater. Agricultural water use is expected to decline as Manteca's residential development is displacing the local agriculture. The net impact on agricultural water supply is neutral as agricultural and residential water use on an annual basis are similar. Industrial users should benefit from Manteca's

conjunctive water use as the groundwater extraction is reduced to the safe aquifer yield.

Surface Water. The City of Manteca, along with the Cities of Escalon, Lathrop and Tracy contracted with the South San Joaquin Irrigation District in 1995 for treated surface water. The contract for the surface water is included in Attachment 3. Construction on the water treatment plant and transmission lines were completed in 2005. Surface water deliveries began in July of 2005.

The surface water deliveries are scheduled to increase until full capacity of 18,500 acre feet per year is reached. The project planned in two phases. Phase 1 provides up to 11,500 acre feet through 2010. Phase 2 would be constructed after 2010 and would provide up to 18,500 acre feet by 2027.

Reclaimed Water. The Urban Water Management Plan and includes reclaimed water in future water planning. Reclaimed water requires construction of tertiary filters and disinfection facilities to meet Title 22 Reclamation Criteria. A reclaimed water distribution system is also required. Recent NPDES disposal and treatment requirements require the construction of tertiary filters and disinfection facilities. The treatment requirements make the use of reclaimed water for irrigation feasible in some areas of the City but will be limited due to the lack of a reclaimed water distribution system. At present, reclaimed water for dust control at construction sites and irrigation of the Big League Dream sports complex is the only currently planned use of the reclaimed water. Additional landscape irrigation with reclaimed water is anticipated in the future and is projected reach 2,300 acre feet per year by 2030. Reclaimed water for irrigation in the Machado Estates Development is not planned.

Groundwater Management. The San Joaquin County Flood Control and Water Conservation District adopted a groundwater management plan for San Joaquin County in 2004, which includes much of the ESJCGB. The City of Manteca participated in the development of the groundwater management plan. A major objective of the groundwater management plan is to stabilize the groundwater level in the central and eastern portions of the basin.

The City of Manteca plans to manage its groundwater use to meet the safe aquifer yield for the area, which has been estimated at 1 acre-ft/acre/year. Historically, Manteca has been extracting groundwater at a rate of 2.4 acre-ft/acre/year. Both the Water Master Plan and the Urban Water Management Plan recognize the overdraft in the basin. To reduce Manteca's overdraft, the City obtained surface water from the South County Water Supply Project in the 2005. The City began reducing its groundwater extraction to the safe aquifer yield when the surface water became available.

Water Supply Reliability. Water supply reliability is addressed in the Urban Water Management Plan. In past droughts, the groundwater supply has been very reliable.

Groundwater levels have dropped during severe droughts but recovered in subsequent years. However, there has been a long-term drop in groundwater levels (approximately 4 feet since 1964) in the Manteca area. The drop in groundwater is due to both the local groundwater pumping and the severe overdraft in the central and eastern portions of the groundwater basin. The combined effort of Manteca to reduce groundwater overdraft and the San Joaquin County Groundwater Management Plan should help maintain the historical reliability of Manteca's groundwater. The City's water supply history from 1960 through 2006 is included in Attachment 4.

The South San Joaquin Irrigation District, which is supplying the surface water from the Stanislaus River, has pre-1914 water rights. With the construction of New Melones Reservoir, the SSJID entitlement was negotiated with the DWR at 300,000 acre-ft per year. The entitlement is subject to reductions when the New Melones inflow is less than 600,000 acre-feet. An examination of the inflows between 1922 and 2000 indicated that SSJID would have received its full allocation of 300,000 acre-ft in all but 16 years during this period. The severity of possible reductions was estimated by examining the three lowest inflow years of 1977, 1924 and 1988, which would have reduced SSJID's location by 37, 24 and 23 percent, respectively. Conservation and increased groundwater development can sustain reductions of this order. Based on SSJID water rights and minimal reductions in past low flow years, the surface water supply is considered a reliable source. Manteca plans to construct additional groundwater wells to maintain full water supply with a 50% reduction in surface water supply. The

Long term overdraft of the basin groundwater poses a water supply reliability threat from the intrusion of saline water. Surface water supplies will enable groundwater pumping to be reduced the in Manteca area and reduce the intrusion of saline water into the area.

Changes in water quality standards have the potential to reduce available groundwater available to the City. The Federal Maximum Contaminant Level (MCL) for arsenic was lowered from 50 ug/l to 10 ug/l in 2001. The State of California is also evaluating the arsenic MCL, which could be lower than the Federal MCL. The revised arsenic MCL becomes effective in 2006. Twelve of the City wells exceed the revised Federal arsenic MCL, with concentrations ranging from 12 to 19 ug/l. Manteca is currently installing arsenic treatment at four wells and plans to install arsenic treatment at the remaining wells over the next three years.

Nitrate in local groundwater also has the potential to reduce the amount of groundwater available to the City. Several City wells exceeded the nitrate MCL in 2006. The effected wells have combined production capacity of 5,200 gpm. The affected wells have been shut down until the elevated nitrate problem is resolved. Plans to resolve the nitrate problem include blending with a low nitrate water source and well modification to eliminate the withdrawal of water from strata containing high

levels of nitrate. Well modifications are expected to be completed in 2007 and will restore 4,100 gpm of the lost production capacity. The water blending project will be completed in 2008 and restore the remaining 1,100 gpm of lost production capacity.

Summary

The City of Manteca has an adequate supply of water for the Machado Estates Development. Surface water in combination with existing and planned groundwater supplies will provide potable water for the development. Construction of the Well 26 storage tank with booster pumping station and water distribution system improvements are necessary to supply water to the Machado Estates Development. The specific water distribution improvements for the development are identified during the tentative map review and approval process.

The City is addressing issues that may affect the reliability of its potable water supply, which include the lower arsenic MCL and nitrate contamination. Additional information on Manteca's water supply planning is available in the Water Master Plan and the 2005 Urban Water Management Plan.

Attachment 1

Machado Estates Development

Community Development

Memo

To: Mike Brinton, Public Works Director
Frederic Clark, Assistant Director of Public Works
Keith Conarroe, Associate Civil Engineer

From: David Hanham, Senior Planner

Date: April 4, 2007

Re: Water Analysis for Machado Estates

Please accept this memo to initiate a water analysis for the following project:

Date Submitted: Application Date: January 9, 2005

Subdivision: Machado Estates # of units: 575

Commercial Project: N/A Size of project: 156 acres

Sent to Public Works: October 3, 2006

Subject to SB 610? Yes

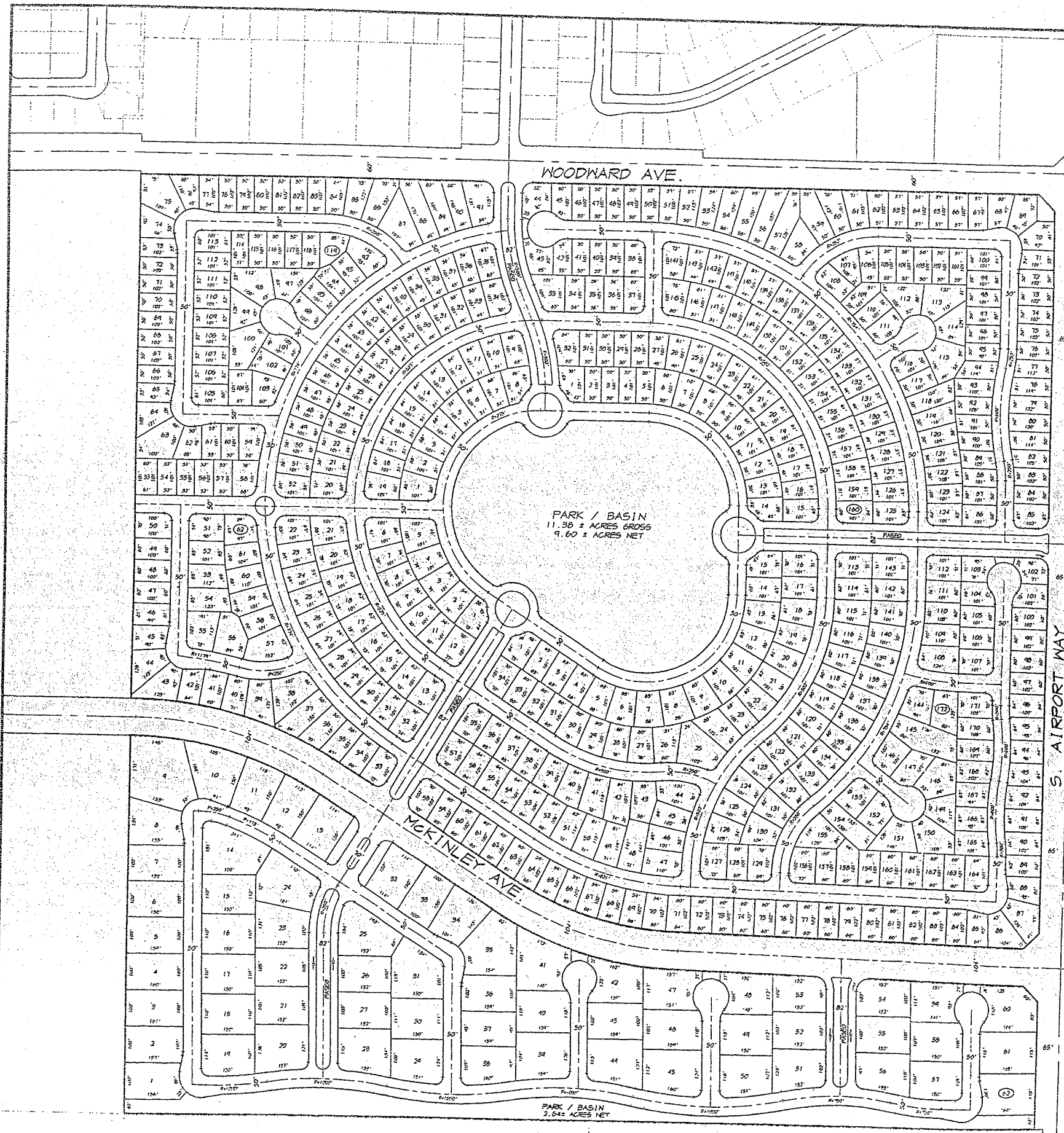
221? Yes

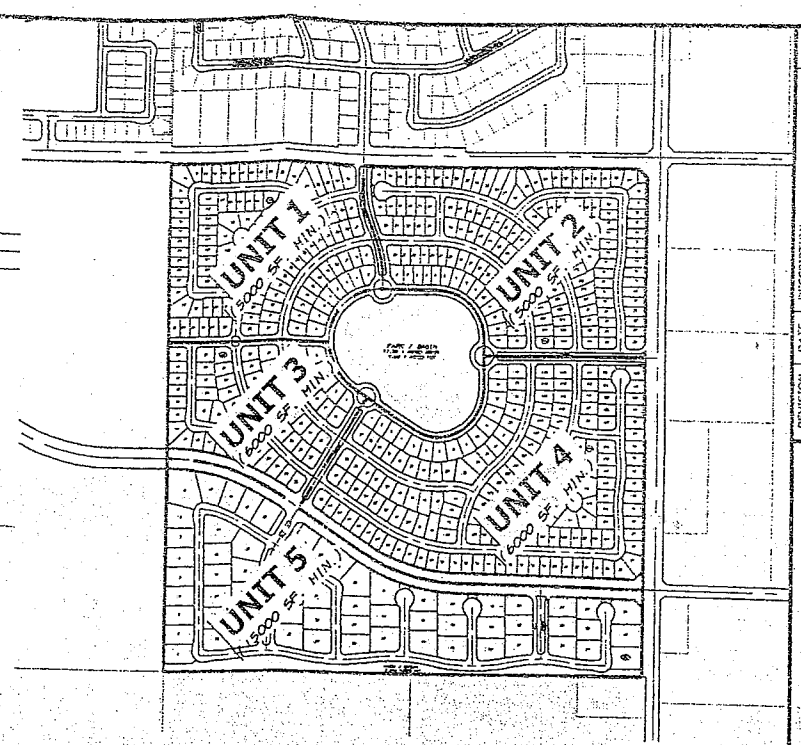
Needs City Council Action?

Went to Council: / /

Analysis Sent Back to Community Development:: / /

Completed Date: / /





NEIGHBORHOOD PLAN

SCALE: 1" = 150'

LAND USE SUMMARY

LAND USE	ACREAGE	UNITS	DU'S/AC.
RESIDENTIAL:			
SINGLE FAMILY (5,000 SF. MIN.)	31.78±	279±	5.58±
SINGLE FAMILY (6,000 SF. MIN.)	52.58±	234±	4.45±
SINGLE FAMILY (15,000 SF. MIN.)	38.62±	62±	1.60±
OTHER:			
PARK/BASIN	17.31±		
TOTAL:	160±	575±	4.02±

BY

REVISION	DATE	DESCRIPTION

ASSOCIATED ENGINEERING, INC.
Surveying · Design · Planning
4206 TECHNOLOGY DRIVE
MODESTO, CALIFORNIA 95356
PH: (209) 545-3390 FAX: (209) 545-3875

CONCEPTUAL DEVELOPMENT SKETCH
MACHADO PROPERTY
CALIFORNIA
MANTECA

RYAN CARROL, R.C.E. 61619
DAVE SYDMORE, L.S. 7136

DRAWN BY: KEVIN
DATE: 4/30/07 3:06
SCALE: 1"=150'
DWG: SKETCH5
CHECKED:
JOB #: 571-07
SHEET

Attachment 2

2005 Urban Water Management Plan Excerpts

Groundwater

The City is located in the Eastern San Joaquin County Groundwater Basin (ESJCGB), which is a sub-basin of the San Joaquin Valley Groundwater Basin. The ESJCGB subbasin number is 5-22.01. DWR's Bulletin 118 – 80, *Ground Water Basins in California* classified the ESJCGB as a basin in a critical condition of overdraft. The Northeastern Groundwater Banking Authority and the San Joaquin County Flood Control and Water Conservation District undertook the development of a groundwater management plan for San Joaquin County, which includes most of the ESJCGB. The San Joaquin County Board of Supervisors adopted the groundwater management plan in September of 2005. The South County Water Supply Project is discussed in the groundwater management plan as an integrated conjuctive use program element.

The groundwater aquifers underlying the City extend to depths in excess of 600 feet have been identified to include four geologic formations. In increasing depth from the surface, the identified aquifers are Victor Formation, Laguna Formation, Mehrten Formation, and Valley Springs Formation. Due to the alluvial generation of these aquifers, there is significant variation in grain size, with lenses and strata of high yield gravel, permeable sandy material and lower permeability clays. In general, the strata slope from the hills east of the City downward to the west, providing good recharge from hill runoff as well as from the Stanislaus River. The City's wells primarily withdraw water from the Laguna and Victor Formations.

The groundwater basin safe yield was estimated in a 1985-groundwater study at 1.0 acre-foot per acre per year. Historically, the City extracted groundwater at a rate of approximately 2.4 acre-feet per acre per year, based on the developed City area. As discussed previously, the South County Water Supply project will allow the City's to reduce local groundwater extraction to the basin safe yield of 1.0 acre-foot per acre per year. Groundwater pumping by City wells from 2000 to 2004 is summarized in Table 5.

Table 5.
City of Manteca Groundwater Pumping

Year	2000	2001	2002	2003	2004
Acre Feet	12,609	12,974	13,516	14,451	14,933
Percent of Water Supply	100	100	100	100	100

Recycled Water

The City wastewater quality control facility (WQCF) treats an average dry-weather wastewater flow of about 6 mgd and has an average dry weather design capacity of 6.95 mgd. A WQCF expansion is currently in progress to increase the average dry weather capacity to 9.87 mgd. Approximately 15 percent of the wastewater treated at the WQCF is from the City of Lathrop.

The City currently disposes of treated wastewater to both land and the San Joaquin River. The wastewater disposed to land is used to irrigate fodder crops on City owned and leased agricultural lands near the WQCF. The discharges to land averaged about 0.87 mgd (1,030 acre-feet) but will be reduced to 0.73 mgd (870 acre-feet) in 2005 as 30 acres of disposal land is converted to a softball field complex. The remainder of the wastewater is discharged to the San Joaquin River. The treated wastewater for agricultural irrigation is unchlorinated secondary effluent. Wastewater discharged to the San Joaquin River is secondary effluent that has been disinfected to 23-mpn/100 ml with chlorine and dechlorinated with sulfur dioxide before discharge.

The 2005 Water Quality Control Facility Master Plan City evaluated the use of recycled wastewater for

Supply and Demand Comparison

Law

> 10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from the state, regional, or local agency population projections within the service area of the urban water supplier.

Supply and Demand Comparison

Table 9 compares current and projected water supply and demand. It indicates that in average water years, the City has sufficient water to meet its customers' needs, through 2025. This is based on continued development of groundwater wells and completion of the South County Surface Water Project. As noted in Table 9, the supply totals assume a groundwater withdrawal rate of 1.0 acre ft per acre per year beginning in 2005.

Table 9.
Projected Supply and Demand Comparison

	2005	2010	2015	2020	2025	2030
Supply totals	15,591	18,471	22,286	27,279	32,334	34,590
Demand totals	15,491	18,310	21,641	25,579	30,234	35,735
Difference	100	161	645	1,700	2,100	-1,145
Units of Measure: Acre-feet/Year						

It is estimated that water demand will exceed supply in 2030 by about 3.3 percent.

Table 10 presents a supply and demand comparison where surface water supply decreases in response to dry year conditions. This analysis assumes that groundwater is extracted at 1 acre-foot/acre per year. The groundwater supply is increased yearly as required to conform to City policy of assuring there is adequate water and sewer capacity for new development. This requires the development of additional groundwater supplies to maintain the groundwater supply at 47 percent of the water supply. The water demands presented in Table 10 assume a 3.4 percent annually increase. The water supply demand scenario calculation is included in Appendix C.

Table 10.

Single Dry Year and Multiple Dry Water Years
Water Demand-Supply Comparison

Water Supply Sources	Current Supply	Single Dry Water Year 2005	Multiple Dry Water Years			
			Year 1 2006	Year 2 2007	Year 3 2008	Year 4 2009
Supply totals	18,474	14,564	19,028	17,904	18,322	18,021
Percent supply reduction	0	22	0	6	5	8
Demand totals	15,491	15491	16,018	16,562	17,125	17,708
Difference	2,983	-927	3,010	1,342	1,197	313
Unit of Measure: Acre-feet/Year						

Attachment 3

South San Joaquin Irrigation District

South County Water Supply Project

Water Supply Contract

EXECUTION COPY

WATER SUPPLY DEVELOPMENT AGREEMENT

This Agreement, dated as of October 1, 1995, by and between the South San Joaquin Irrigation District (the "District"), an irrigation district duly organized and existing pursuant to the Irrigation District Act (the "Irrigation District Act"), commencing with California Water Code, Section 20500 and the City of Manteca (the "City"), a municipal corporation created pursuant to the constitution and laws of the State of California.

WITNESSETH:

WHEREAS, the City and certain other water purveyors in San Joaquin County have expressed interest in purchasing treated water from the District (capitalized terms used herein and not otherwise defined shall have the meanings set forth below);

WHEREAS, in order for the City to receive treated water, certain facilities, including the Project, must be constructed;

WHEREAS, by entering into this Agreement, the City intends to preserve its ability to receive treated water from the Project in the future through subsequent construction of project facilities, in addition to those initially constructed, sufficient to serve the City;

WHEREAS, the District and the City now wish to enter into this Agreement to provide for the construction, operation and financing of the Project, for the sale by the District to the City of the City's Project Allotment and certain other matters;

NOW, THEREFORE, the parties hereto do agree as follows:

Section 1. Definitions.

The following terms shall, for all purposes of this Agreement have the following meanings:

"Additional Project Participant" means any public district, agency or entity or private water company, other than those entities listed in Part I of Appendix A hereto, which executes a Water Supply Agreement in accordance with Section 18 hereof, together with their respective successors or assigns.

"Bonds" mean all bonds, notes or similar obligations (but not including Contracts) of the City authorized and issued by the City under and pursuant to applicable laws of the State of California after the date of execution of this Agreement, the principal of and interest on which are an operation and maintenance expense of the City Water System determined in accordance with generally accepted accounting principles and which are secured by a pledge or a lien on City Net Water System Revenues and which are on a parity with the obligations of the City under this Agreement.

"Bond Resolution" means the resolution or resolutions providing for the issuance of District Bonds and the terms thereof.

"City" shall have the meaning assigned thereto in the preamble hereto.

"City Fiscal Year" means the twelve month period commencing on July 1 of each year and ending on the following June 30 or such other twelve month period which may be designated by the City as its fiscal year.

"City Net Water System Revenues" means, for any City Fiscal Year, the City Water System Revenues for such City Fiscal Year less the City Operation and Maintenance Expenses for such City Fiscal Year.

"City Operation and Maintenance Expenses" means the costs spent or incurred by the City for maintaining and operating the City Water System, calculated in accordance with generally accepted accounting principles, including (among other things) the expenses of management and repair and other expenses necessary to maintain and preserve the City Water System, in good repair and working order, and including administrative costs of the City, salaries and wages of employees, payments to the Public Employees Retirement System, overhead, insurance, taxes (if any), fees of auditors, accountants, attorneys or engineers and insurance premiums, and all other reasonable and necessary costs of the City, but excluding in all cases (i) depreciation, replacement and obsolescence charges or reserves therefor, (ii) amortization of intangibles or other bookkeeping entries of a similar nature, and (iii) charges for the payment of principal and interest on City Prior Debt, Bonds or Contracts.

"City Prior Debt" means notes, bonds or other obligations of the City existing prior to the date of execution hereof, which are identified in Exhibit D hereto and which are payable from City Water System Revenues.

"City Water System" means all properties and assets, real and personal, tangible and intangible, of the City now or hereafter existing, used or pertaining to the acquisition, treatment, reclamation, transmission, distribution and sale of water, including all additions, extensions, expansions,

improvements and betterments thereto and equipment relating thereto; provided, however, that to the extent the City is not the sole owner of an asset or property or to the extent that an asset or property is used in part for the above described water purposes, only the City's ownership interest in such asset or property or only the part of the asset or property so used for water purposes shall be considered to be part of the City Water System.

"City Water System Revenues" means all income, rents, rates, fees, charges, and other moneys derived by the City from the ownership or operation of City Water System including, without limiting the generality of the foregoing, (i) all income, rents, rates, fees, charges or other moneys derived from the sale, furnishing, and supplying of water and other services, facilities, and commodities sold, furnished, or supplied through the facilities of City Water System, including standby and availability charges, capital water facilities fees for design, construction and reconstruction expenses, development fees and other fees allocable to the City Water System, (ii) such taxes or assessments as may be imposed for payment of Fixed Project Costs, Variable O&M Costs or Fixed O&M Costs if the levy thereof and payment hereunder is permitted by law and (iii) the earnings on and income derived from amounts set forth in clauses (i) and (ii) above, and shall not include (y) customers' deposits or any other deposits subject to refund until such deposits have become the property of the City and (z) proceeds of any taxes or assessments except taxes or assessments described in clause (ii) above.

"Contract Payments" means the Fixed Project Costs payable by the City hereunder in any City Fiscal Year and provided that the term Contract Payments shall also include the sum of;

(1) the interest accruing during such City Fiscal Year on all outstanding Bonds, assuming that all outstanding serial Bonds are retired as scheduled and that all outstanding term Bonds are redeemed or paid from sinking fund payments as scheduled (except to the extent that such interest is to be paid from the proceeds of the sale of any Bonds);

(2) that portion of the principal amount of all outstanding serial Bonds maturing during such City Fiscal Year;

(3) that portion of the principal amount of all outstanding term Bonds required to be redeemed or paid during such City Fiscal Year; and

(4) that portion of payments under Contracts (other than under this Agreement) constituting principal and interest required to be made at the times provided in the Contracts.

"Contracts" means this Agreement and all contracts of the City authorized and executed by the City under and pursuant to the applicable

laws of the State of California after the date of execution of this Agreement, the payments under which are an operation and maintenance expense of the City Water System determined in accordance with generally accepted accounting principles and which are secured by a pledge of or lien on the City Net Water System Revenues and which are on a parity with the obligations of the City under this Agreement.

"Debt Service" means, as of the date of calculation and with respect to District Bonds, an amount equal to the sum of (i) interest payable during such District Fiscal Year on District Bonds, except to the extent that such interest is to be paid from capitalized interest and (ii) that portion of principal of District Bonds payable during such District Fiscal Year. Such interest and principal installment for such series shall be calculated on the assumption that no District Bonds outstanding at the date of calculation will cease to be outstanding except by reason of the payment of principal on the due date thereof;

provided further that, as to any such District Bonds bearing or comprising interest at other than a fixed rate, the rate of interest used to calculate Debt Service shall be one hundred ten percent (110%) of the greater of (a) the daily average interest rate on such District Bonds during the twelve (12) calendar months preceding the date of calculation (or the portion of the then current District Fiscal Year that such District Bonds have borne interest) or (b) the most recent effective interest rate on such District Bonds prior to the date of calculation; and

provided further that, as to any such District Bonds or portions thereof bearing no interest but which are sold at a discount and which discount accretes with respect to such District Bonds or portions thereof, such accreted discount shall be treated as interest in the calculation of Debt Service; and

provided further that the amount on deposit in a debt service reserve fund on any date of calculation of Debt Service shall be deducted from the amount of principal due at the final maturity of the District Bonds for which such debt service reserve fund was established and in each preceding District Fiscal Year until such amount is exhausted.

"District Bonds" means bonds, notes or other evidences of indebtedness of the District issued to finance or refinance the Project and includes additional District Bonds to complete the Project.

"District Fiscal Year" means the twelve month period commencing on January 1 of each Year and ending on the following December 31 or such other twelve month period which may be designated by the District as its fiscal year.

"Feasibility Certificate" means a certificate of a consulting engineer to the effect that, based on contracts awarded by the District for construction of the Project and the consulting engineer's estimates of the cost of the portions of the Project for which contracts have not been awarded, the District has sufficient District Bond proceeds together with estimated proceeds to be derived from any authorized but unissued District Bonds and moneys on deposit with the District and legally available for the Project to complete the Project.

"Fixed O&M Costs" means operation, maintenance, power, replacement and other costs, including Project Operation and Maintenance Expenses and a reasonable reserve for contingencies, in each case incurred by the District with respect to the Project, irrespective of the amount of water delivered to the Project Participants.

"Fixed Project Costs" means capital costs, including Debt Service and reserves for the payment of Debt Service of the Project, incurred by the District in accordance with Sections 13 and 14 hereof.

"Independent Certified Public Accountant" means any firm of certified public accountants appointed by the City, or the District, as the case may be, and each of whom is independent pursuant to the Statement on Auditing Standards No. 1 of the American Institute of Certified Public Accountants.

"Operating Committee" means the Operating Committee created in accordance with Section 4 of the Water Supply Agreement.

"Project" means certain facilities necessary to deliver treated water to the Project Participants, including the following; (i) a raw water pipeline from the District's existing raw water system to the Treatment Plant, (ii) the Treatment Plant, and (iii) treated water pipelines from the Treatment Plant to the Project Participants. The District and the City acknowledge that the feasibility of the Project is currently being investigated by the District and that the definition of the Project shall be revised prior to commencement of construction as provided in Section 4 hereof without amendment to this Agreement and that the City may elect to cause certain Project facilities to be sized to include the City's Project Allotment and may elect to cause certain Project facilities to not be sized to include the City's Project Allotment.

"Project Allotment" means 12,700 acre-feet of water per year for Phase I as identified in Exhibit A and 24,500 acre-feet of water per year for Phase II unless such Project Allotment for Phase II is reduced in accordance with the Water Supply Agreement.

"Project Milestones" means the events described in Section 4(b) hereof.

"Project Operation and Maintenance Expenses" means the costs spent or incurred by the District for maintaining and operating the Project, calculated in accordance with generally accepted accounting principles and Section 20 hereof, including (among other things) the expenses of management and repair and other expenses necessary to maintain and preserve the Project, in good repair and working order, and including administrative costs of the District, salaries and wages of employees, payments to the Public Employees Retirement System, overhead, insurance, taxes (if any), fees of auditors, accountants, attorneys or engineers and insurance premiums, and including all other reasonable and necessary costs of the District, or charges required to be paid by it to comply with the terms of the District Bonds or of this Agreement, but excluding in all cases (i) depreciation, replacement and obsolescence charges or reserves therefor, (ii) amortization of intangibles or other bookkeeping entries of a similar nature, (iii) costs of capital additions, replacements, betterments, extensions or improvements to the Project, which under generally accepted accounting principles are chargeable to a capital account or to a reserve for depreciation and (iv) charges for the payment of principal and interest on the District Bonds.

"Project Participant" means the City and each entity listed in Part I of Appendix A hereto executing Water Supply Agreements with the District, and each Additional City.

"Reaches" means the segments of the Project from or through which Project Participants receive water which will be determined in accordance with Section 5(a) hereof.

"Request" means a written certificate of the City Manager of the City specifying the portion of the City's Project Allotment which the City requests be delivered by the District to the City in each month of a Year in accordance with Section 6 hereof.

"Treatment Plant" means water treatment facilities to be located at a site to be determined by the District after consultation with the Operating Committee and with capacity sufficient so as to treat the Project Allotments of all Project Participants, including all associated facilities, rights, properties, electrical facilities and improvements appurtenant thereto as provided and necessary therefor.

"Trustee" means the entity or entities designated by the District pursuant to any Bond Resolution to administer any funds or accounts required by such Bond Resolution or otherwise.

"Variable O & M Costs" means the operation, maintenance, power, replacement and other costs, including Project Operation and Maintenance

Expenses and water supply costs at a cost per acre-foot established in accordance with this Agreement (which cost shall be lower for Project Participants located within the District and higher for those Project Participants located outside the District), incurred by the District in connection with the Project in an amount which is dependent upon and varies with the amount of water delivered to the Project Participants.

"Water Supply Agreement" means this Agreement and each Water Supply Development Agreement by and between the District and a Project Participant, as the same may be amended or supplemented from time to time.

"Year" means the twelve-month period from January 1 through December 31, both dates inclusive.

Section 2. Purpose.

The purpose of this Agreement is for the District to sell Project Allotment to the City, to deliver Project Allotment to the City available from the Project, to provide the terms and conditions of such delivery and sale and to provide for the financing of the Project. The parties hereto confirm that this Agreement constitutes a contractual right to purchase treated water and that no water right is being transferred by the District to any Project Participant under this Agreement. Each Project Participant acknowledges that the District is entering into Agreements with cities located within the District and outside the District and upon execution hereof each Project Participant waives any claim such Project Participant may have to the Project Allotment of other Project Participants.

Section 3. Financing, Construction and Operation.

(a) District to Develop Project. Subject to compliance with all necessary federal and state laws, including but not limited to the California Environmental Quality Act ("CEQA"), the terms and conditions of the District's water rights, permits and licenses and all agreements relating thereto, the District will use its best efforts to cause or accomplish the construction, operation and financing of the Project, the obtaining of all necessary authority and rights, consents and approvals, and the performance of all things necessary and convenient therefor.

The parties acknowledge that the construction and operation of the Project constitutes a project subject to environmental review under CEQA. At the time of execution of this Agreement, the specific nature of the Project is still uncertain and only vaguely defined. As contemplated by this Agreement, the specific nature of the Project will be developed after further study in the next feasibility and preliminary design phase of the Project development, and through those phases City retains full discretion whether

to proceed. Accordingly, the District and each City agree that CEQA review should be deferred to a subsequent phase of Project development after the Project is more specifically defined. The District shall conduct and complete appropriate CEQA environmental review no later than commencement of final Project engineering design. Such environmental review may be tiered to enable the Cities to perform related but independent CEQA analysis.

(b) Project Milestones. The District may approve a Project Milestone only in the event the District has received a certified resolution of the Operating Committee and, in the event of the commencement of construction, the following conditions are met: (i) the District has received a report of a consulting engineer setting forth a description of the Project, which may include amendments to the definition of the Project, (ii) has received a Feasibility Certificate with respect to the Project, (iii) the District has approved any and all conditions imposed by any federal, state or local agency on Project approvals, and (iv) evidence that any approvals, permits, licenses or similar actions required by the State Water Resources Control Board necessary to permit the District to deliver treated water to the Project Participants shall have been received or progress satisfactory to the District and the City has been achieved.

(c) Termination of Participation or Reduction of Project Allotment. The City may terminate its participation in the Project or reduce its Project Allotment (i) on or prior to the issuance of any District Bonds, (ii) on or prior to the commencement of final design of the Project or (iii) on or prior to the commencement of construction determined in accordance with Section 3(b) hereof by delivery of a certified resolution of the City Council delivered to the District. In the event of a termination after the issuance of any District Bonds, the City shall have the option of (a) paying to the District all Fixed Project Costs allocable to the City in accordance with Section 14 hereof, in which case this Agreement shall terminate, or (b) to remain obligated to pay Fixed Project Costs allocable to the City in accordance with Section 14 hereof until paid in full, in which case this Agreement shall not terminate until such payment in full. On and after the date such resolution is delivered to the District, the City shall not be obligated to pay any Fixed Project Costs with respect to construction of the Project or any Fixed O&M Costs or Variable O&M Costs relating to delivery of treated water. Within ten days of notice to the District of a termination of participation or a reduction in the Project Allotment by any Project Participant, the District shall provide written notice thereof to the City. The District shall not issue any District Bonds within 30 days of such notice to the City without written approval thereof by the City.

(d) Obligation to Pay Construction Costs. The District shall not incur any Fixed Project Costs with respect to costs of construction prior to commencement of construction in accordance with Section 3(b) hereof and the City shall not be obligated to pay any Fixed Project Costs with respect to

construction prior to such commencement of construction. In the event that the City elects to terminate its participation in the Project prior to commencement of construction in accordance with Section 3(c) hereof, the City shall have no obligation to pay any Fixed Project Costs with respect to costs of construction.

Section 4. Operating Committee.

(a) General. The District shall establish an Operating Committee for the Project. The Operating Committee shall consist of the General Manager of the District and the City Manager of each Project Participant unless the District or a Project Participant designates another staff member or consultant to serve on the Operating Committee and shall be chaired by the General Manager of the District or his or her designee. The Operating Committee shall meet at least quarterly and at other times when a meeting is called by the chair of the Operating Committee or upon written request thereof by two Project Participants. The Operating Committee shall (i) have authority to approve Project Milestones, (ii) develop operating procedures and may recommend to the District that the District and the Project Participants enter into operating agreements to supplement this Agreement from time to time, and (iii) meet to review, evaluate and recommend to the District by majority vote items related to the acquisition, construction, financing, operation and maintenance of the Project and the status of any water rights issues relating to the District's ability to deliver treated water to the City, including but not limited to review of the construction budget, the annual operations and maintenance budget and other financial and operational matters relating to delivery of treated water to the Project Participants.

(b) The District shall give written notice to the Operating Committee 45 days prior to commencing any Project Milestone. The District may commence any Project Milestone on or after the 45th day following such written notice unless a Project Participant shall have disapproved commencement of such Project Milestone in writing on or before such 45th day. Such disapproval shall include the reason or reasons for the disapproval. In the event the District receives a written disapproval from a Project Participant the District shall work to address and resolve such Project Participant's concerns and then request the written authorization to proceed for the Project Milestone. In the event that the District and such Project Participant cannot resolve such disapproval within 60 days, either the District or the Project Participant may terminate this Agreement by giving written notice to the other party subject to such Project Participant's obligation to pay Fixed Project Costs incurred prior to said date. The Project Milestones are:

(i) Commencement of Final Design. Prior to commencing with the final design phase under an engineering services contract, the District shall provide the City with the preliminary design plans and

preliminary cost estimate The District shall not award a contract for final design work until Section 3(a) and (b) have been complied with.

(ii) Commencement of Construction. Prior to commencing construction, the District shall provide the City with the final design work, including construction-ready final plans and specifications and final cost estimate and a final pricing and delivery policy for raw water. The District shall not commence construction until Section 3(a) and (b) have been complied with.

(iii) Financing. Prior to issuing District Bonds to finance the Project, the District shall give written notice of the District's finance plan and proposed not-to-exceed terms which shall be binding upon the District. The District shall not issue any District Bonds until Section 3(a) and (b) have been complied with.

(c) Compliance with Agreements. No action by the Operating Committee pursuant to the Water Supply Agreements or otherwise shall in any way affect the ability of the District to act with respect to any Bond Resolution, any agreement entered into by the District for the construction or operation of the Project or any applicable licenses, permits or regulatory provisions and the District shall be responsible for executing contracts relating to construction and operation of the Project and fulfilling the obligations of the District thereunder.

Section 5. Construction of the Project.

(a) Determination of Capacities of Reaches and Treatment Plant. Unless otherwise determined by the District after consultation with the Operating Committee, the capacity of the Reaches of the Project will be determined by the Consulting Engineer based upon the Contract Project Allotment and Treatment Plant capacity, at one or more turnouts for the City as agreed to by the District and the City. Unless otherwise agreed by the District and the City in writing, and subject to Section 4 hereof, the Treatment Plant will have sufficient capacity to serve the City its full Project Allotment.

Subject to the rights of the City under subsection (b) of this Section and the other provisions of this Agreement, the District shall provide in each appropriate Reach of the Project and in the Treatment Plant capacity to serve the City with the daily amount requested by the City as agreed to by the City and the District in writing prior to the commencement of the construction of the Project.

(b) Criteria for Determining Capacity of Project. The District shall design and construct the Project with the Reaches and Treatment Plant capacity determined as set forth in subsection (a) of this Section and necessary

(d) Procedure for Determining Water Delivery Schedule. The amounts, times and rates of delivery of water to the City during any Year shall be in accordance with a water delivery schedule for that Year, such schedule to be determined in the following manner:

(1) On or before October 15 of each year, the City shall submit in writing to the District a preliminary water delivery schedule indicating the amounts of water desired by the City during each month of the succeeding three Years or such lesser or greater period as the District shall determine.

(2) Upon receipt of a preliminary schedule the District shall review it and, after consultation with the City, shall make such modifications in it as are necessary to insure that the amounts, times, and rates of delivery to the City will be consistent with the District's overall delivery ability, considering the then current delivery schedules of all Project Participants and the District.

(3) A water delivery schedule may be amended by the District upon the City's written request. Proposed amendments shall be submitted by the City within a reasonable time before the desired change is to become effective, and shall be subject to review and modification by the District in like manner as the schedule itself.

(e) Limit on Peak Deliveries of Water. In no event shall the District contract to deliver to the City from the Project in any Year nor to deliver to the City from the Project in any one day a total amount of Project Allotment greater than that agreed to by the District and each Project Participant prior to the issuance of any District Bonds.

(f) Limit on Rate of Delivery to City. In no event shall the District be obligated to deliver water to the City through any delivery structure at a total combined instantaneous rate of flow exceeding the cubic feet per second and minimum pressure which will be determined upon the initial operation date, except as this rate of flow or pressure may be revised by mutual written agreement of the District and the City.

(g) Delivery of Water Not Delivered in Accordance with Schedule. If in any Year the District, as a result of causes beyond its control, is unable to deliver any portion of the City's Project Allotment for such Year as provided for in the delivery schedule established for that Year, the City may elect to receive the amount of water which otherwise would have been delivered to it during such period at other times during the Year, to the extent that such water is then available and such election is consistent with the District's

overall delivery ability, considering the then current delivery schedules of all Project Participants and the District.

Section 7. Curtailment of Delivery for Maintenance Purposes.

(a) District May Curtail Deliveries. The District may temporarily discontinue or reduce the delivery of water to the City hereunder for the purposes of necessary investigation, inspection, maintenance, repair, or replacement of any of the Project facilities necessary for the delivery of water to the City. The District shall notify the City as far in advance as possible of any such discontinuance or reduction, except in cases of emergency, in which case notice need not be given.

(b) City May Receive Later Delivery of Water Not Delivered. In the event of any discontinuance or reduction of delivery of water pursuant to subsection (a) of this Section, the City may elect to receive the amount of water which otherwise would have been delivered to it during such period under the water delivery schedule for that Year at other times during the Year to the extent that such water is then available and such election is consistent with the District's overall delivery ability, considering the then current delivery schedules of all Project Participants and the District.

Section 8. Shortage in Water Supply.

(a) Shortages. In any Year in which there may occur a shortage or interruption due to drought or other cause in the supply of water available for delivery to the Project Participants, including but not limited to shortages or interruptions caused by changes in laws, regulations or rulings relating to or affecting the District's water rights, permits and licenses, with the result that such supply is less than the total of the annual Project Allotments of all Project Participants for that Year, the District shall reduce the delivery of water to the City pro rata with deliveries to all Project Participants based upon the Project Allotment of the City and each Project Participant without preference or priority among the City and the Project Participants.

(b) Allocation of Shortages. The District shall allocate any shortage or interruption in the supply of water available for delivery by District hereunder between agricultural users and the Project Participants such that any percentage reduction in the delivery of water to the City is approximately equal to the percentage reduction in the delivery of water to the District's agricultural customers.

(c) Future Annexations of Land to District. The District shall not annex any land to the District other than land the acquisition of which has been approved by the Board of Directors prior to the effective date of this Agreement unless said annexation shall include an express condition that the

lands so annexed shall have an entitlement to receive water from District that is subordinate in priority to the right of City to receive water from District pursuant to this Agreement. In any Year in which there may occur a shortage or interruption in the supply of water available hereunder with the result that such supply is less than the total of the annual Project Allotment of all Project Allotments of all Project Participants for the Year, the District shall reduce or suspend the delivery of water by District to lands annexed to District following the effective date of this Agreement.

(d) Future Transfers of Water by District. In the event that, following the effective date of this Agreement, District enters into any agreement for the sale or transfer of water to any retail or wholesale water provider for consumptive use outside District boundaries, the District shall ensure that such transfer agreement includes an express condition that the transferee shall have an entitlement to receive water from the District that is subordinate in priority to the right to City hereunder. In any Year in which there may occur a shortage or interruption in the supply of water with the result that said supply available to the Project Participants is less than the annual Project Allotment of all Project Participants for the year, District will reduce or suspend the delivery of water by the District to such transferee. The District represents and warrants that, as of the effective date of this Agreement, it has not entered into any agreement, other than this Agreement, for the sale or transfer of water for use outside the District's boundaries which is not subordinate in priority to the right or the City and the Project Participants hereunder.

(e) No Liability for Shortages. Neither the District nor any of its officers, agents, or employees shall be liable for any damage, direct or indirect, arising from the shortages in the amount of water to be made available for delivery to the City under this Agreement caused by drought or any other cause beyond its control; provided however that nothing in this clause (e) shall excuse the District from compliance with clauses (a), (b), (c) and (d) hereof.

Section 8.A. Agreements to Meet Statutory, Regulatory and Permitting Requirements

(a) The District and the City hereby acknowledge and agree that the District may from time to time enter into or be obligated to enter into agreements, including water transfer agreements, as part of one of the following statutory, regulatory or permitting purposes:

(1) Settle petitions, proceedings, or hearings before the SWRCB, not instituted by the District, at which the District's consumptive water diversion rights are at issue;

(2) Mitigate the environmental effects of, obtain or maintain necessary governmental approvals for, or resolve challenges to, the Project in accordance with the California Environmental Quality Act or the National Environmental Protection Act; or

(3) Satisfy requirements arising out of Federal Energy Regulatory Commission relicensing of hydro-generation plants owned in whole or in part by the District or by a joint powers agency of which the District is a member, or the licensing of such a plant that is, as of the time of execution of this Agreement, being planned by the District.

(b) (1) To the extent that the District enters into an agreement or agreements for the purposes set forth in sub-section (a) above that commit the District to forego the use of a portion of its water entitlements or to transfer water to other entities, the City and the District agree that the District shall be free to negotiate the terms and conditions of the agreement or agreements without first obtaining the City's concurrence so long as the quantities of water involved will not reduce City's supply of water from the Project in excess of ten percent (10%), excluding reductions caused by any other reason.

(2) Prior to the District entering into any agreement or agreements for the purposes set forth in sub-section (a) above, which commit the District to forego the use of a portion of its water entitlements or to transfer water to other entities and the quantity of water involved cumulatively exceeds ten percent (10%) of City's Project Allotment per year, the District shall obtain the City's approval of the terms and conditions of the agreement or agreements. City agrees that its approval shall not be unreasonably withheld. City will have a period of thirty (30) days from the time District provides written notice of a proposed transfer, to review the proposed transfer. If City reasonably objects to the proposed transfer, it shall provide written notice of its objections to District within the thirty (30) day review period. If City does not object in this manner within the thirty (30) day period, it will be deemed to have given its consent to the proposed transfer.

(3) The City and District agree to proceed as expeditiously as possible to develop a program or programs geared toward insuring water reliability for agricultural and municipal customers within the District and to off-set any losses of water entitlements associated with the application of the provisions of sub-sections (b)(1) and (2) above.

Section 9. Measurement of Water Delivered.

The District shall measure, or cause to be measured, all water delivered to the City and shall keep and maintain accurate and complete records thereof. For this purpose and in accordance with Section 6 hereof, the District

shall install, operate, and maintain, or cause to be installed, operated and maintained, at all delivery structures for delivery of water to the City such measuring devices and equipment as are satisfactory and acceptable to both parties. Said devices and equipment shall be examined, tested, and serviced by the District regularly to insure their accuracy. At any time or times, the City may inspect such measuring devices and equipment, and the measurements and records taken therefrom.

Section 10. Responsibility for Delivery and Distribution of Water.

(a) Neither the District nor any of its officers, agents, or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of water supplied to the City after such water has passed the delivery structures established in accordance with Sections 5(a) and 6(c) hereof; nor for claim of damage of any nature whatsoever, including but not limited to property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water beyond said delivery structures and including attorneys fees and other costs of defense in correction therewith; the City shall indemnify and hold harmless the District and its officers, agents, and employees from any such damages or claims of damages.

(b) Neither the City nor any of its officers, agents or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of water to be supplied to the City until such water has reached the Project facilities, including but not limited to property damage, personal injury or death, arising out of or connected with the control, carriage, handling, use, disposal or distribution of such water before it has reached said delivery structures and including attorneys fees and other costs of defense in connection therewith; the District shall indemnify and hold harmless the City and its officers, agents, and employees from any such damages or claims of damages.

Section 11. Sale or Other Disposition of Project Allotment By City.

(a) Sale or Other Disposition of Project Allotment Without Approval. The City may sell or otherwise dispose of all or any portion of its Project Allotment within its boundaries and within its sphere of influence as determined by the San Joaquin County Local Agency Formation Committee, or any successor entity thereto, or to another Project Participant without approval by the District.

(b) Sale or Other Disposition of Project Allotment Subject to Approval. The City may sell or dispose of all or any portion of its Project Allotment to retain water providers within San Joaquin County, with the approval of the District, provided however that such sale shall be subject to a

right of first refusal of all Project Participants and the District on a pro rata basis to take delivery of such Project Allotment on the same terms and conditions.

(c) No Other Sales or Other Disposition. The City may not sell or otherwise dispose of all or any portion of its Project Allotment or its rights or obligations with respect thereto except as set forth in subsections (a) and (b) of this Section or Section 17 hereof.

(d) No Reduction in City Obligation. In no event shall any sale or other disposition of all or any portion of the City's Project Allotment relieve the City of any of its obligations hereunder.

(e) Notice of Sale or Other Disposition. The City shall give ninety (90) days' advance written notice to the District of any proposed sale or other disposition pursuant to this Section.

Section 12. Rates and Charges.

(a) Establishment of Rates and Charges. The District shall fix charges to the City under this Agreement to produce revenues to the District from the Project equal to the amounts anticipated to be needed by the District to meet the following costs of the District to deliver the City's Project Allotment (including Treatment Plant capacity) through the Project: (i) Fixed Project Costs, (ii) Fixed O&M Costs, and (iii) Variable O&M Costs. The District shall fix charges to the City to produce revenues to the District from the Project to meet the costs described in (i) and (ii) above as set forth in Section 14 hereof and to meet the cost described in (iii) above based on Requests of the City for water and the amount of water received by the District.

(b) Insufficiency of Funds. Because costs determined in accordance with this Agreement are based on estimates if such funds are not sufficient for such purposes, the City shall pay to the District an amount equal to such City's share of the total cost to pay Fixed Project Costs in the proportions established in accordance with Section 14 hereof. The obligation of this Section is incurred by the City for the benefit of future owners of District Bonds, and shall commence and continue to exist and be honored by the City whether or not water is furnished to it from the Project at all times or at all (which provision may be characterized as an obligation to pay all costs on a take-or-pay basis whether or not water is delivered or provided and whether or not the Project is completed or is operable).

(c) Source of Payments. The obligation of the City to make payments under this Agreement is not a general obligation of the City and the City shall make payments under this Agreement solely from City Water System Revenues as a City Operation and Maintenance Expense. The City

shall make such payments prior to any payment therefrom, other than City Prior Debt and on a parity with other City Operation and Maintenance Expenses. Nothing herein shall be construed as prohibiting (i) the City from using any other funds and revenues for purposes of satisfying any provisions of this Agreement or (ii) from incurring obligations payable on a parity with the obligations under this Agreement so long as the City complies with subsection (a) of Section 19(a) hereof.

(d) Obligation Is Not Subject To Reduction. The City shall make payments under this Agreement whether or not the Project is completed, operable, operated or retired and notwithstanding the suspension, interruption, interference, reduction or curtailment of operation of the Project or of water contracted for in whole or in part for any reason whatsoever. Such payments are not subject to any reduction, whether offset or otherwise, and are not conditioned upon performance by the District or any other Project Participant under this Agreement or any other agreement.

(e) Several Obligation. The City shall not be liable under this Agreement for the obligations of any other Project Participant. The City shall be solely responsible and liable for performance of its obligations under this Agreement. The obligation of the City to make payments under this Agreement is a several obligation and not a joint obligation with those of the other Project Participants.

Section 13. Annual Budget and Billing Statement.

The District will prepare a preliminary annual budget for the first year of Project operation at least six months prior to the projected date of Operation. Thereafter, the District will prepare a preliminary annual budget for each applicable Year for credits, costs and expenses relating to the Project, including Fixed Project Costs, Variable O&M Costs and Fixed O&M Costs on or before September 1 of each Year. The District shall submit a draft of such budget to the Operating Committee on or prior to each September 15 for review and comment by the Operating Committee. District staff shall use its best efforts to resolve any questions or concerns caused by a Project Participant during such review. The Board of Directors of the District will adopt a final annual budget for the applicable Year on or before December 1 of each Year after at least one public hearing on the budget and shall allow any Project Participant which may object to any provision of the budget to present such objection during such hearing. The District shall supply a copy of said final annual budget to the City on or before December 15 of each Year. Any amendment to the budget shall be submitted to the Operating Committee for review and comment at least 30 days prior to action thereon by the District Board of Directors. Any such amendment shall be subject to the same hearing requirements applicable to the budget set forth above.

Section 14. Allocation of Costs and Expenses.

For the purpose of allocations of costs and expenses pursuant to this Agreement, the Project shall be allocated (i) to such Reaches as are determined by the District to be necessary for such allocations of costs and (ii) to the Treatment Plant. Except as permitted herein, the District shall not allocate costs and expenses in any way which discriminates among Project Participants which take delivery through the same Reaches except that the cost of raw water included in Variable O&M Costs may be varied between Project Participants within the boundaries of the District and those outside the boundaries of the District. After the execution of this Agreement and prior to commencement of construction of the Project, the District and the Project Participants shall develop a cost allocation method for District general fund and other general overhead and allocable raw water system costs to be allocated to the Project.

(a) Method of Computation of Fixed Project Costs. The Fixed Project Costs shall be sufficient to return to the District those capital costs of the District necessary to treat and deliver water to the City. The total amount of Fixed Project Costs of the Treatment Plant and each Reach of the Project utilized by the City shall be allocated to the City based upon the ratio of the Project Allotment including Treatment Plant capacity of the City to the Project Allotments including Treatment Plant capacity of all Project Participants utilizing the Treatment Plant and such Reach. The City and the District acknowledge that if the City has not elected to have all facilities which are a part of the Project sized to enable the City to take treated water, the City shall not be liable for any Fixed Project Costs for such unconstructed facilities.

(b) Method of Computation of Fixed O&M Costs. The Fixed O&M Costs shall return to the District those costs of the Project necessary to deliver water to the Project Participants which constitute Fixed O&M Costs. The total amount of Fixed O&M Costs of the Treatment Plant and each Reach of the Project for each Year shall be allocated among all Project Participants entitled to delivery of water from or through the Treatment Plant and each Reach based upon the ratio of the Project Allotment including Treatment Plant capacity of each Project Participant to which water is treated at the Treatment Plant or delivered through the Reach to the total Project Allotment including Treatment Plant capacity of all Project Participants for which water is treated at the Treatment Plant or delivered through the Reach, as the case may be. The City and the District acknowledge that if the City has not elected to have all facilities which are a part of the Project sized to enable the City to take treated water, the City shall not be liable for any Fixed O&M Costs for such unconstructed facilities.

(c) Method of Computation of Variable O&M Costs. The Variable O&M Costs shall return to the District those costs of the Project which constitute Variable O&M Costs. There shall be computed for the Treatment Plant and for each Reach of the Project a charge per acre-foot of water which will return to the District the total projected Variable O&M Costs of the Treatment Plant and each Reach for each Year, which computation will reflect the differing cost of raw water to Project Participants within the District and those outside the District. The amount of the Variable O&M costs for the Treatment Plant and for each Reach of the Project shall be the sum of the products obtained when the charges per acre-foot of water determined above for the Treatment Plant and for each Reach necessary to deliver water to the City are multiplied by the number of acre-feet of water treated by the Treatment Plant and water delivered to the City from or through that Reach during the Year, as the case may be. The City and the District acknowledge that if the City has not elected to have all facilities which are a part of the Project sized to enable the City to take treated water, the City shall not be liable for any Variable O&M Costs.

(d) Adjustments of Allocation. On or after the date the Project is in operation, the District shall update the values and amounts of Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs on a quarterly basis, including year-to-date comparisons to the approved Project Budget in order that the costs and expenses to the City may accurately reflect increases or decreases form Year to Year in projected costs, principal and interest payments on District Bonds, annual Project Allotments, estimated deliveries, and all other factors which are determinative of such charges. In addition, each such determination shall include an adjustment to be paid by the City for succeeding Years which shall account for the differences, if any, between projections of costs used by the District in determining the amounts of said costs and expenses for all preceding Years and actual costs incurred by the District during such Years.

Section 15. Time and Method of Payment.

(a) Fixed Project Costs. Payments by the City of the Fixed Project Costs shall commence on December 1, 1995. Thereafter, the City shall pay to the District, on or before January 1 of each Year, 100% of the charge to the City for the next succeeding District Fiscal Year of the Fixed Project Costs.

(b) Fixed O&M Costs. Payments by the City of the Fixed O&M Costs shall commence on ~~December 1, 1995~~ January 1 preceding the estimated Year of the initial operation date. Thereafter, the City shall pay to the District, on or

before January 1 of each Year, the sum of the charges to the City for the Year for the Fixed O&M Costs.

(c) Variable O&M Costs. Payments by the City of the Variable O&M Costs shall commence on the January 1, April 1, July 1 or October 1 which is closest to, but is at least three months immediately preceding, the date on which initial water delivery is estimated to be made to the City. Thereafter, the City shall pay to the District the charges to the City for the Variable O&M Costs for the three-month period commencing on the next succeeding January 1, April 1, July 1 or October l so that the District receives quarterly payments of Variable O&M Costs three months in advance of the time when such Variable O&M Costs will begin to be incurred by the District.

(d) Statement of Charges. The District shall furnish the City with a written statement of the estimated Fixed Project Costs and Fixed O&M Costs of the City for the next succeeding District Fiscal Year, taking into account applicable credits received by the District and estimated investment earnings on moneys related to the Project held by the District. The District shall, on or before March 15, June 15, September 15 and December 15 of each Year, commencing with the District Fiscal Year in which the initial operation date is estimated to occur furnish the City with a statement of the charges to the City for the Variable O&M Costs for the three-month period commencing on the July 1, October l, January 1 or April l, commencing three and one-half months subsequent to such date.

(e) Contest of Accuracy of Charges. If a City questions or disputes the correctness of any billing statement by the District, it shall pay the District the amount claimed when due and shall within thirty (30) days of receipt of such billing statement request an explanation from the District. If the bill is determined to be incorrect, the District will adjust the bill to such City in the next District Fiscal Year. If the District and the City fail to agree on the correctness of a bill within thirty (30) days after the City has requested an explanation, the parties shall promptly submit the dispute to arbitration under Section 1280 et seq. of the Code of Civil Procedure.

Section 16. Obligation in the Event of Default.

(a) Written Demand Upon Failure to Make Payment. Upon failure of the City to make any payment in full when due under this Agreement or to perform any other obligation hereunder, the District shall make written demand upon the City, and if said failure is not remedied within thirty (30) days from the date of such demand or, if District Bonds are outstanding, for such additional time as is reasonably required, in the sole discretion of the Trustee, to correct the same, such failure shall constitute a default at the expiration of such period. Notice of such demand shall be provided to each other Project Participant by the District. Upon failure of the District to

perform any obligation of the District hereunder, the City shall make written demand upon the District, and if said failure is not remedied within thirty (30) days from the date of such demand or, if District Bonds are outstanding, for such additional time as is reasonably required, in the sole discretion of the Trustee, to correct the same, such failure shall constitute a default at the expiration of such period. Notice of such demand shall be provided to each Project Participant by the City making such written demand.

In addition to any default resulting from breach by the District or the City of any agreement, condition, covenant or term hereof, if the District or the City shall file any petition or institute any proceedings under any act or acts, state or federal, dealing with or relating to the subject of bankruptcy or insolvency or under any amendment of such act or acts, either as a bankrupt or as an insolvent or as a debtor or in any similar capacity, wherein or whereby the District or the City asks or seeks or prays to be adjudicated a bankrupt, or is to be discharged from any or all of its debts or obligations, or offers to its creditors to effect a composition or extension of time to pay its debts, or asks, seeks or prays for a reorganization or to effect a plan of reorganization or for a readjustment of its debts or for any other similar relief, or if the District or the City shall make a general or any assignment for the benefit of its creditors, then in each and every such case the District or the City, as the case may be, shall be deemed to be in default hereunder.

(b) Transfer for Defaulting City's Account. Upon the failure of the City to make any payment which failure constitutes a default under this Agreement, the District shall use its best efforts to transfer for the City's account all or a portion of the City's Project Allotment for all or a portion of the remainder of the term of this Agreement. Notwithstanding that all or any portion of the City's Project Allotment is so transferred, the City shall remain liable to the District to pay the full amount of its share of costs hereunder as if such sale or transfer has not been made, except that such liability shall be discharged to the extent that the District shall receive payment from the transferee thereof.

(c) Termination of Entitlement to Project Allotment; Continuing Obligations. Upon the failure of the City to make any payment which failure constitutes a default under this Agreement and causes the District to be in default under any Bond Resolution, the District may (in addition to the remedy provided by subsection (b) of this Section) give notice of termination of the provisions of this Agreement insofar as the same entitle the City to its Project Allotment which notice shall be effective within 30 days thereof unless such termination shall be enjoined, stayed or otherwise delayed by judicial action. Irrespective of such termination, the City shall remain liable to the District to pay the full amount of costs hereunder.

(d) Enforcement of Remedies. In addition to the remedies set forth in this Section, upon the occurrence of an event of default as defined herein, the District or the City, as the case may be, shall be entitled to proceed to protect and enforce the rights vested in such party by this Agreement by such appropriate judicial proceeding as such party shall deem most effectual, either by suit in equity or by action at law, whether for the specific performance of any covenant or agreement contained hereon or to enforce any other legal or equitable right vested in such party by this Agreement or by law. The provisions of this Agreement and the duties of each party hereof, their respective boards, officers or employees shall be enforceable by the other party hereto by mandamus or other appropriate suit, action or proceeding in any court of competent jurisdiction, with the losing party paying all costs and attorney fees. Without limiting the generality of the foregoing, the District or the City, as the case may be, shall have the right to bring the following actions:

(1) Accounting. By action or suit in equity to require an accounting by the District or the City, as the case may be, including its officers, employees and assigns.

(2) Injunction. By action or suit in equity to enjoin any acts or things which may be unlawful or in violation of the rights of the District or the City, as the case may be.

(3) Mandamus. By mandamus or other suit, action or proceeding at law or in equity to enforce its rights against the other party hereto (and its board, officers and employees) and to compel the other party hereto to perform and carry out its duties and obligations under the law and its covenants and agreements as provided herein.

(e) Waiver. The waiver by the District or the Trustee of any breach by the City of any agreement, condition, covenant or term hereof shall not operate as a waiver of any subsequent breach of the same or any other agreement, condition, covenant or term hereof.

(f) Trustee is Third Party Beneficiary. Any Trustee for District Bonds shall have the right, as a third party beneficiary, to initiate and maintain suit to enforce this Agreement to the extent provided in any Bond Resolution.

Section 17. Transfers, Sales and Assignments of Project Allotment or Water System.

(a) Transfer of Project Allotment. The City has rights to make transfers, sales, assignments and exchanges (collectively "transfers") of its Project Allotment or its rights or obligations with respect thereto only as expressly provided in Section 11 hereof or in clause (b) of this Section.

(b) Transfer of Ownership. Except as may be expressly required by law, the City shall not transfer ownership of all or any substantial portion of its Water System to another entity except in an annexation, consolidation, merger or reorganization with another governmental entity or a change in governmental form in accordance with the Cortese-Knox Local Government Reorganization Act of 1985, as amended (commencing with California Government Code Section 56000, et seq.) or any similar successor statute, in which the surviving entity or entities assume in the aggregate all obligations of the City under this Agreement and in which the rights under this Agreement may be enforced as provided in Government Code Section 56121.

(1) The City shall not consent to such annexation, consolidation, merger or reorganization or change in governmental form unless the City shall have delivered to the District a certificate of an independent financial advisor certifying that, based upon the rates and charges of the surviving entity in effect on the date of such annexation, consolidation, merger or reorganization or change in governmental form, shall be in compliance with Section 19(a) hereof and the surviving entity agrees in writing on or prior to such date to assume all obligations of the City hereunder.

(2) The City shall give ninety (90) days advance written notice to the District of any proposed transfer pursuant to this subsection. Appendix A to this Agreement shall be amended as appropriate to reflect any transaction pursuant to this subsection.

Section 18. Additional Project Participants.

The City acknowledges that the District may enter into Water Supply Agreements with Additional Project Participants subsequent to the execution of this Agreement to the extent the District determines that sufficient capacity exists to supply such Additional Project Participant's Project Allotment consistent with the District's overall delivery abilities. Prior to the execution of a Water Supply Agreement with an Additional Project Participant, the District shall promptly provide to the City a revised Exhibit A to this Agreement setting forth the revised list of Project Allotments of the Project Participants. No Water Supply Agreement with an Additional Project Participant shall be executed with an Additional Project Participant outside the boundaries of the District unless the District shall first offer such Project Allotment to each Project Participant on the same terms and conditions as offered to such Additional Project Participant. The Water Supply Agreement with such Additional Project Participant shall establish a price to be paid by the Additional Project Participant to the City an amount which reasonably compensates the City for Fixed Project Costs and Fixed O&M Costs previously paid by the City which are fairly allocable to the Additional Project Participant,

including but not limited to costs incurred by the City in connection with the Project prior to execution of this Agreement, and, if such Additional Project Participant is located outside of the boundaries of the District, is not less than the highest price paid by any Project Participant.

Section 19. Covenants of the City.

(a) Amount of Rates and Charges. The City will fix, prescribe and collect rates and charges for the City Water System which will be at least sufficient to yield during each City Fiscal Year City Net Water System Revenues (excluding Contract Payments) equal to one hundred twenty-five percent (125%) of the Contract payments for such City Fiscal Year. The City may make adjustments from time to time in such rates and charges and may make such classification thereof as it deems necessary, but shall not reduce the rates and charges then in effect unless the City Net Water System Revenues from such reduced rates and charges will at all times be sufficient to meet the requirements of this section.

(b) Against Sale or Other Disposition of Property. The City will not sell, lease or otherwise dispose of the City Water System or any part thereof, except as provided in Section 17 hereof, unless the City determines that such sale, lease or other disposition will not materially adversely affect the City's ability to comply with subsection (a) of this Section. The City will not enter into any agreement or lease which impairs the operation of the City Water System or any part thereof necessary to secure adequate City Net Water System Revenues for the payment of the obligations imposed under this Agreement or which would otherwise impair the rights of the District with respect to the City Water System Revenues or the operation of the City Water System.

(c) Against Competitive Facilities. To the extent permitted by existing law and within the scope of its powers but only to the extent necessary to protect the rights of the owners of District Bonds, the City will not acquire, construct, maintain or operate and will use its best efforts not to permit any other public or private agency, corporation, district or political subdivision or any person whomsoever to acquire, construct, maintain or operate within the boundaries of the City any water system competitive with the City Water System which might have the effect of materially adversely affecting the City's ability to pay Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs.

(d) Maintenance and Operation of the City Water System; Budgets. The City will maintain and preserve the City Water System in good repair and working order at all times and will operate the City Water System in an efficient and economical manner and will pay all City Operation and Maintenance Expenses as they become due and payable. On or before the first

day of each City Fiscal Year thereafter, the City will adopt and file with the District a budget approved by the legislative body of the City, including therein in the estimated City Operation and Maintenance Expenses for such City Fiscal Year the estimated Fixed Project Costs, Fixed O&M Costs and Variable O&M Costs payable. Any budget may be amended at any time during any City Fiscal Year and such amended budget shall be filed by the City with the District. The District may enforce this clause (d) only to the extent necessary to protect the rights of the owners of District Bonds.

(e) Insurance. The City shall procure and maintain or cause to be procured and maintained insurance on the City Water System with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of self-insurance, or participate in a joint powers agency providing insurance or other pooled insurance program, in such amounts and against such risks (including accident to or destruction of the City Water System) as are usually covered in connection with water systems similar to the City Water System.

(f) Accounting Records and Financial Statements.

(i) The City will keep appropriate accounting records in which complete and correct entries shall be made of all transactions relating to the City Water System, which records shall be available for inspection by the District and the Trustee at reasonable hours and under reasonable conditions.

(ii) The City will prepare and file with the District annually within one hundred eighty (180) days after the close of each City Fiscal Year (commencing with the City Fiscal Year ending June 30, 1995) financial statements of the City for the preceding City Fiscal Year prepared in accordance with generally accepted accounting principles, together with a report of an Independent Certified Public Accountant thereon. The City will promptly furnish a copy of such report to the District and to the Trustee.

(g) Protection of Security and Rights of the District. The City will preserve and protect the rights of the District and the Trustee to the obligations of the City hereunder and will warrant and defend such rights against all claims and demands of all persons.

(h) Payment of Taxes and Compliance with Governmental Regulations. The City will pay and discharge all taxes, assessments and other governmental charges which may hereafter be lawfully imposed upon the City Water System or any part thereof or upon the City Water System Revenues when the same shall become due. The City will duly observe and conform with all valid regulations and requirements of any governmental

authority relative to the operation of the City Water System or any part thereof, but the City shall not be required to comply with any regulations or requirements so long as the validity or application thereof shall be contested in good faith.

(i) Further Assurances. The City will adopt, deliver, execute and make any and all further assurances, instruments and resolutions as may be reasonably necessary or proper to effect the financing and refinancing of the Project, to assure the District of the City's intention to perform hereunder and for the better assuring and confirming unto the District and the Trustee of the rights and benefits provided to them herein.

(j) Maintenance of Tax-Exempt Status of District Bonds. Notwithstanding any other provision of this Agreement, the City shall not take any action or omit to take any action, directly or indirectly, in any manner, which would result in any of the District Bonds being treated as an obligation not described in Section 103(a) of the Internal Revenue Code of 1986, as amended, by reason of classification of such District Bond as a "private activity bond" within the meaning of Section 141 of said Code or for any other reason.

Section 20. Covenants of the District.

(a) Insurance. The District shall procure and maintain or cause to be procured and maintained insurance on the Project with responsible insurers so long as such insurance is available from reputable insurance companies, or, alternatively, shall establish a program of self-insurance, or participate in a joint powers agency providing insurance or other pooled insurance program, covering such risks, in such amounts and with such deductibles as shall be determined by the District. The District shall indemnify and hold harmless the City from any liability for personal injury or property damage resulting from any accident or occurrence arising out of or in any way related to the construction or operation of the Project.

(b) Accounting Records and Financial Statements.

(i) The District will keep appropriate accounting records in which complete and correct entries shall be made of all transactions relating to the Project, which records shall be available for inspection, copying and audit by the City and its accountants, attorneys and agents at reasonable hours and under reasonable conditions.

(ii) The District will prepare annually within one hundred eighty (180) days after the close of each District Fiscal Year (commencing with the District Fiscal Year ending December 31, 1995) financial statements of the District for the preceding District Fiscal Year prepared

in accordance with generally accepted accounting principles, together with a report of an Independent Certified Public Accountant thereof. The District will promptly furnish a copy of such report to the City and to the Trustee.

(c) Compliance with Law. The District shall comply with all local, state and federal laws applicable to the Project.

(d) Against Sale or Other Disposition of Project. The District will not sell, lease or otherwise dispose of the Project or any part thereof unless the Board of Directors of the District determines that such sale, lease or other disposition will not materially adversely affect the District's ability to comply with its obligations hereunder and such determination is approved by the Operating Committee.

(e) Maintenance and Operation of the Project. Subject to the payment obligations of the Project Participants hereunder, the District will maintain and preserve the Project in good repair and working order at all times and will operate the Project in an efficient and economical manner.

Section 21. Term.

(a) No provision of this Agreement shall take effect until it and Water Supply Agreements with all Project Participants (other than Additional Project Participants) have been duly executed and delivered to the District together with an opinion for each Project Participant of an attorney or firm of attorneys in substantially the form attached hereto as Exhibit B and an opinion for the District of Brown & Wood, Special Counsel to the District, in substantially the form attached hereto as Exhibit C.

(b) Notwithstanding the delay in effective date of this Agreement until all Project Participants have complied with subsection (a) of this Section, it is agreed by the City that in consideration for the District's signature hereto, and for its commitment to use its best efforts to obtain the commitment of all Project Participants, the City upon its execution and delivery of this Agreement to the District along with the required opinion and any required evidence of compliance as required by subsection (a) of this Section shall be immediately bound not to withdraw its respective offer herein made to enter into this Agreement as executed and/or supplemented or to decrease or terminate its Project Allotment before December 1, 1995.

(c) Unless terminated in accordance with Section 3(c), the term of this Agreement shall continue until the later of December 31, 2029 and the final maturity of District Bonds. The parties hereto agree to negotiate in good faith to amend this Agreement on or prior to such date to extend the term hereof and to include terms and conditions as are mutually agreeable to the

parties, provided that the price to be paid with respect to the Project Allotment in such amendment shall reflect the payment of capital costs to such date. In the event that the District and all Project Participants cannot agree to amend the Agreement, the District agrees to cause ownership of the Project to be transferred to a joint powers agency or similar entity created by the Project Participants and to enter into a raw water sale agreement with such entity on terms and conditions consistent with the raw water pricing and delivery policy in effect under this Agreement at the time of such transfer.

In the event the ownership of the Project is transferred pursuant to this subparagraph (c), the quantity of raw water that will be made available to the entity created by the Project Participants shall not be reduced from the quantity of raw water being made available by the District to the Project Participants immediately prior to the expiration of the term of this Agreement. Should the ownership of the Project be transferred to a new entity, the price paid to the District for raw water shall be on the same terms as prior to the transfer, plus any costs incurred by the District for operation, maintenance or capital improvement reimbursements relating to facilities necessary to deliver raw water to the Project.

Section 22. Assignment.

The District may pledge and assign to any Trustee for District Bonds, all or any portion of the payments received under this Agreement from the City and the District's other rights and interests under this Agreement. Such pledge and assignment by the District shall be made effective for such time as the District shall determine and provide that the Trustee shall have the power to enforce this Agreement in the event of a default by the District under a Bond Resolution. The City may assign its rights or obligations under this Agreement only in accordance with Section 17 hereof.

Section 23. Amendments.

Except as otherwise provided in this Agreement, on and after the date District Bonds are issued and so long as any District Bonds are outstanding in accordance with the applicable Bond Resolution, Sections 11(d), 12(a), (c) and (d), 14(a), 16, 17, 19 and 21 of this Agreement shall not be amended, modified or otherwise changed or rescinded by agreement of the parties without the consent of each Trustee for District Bonds whose consent is required under the applicable Bond Resolution. This Agreement may only be otherwise amended, modified, changed or rescinded in writing by each of the parties hereto.

Notwithstanding the foregoing, the sections of this Agreement set forth in the prior paragraph of this Section may be amended without the consent of each Trustee for District Bonds for any of the following purposes:

(a) to add to the agreements, conditions, covenants and terms contained herein required to be observed or performed by the District or the City other agreements, conditions, covenants and terms hereafter to be observed or performed by the District or the City, or to surrender any right reserved herein to or conferred herein on the District or the City, and which in either case shall not adversely affect the interests of the owners of any District Bonds;

(b) to make such provisions for the purpose of curing any ambiguity or of correcting, curing or supplementing any defective provision contained herein or in regard to questions arising hereunder which the District or the City may deem desirable or necessary and not inconsistent herewith, and which shall not materially adversely affect the interests of the owners of any District Bonds;

(c) to make any modifications or changes necessary or appropriate in the opinion of a firm of nationally recognized standing in the field of law relating to municipal bonds to preserve or protect the exclusion from gross income of interest on the District Bonds for federal income tax purposes;

(d) to make any modifications or changes to this Agreement in order to enable the execution and delivery of District Bonds on a parity with any District Bonds previously issued and to make any modifications or changes necessary or appropriate in connection with the execution and delivery of District Bonds;

(e) to make any other modification or change to the provisions of this Agreement which does not materially adversely affect the interests of the owners of any District Bonds;

(f) to make changes to the definition of "Project," including but not limited to changes resulting from the operation of Sections 3 and 4 hereof.

Section 24. Additional Water in Future.

The District agrees that on or about January 1, 2005, to the extent the Board of Directors of the District determines that water surplus to the needs of agricultural water users within the District is then available and subject to compliance with federal and state laws, including CEQA, and to the District's water rights, permits and licenses, and to state laws applicable thereto, the

District shall commence proceedings to expand the Project to make additional treated water available to the Project Participants, but such expansion shall occur only on terms and conditions reasonably agreeable to the District and the Project Participants. In the event that the District and the Project Participants cannot agree upon terms and conditions for expansion of the Project and delivery of additional treated water, the District shall not be obligated to expand the Project or to make additional treated water available to the Project Participants. Nothing in this Agreement shall be construed to require the District to deliver treated water to the City in excess of the City' s Project Allotment or to enter into any agreement to deliver treated water to the City in excess of the City's Project Allotment unless the District Board of Directors determines that water surplus to the needs of agricultural water users within the District is available to the District.

Section 25. Miscellaneous

The headings of the sections hereof are inserted for convenience only and shall not be deemed a part of this Agreement.

If any one or more of the covenants or agreements provided in this Agreement to be performed should be determined to be invalid or contrary to law, such covenant or agreement shall be deemed and construed to be severable from the remaining covenants and agreements herein contained and shall in no way affect the validity of the remaining provisions of this Agreement.

This Agreement may be executed in several counterparts, all or any of which shall be regarded for all purposes as one original and shall constitute and be but one and the same instrument.

This Agreement shall be governed by and construed in accordance with the laws of the State of California.

IN WITNESS WHEREOF the City has executed this Agreement with the approval of its governing body, and caused its official seal to be affixed and the District has executed this Agreement in accordance with the authorization of its Board of Directors, and caused its official seal to be affixed.

SOUTH SAN JOAQUIN
IRRIGATION DISTRICT

[SEAL]

By _____
President

Attest:

By _____
Secretary

CITY OF MANTECA

[SEAL]

By _____
Mayor

Attest:

By: _____
City Clerk

Approved as to form

By: _____
Special Legal Counsel

EXHIBIT A

PHASE I - UP TO YEAR 2010

City		Project Allotment
1.	City of Escalon	2,015
2.	City of Lathrop	8,007
3.	City of Manteca	12,700
4.	City of Ripon	1,232
5.	City of Tracy	10,000
		33,954

PHASE II - UP TO YEAR 2025
SCHEDULE OF PROJECT ALLOTMENTS

City		Project Allotment
1.	City of Escalon	2,799
2.	City of Lathrop	11,791
3.	City of Manteca	24,500
4.	City of Ripon	3,919
5.	City of Tracy	10,000
		53,009

EXHIBIT "B"

RICHARDS, WATSON & GERSHON
ATTORNEYS AT LAW
A PROFESSIONAL CORPORATION

GLENN R. WATSON
ROBERT G. BEVERLY
HARRY L. GERSHON
DOUGLAS W. ARGUE
MARK L. LAMKEN
ARNOLD SIMON
ERWIN E. ADLER
DAROLD D. PIEPER
ALLEN E. RENNETT
STEVEN L. DORSEY
WILLIAM L. STRAUSZ
ROBERT M. GOLDFRIED
ANTHONY B. DREWRY
MITCHELL E. ABBOTT
TIMOTHY L. NEUFELD
GREGORY W. STEPANICICH
ROCHELLE BROWNE
DONALD STERN
MICHAEL JENKINS
WILLIAM B. RUDELL
DAVID L. COHEN
QUINN M. BARROW
CAROL W. LYNCH
JEFFREY A. RABIN
GREGORY M. KUNERT
THOMAS M. JIMBO
MICHELLE BEAL BAGNERIS
AMANDA F. SUSSKIND
ROBERT C. CECCON
SAYRE WEAVER
STEVEN H. KAUFMANN
GARY E. GANS
JOHN J. HARRIS
KEVIN G. ENNIS
ROBIN D. HARRIS
MICHAEL ESTRADA
LAURENCE S. WIENER
C. EDWARD DILKES
STEVEN R. ORR
DEBORAH R. HAKMAN
SCOTT K. SHINTANI
MICHAEL G. COLANTUONO
TERRY P. KAUFMANN MACIAS
B. TILDEN KIM
RUBIN D. WEINER
SASKIA T. ASAMURA
KAYSER O. SUME
CRAIG A. STEELE
T. PETER PIERCE
ALISON E. MAKER
BENJAMIN BARNOUW
TERENCE R. BOGA
DOUGLAS A. CARLEN
DANIEL L. PINES
LISA MARIE BOND
WINNIE TSIEN
JENNIFER L. HART
DIANE ARKOW
ROXANNE M. DIAZ

RICHARD RICHARDS
(1916-1988)

THIRTY-EIGHTH FLOOR
333 SOUTH HOPE STREET
LOS ANGELES, CALIFORNIA 90071-1469
(213) 626-8484
FACSIMILE (213) 626-0078

OF COUNSEL
WILLIAM K. KRAMER

February 7, 1996

1731211
OUR FILE NUMBER

M5446-00001

South San Joaquin Irrigation District
11011 East Highway 20
Manteca, California 95336

City of Manteca
1001 West Center Street
Manteca, California 95337

Ladies and Gentlemen:

We are acting as special counsel to the City of Manteca (the "City") and we have received the Water Supply Development Agreement, dated October 1, 1995 (the "Agreement"), between the South San Joaquin Irrigation District (the "District") and the City. We have examined and are familiar with: (i) documents relating to the existence, organization and operation of the City provided to us by the City, (ii) certifications by officers of the City, and (iii) documentation of the City relating to the authorization, execution and delivery of the Agreement.

Based upon the foregoing and the examination of law and such other information, papers and documents as we deem necessary or advisable to enable us to render this opinion, including the Constitution and laws of the State of California, together with the resolutions, ordinances and public proceedings of the City, we are of the opinion that:

1. The City is a general law city, duly created, organized and existing under the laws of the State of California and duly qualified to furnish water service within its boundaries.

2. The City has legal authority to enter into the Agreement and to carry out and consummate all transactions reasonably contemplated thereby.

3. Based upon the documents provided to us, the Agreement appears to be duly authorized, executed and delivered by the City, is in full force and effect as to the City in accordance with its terms and, subject to the qualifications set forth in the second to the last paragraph hereof, and assuming that the District has all requisite power and authority, and has taken all necessary action, to authorize, execute and deliver such Agreement, the Agreement constitutes a valid obligation of the City.

4. The City is authorized to obligate itself to make payments under the Agreement from the revenues of its water system as provided in Section 12 of the Agreement.

5. No approval, consent or authorization of any governmental or public agency, authority or person (other than the City itself) is required for the execution and delivery by the City of the Agreement.

Additionally, we have been informed by the City Clerk that based upon her search of the City records, no other instrument or agreement of the City addresses the subject matter of the Agreement. Therefore, based on this information, it appears that the authorization, execution and delivery of the Agreement and compliance with the provisions thereof will not conflict with or constitute a breach of, or default under, any instrument relating to the organization, existence or operation of the City, any commitment, agreement or other instrument to which the City is a party or by which it or its property is bound or affected, or any ruling, regulation, ordinance, judgment, order or decree to which the City (or any of its officers in their respective capacities as such) is subject. We further do not believe that the Agreement will conflict with any provision of the laws of the State of California relating to the City and its affairs.

We have also been informed by the City Clerk that based upon a search of her records, there is no action, suit, proceeding, inquiry or investigation at law or in equity or before any court, public board or body, pending or, to her knowledge, threatened against or affecting the City or any entity affiliated with the City or any of its officers in their respective capacities as such, which questions the powers of the City referred to in paragraph 2 above or the validity of the proceedings taken by the City in connection with the authorization, execution or delivery of the Agreement, or wherein any unfavorable decision, ruling or finding would materially adversely affect the transactions contemplated by the Agreement,

or which would adversely affect the validity or enforceability of the Agreement.

The opinion expressed in paragraph 3 above is qualified to the extent the enforceability of the Agreement may be limited by any applicable bankruptcy, insolvency, reorganization, arrangement, moratorium, or other laws affecting creditors' rights, to the application of equitable principles and to the exercise of judicial discretion in appropriate cases and to he limitations on legal remedies against public agencies in the State of California and provided that no opinion is expressed with respect to any indemnification or contribution provisions contained therein.

This opinion is rendered only with respect to the laws of the State of California and the United States of America and is addressed only to the South San Joaquin Irrigation District and the City. No other person is entitled to rely on this opinion, nor may the opinion be relied upon in connection with any transactions other than those described herein.

Very truly yours,

Laurence S. Wiener

LSW:gg
1731211

EXHIBIT "C"

STUART L. SOMACH
ADMITTED IN CALIFORNIA AND
IN THE DISTRICT OF COLUMBIA

DE CUIR & SOMACH
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
400 CAPITOL MALL
SUITE 1900
SACRAMENTO, CA 95814-4407
TELEPHONE (916) 446-7979
FACSIMILE (916) 446-8199

November 27, 1995

South San Joaquin Irrigation District
11011 East Highway 20
Manteca, California 95336

City of Manteca
1001 West Center Street
Manteca, California 95337

Ladies and Gentlemen:

We are acting as City Attorney to the City of Manteca (the "City") under the Water Supply Development Agreement, dated as of October 1, 1995 (the "Agreement"), between the South San Joaquin Irrigation District (the "District") and the City, and have acted as City Attorney to the City in connection with the matters referred to herein. As such counsel we have examined and are familiar with (i) documents relating to the existence, organization and operation of the City provided to us by the City, (ii) certifications by officers of the City, (iii) all necessary documentation of the City relating to the authorization, execution and delivery of the Agreement, and (iv) an executed counterpart of the Agreement. Terms used herein and not otherwise defined have the respective meanings set forth in the Agreement.

Based upon the foregoing and such examination of law and such other information, papers and documents as we deem necessary or advisable to enable us to render this opinion, including the Constitution and laws of the State of California, together with the resolutions, ordinances and public proceedings of the City, we are of the opinion that:

1. The City is a general law city, duly created, organized and existing under the laws of the State of California and duly qualified to furnish water service within its boundaries.

2. The City has legal right, power and authority to enter into the Agreement and to carry out and consummate all transactions reasonably

contemplated thereby, and the City has complied with the provisions of applicable law relating to such transactions.

3. The Agreement has been duly authorized, executed and delivered by the City, is in full force and effect as to the City in accordance with its terms and, subject to the qualifications set forth in the second to the last paragraph hereof, and assuming that the District has all requisite power and authority, and has taken all necessary action, to authorize, execute and deliver such Agreement, the Agreement constitutes the valid and binding obligation of the City.

4. The obligations of the City to make payments under the Agreement from the Revenues of its City Water System or other lawfully available funds as provided in Section 12 of the Agreement is a valid, legal and binding obligation of the City enforceable in accordance with its terms.

5. No approval, consent or authorization of any governmental or public agency, authority or person is required for the execution and delivery by the City of the Agreement.

6. The authorization, execution and delivery of the Agreement and compliance with the provisions thereof will not conflict with or constitute a breach of, or default under, any instrument relating to the organization, existence or operation of the City, any commitment, agreement or other instrument to which the City is a party or by which it or its property is bound or affected, or any ruling, regulation, ordinance, judgment, order or decree to which the City (or any of its officers in their respective capacities as such) is subject or any provision of the laws of the State of California relating to the City and its affairs.

7. There is no action, suit, proceeding, inquiry or investigation at law or in equity or before any court, public board or body, pending or, to our knowledge, threatened against or affecting the City or any entity affiliated with the City or any of its officers in their respective capacities as such, which questions the powers of the City referred to in paragraph 2 above or the validity of the proceedings taken by the City in connection with the authorization, execution or delivery of the Agreement, or wherein any unfavorable decision, ruling or finding would materially adversely affect the transactions contemplated by the Agreement, or which would adversely affect the validity or enforceability of the Agreement.

The opinion expressed in paragraph 3 above is qualified to the extent that the enforceability of the Agreement may be limited by any applicable bankruptcy, insolvency, reorganization, arrangement, moratorium, or other laws affecting creditors' rights, to the application of equitable principles and to the exercise of judicial discretion in appropriate cases and to the limitations on legal remedies against public agencies in the State of California and provided that no opinion is expressed with respect to any indemnification or contribution provisions contained therein.

This opinion is rendered only with respect to the laws of the State of California and the United States of America and is addressed only to the South San Joaquin Irrigation District and the City. No other person is entitled to rely on this opinion, nor may you rely on it in connection with any transactions other than those described herein

Very truly yours,

Stuart L. Somach
Attorney

SLS/lgs

EXHIBIT D

LIST OF NOTES, BONDS OR OTHER OBLIGATIONS OF THE CITY AS OF DATE OF EXECUTION TO WHICH CITY WATER SYSTEM REVENUES ARE PLEDGED

DESCRIPTION	MAXIMUM ANNUAL DEBT SERVICE

AMENDMENT NO. 1
TO THE WATER SUPPLY DEVELOPMENT AGREEMENT
BETWEEN THE CITY OF MANTECA
AND THE SOUTH SAN JOAQUIN IRRIGATION DISTRICT

This Amendment No. 1 ("Amendment") to the Water Supply Development Agreement is made and entered into between the City of Manteca, a municipal corporation ("City"), and the South San Joaquin Irrigation District ("SSJID").

RECITALS

A. The City and SSJID entered into a Water Supply /Development Agreement ("WSDA Agreement") dated as of October 1, 1995.

B. The parties desire to make certain changes to the WSDA Agreement which are set forth below.

NOW THEREFORE, THE PARTIES MUTUALLY AGREE AS FOLLOWS:

1. Incorporation By Reference. This amendment hereby incorporates by reference all terms and conditions set forth in the WSDA Agreement, unless specifically modified by this Amendment. All terms and conditions set forth in the WSDA Agreement which are not specifically modified by this Amendment shall remain in full force and effect.

2. Terms of Amendment.

A. The definition of "Fixed Project Costs" in Section 1 is amended to read as follows:

"Fixed Project Costs" means capital costs incurred by District related to design, right of way, acquisition, CEQA compliance, construction management and construction of the Project and including Debt Service and Reserves for the payment of the Debt Service of the Project in accordance with Sections 13 and 14.

B. Section 3(d) , is amended to read as follows:

"(d) Obligation to Pay Fixed Project Costs. The City and the District acknowledge that the City is obligated to pay Fixed Project Costs in advance of the delivery of treated water and prior to commencement of actual construction of the Project. Fixed Project Costs may be paid by the City by cash payments or the City may cause such Fixed Project Costs to be financed through the issuance of District Bonds as provided in Sections 3 and 4 hereof. The City and the District further acknowledge that if the City pays Fixed Project Costs to the District in cash, such Fixed Project Costs shall not thereafter be allocated to the City in the determination of rates and charges as set forth in Section 12 hereof or for the annual budget as provided in Section 13 hereof. In the event

City has paid all Fixed Project Costs allocable thereto prior to the notice of termination as set forth in Section 3(c) in cash, the City and the District acknowledge that no further monies shall be due from City for Fixed Project Costs."

C. Section 12(a), Rates and Charges, subparagraph (i) is amended to read as follows:

(i) Fixed Project Costs unless the City has satisfied its Fixed Project Costs as provided for in Section 3.

D. Section 12(c), Rates and Charges, is amended to read as follows:

"(c) Source of Payments. The obligation of the City to make payments under this Agreement is not a general obligation of the City and the City shall make payments under this Agreement solely from City Water System Revenues, including but not limited to, Development Mitigation Fees collected pursuant to Government Code sections 66000 (AB1600), connection fees, and/or capacity charges. The City shall make such payments prior to any payment therefrom, other than City Prior Debt, and on a parity with other City Operation and Maintenance Expenses. Nothing herein shall be construed as prohibiting (i) the City from using any other funds and revenues, for purposes of satisfying any provisions of this Agreement or (ii) from incurring obligations payable on a parity with the obligations under this Agreement so long as City complies with subsection (a) of Section 19(a) hereof."

E. Section 14(a), "Allocation of Costs and Expenses" is amended to read as follows:

"(a) Method of Computation of Fixed Project Costs. The Fixed Project Costs shall be sufficient to return to the District those capital costs of the District necessary to treat and deliver water to the City, less payments made by City. The total amount of Fixed Project Costs, including each Reach utilized by City, shall be allocated to the City based upon the City's proportionate share of the total capacity of the Treatment Plant and the Reaches, except that those Fixed Project Costs not related to capacity shall be allocated based the City's proportionate share of the total Project allotment. The City and the District acknowledge that if the City has not elected to have all facilities which are a part of the Project sized to enable the City to take treated water, the City shall not be liable for any Fixed Project Costs for such unconstructed facilities."

F. Section 19(a) is amended to read as follows:

(a) Amount of Rates and Charges. The City will fix, prescribe and collect rates and charges for the City Water System which will be at least sufficient to yield during each City Fiscal Year City Net Water System Revenues (excluding Contract Payments) equal to one hundred twenty-five percent (125%) of the Contract Payments for such City Fiscal Year. The City may make adjustments from time to time in such rates and charges and

may make such classification thereof as it deems necessary, but shall not reduce the rates and charges then in effect unless the City Net Water System Revenues from such reduced rates and charges will at all times be sufficient to meet the requirements of this section; provided however that to the extent all or a portion of Fixed Project Costs are paid by the City in advance from City reserves, such portion of Fixed Project Costs shall not be included in Contract Payments for purposes of this Section 19(a).

G. Exhibit A of the WSDA Agreement is deleted and is replaced by Exhibit 1 attached hereto, which is hereby appended to the WSDA Agreement as Exhibit E and is incorporated herein by this reference.

3. Payment of Fixed Project Costs. City has paid to District Fixed Project Costs in the following amounts: $743,408.42 as of March 28, 2000. The parties anticipate that at least two more payments of Fixed Project Costs will be required, prior to final design and prior to construction, and additional payments may be required for other purposes before completion of the Project.

4. Estimated Project Budget and Cost Allocation. A copy of the allocation among the Cities of Fixed Project Costs for Phase 1 is attached hereto as Exhibit 2 and is hereby appended to the WSDA Agreement as Exhibit F. The allocation is based upon the latest estimated Project budget in Table 1 which is attached to Exhibit 2. The Operating Committee has recommended the proposed budget to the District for its approval. The District has the discretion to approve the budget and any changes to the budget, as provided in the WSDA Agreement.

5. Consent of Trustee Not Required. The consent of Trustee to this Amendment No. 1 is not required under Section 23 of the WSDA Agreement as there are no outstanding District Bonds at the time of execution of this Amendment No. 1.

6. Modifications. This Amendment may not be modified orally or in any manner other than by an agreement in writing signed by both parties, in accordance with the requirements of the WSDA Agreement.

7. Severability. In the event any term of this Amendment is held invalid by a court of competent jurisdiction, the Amendment shall be construed as not containing that term, and the remainder of this Amendment shall remain in full force and effect.

8. Signatures. The individuals executing this Amendment represent and warrant that they have the right, power, legal capacity, and authority to enter into and to execute this Amendment on behalf of the respective legal entities. This Amendment shall inure to the benefit of and be binding upon the parties thereto and their respective successors and assigns.

IN WITNESS WHEREOF the parties do hereby agree to the full performance of the terms set forth herein.

CITY OF MANTECA

By: _____
Carlon Perry
Title: Mayor
Date: 4-17-00

Attest:

By: _____
Joann Tilton
Title: City Clerk
Date: 4-17-00

Approved as to form

By: _____
Kelley M. Taber
DeCuir & Somach
Date: 4/20/00

SOUTH SAN JOAQUIN IRRIGATION DISTRICT

By: _____

Title: President of the SSJID Board
Date: 5-18-2000

Attest:

By: _____

Title: Secretary of the SSJID Board
Date: 5-18-2000

Approved as to form

By: _____
Steven P. Emrick
Title: General Counsel
Date: 5-18-00

EXHIBIT 1

APPENDED AS EXHIBIT E TO WATER SUPPLY DEVELOPMENT AGREEMENT AND IN REPLACEMENT OF EXHIBIT A

SCHEDULE OF PROJECT ALLOTMENTS

PHASE I - UP TO YEAR 2010

City	Project Allotment
1. City of Escalon	2,015
2. City of Manteca	11,500
3. City of Lathrop	8,007
4. City of Tracy	10,000
	31,522

PHASE II - UP TO YEAR 2025

City	Project Allotment
1. City of Escalon	2,799
2. City of Manteca	18,500
3. City of Lathrop	11,791
4. City of Tracy	10,000
	43,090

EXHIBIT 2

APPENDED AS EXHIBIT F TO WATER SUPPLY DEVELOPMENT AGREEMENT

ESTIMATED PROJECT BUDGET AND COST ALLOCATIONS

Set forth below is the allocation of Fixed Project Costs among the Cities based upon the latest estimated Project budget in Table 1 attached hereto. Each party hereto acknowledges that the costs will change from time to time as project design and construction is undertaken and that no final costs allocation can be determined until completion of the Project.

City	Estimated Share	Percent of Total
Escalon	$2,203,450	1.83%
Manteca	$37,097,963	29.40%
Lathrop	$42,102,256	33.35%
Tracy	$44,698,751	35.42%

Attachment 4

City of Manteca Water Supply History

City of Manteca Water Supply History

Year	Population	Developed Area	Total City Area	Annual Groundwater Use		Annual Surface Water Use		Annual Average Day Use
		Acres	Acres	AF	MG	AF	MG	MGD
1960	8242	1117	1176	2,277	742			2.03
1961	8662	1225	1289	2,486	810			2.22
1962	9350	1272	1339	2,575	839			2.30
1963	10175	1338	1408	2,225	725			1.99
1964	10700	1338	1408	2,461	802			2.20
1965	11200	1467	1544	2,467	804			2.20
1966	12000	1540	1621	2,777	905			2.48
1967	12550	1540	1621	2,547	830			2.27
1968	12950	1747	1839	2,802	913			2.50
1969	13500	1831	1927	3,004	979			2.68
1970	13824	1831	1927	3,115	1,015			2.78
1971	14600	1976	2196	3,225	1,051			2.88
1972	15650	2068	2298	3,710	1,209			3.31
1973	16350	2377	2641	3,646	1,188			3.25
1974	17050	2414	2682	3,621	1,180			3.23
1975	17750	2466	2835	3,901	1,271			3.48
1976	18000	2519	2964	4,478	1,459			4.00
1977	18400	2884	3475	3,830	1,248			3.42
1978	20107	3014	3676	4,619	1,505			4.12
1979	21600	3046	3807	5,472	1,783			4.88
1980	23150	3169	4063	5,785	1,885			5.16
1981	25641	3187	4086	6,485	2,113			5.79
1982	27009	3316	4251	6,319	2,059			5.64
1983	27891	3316	4251	6,604	2,152			5.90
1984	29027	3344	4287	8,124	2,647			7.25
1985	32545	3353	4299	8,621	2,809			7.70
1986	35437	3968	5087	9,099	2,965			8.12
1987	37125	4238	5433	9,437	3,075			8.42
1988	38220	4253	5453	8,881	2,894			7.93
1989	39664	4253	5453	10,124	3,299			9.04
1990	40733	4300	6320	9,873	3,217			8.81
1991	41632	4350	6533	8,940	2,913			7.98
1992	42147	4400	6912	9,695	3,159			8.65
1993	43469	4450	6951	10,272	3,347			9.17
1994	44236	4525	7288	10,290	3,353			9.19
1995	44111	4600	7372	10,631	3,464			9.49
1996	44961	4725	9504	11,014	3,589			9.83
1997	45930	4850	9713	11,939	3,890			10.66
1998	47111	4985	9939	10,545	3,436			9.41
1999	48027	5411	10126	12,273	3,999			10.96
2000	49258	5837	10126	12,608	4,108			11.25
2001	51924	6126	10216	12,975	4,228			11.58
2002	54975	6415	10269	13,515	4,404			12.06
2003	57200	6704	10269	14,450	4,708			12.90
2004	57900	6993	10322	14,930	4,865			13.33
2005	61200	7281	10975	11,275	3,674	3,667	1,194.8	13.34
2006	66000	8393	10975	8,062	2,627	6,739	2,195.8	13.21

Surface water deliver started in 2005

Appendix H

Traffic Calculations

Existing Conditions Analysis:

Intersection LOS
Peak Hour Signal Warrants
Freeway LOS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	85	15	15	150	150	15	25	15	200	20	15
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)	16	92	16	16	163	163	16	27	16	217	22	16

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	16	109	16	326	60	255
Volume Left (vph)	16	0	16	0	16	217
Volume Right (vph)	0	16	0	163	16	16
Hadj (s)	0.53	-0.07	0.53	-0.32	-0.08	0.17
Departure Headway (s)	6.4	5.8	6.1	5.3	5.5	5.4
Degree Utilization, x	0.03	0.17	0.03	0.48	0.09	0.38
Capacity (veh/h)	523	580	560	658	576	627
Control Delay (s)	8.4	8.8	8.1	11.8	9.0	11.6
Approach Delay (s)	8.7		11.6		9.0	11.6
Approach LOS	A		B		A	B

Intersection Summary			
Delay	10.9		
HCM Level of Service	B		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	25	70	45	30	20	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	76	49	33	22	27
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	82				196	65
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	82				196	65
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1516				779	999

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	103	82	49
Volume Left	27	0	22
Volume Right	0	33	27
cSH	1516	1700	887
Volume to Capacity	0.02	0.05	0.06
Queue Length 95th (ft)	1	0	4
Control Delay (s)	2.1	0.0	9.3
Lane LOS	A		A
Approach Delay (s)	2.1	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	85	70	10	25	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	92	76	11	27	5
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	87				185	82
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	87				185	82
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				97	99
cM capacity (veh/h)	1509				802	978

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	5	92	87	33
Volume Left	5	0	0	27
Volume Right	0	0	11	5
cSH	1509	1700	1700	826
Volume to Capacity	0.00	0.05	0.05	0.04
Queue Length 95th (ft)	0	0	0	3
Control Delay (s)	7.4	0.0	0.0	9.5
Lane LOS	A			A
Approach Delay (s)	0.4		0.0	9.5
Approach LOS				A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	14.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.94		1.00	0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3318		1770	3351		1770	1863	1583	1770	1829	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3318		1770	3351		1770	1863	1583	1770	1829	
Volume (vph)	10	175	125	150	165	90	80	210	180	75	220	30
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)	11	190	136	163	179	98	87	228	196	82	239	33
RTOR Reduction (vph)	0	113	0	0	72	0	0	0	118	0	6	0
Lane Group Flow (vph)	11	213	0	163	205	0	87	228	78	82	266	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	1.2	12.3		7.9	19.0		5.8	28.8	28.8	7.0	30.0	
Effective Green, g (s)	1.2	12.3		7.9	19.0		5.8	28.8	28.8	7.0	30.0	
Actuated g/C Ratio	0.02	0.17		0.11	0.26		0.08	0.40	0.40	0.10	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	30	567		194	884		143	745	633	172	762	
v/s Ratio Prot	0.01	c0.06		c0.09	0.06		c0.05	0.12		0.05	c0.15	
v/s Ratio Perm									0.05			
v/c Ratio	0.37	0.38		0.84	0.23		0.61	0.31	0.12	0.48	0.35	
Uniform Delay, d1	35.0	26.4		31.4	20.8		32.0	14.8	13.6	30.8	14.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.4	0.4		26.5	0.1		7.1	1.1	0.4	2.1	1.3	
Delay (s)	42.5	26.9		57.9	20.9		39.1	15.8	14.0	32.8	15.6	
Level of Service	D	C		E	C		D	B	B	C	B	
Approach Delay (s)		27.4			34.6			19.1			19.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	110	45	425	95	50	445
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	49	462	103	54	484
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.78	0.78			0.78	
vC, conflicting volume	1106	514			565	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1135	379			445	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	27	91			94	
cM capacity (veh/h)	164	523			874	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	565	538
Volume Left	120	0	54
Volume Right	49	103	0
cSH	205	1700	874
Volume to Capacity	0.82	0.33	0.06
Queue Length 95th (ft)	150	0	5
Control Delay (s)	72.4	0.0	1.7
Lane LOS	F		A
Approach Delay (s)	72.4	0.0	1.7
Approach LOS	F		

Intersection Summary			
Average Delay	10.3		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	10	5	10	155	5	10	15	500	60	5	535	15
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)	11	5	11	168	5	11	16	543	65	5	582	16
RTOR Reduction (vph)	0	0	9	0	0	9	0	0	39	0	0	5
Lane Group Flow (vph)	11	5	2	168	5	2	16	543	26	5	582	11
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.1	7.8	7.8	6.5	8.2	8.2	0.9	20.1	20.1	0.7	19.9	19.9
Effective Green, g (s)	6.1	7.8	7.8	6.5	8.2	8.2	0.9	20.1	20.1	0.7	19.9	19.9
Actuated g/C Ratio	0.12	0.15	0.15	0.13	0.16	0.16	0.02	0.39	0.39	0.01	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	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	3.0
Lane Grp Cap (vph)	410	284	242	225	299	254	31	733	623	24	726	616
v/s Ratio Prot	0.00	c0.00		c0.09	0.00		c0.01	0.29		0.00	c0.31	
v/s Ratio Perm			0.00			0.00			0.02			0.01
v/c Ratio	0.03	0.02	0.01	0.75	0.02	0.01	0.52	0.74	0.04	0.21	0.80	0.02
Uniform Delay, d1	19.9	18.4	18.4	21.5	18.1	18.0	24.9	13.3	9.6	24.9	13.8	9.6
Progression 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
Incremental Delay, d2	0.0	0.0	0.0	12.6	0.0	0.0	13.7	4.0	0.0	4.3	6.4	0.0
Delay (s)	19.9	18.4	18.4	34.2	18.1	18.0	38.6	17.3	9.6	29.2	20.2	9.6
Level of Service	B	B	B	C	B	B	D	B	A	C	C	A
Approach Delay (s)		19.0			32.8			17.1			20.0	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	51.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	45	0	220	140	355	0	0	295	405
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)	0	0	0	49	0	239	152	386	0	0	321	440
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											494	
pX, platoon unblocked	0.70	0.70	0.70	0.70	0.70		0.70					
vC, conflicting volume	1470	1231	541	1231	1451	386	761			386		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1673	1330	343	1330	1645	386	658			386		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	35	100	64	77			100		
cM capacity (veh/h)	28	83	489	75	53	662	650			1173		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	288	152	386	761
Volume Left	49	152	0	0
Volume Right	239	0	0	440
cSH	285	650	1700	1700
Volume to Capacity	1.01	0.23	0.23	0.45
Queue Length 95th (ft)	264	23	0	0
Control Delay (s)	95.7	12.2	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	95.7	3.5		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	18.5		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	130	0	40	0	0	0	0	365	80	125	215	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)	141	0	43	0	0	0	0	397	87	136	234	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	946	989	234	989	946	440	234			484		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	946	989	234	989	946	440	234			484		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	35	100	95	100	100	100	100			87		
cM capacity (veh/h)	218	216	805	193	229	617	1334			1079		

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	185	484	136	234
Volume Left	141	0	136	0
Volume Right	43	87	0	0
cSH	263	1700	1079	1700
Volume to Capacity	0.70	0.28	0.13	0.14
Queue Length 95th (ft)	119	0	11	0
Control Delay (s)	45.4	0.0	8.8	0.0
Lane LOS	E		A	
Approach Delay (s)	45.4	0.0	3.2	
Approach LOS	E			

Intersection Summary			
Average Delay	9.2		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	90	5	0	0	5	85	5	270	5	35	170	50
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)	98	5	0	0	5	92	5	293	5	38	185	54
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	660	571	185	568	620	293	239			299		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	660	571	185	568	620	293	239			299		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	69	99	100	100	99	88	100			97		
cM capacity (veh/h)	318	416	857	418	390	746	1328			1262		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	98	5	0	0	5	92	5	293	5	38	185	54
Volume Left	98	0	0	0	0	0	5	0	0	38	0	0
Volume Right	0	0	0	0	0	92	0	0	5	0	0	54
cSH	318	416	1700	1700	390	746	1328	1700	1700	1262	1700	1700
Volume to Capacity	0.31	0.01	0.00	0.00	0.01	0.12	0.00	0.17	0.00	0.03	0.11	0.03
Queue Length 95th (ft)	32	1	0	0	1	11	0	0	0	2	0	0
Control Delay (s)	21.3	13.8	0.0	0.0	14.4	10.5	7.7	0.0	0.0	7.9	0.0	0.0
Lane LOS	C	B	A	A	B	B	A			A		
Approach Delay (s)	20.9			10.7			0.1			1.1		
Approach LOS	C			B								

Intersection Summary				
Average Delay	4.5			
Intersection Capacity Utilization	39.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	65	20	25	10	25	60	20	155	10	15	120	35
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)	71	22	27	11	27	65	22	168	11	16	130	38

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	120	103	201	185
Volume Left (vph)	71	11	22	16
Volume Right (vph)	27	65	11	38
Hadj (s)	0.02	-0.32	0.02	-0.07
Departure Headway (s)	5.0	4.7	4.7	4.6
Degree Utilization, x	0.17	0.13	0.26	0.24
Capacity (veh/h)	659	696	723	728
Control Delay (s)	9.0	8.4	9.4	9.1
Approach Delay (s)	9.0	8.4	9.4	9.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.0		
HCM Level of Service	A		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	5	180	0	5	150
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	196	0	5	163
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	370	196			196	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	370	196			196	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	628	846			1377	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	196	168
Volume Left	0	0	5
Volume Right	5	0	0
cSH	846	1700	1377
Volume to Capacity	0.01	0.12	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	9.3	0.0	0.3
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	0.3
Approach LOS	A		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	21.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	230	15	25	110	185	5	10	15	145	30	20
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)	22	250	16	27	120	201	5	11	16	158	33	22

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	22	266	27	321	33	212
Volume Left (vph)	22	0	27	0	5	158
Volume Right (vph)	0	16	0	201	16	22
Hadj (s)	0.53	-0.01	0.53	-0.40	-0.23	0.12
Departure Headway (s)	6.2	5.6	6.1	5.2	5.7	5.7
Degree Utilization, x	0.04	0.42	0.05	0.46	0.05	0.33
Capacity (veh/h)	550	612	559	668	533	585
Control Delay (s)	8.2	11.4	8.2	11.4	9.0	11.4
Approach Delay (s)	11.2		11.1		9.0	11.4
Approach LOS	B		B		A	B

Intersection Summary			
Delay	11.1		
HCM Level of Service	B		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	60	65	20	30	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	65	71	22	33	33
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	92				190	82
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	92				190	82
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				96	97
cM capacity (veh/h)	1502				787	978

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	87	92	65
Volume Left	22	0	33
Volume Right	0	22	33
cSH	1502	1700	872
Volume to Capacity	0.01	0.05	0.07
Queue Length 95th (ft)	1	0	6
Control Delay (s)	1.9	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	1.9	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	85	80	35	20	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	92	87	38	22	5
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	125				209	106
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	125				209	106
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				97	99
cM capacity (veh/h)	1462				776	948

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	5	92	125	27
Volume Left	5	0	0	22
Volume Right	0	0	38	5
cSH	1462	1700	1700	805
Volume to Capacity	0.00	0.05	0.07	0.03
Queue Length 95th (ft)	0	0	0	3
Control Delay (s)	7.5	0.0	0.0	9.6
Lane LOS	A			A
Approach Delay (s)	0.4		0.0	9.6
Approach LOS				A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3411		1770	3295		1770	1863	1583	1770	1839	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3411		1770	3295		1770	1863	1583	1770	1839	
Volume (vph)	55	330	105	115	170	145	40	205	150	195	265	25
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)	60	359	114	125	185	158	43	223	163	212	288	27
RTOR Reduction (vph)	0	39	0	0	120	0	0	0	108	0	3	0
Lane Group Flow (vph)	60	434	0	125	223	0	43	223	55	212	312	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.2	14.3		7.5	17.6		4.1	24.6	24.6	10.5	31.0	
Effective Green, g (s)	4.2	14.3		7.5	17.6		4.1	24.6	24.6	10.5	31.0	
Actuated g/C Ratio	0.06	0.20		0.10	0.24		0.06	0.34	0.34	0.14	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	102	669		182	796		100	629	534	255	782	
v/s Ratio Prot	0.03	c0.13		c0.07	c0.07		0.02	0.12		c0.12	c0.17	
v/s Ratio Perm									0.03			
v/c Ratio	0.59	0.65		0.69	0.28		0.43	0.35	0.10	0.83	0.40	
Uniform Delay, d1	33.5	27.0		31.6	22.5		33.3	18.2	16.6	30.3	14.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.4	2.2		10.3	0.2		3.0	1.6	0.4	20.0	1.5	
Delay (s)	41.9	29.2		41.8	22.7		36.2	19.7	17.0	50.4	16.0	
Level of Service	D	C		D	C		D	B	B	D	B	
Approach Delay (s)		30.6			27.8			20.3			29.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	27.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	72.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	85	45	350	130	65	420
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	49	380	141	71	457
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.85	0.85			0.85	
vC, conflicting volume	1049	451			522	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1057	356			439	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	92			93	
cM capacity (veh/h)	197	586			955	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	141	522	527
Volume Left	92	0	71
Volume Right	49	141	0
cSH	255	1700	955
Volume to Capacity	0.55	0.31	0.07
Queue Length 95th (ft)	77	0	6
Control Delay (s)	35.3	0.0	2.0
Lane LOS	E		A
Approach Delay (s)	35.3	0.0	2.0
Approach LOS	E		

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	20	5	30	50	5	10	75	450	110	15	460	30
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)	22	5	33	54	5	11	82	489	120	16	500	33
RTOR Reduction (vph)	0	0	28	0	0	9	0	0	69	0	0	12
Lane Group Flow (vph)	22	5	5	54	5	2	82	489	51	16	500	21
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.4	8.3	8.3	6.5	8.4	8.4	4.0	23.1	23.1	0.8	19.9	19.9
Effective Green, g (s)	6.4	8.3	8.3	6.5	8.4	8.4	4.0	23.1	23.1	0.8	19.9	19.9
Actuated g/C Ratio	0.12	0.15	0.15	0.12	0.15	0.15	0.07	0.42	0.42	0.01	0.36	0.36
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	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	3.0
Lane Grp Cap (vph)	402	283	240	210	286	243	129	787	669	26	678	576
v/s Ratio Prot	0.01	0.00		c0.03	0.00		c0.05	c0.26		0.01	c0.27	
v/s Ratio Perm			c0.00			0.00			0.03			0.01
v/c Ratio	0.05	0.02	0.02	0.26	0.02	0.01	0.64	0.62	0.08	0.62	0.74	0.04
Uniform Delay, d1	21.5	19.7	19.7	21.9	19.6	19.6	24.6	12.4	9.4	26.8	15.1	11.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.0	0.0	0.7	0.0	0.0	9.8	1.5	0.0	36.3	4.2	0.0
Delay (s)	21.5	19.8	19.8	22.6	19.7	19.6	34.5	13.9	9.5	63.1	19.3	11.2
Level of Service	C	B	B	C	B	B	C	B	A	E	B	B
Approach Delay (s)		20.4			21.9			15.6			20.1	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	54.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	90	0	140	55	495	0	0	385	155
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)	0	0	0	98	0	152	60	538	0	0	418	168
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											494	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75		0.75					
vC, conflicting volume	1312	1160	503	1160	1245	538	587			538		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1414	1213	341	1213	1324	538	452			538		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	14	100	72	93			100		
cM capacity (veh/h)	59	127	529	113	109	543	836			1030		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	250	60	538	587
Volume Left	98	60	0	0
Volume Right	152	0	0	168
cSH	218	836	1700	1700
Volume to Capacity	1.14	0.07	0.32	0.35
Queue Length 95th (ft)	296	6	0	0
Control Delay (s)	151.7	9.6	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	151.7	1.0		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	26.8		
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	300	0	175	0	0	0	0	250	95	160	315	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)	326	0	190	0	0	0	0	272	103	174	342	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	1014	1065	342	1204	1014	323	342			375		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1014	1065	342	1204	1014	323	342			375		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	73	100	100	100	100			85		
cM capacity (veh/h)	193	190	700	104	204	718	1217			1183		

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	516	375	174	342
Volume Left	326	0	174	0
Volume Right	190	103	0	0
cSH	263	1700	1183	1700
Volume to Capacity	1.96	0.22	0.15	0.20
Queue Length 95th (ft)	923	0	13	0
Control Delay (s)	478.7	0.0	8.6	0.0
Lane LOS	F		A	
Approach Delay (s)	478.7	0.0	2.9	
Approach LOS	F			

Intersection Summary			
Average Delay	176.6		
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	85	5	5	5	5	90	5	170	10	100	255	135
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)	92	5	5	5	5	98	5	185	11	109	277	147
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	791	701	277	698	837	185	424			196		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	791	701	277	698	837	185	424			196		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	63	98	99	98	98	89	100			92		
cM capacity (veh/h)	251	333	762	326	278	857	1135			1377		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	92	5	5	5	5	98	5	185	11	109	277	147
Volume Left	92	0	0	5	0	0	5	0	0	109	0	0
Volume Right	0	0	5	0	0	98	0	0	11	0	0	147
cSH	251	333	762	326	278	857	1135	1700	1700	1377	1700	1700
Volume to Capacity	0.37	0.02	0.01	0.02	0.02	0.11	0.00	0.11	0.01	0.08	0.16	0.09
Queue Length 95th (ft)	40	1	1	1	1	10	0	0	0	6	0	0
Control Delay (s)	27.4	16.0	9.8	16.2	18.2	9.7	8.2	0.0	0.0	7.8	0.0	0.0
Lane LOS	D	C	A	C	C	A	A			A		
Approach Delay (s)	25.9			10.5			0.2			1.6		
Approach LOS	D			B								

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	35	50	20	10	25	35	20	115	10	65	130	70
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)	38	54	22	11	27	38	22	125	11	71	141	76

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	114	76	158	288
Volume Left (vph)	38	11	22	71
Volume Right (vph)	22	38	11	76
Hadj (s)	-0.01	-0.24	0.02	-0.08
Departure Headway (s)	5.0	4.9	4.8	4.5
Degree Utilization, x	0.16	0.10	0.21	0.36
Capacity (veh/h)	647	659	715	760
Control Delay (s)	9.0	8.4	9.0	10.0
Approach Delay (s)	9.0	8.4	9.0	10.0
Approach LOS	A	A	A	B

Intersection Summary			
Delay	9.4		
HCM Level of Service	A		
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	10	135	5	15	145
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	11	147	5	16	158
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	340	149			152	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	340	149			152	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	649	897			1429	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	152	174
Volume Left	5	0	16
Volume Right	11	5	0
cSH	796	1700	1429
Volume to Capacity	0.02	0.09	0.01
Queue Length 95th (ft)	2	0	1
Control Delay (s)	9.6	0.0	0.8
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	0.8
Approach LOS	A		

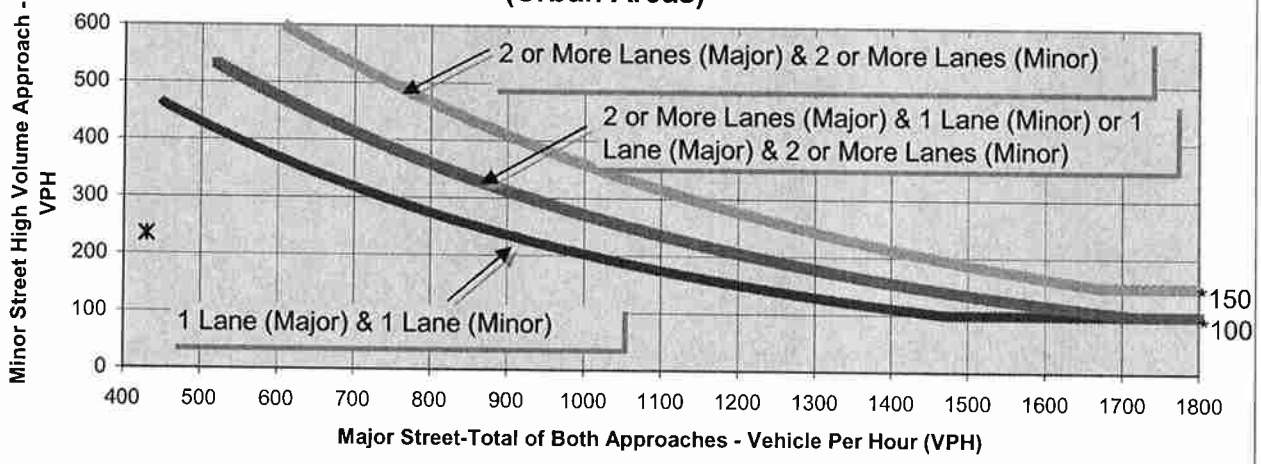
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

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Yosemite Ave. & McKinley Ave.

Computed by Fehr & Peers Date 3/21/2007
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		430	235	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

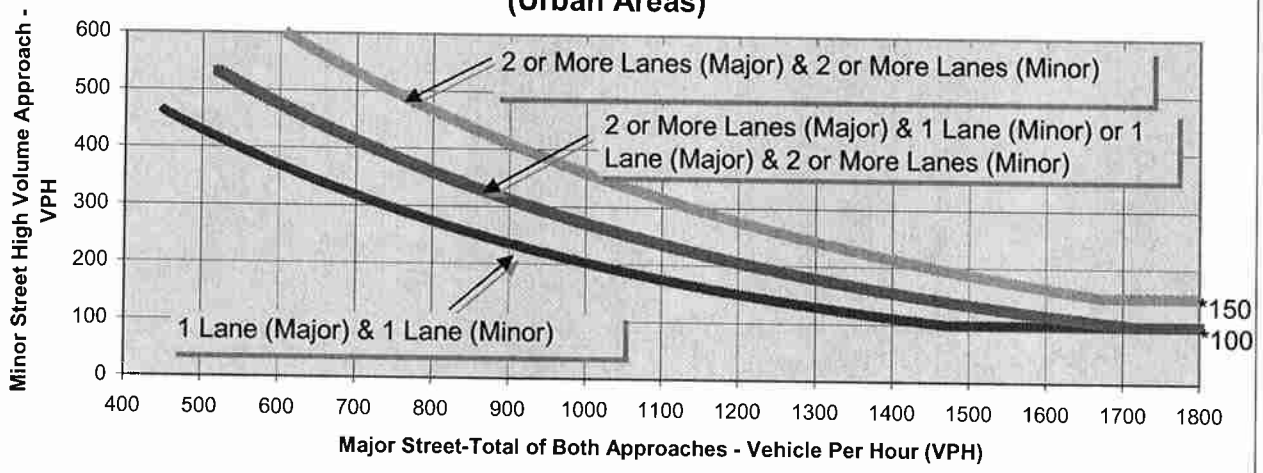
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- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Woodward Ave. & McKinley Ave.

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		170	45	

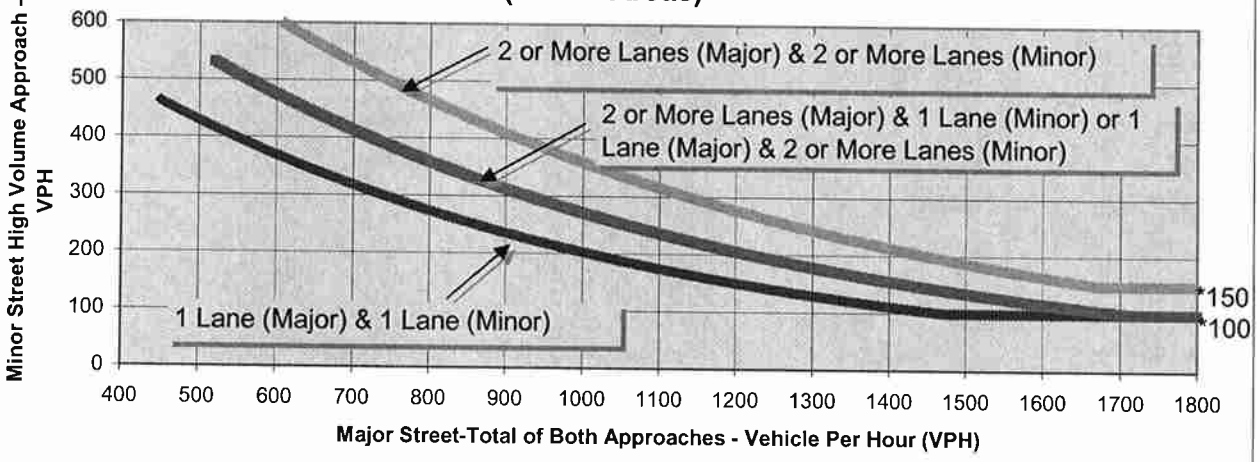
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		170	30	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

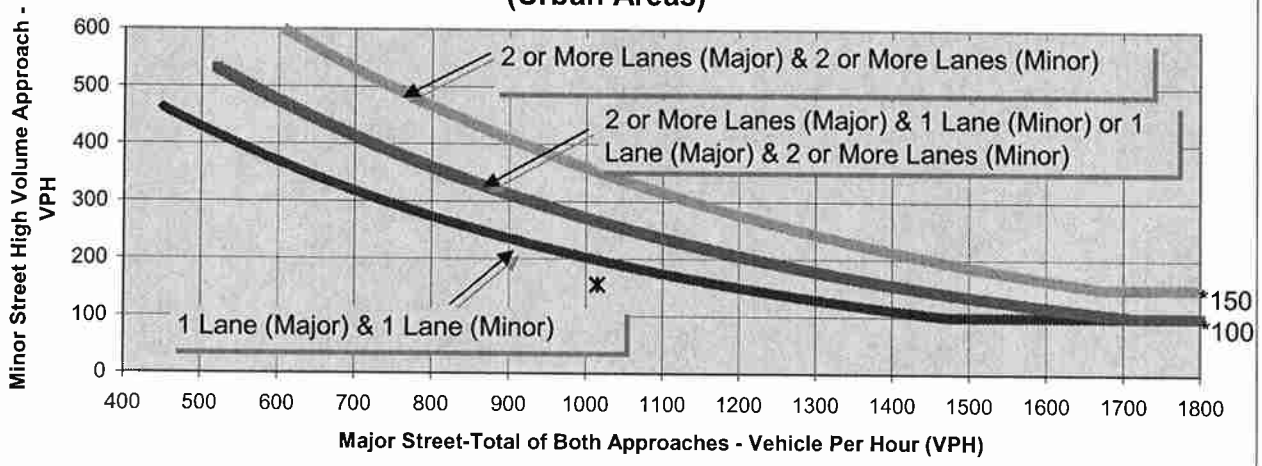
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- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1015	155	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

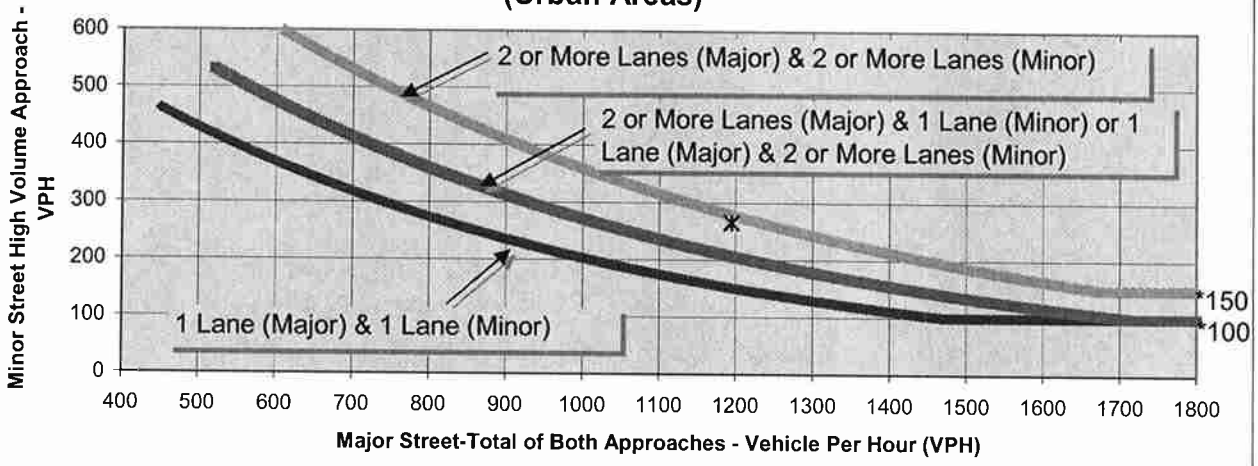
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- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1195	265	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

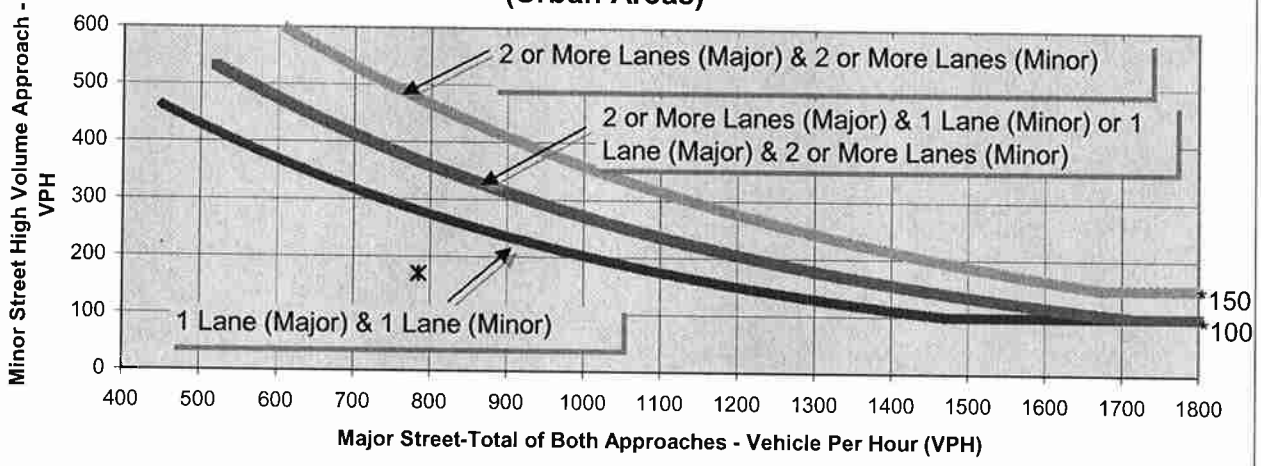
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		785	170	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

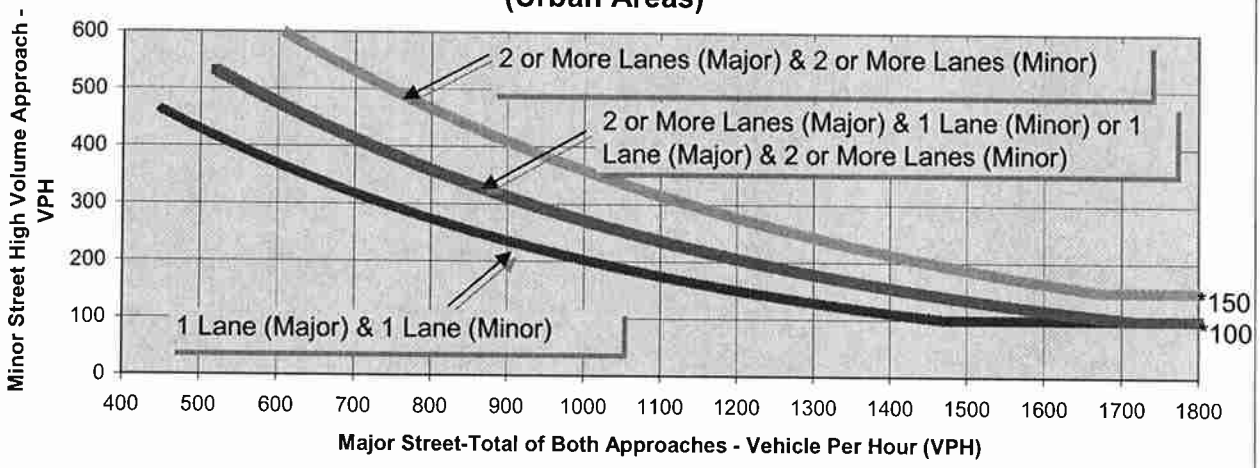
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		535	95	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

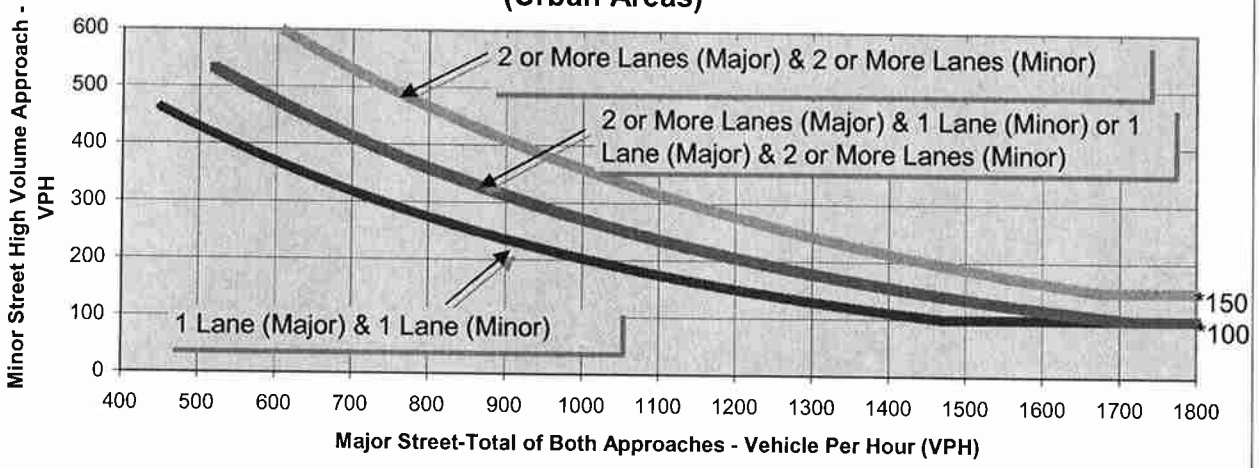
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- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		355	110	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

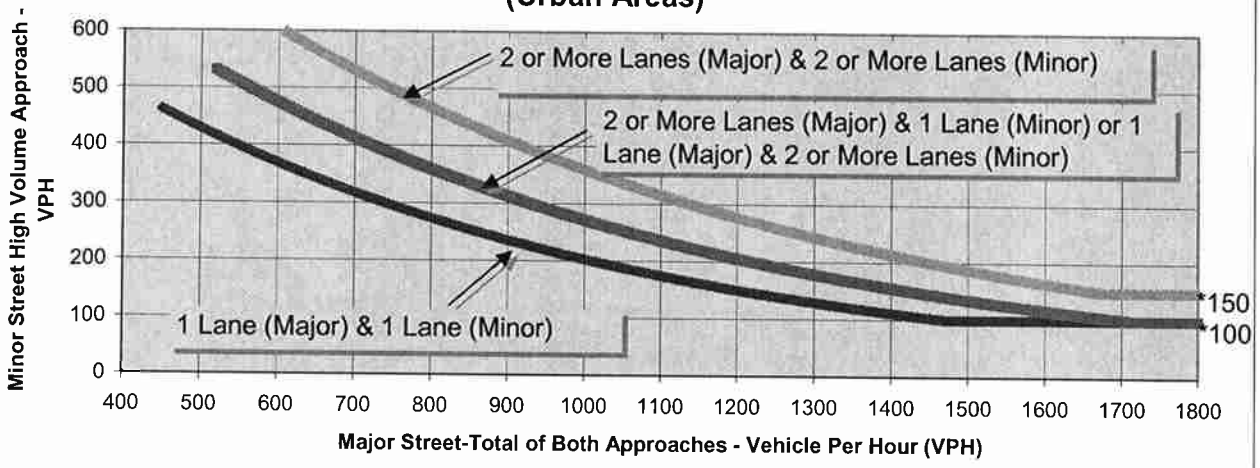
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- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		335	5	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

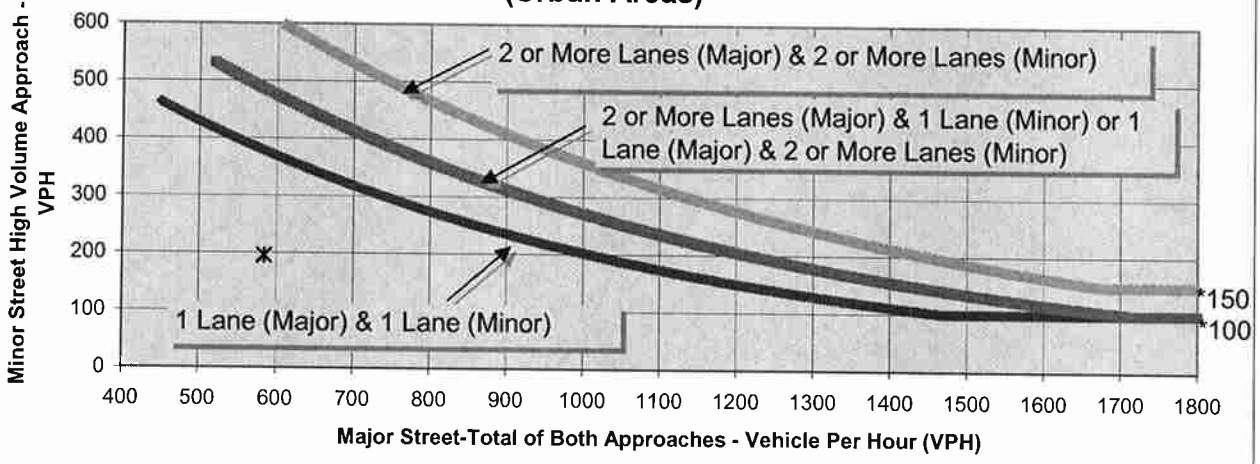
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Yosemite Ave. & McKinley Ave.

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		585	195	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

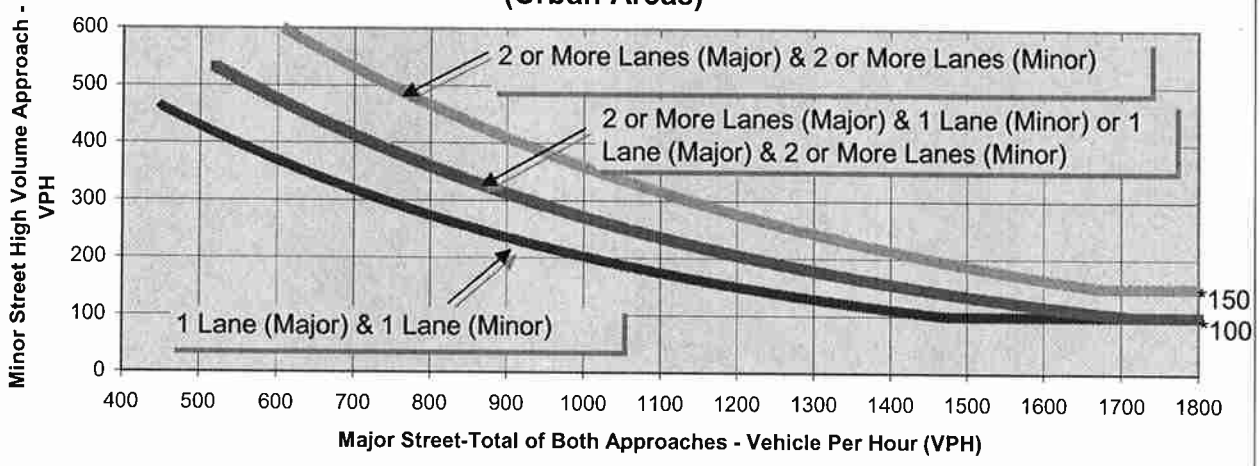
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		165	60	

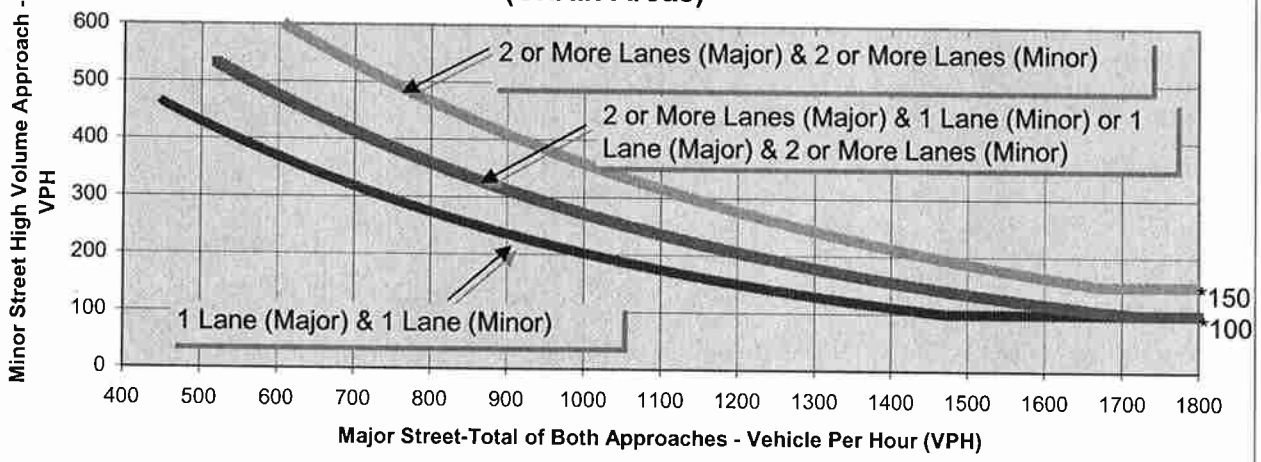
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		205	25	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

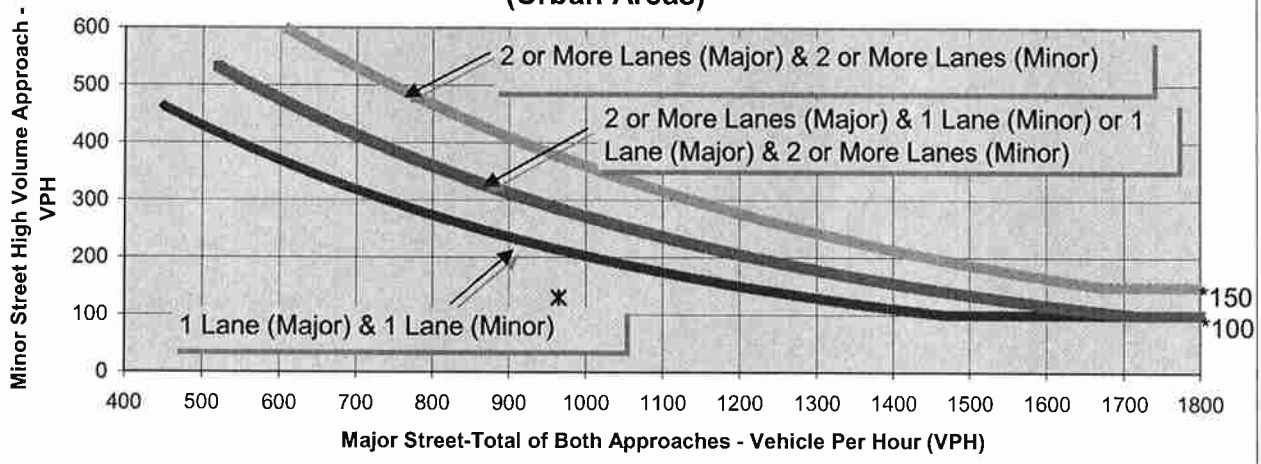
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- [ ] Cumulative No Project Conditions
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		965	130	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

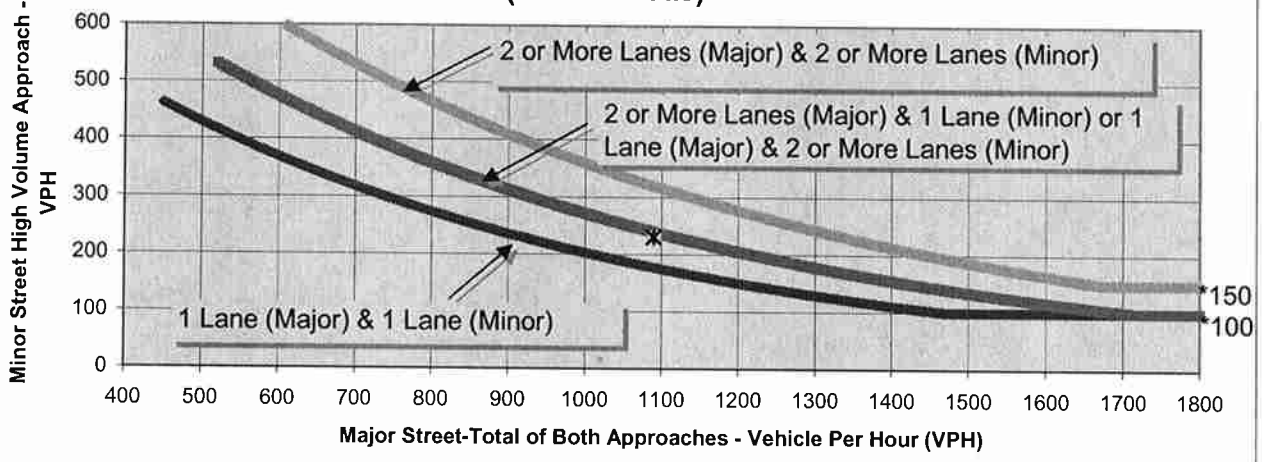
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- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No SA07-0092 Page No 1
Subject Existing - PM
Airport Wy. & SR 120 WB

Computed by Fehr & Peers Date 3/21/2007
Checked by Date
Approved by Date Sheet No 5 of 9

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1090	230	

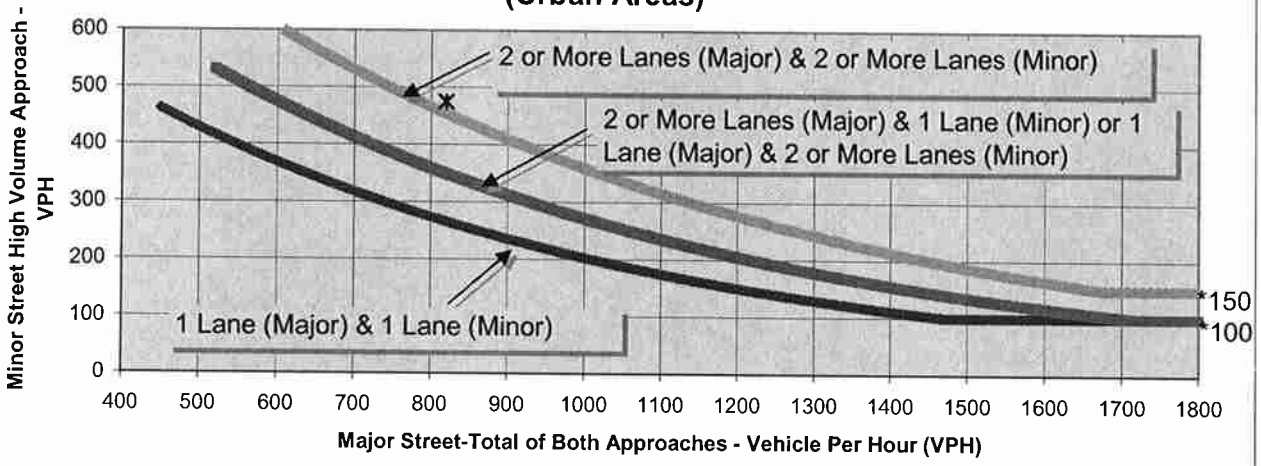
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Existing - PM
Approved by		Date			Airport Wy. & SR 120 EB
				Sheet No	6 of 9

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		820	475	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

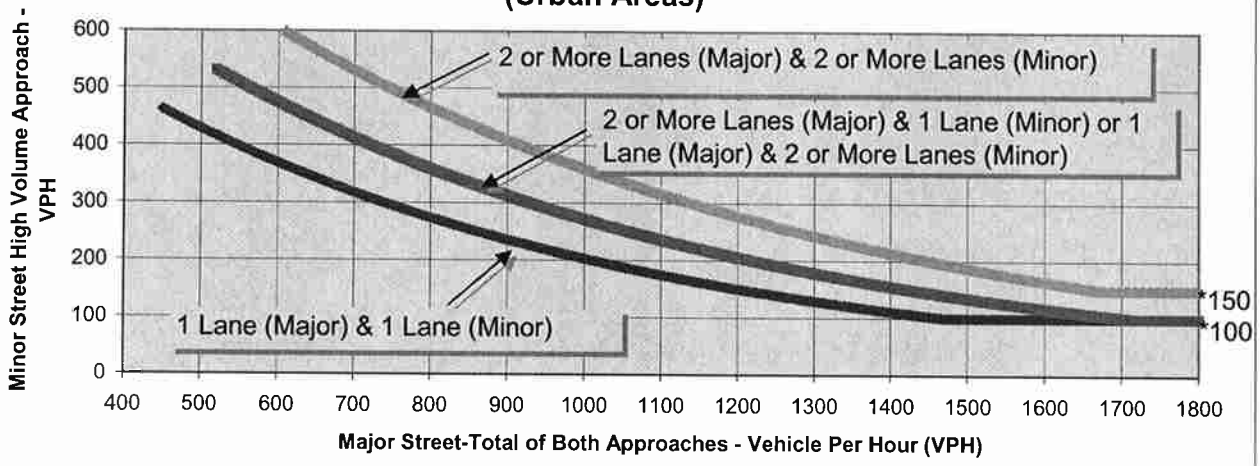
- ☑ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No SA07-0092 Page No 1
Subject Existing - PM
Airport Wy. & Atherton Rd.

Computed by Fehr & Peers Date 3/21/2007
Checked by Date
Approved by Date Sheet No 7 of 9

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		675	100	

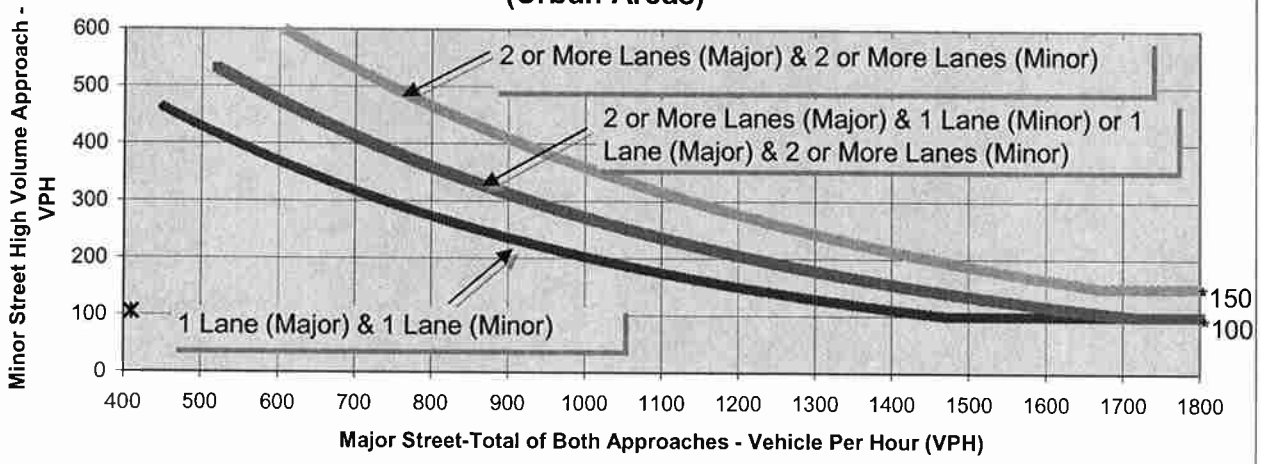
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Existing - PM
Approved by		Date			Airport Wy. & Woodward Ave.
				Sheet No	8 of 9

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		410	105	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

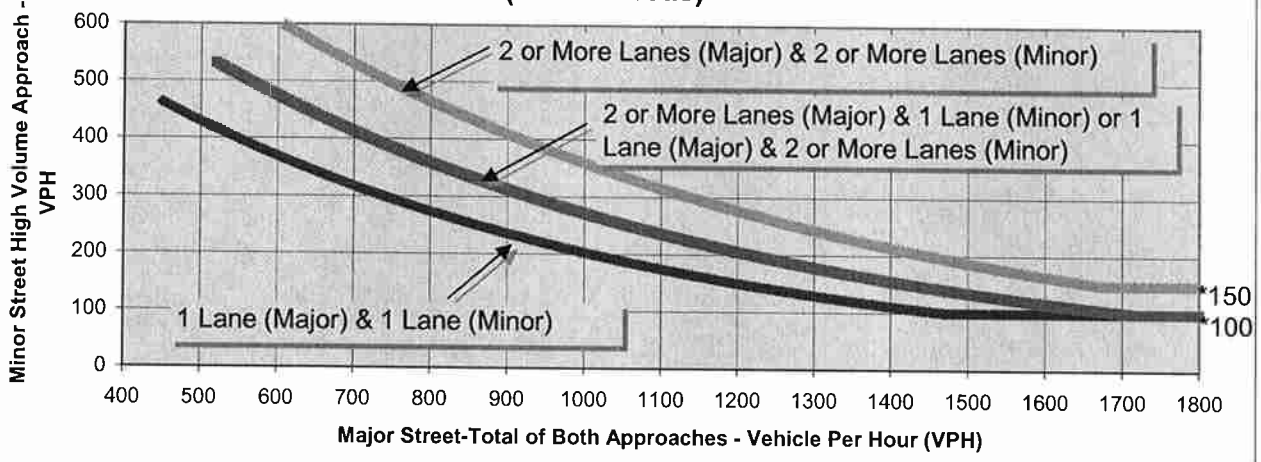
- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No SA07-0092 Page No 1
Subject Existing - PM
Airport Wy. & Peach Ave.

Computed by Fehr & Peers Date 3/21/2007
Checked by Date
Approved by Date Sheet No 9 of 9

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		300	15	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	1890	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	525	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1103	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1103	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	19.0	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	1925	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	535	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1123	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1123	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	19.4	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3290	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	914	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1919	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1919	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.2	mi/h
Number of lanes, N	2	
Density, D	33.5	pc/mi/ln

Level of service, LOS D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone:
E-mail:

Fax:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3570	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	992	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2083	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2083	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	55.3	mi/h
Number of lanes, N	2	
Density, D	37.7	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3400	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	944	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1983	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1983	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	56.7	mi/h
Number of lanes, N	2	
Density, D	35.0+	pc/mi/ln

Level of service, LOS E

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3180	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	883	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1855	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1855	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.6	mi/h
Number of lanes, N	2	
Density, D	32.2	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2220	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	617	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1295	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1295	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	22.3	pc/mi/ln

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2200	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	611	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1283	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1283	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	22.1	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1890	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	170	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	205	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1890		170		205		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	525		47		57		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	2205		191		230		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2205 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2205	4700	No
$v_{FO} = v_F - v_R$	2014	4700	No
v_R	191	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2205	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 18.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.445

Space mean speed in ramp influence area, S_R = 54.8 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.8 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1720	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	205	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	170	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1720	205	170	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	478	57	47	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2007	230	191	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2007 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2237	4700	No

$v_{3 \text{ or } av34}$ = 0 pc/h (Equation 25-4 or 25-5)

Is $v_{3 \text{ or } av34}$ > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2 No

If yes, v_{12A} = (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2007	4400	No	!

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.323

Space mean speed in ramp influence area, S_R = 57.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 57.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3290	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	265	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	545	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	3290		265		545		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	914		74		151		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3838		297		612		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 3838 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3838	4700	No
$v_{FO} = v - v_{FR}$	3541	4700	No
v_R	297	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3838	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 32.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.455

Space mean speed in ramp influence area, S_R = 54.5 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.5 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3025	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	545	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	265	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3025	545	265	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	840	151	74	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, E_T	1.5	1.5	1.5	
Recreational vehicle PCE, E_R	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3529	612	297	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3529 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		4141	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3529	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 34.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.531	
Space mean speed in ramp influence area,	S_R = 52.8	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 52.8	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3400	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	475	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	255	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	3400		475		255		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	944		132		71		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, E_T	1.5		1.5		1.5		
Recreational vehicle PCE, E_R	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3967		533		286		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 3967 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3967	4700	No
$v_{FO} = v - v_R$	3434	4700	No
v_R	533	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3967	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 33.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.476

Space mean speed in ramp influence area, S_R = 54.1 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.1 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2925	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	255	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	475	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2925	255	475	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	813	71	132	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3413	286	533	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3413 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		3699	4700	No
v_{3} or v_{av34}		0 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34}	> 2700 pc/h?		No	
Is v_{3} or v_{av34}	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3413	4400	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 31.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.444	
Space mean speed in ramp influence area,	S_R = 54.8	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 54.8	mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2220	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	230	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	210	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2220		230		210		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	617		64		58		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	2590		258		236		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 2590 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2590	4700	No
$v_{FO} = v - v_F - v_R$	2332	4700	No
v_R	258	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2590	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 22.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.451

Space mean speed in ramp influence area, S_R = 54.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Existing Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1990	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	210	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	230	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1990	210	230	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	553	58	64	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2322	236	258	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2322 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		2558	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2322	4400	No	t

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.336	
Space mean speed in ramp influence area,	S_R = 57.3	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 57.3	mph

Cumulative No Project Conditions Analysis:

Intersection LOS
Peak Hour Signal Warrants
Freeway LOS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	100	180	400	160	270	240	150	110	210	210	20
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)	22	109	196	435	174	293	261	163	120	228	228	22

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	22	304	435	467	543	478
Volume Left (vph)	22	0	435	0	261	228
Volume Right (vph)	0	196	0	293	120	22
Hadj (s)	0.53	-0.42	0.53	-0.41	0.00	0.10
Departure Headway (s)	10.2	9.2	9.7	8.8	9.0	9.1
Degree Utilization, x	0.06	0.78	1.17	1.14	1.36	1.21
Capacity (veh/h)	348	384	376	414	410	401
Control Delay (s)	12.7	37.2	131.9	116.3	201.0	142.8
Approach Delay (s)	35.6		123.8		201.0	142.8
Approach LOS	E		F		F	F

Intersection Summary			
Delay	133.7		
HCM Level of Service	F		
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1841		1770	1824		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1841		1770	1824		1770	1863	1583	1770	1863	1583
Volume (vph)	105	120	10	250	630	100	10	30	30	60	130	335
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)	114	130	11	272	685	109	11	33	33	65	141	364
RTOR Reduction (vph)	0	3	0	0	6	0	0	0	28	0	0	295
Lane Group Flow (vph)	114	138	0	272	788	0	11	33	5	65	141	69
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.1	26.1		12.1	33.1		0.9	10.8	10.8	2.9	12.8	12.8
Effective Green, g (s)	5.1	26.1		12.1	33.1		0.9	10.8	10.8	2.9	12.8	12.8
Actuated g/C Ratio	0.08	0.38		0.18	0.49		0.01	0.16	0.16	0.04	0.19	0.19
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)	133	708		315	889		23	296	252	76	351	298
v/s Ratio Prot	0.06	0.07		c0.15	c0.43		0.01	0.02		c0.04	c0.08	
v/s Ratio Perm									0.00			0.04
v/c Ratio	0.86	0.19		0.86	0.89		0.48	0.11	0.02	0.86	0.40	0.23
Uniform Delay, d1	31.0	13.9		27.1	15.7		33.3	24.4	24.1	32.3	24.2	23.4
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	38.6	0.1		20.9	10.6		14.8	0.2	0.0	56.8	0.8	0.4
Delay (s)	69.6	14.0		48.0	26.3		48.1	24.6	24.1	89.1	24.9	23.8
Level of Service	E	B		D	C		D	C	C	F	C	C
Approach Delay (s)		38.9			31.8			27.8			31.5	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	67.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	190	860	20	160	120
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	207	935	22	174	130
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	957				1196	946
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	957				1196	946
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				13	59
cM capacity (veh/h)	719				199	317

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	207	957	304
Volume Left	22	0	0	174
Volume Right	0	0	22	130
cSH	719	1700	1700	237
Volume to Capacity	0.03	0.12	0.56	1.28
Queue Length 95th (ft)	2	0	0	392
Control Delay (s)	10.2	0.0	0.0	197.0
Lane LOS	B			F
Approach Delay (s)	1.0		0.0	197.0
Approach LOS				F

Intersection Summary			
Average Delay	40.4		
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	0.94		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3295		1770	3342		1770	1863	1583	1770	1817	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3295		1770	3342		1770	1863	1583	1770	1817	
Volume (vph)	50	200	170	170	170	100	180	360	190	90	710	140
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)	54	217	185	185	185	109	196	391	207	98	772	152
RTOR Reduction (vph)	0	155	0	0	83	0	0	0	128	0	9	0
Lane Group Flow (vph)	54	247	0	185	211	0	196	391	79	98	915	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.5	12.3		10.4	18.2		8.0	29.0	29.0	8.0	29.0	
Effective Green, g (s)	4.5	12.3		10.4	18.2		8.0	29.0	29.0	8.0	29.0	
Actuated g/C Ratio	0.06	0.16		0.14	0.24		0.11	0.38	0.38	0.11	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	105	535		243	803		187	714	606	187	696	
v/s Ratio Prot	0.03	c0.07		c0.10	0.06		c0.11	0.21		0.06	c0.50	
v/s Ratio Perm									0.05			
v/c Ratio	0.51	0.46		0.76	0.26		1.05	0.55	0.13	0.52	1.32	
Uniform Delay, d1	34.5	28.7		31.5	23.3		33.8	18.2	15.2	32.0	23.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.2	0.6		13.1	0.2		79.1	3.0	0.4	2.6	151.9	
Delay (s)	38.7	29.3		44.6	23.5		112.9	21.2	15.6	34.7	175.3	
Level of Service	D	C		D	C		F	C	B	C	F	
Approach Delay (s)		30.5			31.6			42.4			161.8	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM Average Control Delay	82.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	75.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	190	70	660	100	60	990
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	76	717	109	65	1076
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.77	0.77			0.77	
vC, conflicting volume	1978	772			826	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2263	705			775	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	77			90	
cM capacity (veh/h)	31	338			651	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	283	826	1141
Volume Left	207	0	65
Volume Right	76	109	0
cSH	41	1700	651
Volume to Capacity	6.82	0.49	0.10
Queue Length 95th (ft)	Err	0	8
Control Delay (s)	Err	0.0	3.5
Lane LOS	F		A
Approach Delay (s)	Err	0.0	3.5
Approach LOS	F		

Intersection Summary			
Average Delay	1257.7		
Intersection Capacity Utilization	121.0%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	40	50	130	160	140	20	580	700	340	150	830	200
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)	43	54	141	174	152	22	630	761	370	163	902	217
RTOR Reduction (vph)	0	0	131	0	0	18	0	0	95	0	0	23
Lane Group Flow (vph)	43	54	10	174	152	4	630	761	275	163	902	194
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	5.9	11.0	11.0	21.0	26.1	26.1	42.0	85.8	85.8	16.2	60.0	60.0
Effective Green, g (s)	5.9	11.0	11.0	21.0	26.1	26.1	42.0	85.8	85.8	16.2	60.0	60.0
Actuated g/C Ratio	0.04	0.07	0.07	0.14	0.17	0.17	0.28	0.57	0.57	0.11	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	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	3.0
Lane Grp Cap (vph)	135	137	116	248	324	275	496	1066	905	191	745	633
v/s Ratio Prot	0.01	c0.03		c0.10	0.08		c0.36	0.41		0.09	c0.48	
v/s Ratio Perm			0.01			0.00			0.17			0.12
v/c Ratio	0.32	0.39	0.09	0.70	0.47	0.01	1.27	0.71	0.30	0.85	1.21	0.31
Uniform Delay, d1	70.1	66.3	64.8	61.5	55.7	51.3	54.0	23.2	16.6	65.7	45.0	30.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.07	0.88	0.82	1.00	1.00	1.00
Incremental Delay, d2	1.4	1.9	0.3	8.7	1.1	0.0	123.1	0.4	0.1	29.0	107.1	1.3
Delay (s)	71.5	68.2	65.2	70.2	56.8	51.3	181.0	20.8	13.7	94.7	152.1	32.0
Level of Service	E	E	E	E	E	D	F	C	B	F	F	C
Approach Delay (s)		67.0			63.1			76.6			124.5	
Approach LOS		E			E			E			F	

Intersection Summary			
HCM Average Control Delay	91.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.92		1.00	1.00			0.95	
Flt Protected					0.98		0.95	1.00			1.00	
Satd. Flow (prot)					1683		1770	1863			1764	
Flt Permitted					0.98		0.95	1.00			1.00	
Satd. Flow (perm)					1683		1770	1863			1764	
Volume (vph)	0	0	0	430	0	580	570	1040	0	0	680	440
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)	0	0	0	467	0	630	620	1130	0	0	739	478
RTOR Reduction (vph)	0	0	0	0	33	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	1064	0	620	1130	0	0	1202	0
Turn Type				Perm			Prot					
Protected Phases					8		5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					52.0		28.0	90.0			58.0	
Effective Green, g (s)					52.0		28.0	90.0			58.0	
Actuated g/C Ratio					0.35		0.19	0.60			0.39	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					583		330	1118			682	
v/s Ratio Prot							c0.35	0.61			c0.68	
v/s Ratio Perm					0.63							
v/c Ratio					1.83		1.88	1.01			1.76	
Uniform Delay, d1					49.0		61.0	30.0			46.0	
Progression Factor					1.00		0.40	0.54			0.47	
Incremental Delay, d2					378.2		396.5	10.9			343.4	
Delay (s)					427.2		420.7	27.0			365.1	
Level of Service					F		F	C			F	
Approach Delay (s)		0.0			427.2			166.5			365.1	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	296.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	163.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		1.00						1.00		1.00	1.00	
Frt		0.94						0.98		1.00	1.00	
Flt Protected		0.97						1.00		0.95	1.00	
Satd. Flow (prot)		1703						1826		1770	1863	
Flt Permitted		0.97						1.00		0.95	1.00	
Satd. Flow (perm)		1703						1826		1770	1863	
Volume (vph)	540	0	440	0	0	0	0	1070	180	200	910	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	478	0	0	0	0	1163	196	217	989	0
RTOR Reduction (vph)	0	19	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	1046	0	0	0	0	0	1355	0	217	989	0
Turn Type	Perm									Prot		
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)		56.0						70.0		12.0	86.0	
Effective Green, g (s)		56.0						70.0		12.0	86.0	
Actuated g/C Ratio		0.37						0.47		0.08	0.57	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		636						852		142	1068	
v/s Ratio Prot								c0.74		c0.12	0.53	
v/s Ratio Perm		0.61										
v/c Ratio		1.64						1.59		1.53	0.93	
Uniform Delay, d1		47.0						40.0		69.0	29.1	
Progression Factor		1.00						1.00		1.26	0.70	
Incremental Delay, d2		296.8						271.1		240.9	1.8	
Delay (s)		343.8						311.1		327.6	22.1	
Level of Service		F						F		F	C	
Approach Delay (s)		343.8			0.0			311.1			77.1	
Approach LOS		F			A			F			E	

Intersection Summary			
HCM Average Control Delay	243.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.61		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	163.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	450	60	10	70	50	410	10	390	40	460	790	100
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)	489	65	11	76	54	446	11	424	43	500	859	109
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											720	
pX, platoon unblocked	0.60	0.60	0.60	0.60	0.60		0.60					
vC, conflicting volume	2777	2348	859	2348	2413	424	967			467		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3958	3244	765	3244	3352	424	946			467		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	96	0	0	29	98			54		
cM capacity (veh/h)	0	3	242	0	3	630	436			1094		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	489	65	11	76	54	446	11	424	43	500	859	109
Volume Left	489	0	0	76	0	0	11	0	0	500	0	0
Volume Right	0	0	11	0	0	446	0	0	43	0	0	109
cSH	0	3	242	0	3	630	436	1700	1700	1094	1700	1700
Volume to Capacity	Err	21.89	0.04	Err	21.55	0.71	0.02	0.25	0.03	0.46	0.51	0.06
Queue Length 95th (ft)	Err	Err	4	Err	Err	145	2	0	0	61	0	0
Control Delay (s)	Err	Err	20.6	Err	Err	23.3	13.5	0.0	0.0	11.0	0.0	0.0
Lane LOS	F	F	C	F	F	C	B			B		
Approach Delay (s)	Err			Err			0.3			3.8		
Approach LOS	F			F								

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	130	170	50	20	110	70	100	240	60	20	180	670
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)	141	185	54	22	120	76	109	261	65	22	196	728

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	380	217	435	946
Volume Left (vph)	141	22	109	22
Volume Right (vph)	54	76	65	728
Hadj (s)	0.02	-0.16	-0.01	-0.42
Departure Headway (s)	8.4	9.1	8.1	7.8
Degree Utilization, x	0.88	0.55	0.98	2.05
Capacity (veh/h)	416	374	435	467
Control Delay (s)	48.7	22.5	66.8	496.3
Approach Delay (s)	48.7	22.5	66.8	496.3
Approach LOS	E	C	F	F

Intersection Summary			
Delay	263.8		
HCM Level of Service	F		
Intersection Capacity Utilization	114.2%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	10	10	10	10	30	10	360	10	40	200	10
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)	11	11	11	11	11	33	11	391	11	43	217	11
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	761	734	223	739	734	397	228			402		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	761	734	223	739	734	397	228			402		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	97	99	96	97	95	99			96		
cM capacity (veh/h)	288	332	817	309	332	653	1340			1156		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	22	11	43	11	402	43	228
Volume Left	11	0	11	0	11	0	43	0
Volume Right	0	11	0	33	0	11	0	11
cSH	288	472	309	526	1340	1700	1156	1700
Volume to Capacity	0.04	0.05	0.04	0.08	0.01	0.24	0.04	0.13
Queue Length 95th (ft)	3	4	3	7	1	0	3	0
Control Delay (s)	18.0	13.0	17.1	12.5	7.7	0.0	8.2	0.0
Lane LOS	C	B	C	B	A		A	
Approach Delay (s)	14.7		13.4		0.2		1.3	
Approach LOS	B		B					

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	70	310	250	270	190	190	280	420	450	250	320	90
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)	76	337	272	293	207	207	304	457	489	272	348	98

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	76	609	293	413	1250	717
Volume Left (vph)	76	0	293	0	304	272
Volume Right (vph)	0	272	0	207	489	98
Hadj (s)	0.53	-0.28	0.53	-0.32	-0.15	0.03
Departure Headway (s)	10.2	9.4	10.2	9.3	9.3	9.5
Degree Utilization, x	0.21	1.58	0.83	1.07	3.23	1.89
Capacity (veh/h)	350	388	351	393	390	385
Control Delay (s)	14.7	296.1	46.0	95.3	1030.0	432.3
Approach Delay (s)	264.8		74.8		1030.0	432.3
Approach LOS	F		F		F	F

Intersection Summary			
Delay	545.4		
HCM Level of Service	F		
Intersection Capacity Utilization	131.3%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1780		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1780		1770	1863	1583	1770	1863	1583
Volume (vph)	450	660	10	150	330	140	10	190	290	200	60	160
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)	489	717	11	163	359	152	11	207	315	217	65	174
RTOR Reduction (vph)	0	1	0	0	15	0	0	0	237	0	0	124
Lane Group Flow (vph)	489	727	0	163	496	0	11	207	78	217	65	50
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	27.0	44.0		10.0	27.0		1.2	18.2	18.2	12.0	29.0	29.0
Effective Green, g (s)	27.0	44.0		10.0	27.0		1.2	18.2	18.2	12.0	29.0	29.0
Actuated g/C Ratio	0.27	0.44		0.10	0.27		0.01	0.18	0.18	0.12	0.29	0.29
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)	477	816		177	480		21	338	288	212	539	458
v/s Ratio Prot	c0.28	0.39		0.09	c0.28		0.01	c0.11		c0.12	0.03	
v/s Ratio Perm									0.05			0.03
v/c Ratio	1.03	0.89		0.92	1.03		0.52	0.61	0.27	1.02	0.12	0.11
Uniform Delay, d1	36.6	25.9		44.7	36.6		49.2	37.8	35.3	44.1	26.2	26.1
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	47.8	12.0		45.4	49.7		21.6	3.3	0.5	68.1	0.1	0.1
Delay (s)	84.4	37.9		90.1	86.3		70.8	41.0	35.8	112.2	26.3	26.2
Level of Service	F	D		F	F		E	D	D	F	C	C
Approach Delay (s)		56.6			87.2			38.6			67.1	
Approach LOS		E			F			D			E	

Intersection Summary			
HCM Average Control Delay	62.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	100.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	160	990	560	240	30	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	174	1076	609	261	33	65
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	870				2163	739
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870				2163	739
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				19	84
cM capacity (veh/h)	775				40	417

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	174	1076	870	98
Volume Left	174	0	0	33
Volume Right	0	0	261	65
cSH	775	1700	1700	101
Volume to Capacity	0.22	0.63	0.51	0.97
Queue Length 95th (ft)	21	0	0	146
Control Delay (s)	11.0	0.0	0.0	157.2
Lane LOS	B			F
Approach Delay (s)	1.5		0.0	157.2
Approach LOS				F

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.94		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3331		1770	1863	1583	1770	1803	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3331		1770	1863	1583	1770	1803	
Volume (vph)	230	630	120	120	280	180	110	710	290	200	550	150
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)	250	685	130	130	304	196	120	772	315	217	598	163
RTOR Reduction (vph)	0	19	0	0	136	0	0	0	122	0	12	0
Lane Group Flow (vph)	250	796	0	130	364	0	120	772	193	217	749	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	8.1	17.8		8.0	17.7		6.1	22.2	22.2	13.2	29.3	
Effective Green, g (s)	8.1	17.8		8.0	17.7		6.1	22.2	22.2	13.2	29.3	
Actuated g/C Ratio	0.10	0.23		0.10	0.23		0.08	0.29	0.29	0.17	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	186	797		183	764		140	536	455	303	684	
v/s Ratio Prot	c0.14	c0.23		0.07	0.11		0.07	c0.41		c0.12	c0.42	
v/s Ratio Perm									0.12			
v/c Ratio	1.34	1.00		0.71	0.48		0.86	1.44	0.42	0.72	1.10	
Uniform Delay, d1	34.6	29.7		33.5	25.7		35.1	27.5	22.3	30.2	24.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	186.3	31.3		12.2	0.5		37.2	208.6	2.9	7.8	63.4	
Delay (s)	220.8	60.9		45.7	26.2		72.3	236.1	25.2	38.1	87.3	
Level of Service	F	E		D	C		E	F	C	D	F	
Approach Delay (s)		98.5			30.2			164.8			76.4	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	102.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	90	50	1060	260	90	700
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	54	1152	283	98	761
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked						
vC, conflicting volume	2250	1293			1435	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2250	1293			1435	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	73			79	
cM capacity (veh/h)	36	199			473	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	152	1435	859
Volume Left	98	0	98
Volume Right	54	283	0
cSH	51	1700	473
Volume to Capacity	2.97	0.84	0.21
Queue Length 95th (ft)	404	0	19
Control Delay (s)	1056.0	0.0	6.5
Lane LOS	F		A
Approach Delay (s)	1056.0	0.0	6.5
Approach LOS	F		

Intersection Summary			
Average Delay	68.0		
Intersection Capacity Utilization	127.1%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	450	250	700	440	130	300	600	570	190	30	550	210
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)	489	272	761	478	141	326	652	620	207	33	598	228
RTOR Reduction (vph)	0	0	329	0	0	188	0	0	65	0	0	37
Lane Group Flow (vph)	489	272	432	478	141	138	652	620	142	33	598	191
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	37.5	28.0	28.0	28.0	18.5	18.5	38.0	72.4	72.4	5.6	40.0	40.0
Effective Green, g (s)	37.5	28.0	28.0	28.0	18.5	18.5	38.0	72.4	72.4	5.6	40.0	40.0
Actuated g/C Ratio	0.25	0.19	0.19	0.19	0.12	0.12	0.25	0.48	0.48	0.04	0.27	0.27
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	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	3.0
Lane Grp Cap (vph)	858	348	295	330	230	195	448	899	764	66	497	422
v/s Ratio Prot	0.14	0.15		c0.27	0.08		c0.37	0.33		0.02	c0.32	
v/s Ratio Perm			c0.27			0.09			0.09			0.12
v/c Ratio	0.57	0.78	1.46	1.45	0.61	0.71	1.46	0.69	0.19	0.50	1.20	0.45
Uniform Delay, d1	49.2	58.1	61.0	61.0	62.4	63.1	56.0	30.1	22.1	70.8	55.0	45.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.94	0.81	1.00	1.00	1.00
Incremental Delay, d2	0.9	10.9	226.1	218.1	4.8	11.0	208.5	1.2	0.2	5.8	109.4	3.5
Delay (s)	50.1	69.0	287.1	279.1	67.1	74.1	260.7	29.6	17.9	76.7	164.4	49.4
Level of Service	D	E	F	F	E	E	F	C	B	E	F	D
Approach Delay (s)		172.0			176.8			129.9			130.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	152.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	113.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.92		1.00	1.00			0.94	
Flt Protected					0.98		0.95	1.00			1.00	
Satd. Flow (prot)					1680		1770	1863			1759	
Flt Permitted					0.98		0.95	1.00			1.00	
Satd. Flow (perm)					1680		1770	1863			1759	
Volume (vph)	0	0	0	200	0	290	530	1070	0	0	990	700
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)	0	0	0	217	0	315	576	1163	0	0	1076	761
RTOR Reduction (vph)	0	0	0	0	35	0	0	0	0	0	17	0
Lane Group Flow (vph)	0	0	0	0	497	0	576	1163	0	0	1820	0
Turn Type				Perm			Prot					
Protected Phases					8		5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					28.0		26.0	114.0			84.0	
Effective Green, g (s)					28.0		26.0	114.0			84.0	
Actuated g/C Ratio					0.19		0.17	0.76			0.56	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					314		307	1416			985	
v/s Ratio Prot							c0.33	0.62			c1.03	
v/s Ratio Perm					0.30							
v/c Ratio					1.58		1.88	0.82			1.85	
Uniform Delay, d1					61.0		62.0	11.5			33.0	
Progression Factor					1.00		0.87	0.33			0.98	
Incremental Delay, d2					277.0		395.4	0.5			381.8	
Delay (s)					338.0		449.3	4.3			414.1	
Level of Service					F		F	A			F	
Approach Delay (s)		0.0			338.0			151.7			414.1	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	293.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.80		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	189.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		1.00						1.00		1.00	1.00	
Frt		0.92						0.96		1.00	1.00	
Flt Protected		0.98						1.00		0.95	1.00	
Satd. Flow (prot)		1677						1790		1770	1863	
Flt Permitted		0.98						1.00		0.95	1.00	
Satd. Flow (perm)		1677						1790		1770	1863	
Volume (vph)	520	0	800	0	0	0	0	1080	440	330	860	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	565	0	870	0	0	0	0	1174	478	359	935	0
RTOR Reduction (vph)	0	37	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	0	1398	0	0	0	0	0	1642	0	359	935	0
Turn Type	Perm									Prot		
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)		57.0						66.0		15.0	85.0	
Effective Green, g (s)		57.0						66.0		15.0	85.0	
Actuated g/C Ratio		0.38						0.44		0.10	0.57	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		637						788		177	1056	
v/s Ratio Prot								c0.92		c0.20	0.50	
v/s Ratio Perm		0.83										
v/c Ratio		2.19						2.08		2.03	0.89	
Uniform Delay, d1		46.5						42.0		67.5	28.3	
Progression Factor		1.00						1.00		0.96	0.55	
Incremental Delay, d2		542.6						492.3		464.5	1.2	
Delay (s)		589.1						534.3		529.3	16.7	
Level of Service		F						F		F	B	
Approach Delay (s)		589.1			0.0			534.3			158.9	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	441.4	HCM Level of Service	F
HCM Volume to Capacity ratio	2.12		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	189.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	190	170	30	50	160	640	10	690	100	640	540	480
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)	207	185	33	54	174	696	11	750	109	696	587	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											720	
pX, platoon unblocked												
vC, conflicting volume	3533	2859	587	2875	3272	750	1109			859		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3533	2859	587	2875	3272	750	1109			859		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	94	0	0	0	98			11		
cM capacity (veh/h)	0	2	510	0	1	411	630			782		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	207	185	33	54	174	696	11	750	109	696	587	522
Volume Left	207	0	0	54	0	0	11	0	0	696	0	0
Volume Right	0	0	33	0	0	696	0	0	109	0	0	522
cSH	0	2	510	0	1	411	630	1700	1700	782	1700	1700
Volume to Capacity	Err	100.91	0.06	Err	178.11	1.69	0.02	0.44	0.06	0.89	0.35	0.31
Queue Length 95th (ft)	Err	Err	5	Err	Err	1045	1	0	0	290	0	0
Control Delay (s)	Err	Err	12.5	Err	Err	345.0	10.8	0.0	0.0	34.3	0.0	0.0
Lane LOS	F	F	B	F	F	F	B			D		
Approach Delay (s)	Err			Err			0.1			13.2		
Approach LOS	F			F								

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	104.1%	ICU Level of Service	G	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	600	290	130	100	340	40	130	160	70	70	220	330
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)	652	315	141	109	370	43	141	174	76	76	239	359

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	1109	522	391	674
Volume Left (vph)	652	109	141	76
Volume Right (vph)	141	43	76	359
Hadj (s)	0.08	0.03	-0.01	-0.26
Departure Headway (s)	9.6	9.6	9.6	9.3
Degree Utilization, x	2.97	1.39	1.04	1.74
Capacity (veh/h)	385	385	380	391
Control Delay (s)	912.8	217.3	88.6	366.5
Approach Delay (s)	912.8	217.3	88.6	366.5
Approach LOS	F	F	F	F

Intersection Summary			
Delay	522.0		
HCM Level of Service	F		
Intersection Capacity Utilization	138.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	10	10	90	10	60	10	290	70	90	350	10
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)	11	11	11	98	11	65	11	315	76	98	380	11
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	989	995	386	967	962	353	391			391		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	989	995	386	967	962	353	391			391		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	95	98	52	95	91	99			92		
cM capacity (veh/h)	183	222	662	206	232	690	1167			1167		

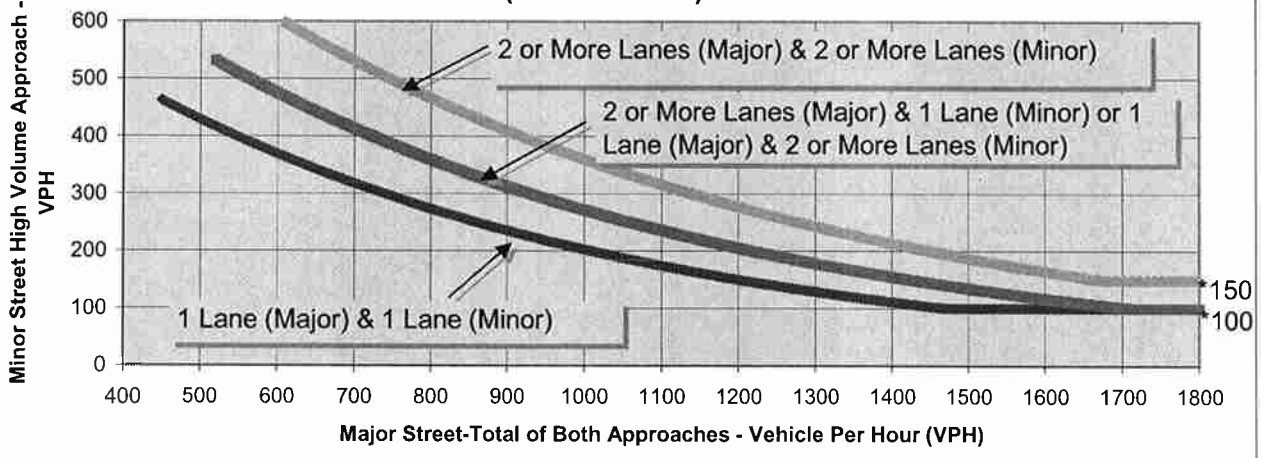
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	22	98	76	11	391	98	391
Volume Left	11	0	98	0	11	0	98	0
Volume Right	0	11	0	65	0	76	0	11
cSH	183	333	206	539	1167	1700	1167	1700
Volume to Capacity	0.06	0.07	0.48	0.14	0.01	0.23	0.08	0.23
Queue Length 95th (ft)	5	5	58	12	1	0	7	0
Control Delay (s)	25.9	16.6	37.5	12.8	8.1	0.0	8.4	0.0
Lane LOS	D	C	E	B	A		A	
Approach Delay (s)	19.7		26.7		0.2		1.7	
Approach LOS	C		D					

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1130	500	

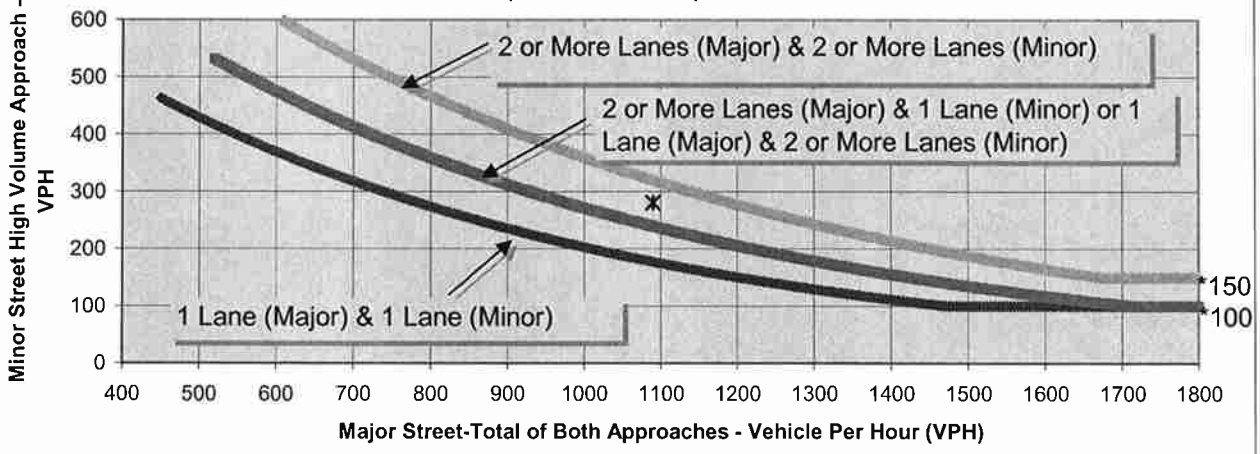
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Approved by		Date			Woodward Ave. & Bella Terra Dr.
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1090	280	

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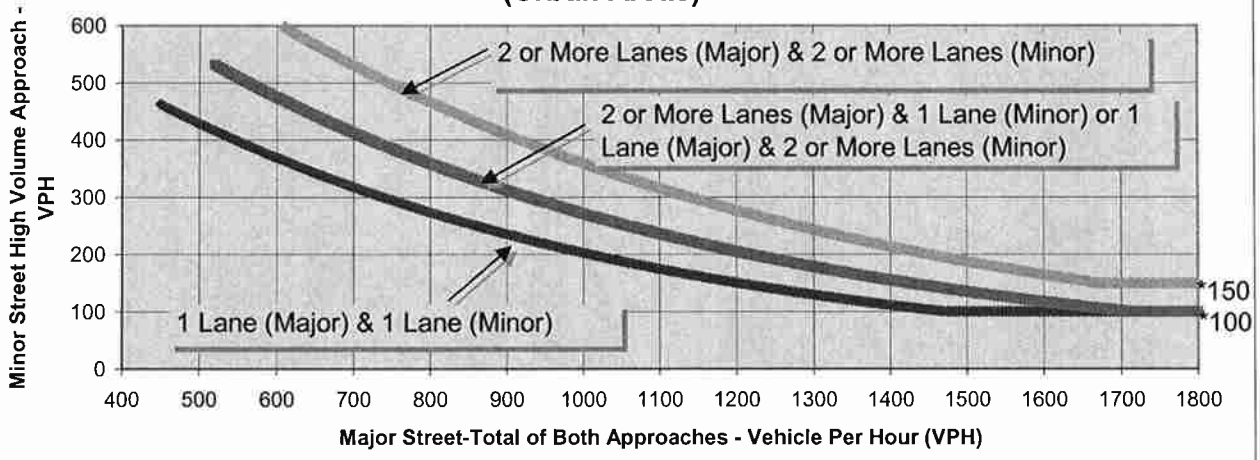
- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Airport Wy. & Wawona St.

Computed by Fehr & Peers Date 3/21/2007
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Approved by Date Sheet No 3 of 6

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1810	70+190	

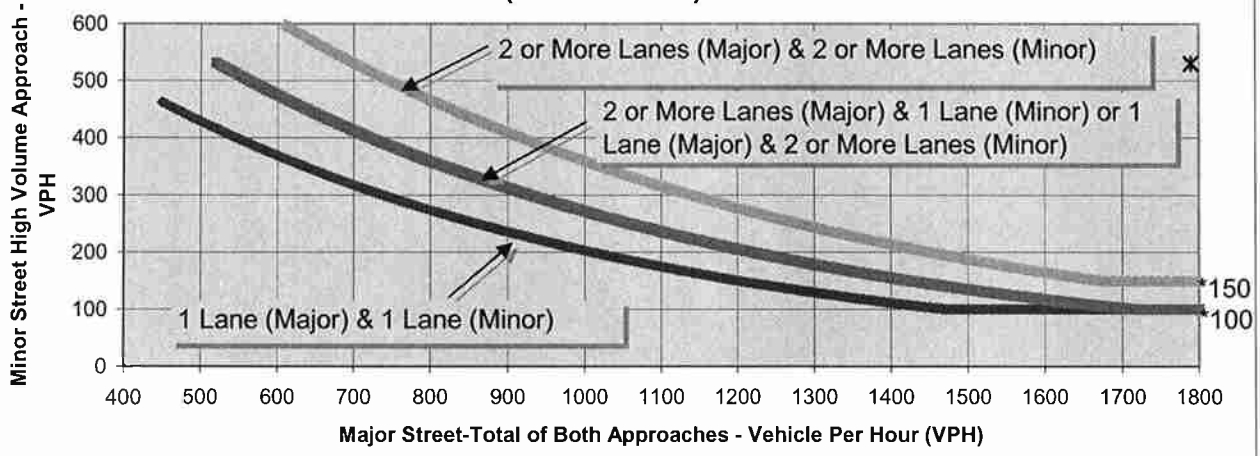
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1790	530	

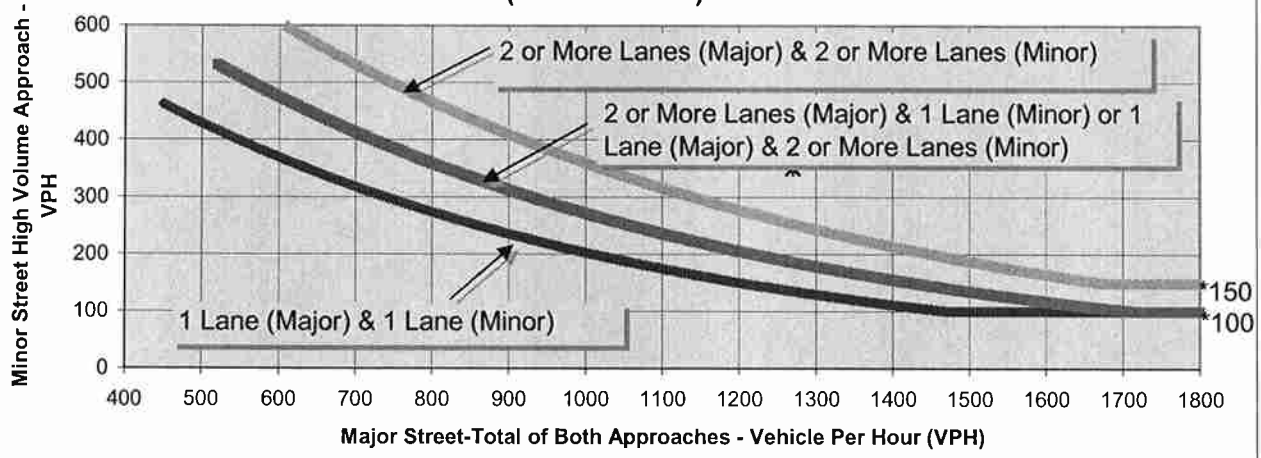
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- [x] Existing Conditions
- [ ] Existing Plus Project Conditions
- [ ] Cumulative No Project Conditions
- [ ] Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1270	350	

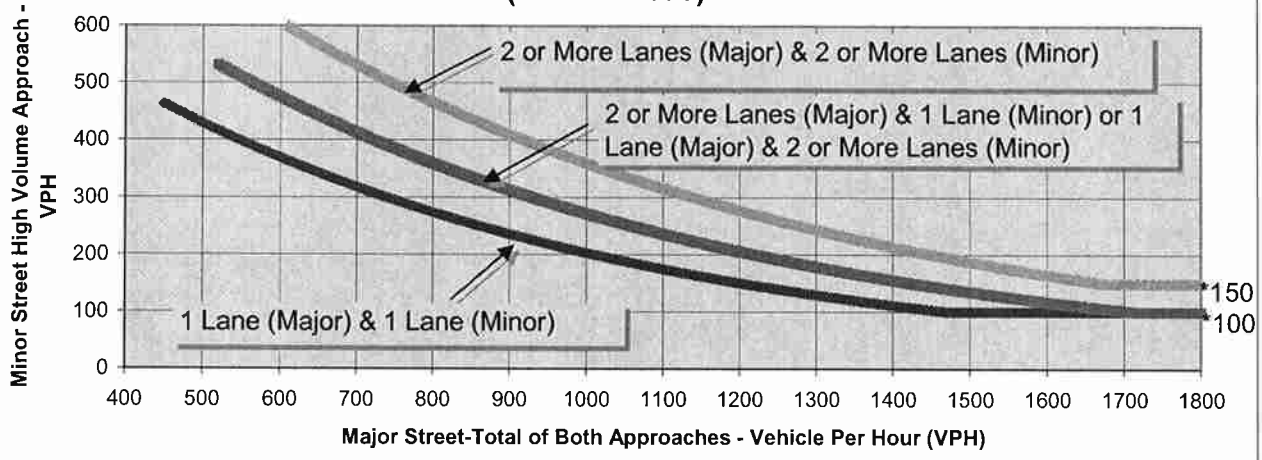
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		630	50	

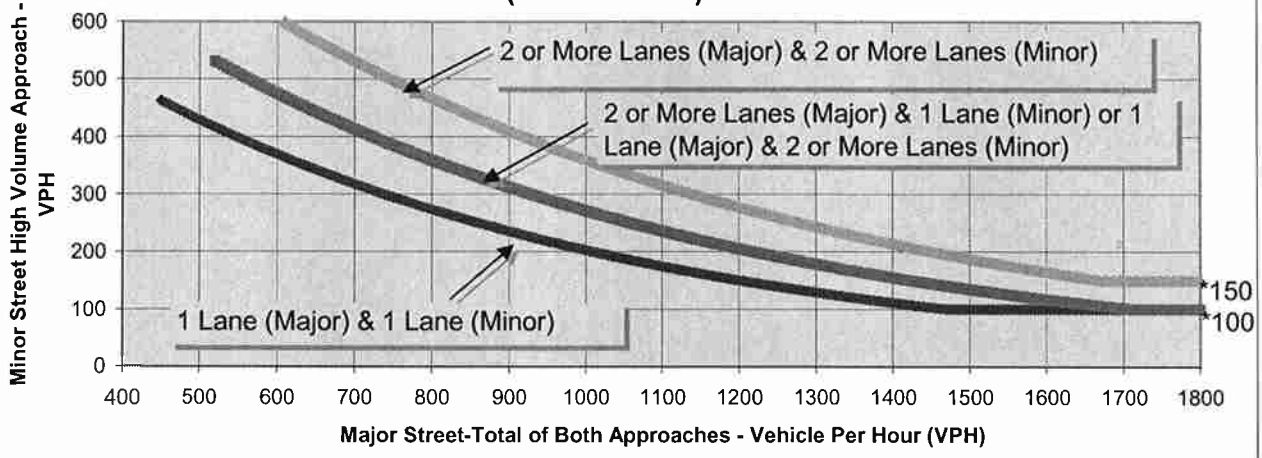
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- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1280	1150	

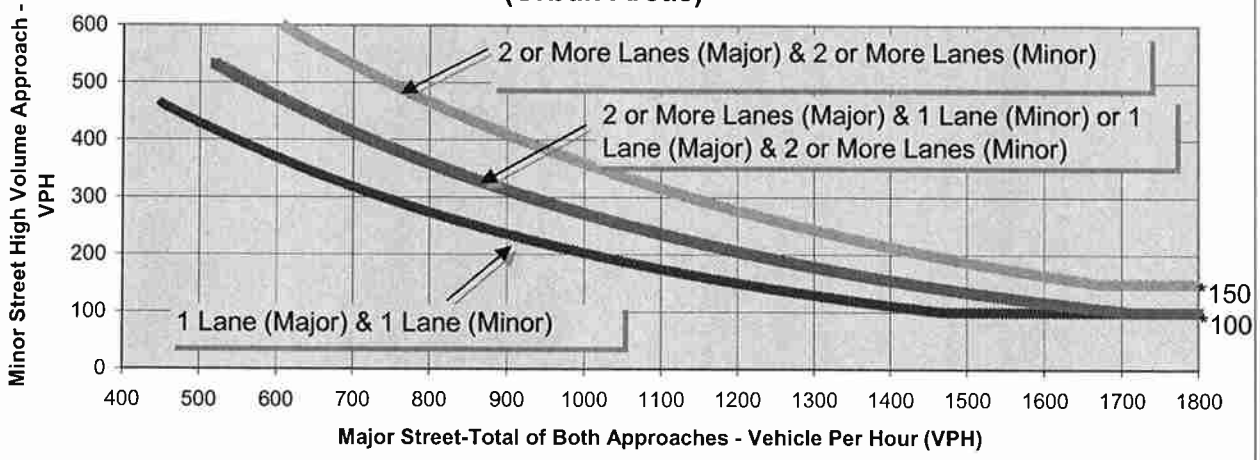
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

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- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1950	90	

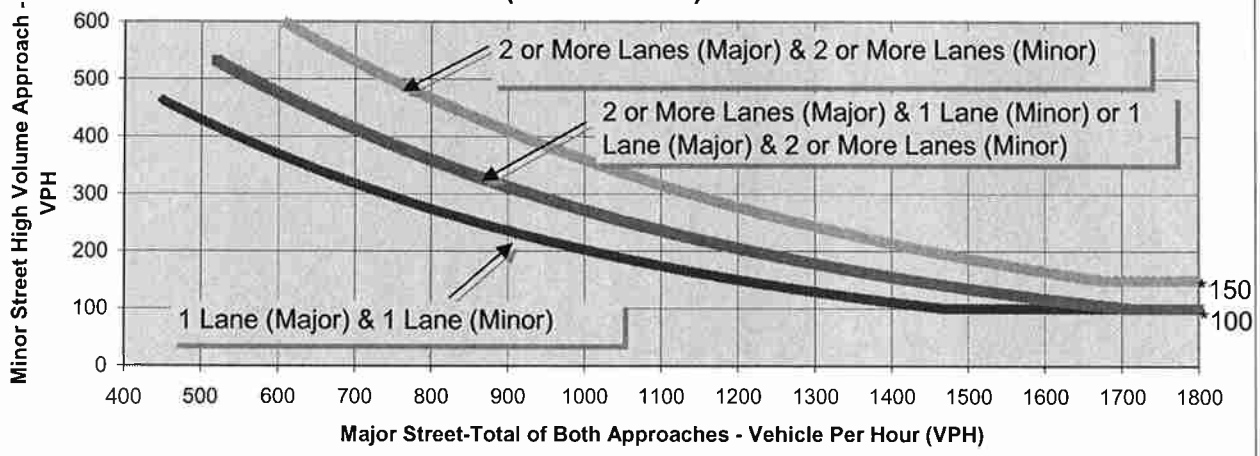
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- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		2110	140	

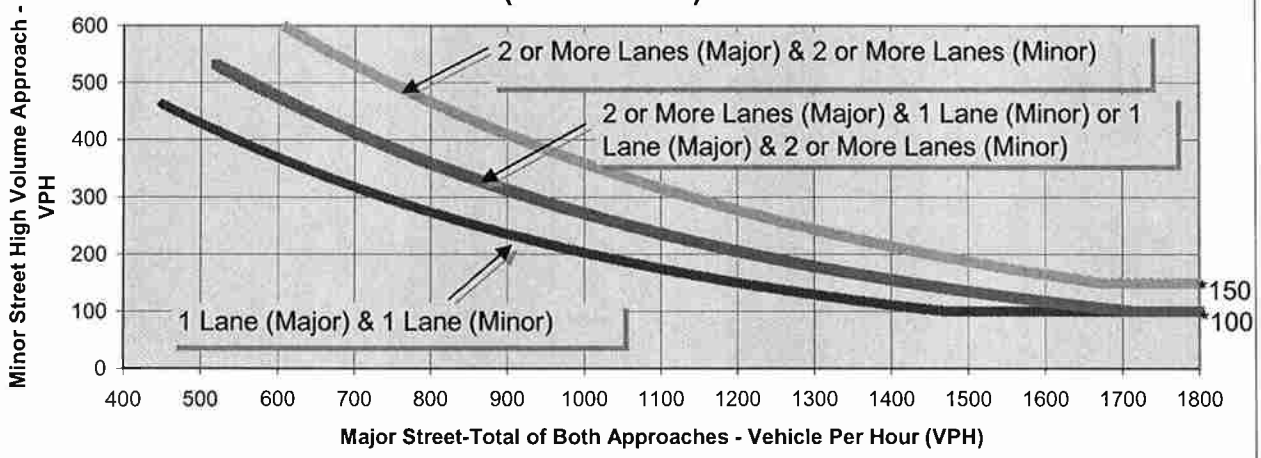
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- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

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Approved by		Date	Sheet No	4 of 6	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		2460	850	

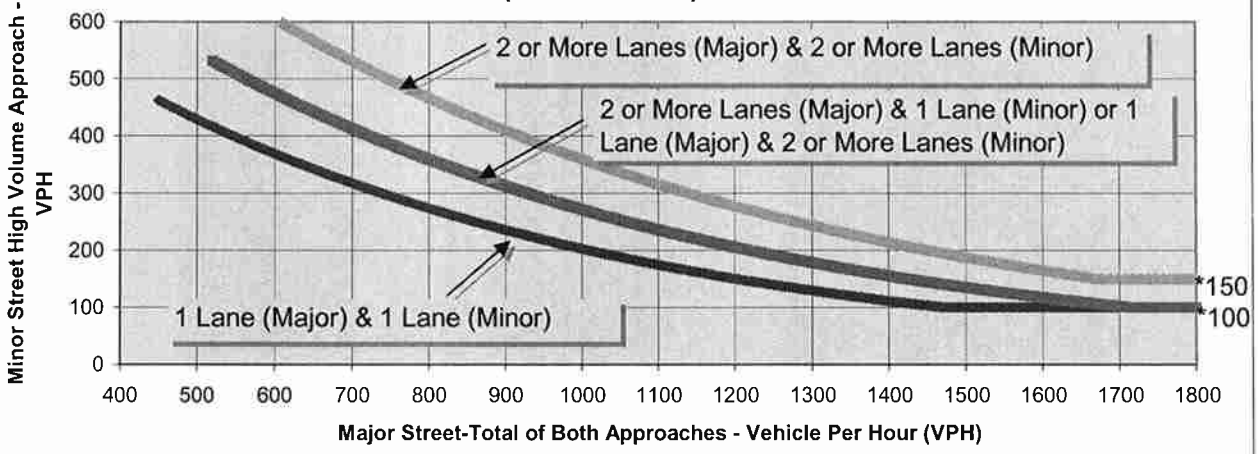
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Cumulative NP - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Woodward Ave.	
Checked by		Date			
Approved by		Date	Sheet No	5 of 6	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		980	1020	

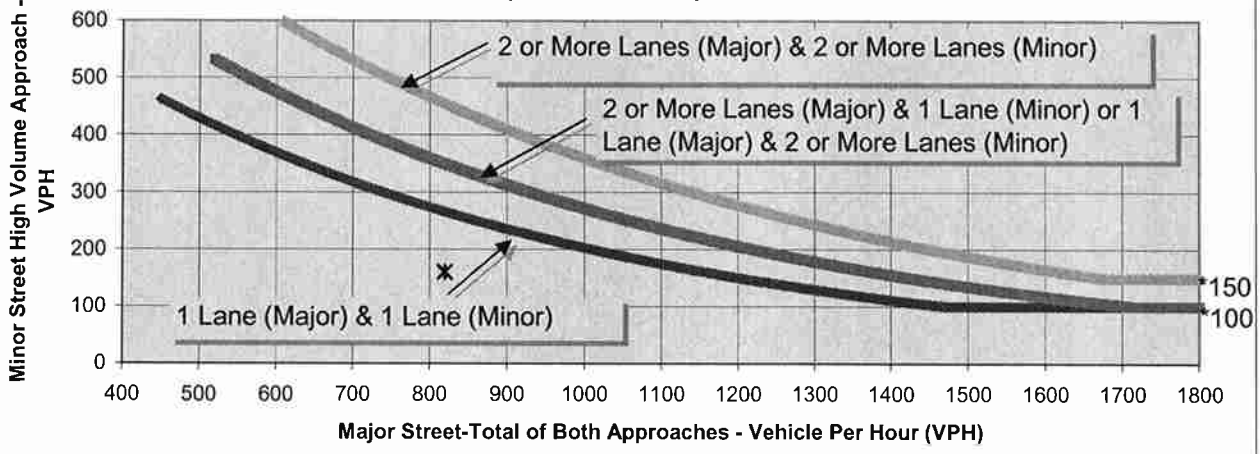
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No	SA07-0092	Page No	1		
Subject	Cumulative NP - PM				
Computed by	Fehr & Peers	Date	3/21/2007	Airport Wy. & Peach Ave.	
Checked by		Date			
Approved by		Date		Sheet No	6 of 6

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		820	160	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☑ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3580	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	994	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2088	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2088	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	55.2	mi/h
Number of lanes, N	2	
Density, D	37.8	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2980	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	828	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1738	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1738	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	30.0	pc/mi/ln

Level of service, LOS D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	6000	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1667	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3500	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3500	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6000	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1667	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3500	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3500	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6000	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1667	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3500	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3500	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	5450	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1514	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3179	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3179	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2810	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	781	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1639	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1639	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	28.3	pc/mi/ln

Level of service, LOS D

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3550	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	986	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2071	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2071	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	55.5	mi/h
Number of lanes, N	2	
Density, D	37.3	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions

Description: Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3580	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	980	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	380	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3580	980	380	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	994	272	106	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4177	1100	426	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4177 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4177	4700	No
$v_{FO} = v_F - v_R$	3077	4700	No
v_R	1100	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	4177	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 35.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, D_S = 0.527

Space mean speed in ramp influence area, S_R = 52.9 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 52.9 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2600	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	380	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	980	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2600	380	980	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	722	106	272	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3033	426	1100	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3033 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		3459	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3033	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 29.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.410

Space mean speed in ramp influence area, S_R = 55.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 55.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6000	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1010	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1010	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6000		1010		1010		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1667		281		281		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7000		1133		1133		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 7000 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7000	4700	Yes
$v_{FO} = v - v_F - v_R$	5867	4700	Yes
v_R	1133	2000	No
$v_{3 \text{ or } av34} - v_{av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} - v_{av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34} - v_{av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	7000	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 60.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.530

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 52.8 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4990	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1010	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1010	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4990	1010	1010	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1386	281	281	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5822	1133	1133	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 5822 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6955	4700	Yes
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	5822	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 56.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 4.375

Space mean speed in ramp influence area, S_R = -35.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6000	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1320	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	770	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6000		1320		770		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1667		367		214		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7000		1481		864		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 7000 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7000	4700	Yes
$v_{FO} = v - v_F - v_R$	5519	4700	Yes
v_R	1481	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	7000	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 60.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.561

Space mean speed in ramp influence area, S_R = 52.1 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 52.1 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4680	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	770	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1320	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4680	770	1320	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1300	214	367	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5460	864	1481	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_R (P_{FM})$ = 5460 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6324	4700	Yes

$v_{3 \text{ or } av34}$ = 0 pc/h (Equation 25-4 or 25-5)

Is $v_{3 \text{ or } av34}$ > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2 No

If yes, v_{12A} = (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5460	4400	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 51.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 2.461

Space mean speed in ramp influence area, S_R = 8.4 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 8.4 mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2810	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	490	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1230	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2810		490		1230		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	781		136		342		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3278		550		1380		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3278 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3278	4700	No
$v_{FO} = v_F - v_R$	2728	4700	No
v_R	550	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3278	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 27.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.478

Space mean speed in ramp influence area, S_R = 54.0 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.0 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2320	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1230	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	490	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2320	1230	490	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	644	342	136	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, E_T	1.5	1.5	1.5	
Recreational vehicle PCE, E_R	1.2	1.2	1.2	
Heavy vehicle adjustment, f_{HV}	0.952	0.990	0.990	
Driver population factor, f_P	1.00	1.00	1.00	
Flow rate, vp	2707	1380	550	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2707 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		4087	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A}	=		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2707	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 33.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.518	
Space mean speed in ramp influence area,	S_R = 53.1	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 53.1	mph

Existing Plus Project Conditions Analysis:

Intersection LOS
Peak Hour Signal Warrants
Freeway LOS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	85	16	15	150	150	18	28	15	200	21	15
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)	16	92	17	16	163	163	20	30	16	217	23	16

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	16	110	16	326	66	257
Volume Left (vph)	16	0	16	0	20	217
Volume Right (vph)	0	17	0	163	16	16
Hadj (s)	0.53	-0.08	0.53	-0.32	-0.05	0.17
Departure Headway (s)	6.4	5.8	6.1	5.3	5.5	5.4
Degree Utilization, x	0.03	0.18	0.03	0.48	0.10	0.38
Capacity (veh/h)	519	577	557	654	574	624
Control Delay (s)	8.4	8.8	8.1	11.9	9.1	11.7
Approach Delay (s)	8.8		11.7		9.1	11.7
Approach LOS	A		B		A	B

Intersection Summary				
Delay	11.0			
HCM Level of Service	B			
Intersection Capacity Utilization	43.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	25	70	45	36	22	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	76	49	39	24	27
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	88				199	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	88				199	68
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	97
cM capacity (veh/h)	1508				775	995

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	103	88	51
Volume Left	27	0	24
Volume Right	0	39	27
cSH	1508	1700	878
Volume to Capacity	0.02	0.05	0.06
Queue Length 95th (ft)	1	0	5
Control Delay (s)	2.1	0.0	9.4
Lane LOS	A		A
Approach Delay (s)	2.1	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)	15		

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)	5	85	2	30	70	10	6	0	89	25	0	5
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)	5	92	2	33	76	11	7	0	97	27	0	5
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	87			95			251	257	93	347	252	82
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	87			95			251	257	93	347	252	82
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			98			99	100	90	95	100	99
cM capacity (veh/h)	1509			1499			685	631	964	536	635	978

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	5	95	33	87	7	97	33
Volume Left	5	0	33	0	7	0	27
Volume Right	0	2	0	11	0	97	5
cSH	1509	1700	1499	1700	685	964	580
Volume to Capacity	0.00	0.06	0.02	0.05	0.01	0.10	0.06
Queue Length 95th (ft)	0	0	2	0	1	8	4
Control Delay (s)	7.4	0.0	7.5	0.0	10.3	9.2	11.6
Lane LOS	A		A		B	A	B
Approach Delay (s)	0.4		2.0		9.2		11.6
Approach LOS					A		B

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.94		1.00	0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3318		1770	3351		1770	1863	1583	1770	1830	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3318		1770	3351		1770	1863	1583	1770	1830	
Volume (vph)	10	175	125	153	165	90	80	226	190	75	226	30
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)	11	190	136	166	179	98	87	246	207	82	246	33
RTOR Reduction (vph)	0	113	0	0	72	0	0	0	124	0	5	0
Lane Group Flow (vph)	11	213	0	166	205	0	87	246	83	82	274	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	1.2	12.3		7.9	19.0		5.8	28.8	28.8	7.0	30.0	
Effective Green, g (s)	1.2	12.3		7.9	19.0		5.8	28.8	28.8	7.0	30.0	
Actuated g/C Ratio	0.02	0.17		0.11	0.26		0.08	0.40	0.40	0.10	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	30	567		194	884		143	745	633	172	763	
v/s Ratio Prot	0.01	c0.06		c0.09	0.06		c0.05	0.13		0.05	c0.15	
v/s Ratio Perm									0.05			
v/c Ratio	0.37	0.38		0.86	0.23		0.61	0.33	0.13	0.48	0.36	
Uniform Delay, d1	35.0	26.4		31.5	20.8		32.0	14.9	13.7	30.8	14.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.4	0.4		28.9	0.1		7.1	1.2	0.4	2.1	1.3	
Delay (s)	42.5	26.9		60.4	20.9		39.1	16.1	14.1	32.8	15.7	
Level of Service	D	C		E	C		D	B	B	C	B	
Approach Delay (s)		27.4			35.7			19.1			19.6	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	111	45	451	98	50	454
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	49	490	107	54	493
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.75	0.75			0.75	
vC, conflicting volume	1146	543			597	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1195	388			459	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	16	90			93	
cM capacity (veh/h)	143	492			821	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	170	597	548
Volume Left	121	0	54
Volume Right	49	107	0
cSH	180	1700	821
Volume to Capacity	0.94	0.35	0.07
Queue Length 95th (ft)	184	0	5
Control Delay (s)	104.8	0.0	1.8
Lane LOS	F		A
Approach Delay (s)	104.8	0.0	1.8
Approach LOS	F		

Intersection Summary			
Average Delay	14.3		
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	10	5	12	157	5	10	21	529	66	5	545	15
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)	11	5	13	171	5	11	23	575	72	5	592	16
RTOR Reduction (vph)	0	0	11	0	0	9	0	0	43	0	0	5
Lane Group Flow (vph)	11	5	2	171	5	2	23	575	29	5	592	11
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.1	7.9	7.9	6.5	8.3	8.3	1.0	20.6	20.6	0.7	20.3	20.3
Effective Green, g (s)	6.1	7.9	7.9	6.5	8.3	8.3	1.0	20.6	20.6	0.7	20.3	20.3
Actuated g/C Ratio	0.12	0.15	0.15	0.13	0.16	0.16	0.02	0.40	0.40	0.01	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	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	3.0
Lane Grp Cap (vph)	405	285	242	223	299	254	34	742	631	24	732	622
v/s Ratio Prot	0.00	c0.00		c0.10	0.00		c0.01	0.31		0.00	c0.32	
v/s Ratio Perm			0.00			0.00			0.02			0.01
v/c Ratio	0.03	0.02	0.01	0.77	0.02	0.01	0.68	0.77	0.05	0.21	0.81	0.02
Uniform Delay, d1	20.2	18.6	18.6	21.9	18.3	18.2	25.2	13.5	9.5	25.2	14.0	9.6
Progression 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
Incremental Delay, d2	0.0	0.0	0.0	14.5	0.0	0.0	42.2	5.1	0.0	4.3	6.6	0.0
Delay (s)	20.2	18.6	18.6	36.4	18.3	18.2	67.4	18.6	9.6	29.5	20.5	9.6
Level of Service	C	B	B	D	B	B	E	B	A	C	C	A
Approach Delay (s)		19.2			34.9			19.3			20.3	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	51.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	77	0	220	302	396	0	0	309	405
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)	0	0	0	84	0	239	328	430	0	0	336	440
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											494	
pX, platoon unblocked	0.69	0.69	0.69	0.69	0.69		0.69					
vC, conflicting volume	1882	1643	556	1643	1863	430	776			430		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2274	1929	358	1929	2247	430	676			430		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	62	48			100		
cM capacity (veh/h)	7	22	475	21	14	625	633			1129		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	323	328	430	776
Volume Left	84	328	0	0
Volume Right	239	0	0	440
cSH	72	633	1700	1700
Volume to Capacity	4.46	0.52	0.25	0.46
Queue Length 95th (ft)	Err	75	0	0
Control Delay (s)	Err	16.6	0.0	0.0
Lane LOS	F	C		
Approach Delay (s)	Err	7.2		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	1740.6		
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	130	0	94	0	0	0	0	568	177	125	261	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)	141	0	102	0	0	0	0	617	192	136	284	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	1269	1365	284	1371	1269	714	284			810		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1269	1365	284	1371	1269	714	284			810		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	86	100	100	100	100			83		
cM capacity (veh/h)	127	123	755	93	140	432	1279			816		

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	243	810	136	284
Volume Left	141	0	136	0
Volume Right	102	192	0	0
cSH	195	1700	816	1700
Volume to Capacity	1.25	0.48	0.17	0.17
Queue Length 95th (ft)	327	0	15	0
Control Delay (s)	196.8	0.0	10.3	0.0
Lane LOS	F		B	
Approach Delay (s)	196.8	0.0	3.3	
Approach LOS	F			

Intersection Summary			
Average Delay	33.5		
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	90	5	0	0	5	85	5	570	5	35	270	50
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)	98	5	0	0	5	92	5	620	5	38	293	54
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	1095	1005	293	1003	1054	620	348			625		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1095	1005	293	1003	1054	620	348			625		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	33	98	100	100	97	81	100			96		
cM capacity (veh/h)	147	231	746	210	216	488	1211			956		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	98	5	0	0	5	92	5	620	5	38	293	54
Volume Left	98	0	0	0	0	0	5	0	0	38	0	0
Volume Right	0	0	0	0	0	92	0	0	5	0	0	54
cSH	147	231	1700	1700	216	488	1211	1700	1700	956	1700	1700
Volume to Capacity	0.67	0.02	0.00	0.00	0.03	0.19	0.00	0.36	0.00	0.04	0.17	0.03
Queue Length 95th (ft)	93	2	0	0	2	17	0	0	0	3	0	0
Control Delay (s)	68.4	21.0	0.0	0.0	22.1	14.1	8.0	0.0	0.0	8.9	0.0	0.0
Lane LOS	F	C	A	A	C	B	A			A		
Approach Delay (s)	65.9			14.5			0.1			0.9		
Approach LOS	F			B								

Intersection Summary				
Average Delay	7.1			
Intersection Capacity Utilization	50.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	154	20	25	13	25	60	20	366	20	15	190	65
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)	167	22	27	14	27	65	22	398	22	16	207	71

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	216	107	441	293
Volume Left (vph)	167	14	22	16
Volume Right (vph)	27	65	22	71
Hadj (s)	0.11	-0.31	0.01	-0.10
Departure Headway (s)	6.3	6.1	5.4	5.6
Degree Utilization, x	0.38	0.18	0.67	0.45
Capacity (veh/h)	506	482	632	591
Control Delay (s)	13.0	10.5	18.7	13.1
Approach Delay (s)	13.0	10.5	18.7	13.1
Approach LOS	B	B	C	B

Intersection Summary				
Delay		15.2		
HCM Level of Service		C		
Intersection Capacity Utilization		51.3%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	117	0	0	289	190	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	127	0	0	314	207	41
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	521	207	248			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	521	207	248			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	75	100	100			
cM capacity (veh/h)	516	834	1318			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1	SB 2
Volume Total	127	0	314	207	41
Volume Left	127	0	0	0	0
Volume Right	0	0	0	0	41
cSH	516	1700	1318	1700	1700
Volume to Capacity	0.25	0.00	0.00	0.12	0.02
Queue Length 95th (ft)	24	0	0	0	0
Control Delay (s)	14.2	0.0	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	14.2		0.0	0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	104	3	3	0	1	5	1	180	0	5	150	35
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)	113	3	3	0	1	5	1	196	0	5	163	38
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	378	372	163	377	410	196	201			196		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	378	372	163	377	410	196	201			196		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	99	100	100	100	99	100			100		
cM capacity (veh/h)	573	556	882	574	529	846	1371			1377		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2
Volume Total	113	7	7	197	168	38
Volume Left	113	0	0	1	5	0
Volume Right	0	3	5	0	0	38
cSH	573	682	769	1371	1377	1700
Volume to Capacity	0.20	0.01	0.01	0.00	0.00	0.02
Queue Length 95th (ft)	18	1	1	0	0	0
Control Delay (s)	12.8	10.3	9.7	0.0	0.3	0.0
Lane LOS	B	B	A	A	A	
Approach Delay (s)	12.7		9.7	0.0	0.2	
Approach LOS	B		A			

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	230	19	25	110	185	7	12	15	145	34	20
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)	22	250	21	27	120	201	8	13	16	158	37	22

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	22	271	27	321	37	216
Volume Left (vph)	22	0	27	0	8	158
Volume Right (vph)	0	21	0	201	16	22
Hadj (s)	0.53	-0.02	0.53	-0.40	-0.19	0.12
Departure Headway (s)	6.2	5.7	6.2	5.2	5.8	5.7
Degree Utilization, x	0.04	0.43	0.05	0.47	0.06	0.34
Capacity (veh/h)	547	609	555	660	526	582
Control Delay (s)	8.3	11.6	8.3	11.5	9.1	11.6
Approach Delay (s)	11.4		11.3		9.1	11.6
Approach LOS	B		B		A	B

Intersection Summary				
Delay	11.3			
HCM Level of Service	B			
Intersection Capacity Utilization	45.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	20	60	65	24	37	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	65	71	26	40	33
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	97				192	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	97				192	84
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				95	97
cM capacity (veh/h)	1497				785	976

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	87	97	73
Volume Left	22	0	40
Volume Right	0	26	33
cSH	1497	1700	860
Volume to Capacity	0.01	0.06	0.08
Queue Length 95th (ft)	1	0	7
Control Delay (s)	1.9	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	1.9	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	21.5%	ICU Level of Service	A
Analysis Period (min)	15		

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)	5	85	7	100	80	35	4	0	59	20	0	5
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)	5	92	8	109	87	38	4	0	64	22	0	5
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	125			100			417	449	96	491	434	106
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	125			100			417	449	96	491	434	106
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			93			99	100	93	95	100	99
cM capacity (veh/h)	1462			1493			511	466	960	429	476	948

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	5	100	109	125	4	64	27
Volume Left	5	0	109	0	4	0	22
Volume Right	0	8	0	38	0	64	5
cSH	1462	1700	1493	1700	511	960	482
Volume to Capacity	0.00	0.06	0.07	0.07	0.01	0.07	0.06
Queue Length 95th (ft)	0	0	6	0	1	5	4
Control Delay (s)	7.5	0.0	7.6	0.0	12.1	9.0	12.9
Lane LOS	A		A		B	A	B
Approach Delay (s)	0.4		3.5		9.2		12.9
Approach LOS					A		B

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	27.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3411		1770	3295		1770	1863	1583	1770	1840	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3411		1770	3295		1770	1863	1583	1770	1840	
Volume (vph)	55	330	105	126	170	145	40	216	156	195	283	25
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)	60	359	114	137	185	158	43	235	170	212	308	27
RTOR Reduction (vph)	0	39	0	0	120	0	0	0	113	0	3	0
Lane Group Flow (vph)	60	434	0	137	223	0	43	235	57	212	332	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.2	14.3		7.6	17.7		4.1	24.6	24.6	10.5	31.0	
Effective Green, g (s)	4.2	14.3		7.6	17.7		4.1	24.6	24.6	10.5	31.0	
Actuated g/C Ratio	0.06	0.20		0.10	0.24		0.06	0.34	0.34	0.14	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	102	668		184	799		99	628	533	255	781	
v/s Ratio Prot	0.03	c0.13		c0.08	c0.07		0.02	0.13		c0.12	c0.18	
v/s Ratio Perm									0.04			
v/c Ratio	0.59	0.65		0.74	0.28		0.43	0.37	0.11	0.83	0.42	
Uniform Delay, d1	33.6	27.0		31.8	22.5		33.3	18.4	16.6	30.4	14.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.4	2.3		15.0	0.2		3.0	1.7	0.4	20.0	1.7	
Delay (s)	41.9	29.3		46.8	22.7		36.4	20.1	17.1	50.4	16.4	
Level of Service	D	C		D	C		D	C	B	D	B	
Approach Delay (s)		30.7			29.5			20.5			29.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	27.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	89	45	367	132	65	449
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	97	49	399	143	71	488
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.83	0.83			0.83	
vC, conflicting volume	1100	471			542	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1120	365			451	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	45	91			92	
cM capacity (veh/h)	176	567			924	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	146	542	559
Volume Left	97	0	71
Volume Right	49	143	0
cSH	229	1700	924
Volume to Capacity	0.64	0.32	0.08
Queue Length 95th (ft)	96	0	6
Control Delay (s)	44.8	0.0	2.0
Lane LOS	E		A
Approach Delay (s)	44.8	0.0	2.0
Approach LOS	E		

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	20	5	37	57	5	10	79	469	114	15	493	30
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)	22	5	40	62	5	11	86	510	124	16	536	33
RTOR Reduction (vph)	0	0	34	0	0	9	0	0	70	0	0	11
Lane Group Flow (vph)	22	5	6	62	5	2	86	510	54	16	536	22
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.3	8.3	8.3	6.5	8.5	8.5	4.0	24.5	24.5	0.8	21.3	21.3
Effective Green, g (s)	6.3	8.3	8.3	6.5	8.5	8.5	4.0	24.5	24.5	0.8	21.3	21.3
Actuated g/C Ratio	0.11	0.15	0.15	0.12	0.15	0.15	0.07	0.44	0.44	0.01	0.38	0.38
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	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	3.0
Lane Grp Cap (vph)	386	276	234	205	282	240	126	814	691	25	707	601
v/s Ratio Prot	0.01	0.00		c0.04	0.00		c0.05	c0.27		0.01	c0.29	
v/s Ratio Perm			c0.00			0.00			0.03			0.01
v/c Ratio	0.06	0.02	0.03	0.30	0.02	0.01	0.68	0.63	0.08	0.64	0.76	0.04
Uniform Delay, d1	22.2	20.4	20.4	22.7	20.2	20.2	25.4	12.3	9.2	27.5	15.2	10.9
Progression 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
Incremental Delay, d2	0.1	0.0	0.0	0.8	0.0	0.0	14.2	1.5	0.0	44.6	4.7	0.0
Delay (s)	22.3	20.4	20.5	23.6	20.3	20.2	39.6	13.8	9.3	72.1	19.8	11.0
Level of Service	C	C	C	C	C	C	D	B	A	E	B	B
Approach Delay (s)		21.1			22.9			16.1			20.8	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	56.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	200	0	140	163	522	0	0	432	155
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)	0	0	0	217	0	152	177	567	0	0	470	168
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											494	
pX, platoon unblocked	0.73	0.73	0.73	0.73	0.73		0.73					
vC, conflicting volume	1628	1476	554	1476	1560	567	638			567		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1857	1649	391	1649	1764	567	506			567		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	71	77			100		
cM capacity (veh/h)	24	56	482	48	47	523	776			1005		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	370	177	567	638
Volume Left	217	177	0	0
Volume Right	152	0	0	168
cSH	76	776	1700	1700
Volume to Capacity	4.85	0.23	0.33	0.38
Queue Length 95th (ft)	Err	22	0	0
Control Delay (s)	Err	11.0	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	Err	2.6		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	2110.1		
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	300	0	358	0	0	0	0	385	160	160	472	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)	326	0	389	0	0	0	0	418	174	174	513	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	1366	1453	513	1755	1366	505	513			592		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1366	1453	513	1755	1366	505	513			592		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	31	100	100	100	100			82		
cM capacity (veh/h)	107	107	561	18	121	567	1052			983		

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	715	592	174	513
Volume Left	326	0	174	0
Volume Right	389	174	0	0
cSH	192	1700	983	1700
Volume to Capacity	3.73	0.35	0.18	0.30
Queue Length 95th (ft)	Err	0	16	0
Control Delay (s)	Err	0.0	9.4	0.0
Lane LOS	F		A	
Approach Delay (s)	Err	0.0	2.4	
Approach LOS	F			

Intersection Summary			
Average Delay	3586.3		
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	85	5	5	5	5	90	5	370	10	100	595	135
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)	92	5	5	5	5	98	5	402	11	109	647	147
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	1378	1288	647	1285	1424	402	793			413		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1378	1288	647	1285	1424	402	793			413		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	96	99	96	96	85	99			91		
cM capacity (veh/h)	92	147	471	125	122	648	828			1146		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	92	5	5	5	5	98	5	402	11	109	647	147
Volume Left	92	0	0	5	0	0	5	0	0	109	0	0
Volume Right	0	0	5	0	0	98	0	0	11	0	0	147
cSH	92	147	471	125	122	648	828	1700	1700	1146	1700	1700
Volume to Capacity	1.00	0.04	0.01	0.04	0.04	0.15	0.01	0.24	0.01	0.09	0.38	0.09
Queue Length 95th (ft)	147	3	1	3	3	13	0	0	0	8	0	0
Control Delay (s)	176.1	30.4	12.7	35.0	35.9	11.5	9.4	0.0	0.0	8.5	0.0	0.0
Lane LOS	F	D	B	D	E	B	A			A		
Approach Delay (s)	159.8			13.9			0.1			1.0		
Approach LOS	F			B								

Intersection Summary				
Average Delay	12.4			
Intersection Capacity Utilization	56.0%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	94	50	20	21	25	35	20	256	16	65	370	170
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)	102	54	22	23	27	38	22	278	17	71	402	185

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	178	88	317	658
Volume Left (vph)	102	23	22	71
Volume Right (vph)	22	38	17	185
Hadj (s)	0.08	-0.17	0.01	-0.11
Departure Headway (s)	6.9	6.9	5.9	5.3
Degree Utilization, x	0.34	0.17	0.52	0.97
Capacity (veh/h)	505	480	595	666
Control Delay (s)	13.3	11.3	15.2	49.9
Approach Delay (s)	13.3	11.3	15.2	49.9
Approach LOS	B	B	C	E

Intersection Summary				
Delay		33.1		
HCM Level of Service		D		
Intersection Capacity Utilization	72.1%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	78	0	0	214	278	133
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	85	0	0	233	302	145
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	535	302	447			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	535	302	447			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	100	100			
cM capacity (veh/h)	506	737	1114			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1	SB 2
Volume Total	85	0	233	302	145
Volume Left	85	0	0	0	0
Volume Right	0	0	0	0	145
cSH	506	1700	1114	1700	1700
Volume to Capacity	0.17	0.00	0.00	0.18	0.09
Queue Length 95th (ft)	15	0	0	0	0
Control Delay (s)	13.5	0.0	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	13.5		0.0	0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	69	2	2	5	4	10	4	135	5	15	145	118
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)	75	2	2	5	4	11	4	147	5	16	158	128
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	361	351	158	352	477	149	286			152		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	361	351	158	352	477	149	286			152		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	100	100	99	99	99	100			99		
cM capacity (veh/h)	576	565	888	593	480	897	1276			1429		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2
Volume Total	75	4	21	157	174	128
Volume Left	75	0	5	4	16	0
Volume Right	0	2	11	5	0	128
cSH	576	690	681	1276	1429	1700
Volume to Capacity	0.13	0.01	0.03	0.00	0.01	0.08
Queue Length 95th (ft)	11	0	2	0	1	0
Control Delay (s)	12.2	10.2	10.5	0.2	0.8	0.0
Lane LOS	B	B	B	A	A	
Approach Delay (s)	12.1		10.5	0.2	0.5	
Approach LOS	B		B			

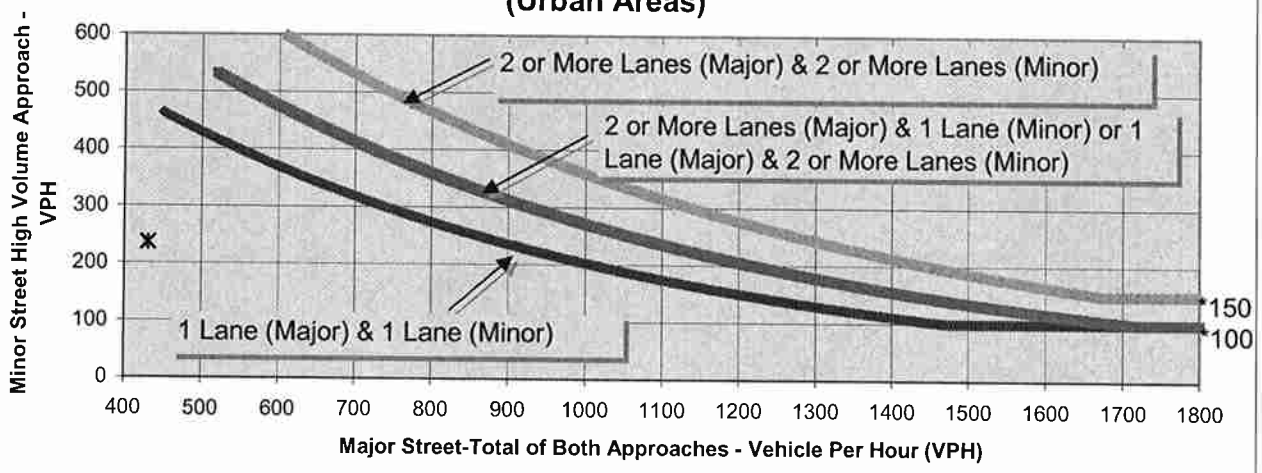
Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

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Subject Existing Plus Project - AM
Yosemite Ave. & McKinley Ave.

Computed by Fehr & Peers Date 3/21/2007
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		431	236	

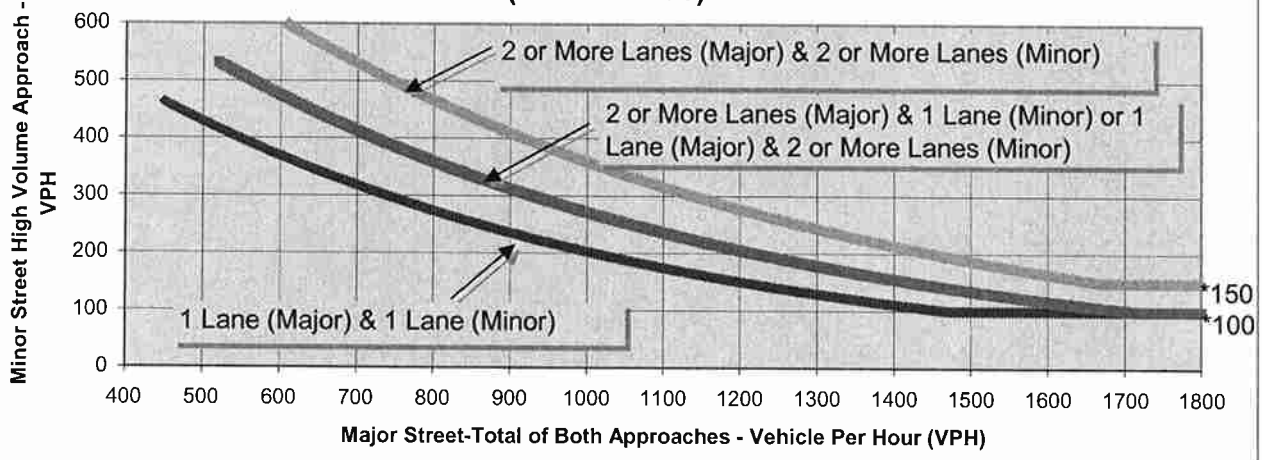
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		176	47	

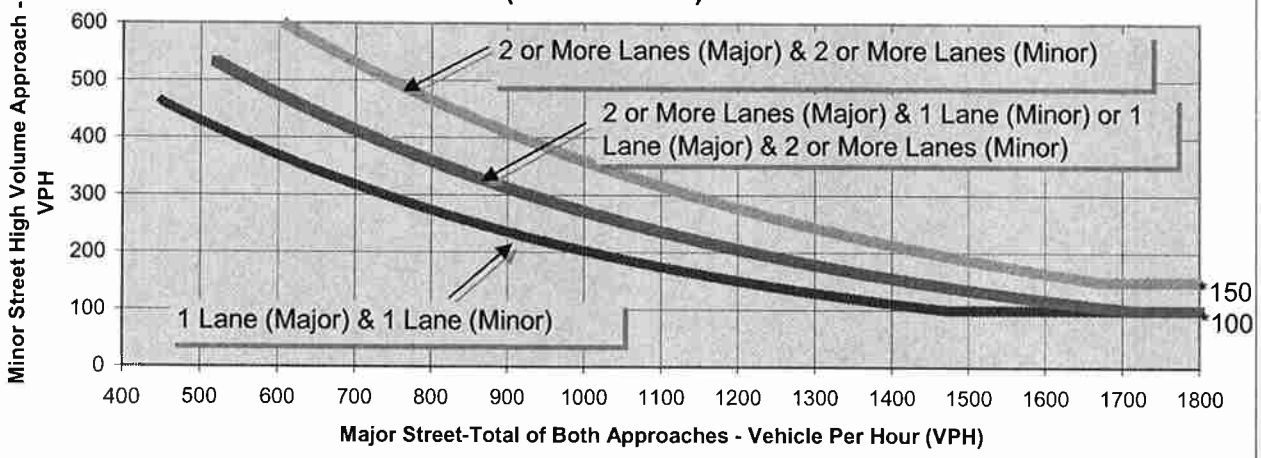
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
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Approved by		Date			Woodward Ave. & Bella Terra Dr.
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		202	95	

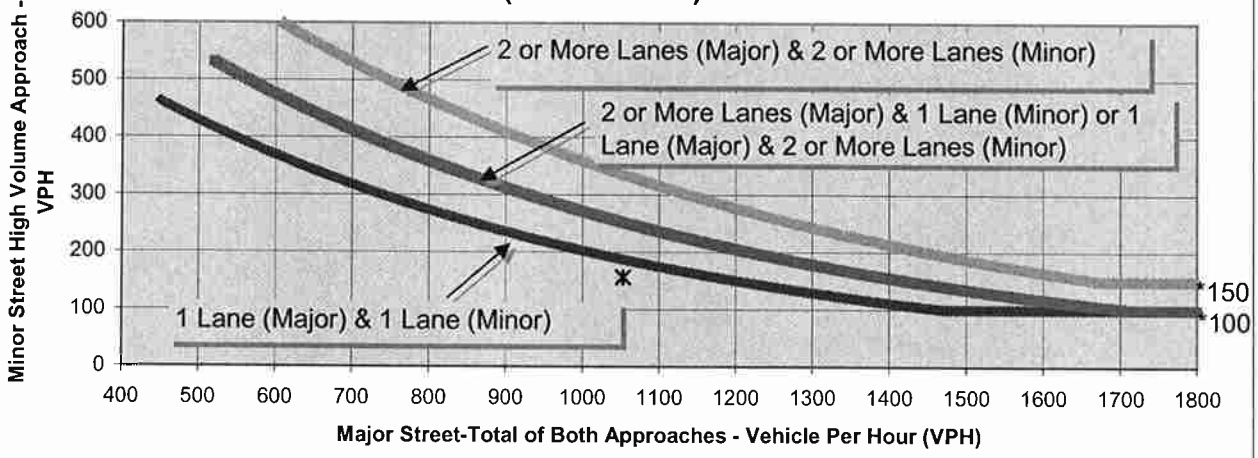
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Checked by		Date		Subject	Existing Plus Project - AM
Approved by		Date			Airport Wy. & Wawona St.
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1053	156	

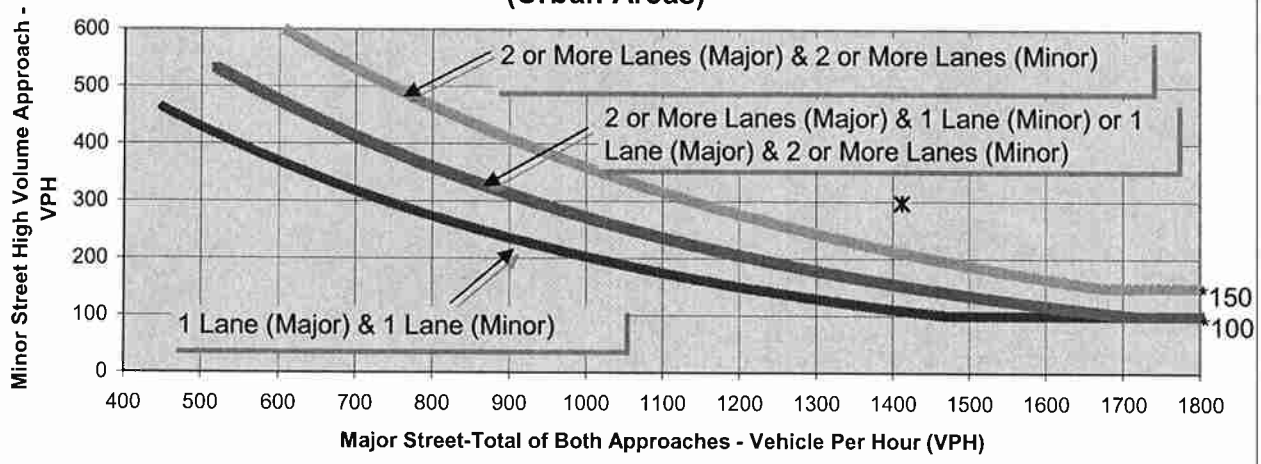
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Existing Plus Project - AM
Approved by		Date			Airport Wy. & SR 120 WB
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1412	297	

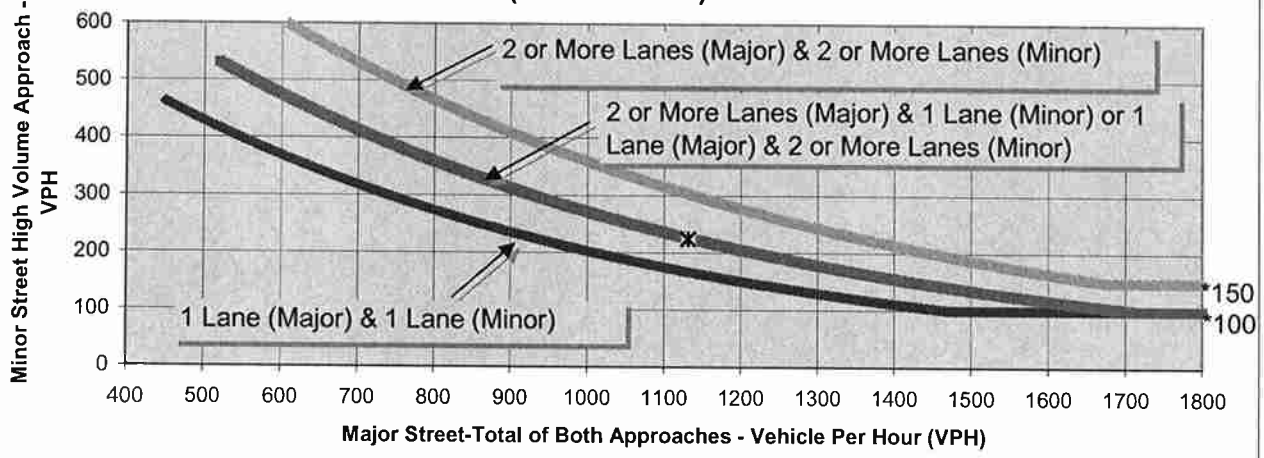
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Approved by		Date			Airport Wy. & SR 120 EB
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1131	224	

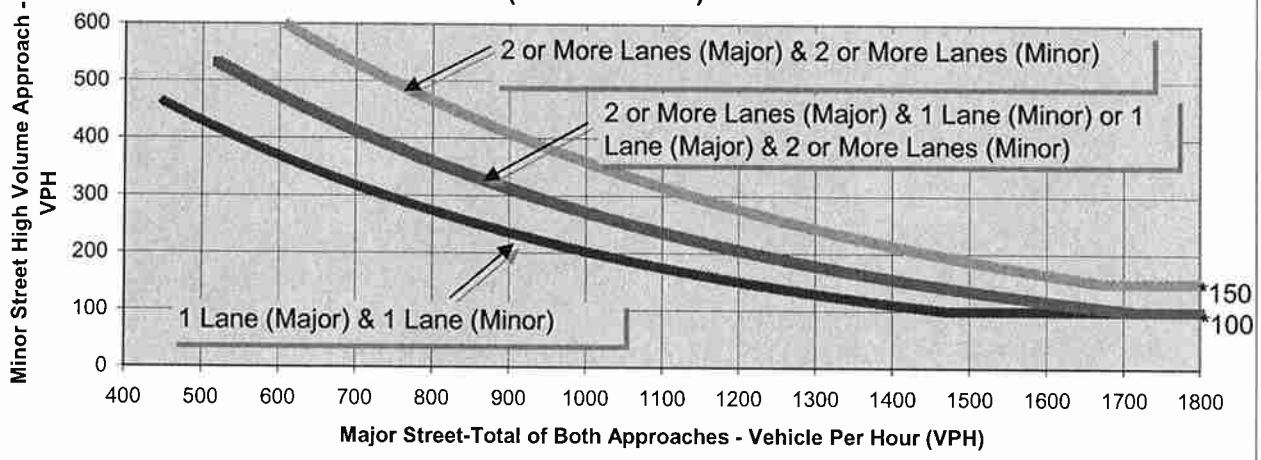
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		935	95	

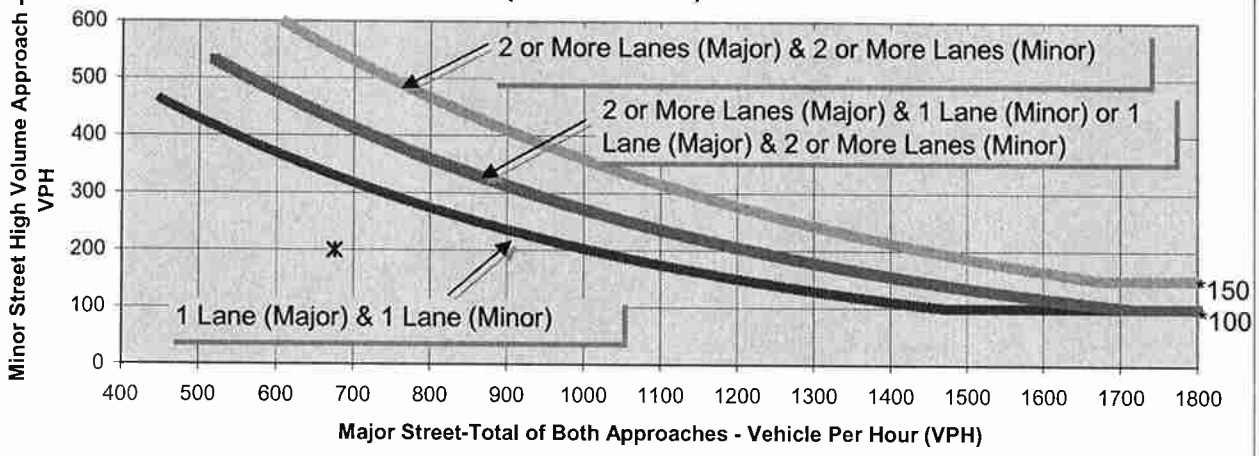
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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Approved by		Date			Airport Wy. & Woodward Ave.
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		676	199	

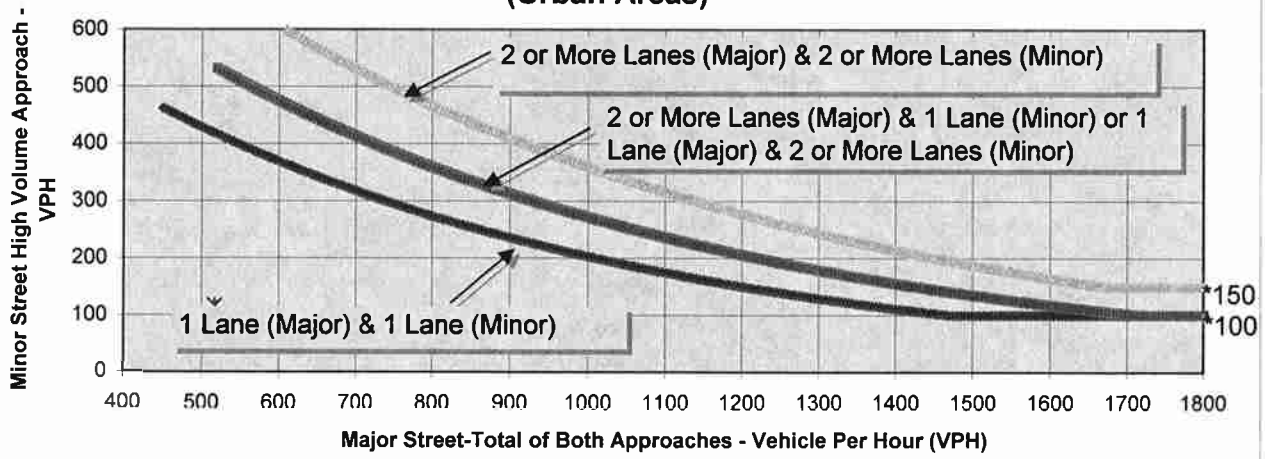
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - AM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Site Access	
Checked by		Date			
Approved by		Date	Sheet No	9 of 10	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		517	117	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

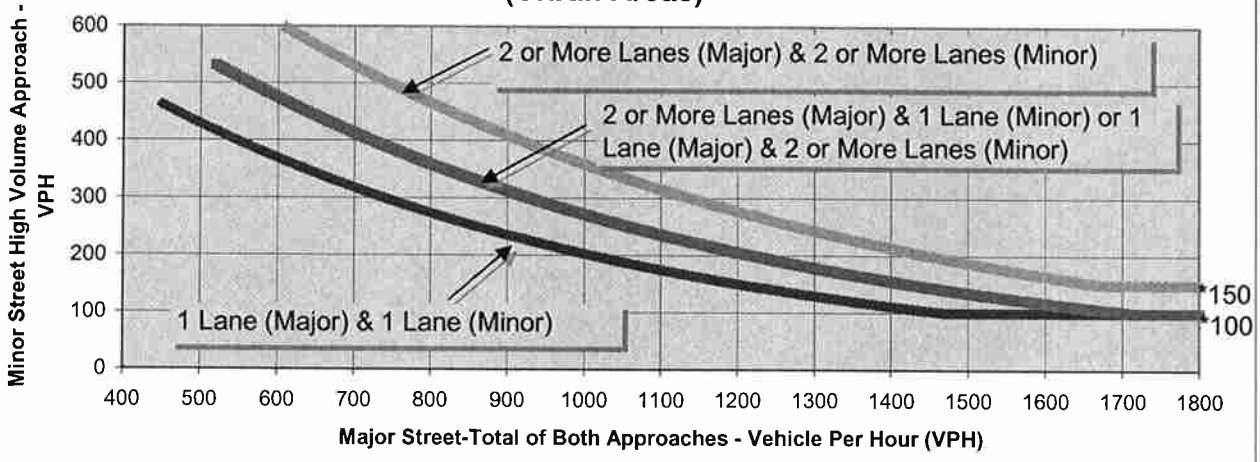
- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No SA07-0092 Page No 1
Subject Existing Plus Project - AM
Airport Wy. & Peach Ave.

Computed by Fehr & Peers Date 3/21/2007
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Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		371	110	

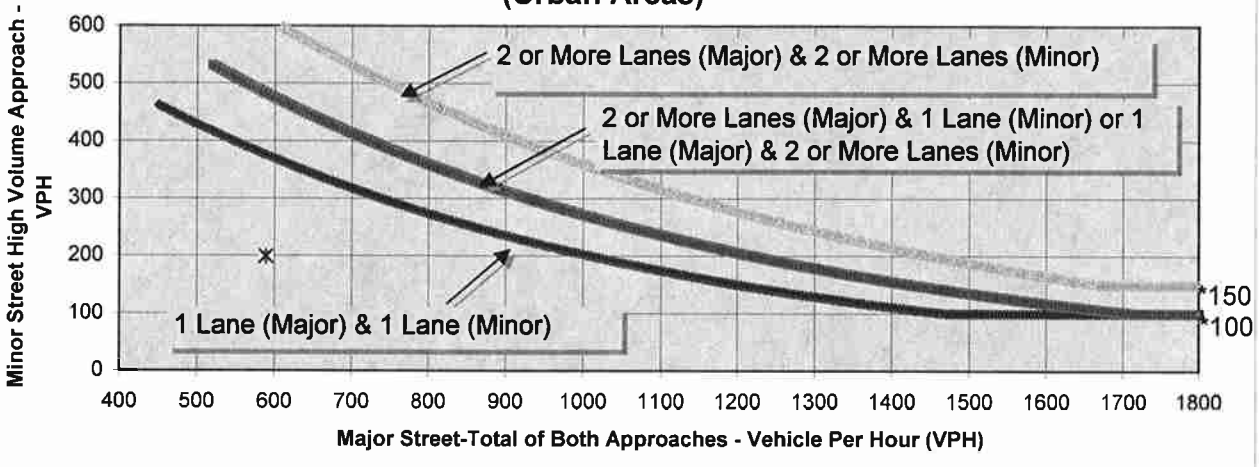
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

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			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Yosemite Ave. & McKinley Ave.	
Checked by		Date			
Approved by		Date	Sheet No	1 of 10	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		589	199	

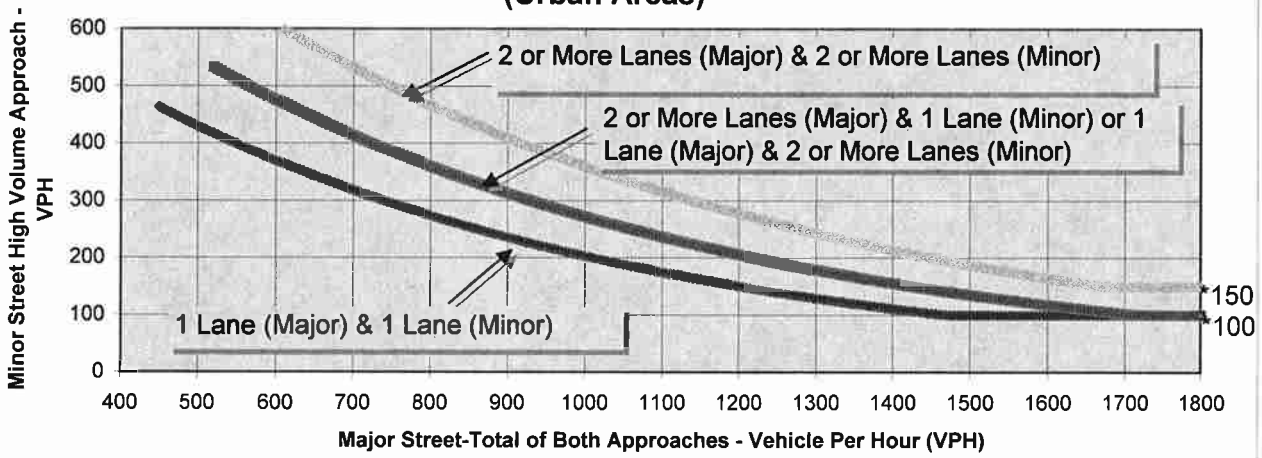
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Woodward Ave. & McKinley Ave.	
Checked by		Date			
Approved by		Date	Sheet No	2 of 10	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		169	67	

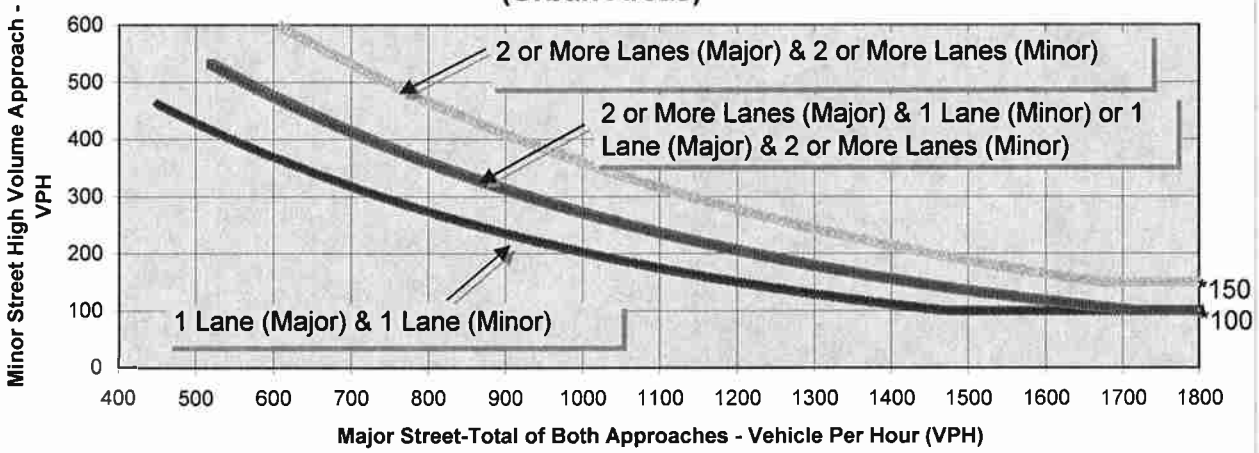
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Existing Plus Project - PM
Approved by		Date			Woodward Ave. & Bella Terra Dr.
				Sheet No	3 of 10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		312	63	

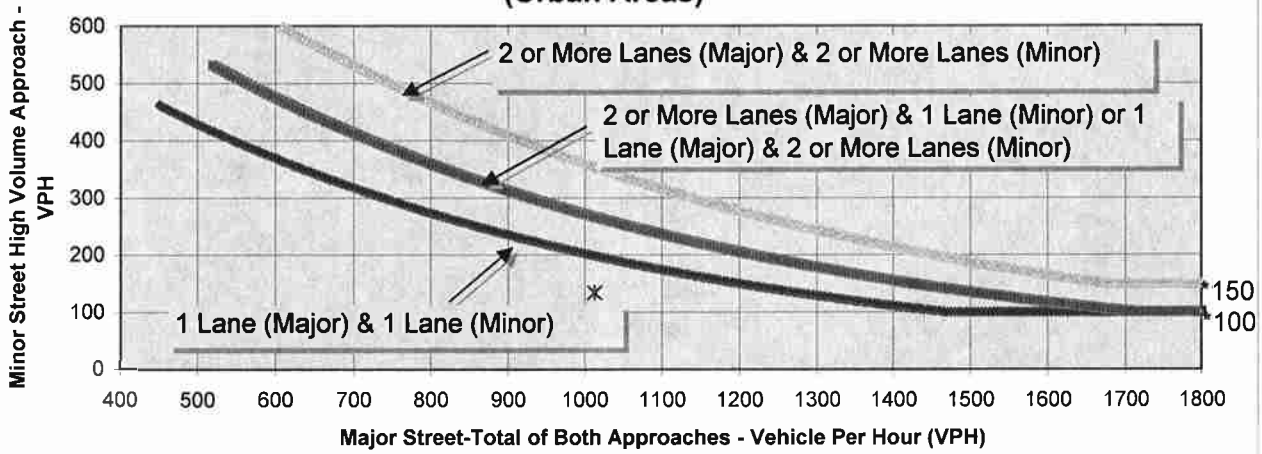
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Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Wawona St.	
Checked by		Date			
Approved by		Date	Sheet No	4 of	10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1013	134	

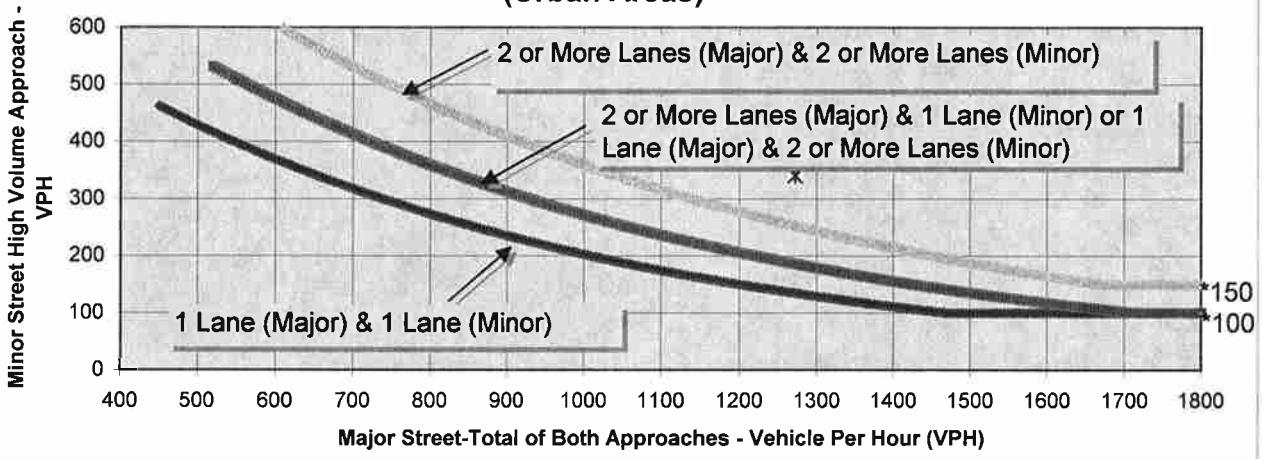
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- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & SR 120 WB	
Checked by		Date			
Approved by		Date	Sheet No	5 of	10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



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Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1272	340	

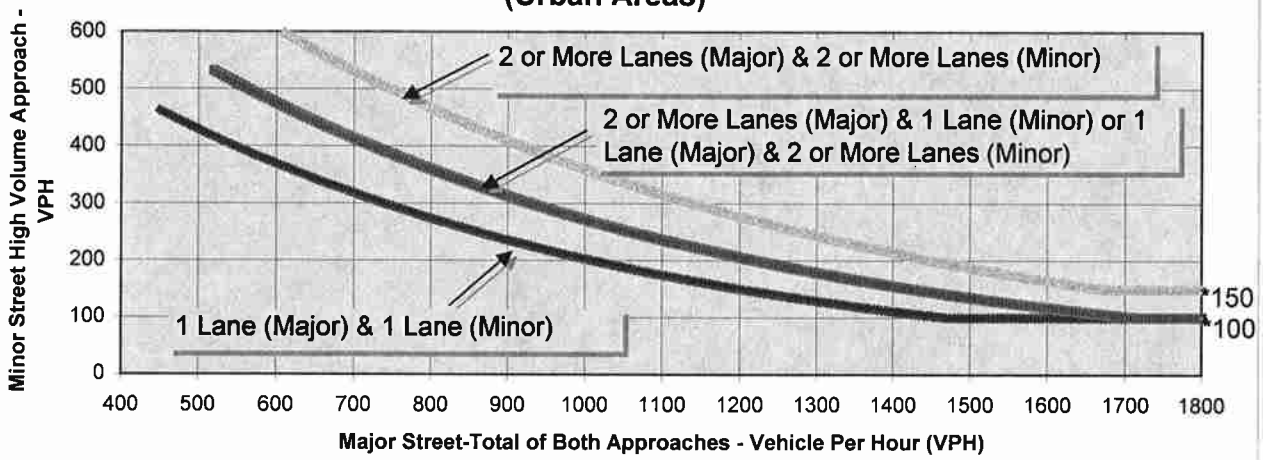
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Existing Plus Project - PM
Approved by		Date			Airport Wy. & SR 120 EB
				Sheet No	6 of 10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	YES
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1177	658	

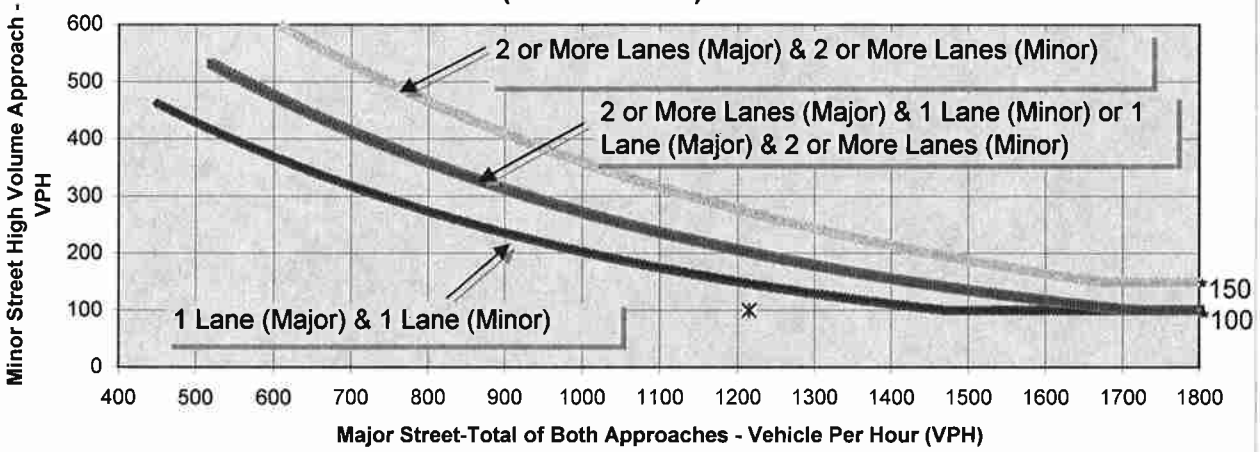
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Atherton Rd.	
Checked by		Date			
Approved by		Date	Sheet No	7 of	10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1215	100	

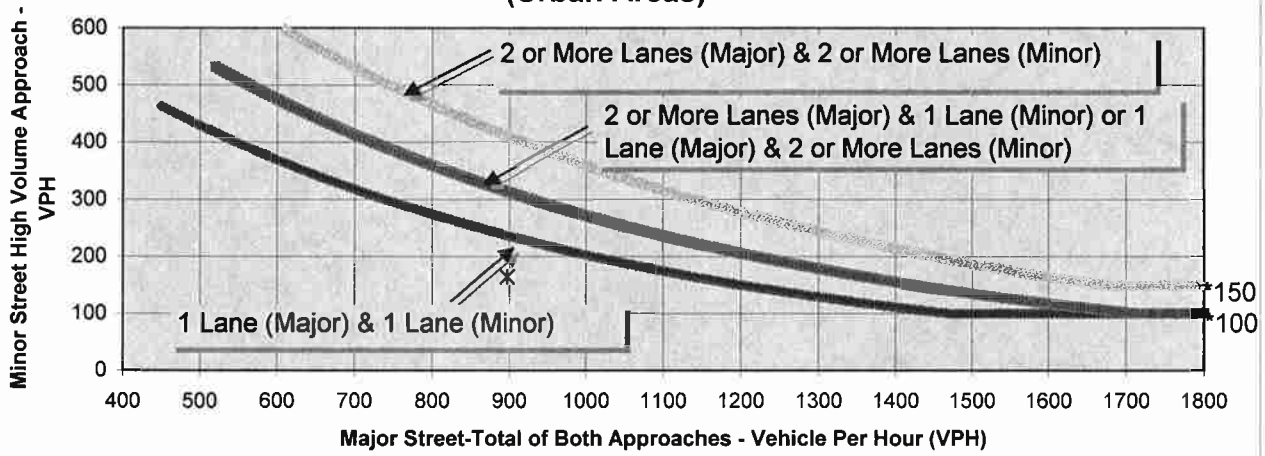
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Woodward Ave.	
Checked by		Date			
Approved by		Date	Sheet No	8 of 10	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		897	164	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

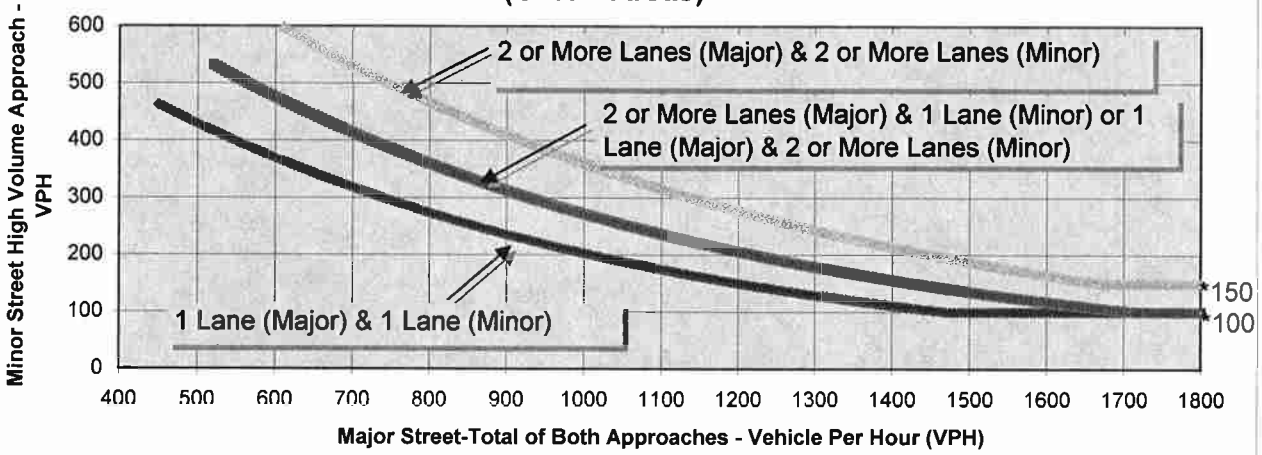
- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No SA07-0092 Page No 1
Subject Existing Plus Project - PM
Airport Wy. & Site Access

Computed by Fehr & Peers Date 3/21/2007
Checked by Date
Approved by Date Sheet No 9 of 10

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		625	78	

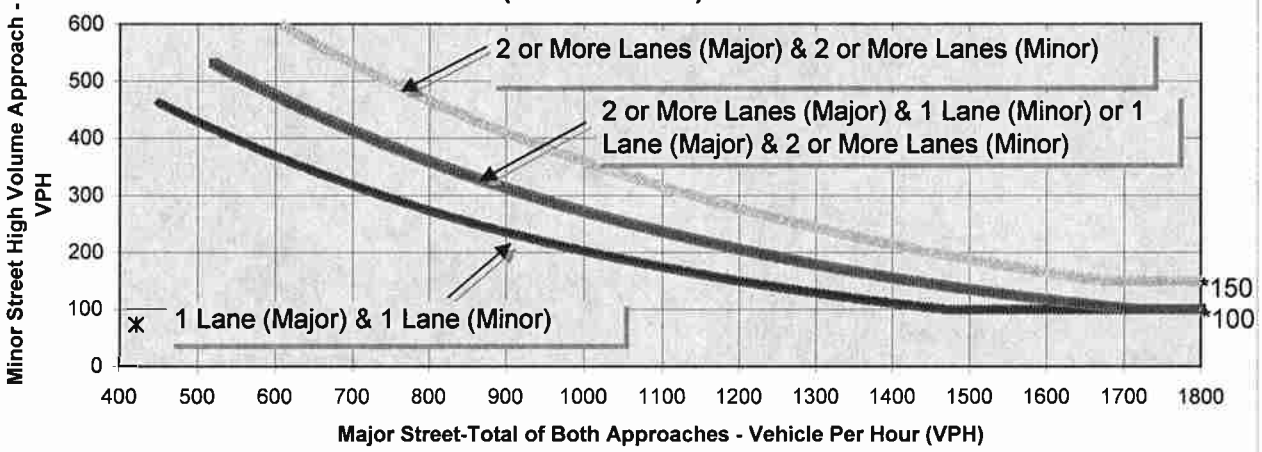
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

			Project No	SA07-0092	Page No 1
			Subject	Existing Plus Project - PM	
Computed by	Fehr & Peers	Date 3/21/2007		Airport Wy. & Peach Ave.	
Checked by		Date			
Approved by		Date	Sheet No	10 of 10	

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		422	73	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☑ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☐ Cumulative Plus Project Conditions

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	1944	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	540	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1134	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1134	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	19.6	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2022	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	562	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1180	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1180	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	20.3	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3322	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	923	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1938	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1938	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.1	mi/h
Number of lanes, N	2	
Density, D	33.9	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3732	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1037	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2177	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2177	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	53.4	mi/h
Number of lanes, N	2	
Density, D	40.7	pc/mi/ln

Level of service, LOS E

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3583	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	995	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2090	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2090	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	55.2	mi/h
Number of lanes, N	2	
Density, D	37.9	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3245	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	901	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1893	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1893	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.4	mi/h
Number of lanes, N	2	
Density, D	33.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	2330	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	647	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1359	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1359	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	23.4	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	3/21/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2308	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	641	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1346	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1346	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	23.2	pc/mi/ln

Level of service, LOS C

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1944	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	224	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	302	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1944		224		302		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	540		62		84		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	2268		251		339		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2268 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2268	4700	No
$v_{FO} = v_F - v_R$	2017	4700	No
v_R	251	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?	No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2	No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2268	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 19.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.451

Space mean speed in ramp influence area, S_R = 54.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1720	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	302	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	224	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1720	302	224	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	478	84	62	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2007	339	251	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2007 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2346	4700	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2007	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.327

Space mean speed in ramp influence area, S_R = 57.5 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 57.5 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3322	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	297	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	707	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	3322		297		707		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	923		83		196		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, E_T	1.5		1.5		1.5		
Recreational vehicle PCE, E_R	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3876		333		793		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 3876 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3876	4700	No
$v_{FO} = v - v_F - v_R$	3543	4700	No
v_R	333	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3876	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 33.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.458

Space mean speed in ramp influence area, S_R = 54.5 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.5 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3025	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	707	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	297	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3025	707	297	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	840	196	83	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3529	793	333	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3529 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		4322	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3529	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 35.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable,	M_S = 0.580	
Space mean speed in ramp influence area,	S_R = 51.7	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 51.7	mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3583	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	320	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3583	658	320	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	995	183	89	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4180	738	359	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4180 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4180	4700	No
$v_{FO} = v_F - v_R$	3442	4700	No
v_R	738	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4180	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 35.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, D_S = 0.494

Space mean speed in ramp influence area, S_R = 53.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 53.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2925	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	320	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	658	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2925	320	658	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	813	89	183	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	

Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3413	359	738	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3413 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		3772	4700	No
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3413	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 31.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.456

Space mean speed in ramp influence area, S_R = 54.5 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.5 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2330	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	340	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	318	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2330		340		318		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	647		94		88		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, E_T	1.5		1.5		1.5		
Recreational vehicle PCE, E_R	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	2718		382		357		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2718 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		2718	4700	No
$v_{FO} = v_F - v_R$		2336	4700	No
v_R		382	2000	No
$v_{3 \text{ or } av34}$	$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is	$v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is	$v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2718	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 23.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.462

Space mean speed in ramp influence area, S_R = 54.4 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 54.4 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	3/21/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	E+P Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1990	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	318	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	340	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1990	318	340	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	553	88	94	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2322	357	382	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2322 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2679	4700	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2322	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.343	
Space mean speed in ramp influence area,	S_R = 57.1	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 57.1	mph

Cumulative Plus Project Conditions Analysis:

Intersection LOS
Peak Hour Signal Warrants
Freeway LOS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	100	181	400	160	270	243	153	110	210	211	20
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)	22	109	197	435	174	293	264	166	120	228	229	22

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	22	305	435	467	550	479
Volume Left (vph)	22	0	435	0	264	228
Volume Right (vph)	0	197	0	293	120	22
Hadj (s)	0.53	-0.42	0.53	-0.41	0.00	0.10
Departure Headway (s)	10.2	9.2	9.7	8.8	9.0	9.1
Degree Utilization, x	0.06	0.78	1.17	1.14	1.37	1.21
Capacity (veh/h)	348	384	376	413	410	401
Control Delay (s)	12.7	37.5	132.2	116.5	208.2	144.2
Approach Delay (s)	35.9		124.1		208.2	144.2
Approach LOS	E		F		F	F

Intersection Summary			
Delay	136.1		
HCM Level of Service	F		
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1836		1770	1823		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1836		1770	1823		1770	1863	1583	1770	1863	1583
Volume (vph)	105	123	13	250	639	106	18	30	30	62	130	335
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)	114	134	14	272	695	115	20	33	33	67	141	364
RTOR Reduction (vph)	0	4	0	0	7	0	0	0	28	0	0	287
Lane Group Flow (vph)	114	144	0	272	803	0	20	33	5	67	141	77
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	4.9	27.6		12.7	35.4		1.9	11.8	11.8	4.2	14.1	14.1
Effective Green, g (s)	4.9	27.6		12.7	35.4		1.9	11.8	11.8	4.2	14.1	14.1
Actuated g/C Ratio	0.07	0.38		0.18	0.49		0.03	0.16	0.16	0.06	0.20	0.20
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)	120	701		311	893		47	304	258	103	363	309
v/s Ratio Prot	0.06	0.08		c0.15	c0.44		0.01	0.02		c0.04	c0.08	
v/s Ratio Perm									0.00			0.05
v/c Ratio	0.95	0.21		0.87	0.90		0.43	0.11	0.02	0.65	0.39	0.25
Uniform Delay, d1	33.6	15.0		29.0	16.8		34.7	25.8	25.4	33.3	25.3	24.6
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	66.4	0.1		22.8	11.8		6.1	0.2	0.0	13.8	0.7	0.4
Delay (s)	100.0	15.1		51.8	28.6		40.8	25.9	25.4	47.1	26.0	25.1
Level of Service	F	B		D	C		D	C	C	D	C	C
Approach Delay (s)		52.0			34.5			29.2			27.9	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	72.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

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)	20	190	5	28	860	20	15	0	83	160	0	120
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)	22	207	5	30	935	22	16	0	90	174	0	130
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	957			212			1379	1270	209	1347	1262	946
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	957			212			1379	1270	209	1347	1262	946
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			76	100	89	0	100	59
cM capacity (veh/h)	719			1358			69	159	831	110	161	317

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	22	212	30	957	16	90	304
Volume Left	22	0	30	0	16	0	174
Volume Right	0	5	0	22	0	90	130
cSH	719	1700	1358	1700	69	831	153
Volume to Capacity	0.03	0.12	0.02	0.56	0.24	0.11	1.99
Queue Length 95th (ft)	2	0	2	0	21	9	594
Control Delay (s)	10.2	0.0	7.7	0.0	72.7	9.9	519.5
Lane LOS	B		A		F	A	F
Approach Delay (s)	0.9		0.2		19.5		519.5
Approach LOS					C		F

Intersection Summary			
Average Delay	98.5		
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	0.94		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3295		1770	3342		1770	1863	1583	1770	1817	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3295		1770	3342		1770	1863	1583	1770	1817	
Volume (vph)	50	200	170	171	170	100	180	367	193	90	712	140
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)	54	217	185	186	185	109	196	399	210	98	774	152
RTOR Reduction (vph)	0	155	0	0	83	0	0	0	130	0	9	0
Lane Group Flow (vph)	54	247	0	186	211	0	196	399	80	98	917	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.5	12.4		10.4	18.3		8.0	29.0	29.0	8.0	29.0	
Effective Green, g (s)	4.5	12.4		10.4	18.3		8.0	29.0	29.0	8.0	29.0	
Actuated g/C Ratio	0.06	0.16		0.14	0.24		0.11	0.38	0.38	0.11	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	105	539		243	807		187	713	606	187	695	
v/s Ratio Prot	0.03	c0.08		c0.11	0.06		c0.11	0.21		0.06	c0.50	
v/s Ratio Perm									0.05			
v/c Ratio	0.51	0.46		0.77	0.26		1.05	0.56	0.13	0.52	1.32	
Uniform Delay, d1	34.6	28.7		31.5	23.3		33.9	18.4	15.2	32.1	23.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.2	0.6		13.4	0.2		79.1	3.2	0.5	2.6	154.0	
Delay (s)	38.8	29.3		44.9	23.5		113.0	21.5	15.7	34.7	177.4	
Level of Service	D	C		D	C		F	C	B	C	F	
Approach Delay (s)		30.4			31.8			42.3			163.7	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM Average Control Delay	83.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	75.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	191	70	670	103	60	993
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	208	76	728	112	65	1079
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked	0.75	0.75			0.75	
vC, conflicting volume	1994	784			840	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2323	713			787	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	77			90	
cM capacity (veh/h)	28	325			625	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	284	840	1145
Volume Left	208	0	65
Volume Right	76	112	0
cSH	37	1700	625
Volume to Capacity	7.74	0.49	0.10
Queue Length 95th (ft)	Err	0	9
Control Delay (s)	Err	0.0	3.7
Lane LOS	F		A
Approach Delay (s)	Err	0.0	3.7
Approach LOS	F		

Intersection Summary			
Average Delay	1252.4		
Intersection Capacity Utilization	121.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	40	50	133	164	140	20	590	713	350	150	834	200
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)	43	54	145	178	152	22	641	775	380	163	907	217
RTOR Reduction (vph)	0	0	134	0	0	18	0	0	95	0	0	23
Lane Group Flow (vph)	43	54	11	178	152	4	641	775	285	163	907	194
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	5.9	11.0	11.0	21.0	26.1	26.1	42.0	85.8	85.8	16.2	60.0	60.0
Effective Green, g (s)	5.9	11.0	11.0	21.0	26.1	26.1	42.0	85.8	85.8	16.2	60.0	60.0
Actuated g/C Ratio	0.04	0.07	0.07	0.14	0.17	0.17	0.28	0.57	0.57	0.11	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	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	3.0
Lane Grp Cap (vph)	135	137	116	248	324	275	496	1066	905	191	745	633
v/s Ratio Prot	0.01	c0.03		c0.10	0.08		c0.36	0.42		0.09	c0.49	
v/s Ratio Perm			0.01			0.00			0.18			0.12
v/c Ratio	0.32	0.39	0.09	0.72	0.47	0.01	1.29	0.73	0.31	0.85	1.22	0.31
Uniform Delay, d1	70.1	66.3	64.8	61.7	55.7	51.3	54.0	23.5	16.8	65.7	45.0	30.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.08	0.87	0.81	1.00	1.00	1.00
Incremental Delay, d2	1.4	1.9	0.3	9.5	1.1	0.0	133.0	0.4	0.1	29.0	109.9	1.3
Delay (s)	71.5	68.2	65.2	71.2	56.8	51.3	191.1	21.0	13.7	94.7	154.9	32.0
Level of Service	E	E	E	E	E	D	F	C	B	F	F	C
Approach Delay (s)		67.0			63.7			80.2			126.6	
Approach LOS		E			E			F			F	

Intersection Summary			
HCM Average Control Delay	94.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.92		1.00	1.00			0.95	
Flt Protected					0.98		0.95	1.00			1.00	
Satd. Flow (prot)					1685		1770	1863			1765	
Flt Permitted					0.98		0.95	1.00			1.00	
Satd. Flow (perm)					1685		1770	1863			1765	
Volume (vph)	0	0	0	462	0	580	715	1073	0	0	691	440
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)	0	0	0	502	0	630	777	1166	0	0	751	478
RTOR Reduction (vph)	0	0	0	0	30	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	0	0	0	1102	0	777	1166	0	0	1214	0
Turn Type				Perm			Prot					
Protected Phases					8		5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					52.0		28.0	90.0			58.0	
Effective Green, g (s)					52.0		28.0	90.0			58.0	
Actuated g/C Ratio					0.35		0.19	0.60			0.39	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					584		330	1118			682	
v/s Ratio Prot							c0.44	0.63			c0.69	
v/s Ratio Perm					0.65							
v/c Ratio					1.89		2.35	1.04			1.78	
Uniform Delay, d1					49.0		61.0	30.0			46.0	
Progression Factor					1.00		0.40	0.58			0.48	
Incremental Delay, d2					405.6		610.4	22.4			351.3	
Delay (s)					454.6		634.7	39.7			373.2	
Level of Service					F		F	D			F	
Approach Delay (s)		0.0			454.6			277.6			373.2	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	351.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	174.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		1.00						1.00		1.00	1.00	
Frt		0.94						0.98		1.00	1.00	
Flt Protected		0.97						1.00		0.95	1.00	
Satd. Flow (prot)		1699						1817		1770	1863	
Flt Permitted		0.97						1.00		0.95	1.00	
Satd. Flow (perm)		1699						1817		1770	1863	
Volume (vph)	540	0	489	0	0	0	0	1248	277	200	953	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	532	0	0	0	0	1357	301	217	1036	0
RTOR Reduction (vph)	0	22	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	1097	0	0	0	0	0	1653	0	217	1036	0
Turn Type	Perm									Prot		
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)		56.0						70.0		12.0	86.0	
Effective Green, g (s)		56.0						70.0		12.0	86.0	
Actuated g/C Ratio		0.37						0.47		0.08	0.57	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		634						848		142	1068	
v/s Ratio Prot								c0.91		c0.12	0.56	
v/s Ratio Perm		0.65										
v/c Ratio		1.73						1.95		1.53	0.97	
Uniform Delay, d1		47.0						40.0		69.0	30.8	
Progression Factor		1.00						1.00		1.25	0.70	
Incremental Delay, d2		335.3						431.3		240.9	3.8	
Delay (s)		382.3						471.3		327.5	25.5	
Level of Service		F						F		F	C	
Approach Delay (s)		382.3			0.0			471.3			77.8	
Approach LOS		F			A			F			E	

Intersection Summary			
HCM Average Control Delay	324.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	174.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	450	60	10	71	50	410	10	665	43	460	882	100
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)	489	65	11	77	54	446	11	723	47	500	959	109
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											720	
pX, platoon unblocked	0.53	0.53	0.53	0.53	0.53		0.53					
vC, conflicting volume	3176	2750	959	2747	2812	723	1067			770		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5105	4301	922	4295	4418	723	1127			770		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	91	0	0	0	97			41		
cM capacity (veh/h)	0	0	174	0	0	426	329			845		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	489	65	11	77	54	446	11	723	47	500	959	109
Volume Left	489	0	0	77	0	0	11	0	0	500	0	0
Volume Right	0	0	11	0	0	446	0	0	47	0	0	109
cSH	0	0	174	0	0	426	329	1700	1700	845	1700	1700
Volume to Capacity	Err	173.60	0.06	Err	174.21	1.05	0.03	0.43	0.03	0.59	0.56	0.06
Queue Length 95th (ft)	Err	Err	5	Err	Err	355	3	0	0	100	0	0
Control Delay (s)	Err	Err	27.1	Err	Err	87.5	16.3	0.0	0.0	15.2	0.0	0.0
Lane LOS	F	F	D	F	F	F	C			C		
Approach Delay (s)	Err			Err			0.2			4.9		
Approach LOS	F			F								

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	213	170	50	25	110	70	100	435	76	20	245	698
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)	232	185	54	27	120	76	109	473	83	22	266	759

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	471	223	664	1047
Volume Left (vph)	232	27	109	22
Volume Right (vph)	54	76	83	759
Hadj (s)	0.06	-0.15	-0.01	-0.40
Departure Headway (s)	8.6	9.4	8.5	8.1
Degree Utilization, x	1.12	0.58	1.56	2.35
Capacity (veh/h)	433	372	428	454
Control Delay (s)	108.9	24.8	287.3	634.0
Approach Delay (s)	108.9	24.8	287.3	634.0
Approach LOS	F	C	F	F

Intersection Summary			
Delay	379.0		
HCM Level of Service	F		
Intersection Capacity Utilization	129.4%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	116	0	0	495	282	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	0	0	538	307	41
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	845	307	348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	845	307	348			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	100	100			
cM capacity (veh/h)	333	733	1211			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1	SB 2
Volume Total	126	0	538	307	41
Volume Left	126	0	0	0	0
Volume Right	0	0	0	0	41
cSH	333	1700	1211	1700	1700
Volume to Capacity	0.38	0.00	0.00	0.18	0.02
Queue Length 95th (ft)	43	0	0	0	0
Control Delay (s)	22.2	0.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	22.2		0.0	0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	105	13	13	10	11	30	11	360	10	40	200	42
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)	114	14	14	11	12	33	12	391	11	43	217	46
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	781	753	240	746	771	397	263			402		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	781	753	240	746	771	397	263			402		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	59	96	98	96	96	95	99			96		
cM capacity (veh/h)	278	323	799	302	315	653	1301			1156		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	114	28	11	45	12	402	43	263
Volume Left	114	0	11	0	12	0	43	0
Volume Right	0	14	0	33	0	11	0	46
cSH	278	460	302	507	1301	1700	1156	1700
Volume to Capacity	0.41	0.06	0.04	0.09	0.01	0.24	0.04	0.15
Queue Length 95th (ft)	48	5	3	7	1	0	3	0
Control Delay (s)	26.7	13.3	17.4	12.8	7.8	0.0	8.2	0.0
Lane LOS	D	B	C	B	A		A	
Approach Delay (s)	24.0		13.7		0.2		1.2	
Approach LOS	C		B					

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	70	310	254	270	190	190	282	422	450	250	324	90
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)	76	337	276	293	207	207	307	459	489	272	352	98

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	76	613	293	413	1254	722
Volume Left (vph)	76	0	293	0	307	272
Volume Right (vph)	0	276	0	207	489	98
Hadj (s)	0.53	-0.28	0.53	-0.32	-0.15	0.03
Departure Headway (s)	10.2	9.3	10.2	9.3	9.3	9.5
Degree Utilization, x	0.21	1.59	0.83	1.07	3.24	1.90
Capacity (veh/h)	350	389	351	393	390	385
Control Delay (s)	14.7	300.7	46.0	95.3	1035.2	437.3
Approach Delay (s)	269.1		74.8		1035.2	437.3
Approach LOS	F		F		F	F

Intersection Summary			
Delay	549.4		
HCM Level of Service	F		
Intersection Capacity Utilization	132.0%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1855		1770	1779		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1855		1770	1779		1770	1863	1583	1770	1863	1583
Volume (vph)	450	669	19	150	336	144	15	190	290	207	60	160
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)	489	727	21	163	365	157	16	207	315	225	65	174
RTOR Reduction (vph)	0	1	0	0	15	0	0	0	235	0	0	127
Lane Group Flow (vph)	489	747	0	163	507	0	16	207	80	225	65	47
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	27.0	44.0		10.0	27.0		2.3	17.4	17.4	12.0	27.1	27.1
Effective Green, g (s)	27.0	44.0		10.0	27.0		2.3	17.4	17.4	12.0	27.1	27.1
Actuated g/C Ratio	0.27	0.44		0.10	0.27		0.02	0.18	0.18	0.12	0.27	0.27
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)	481	821		178	483		41	326	277	214	508	432
v/s Ratio Prot	c0.28	0.40		0.09	c0.28		0.01	c0.11		c0.13	0.03	
v/s Ratio Perm									0.05			0.03
v/c Ratio	1.02	0.91		0.92	1.05		0.39	0.63	0.29	1.05	0.13	0.11
Uniform Delay, d1	36.2	25.8		44.3	36.2		47.9	38.1	35.6	43.7	27.2	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	45.3	13.8		43.7	54.4		6.0	4.0	0.6	75.7	0.1	0.1
Delay (s)	81.5	39.7		88.0	90.6		53.9	42.1	36.2	119.4	27.4	27.2
Level of Service	F	D		F	F		D	D	D	F	C	C
Approach Delay (s)		56.2			90.0			39.0			71.9	
Approach LOS		E			F			D			E	

Intersection Summary			
HCM Average Control Delay	63.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	99.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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)	160	990	16	94	560	240	10	0	55	30	0	60
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)	174	1076	17	102	609	261	11	0	60	33	0	65
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	870			1093			2311	2507	1085	2427	2385	739
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	870			1093			2311	2507	1085	2427	2385	739
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 %	78			84			34	100	77	0	100	84
cM capacity (veh/h)	775			638			16	19	263	12	22	417

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	174	1093	102	870	11	60	98
Volume Left	174	0	102	0	11	0	33
Volume Right	0	17	0	261	0	60	65
cSH	775	1700	638	1700	16	263	35
Volume to Capacity	0.22	0.64	0.16	0.51	0.66	0.23	2.78
Queue Length 95th (ft)	21	0	14	0	43	21	278
Control Delay (s)	11.0	0.0	11.7	0.0	414.1	22.6	1046.3
Lane LOS	B		B		F	C	F
Approach Delay (s)	1.5		1.2		82.9		1046.3
Approach LOS					F		F

Intersection Summary			
Average Delay	46.2		
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.94		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3331		1770	1863	1583	1770	1803	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3331		1770	1863	1583	1770	1803	
Volume (vph)	230	630	120	124	280	180	110	715	292	200	557	150
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)	250	685	130	135	304	196	120	777	317	217	605	163
RTOR Reduction (vph)	0	19	0	0	135	0	0	0	122	0	12	0
Lane Group Flow (vph)	250	796	0	135	365	0	120	777	195	217	756	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	8.1	17.8		8.1	17.8		6.1	22.2	22.2	13.2	29.3	
Effective Green, g (s)	8.1	17.8		8.1	17.8		6.1	22.2	22.2	13.2	29.3	
Actuated g/C Ratio	0.10	0.23		0.10	0.23		0.08	0.29	0.29	0.17	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	185	796		185	767		140	535	455	302	683	
v/s Ratio Prot	c0.14	c0.23		0.08	0.11		0.07	c0.42		c0.12	c0.42	
v/s Ratio Perm									0.12			
v/c Ratio	1.35	1.00		0.73	0.48		0.86	1.45	0.43	0.72	1.11	
Uniform Delay, d1	34.6	29.7		33.5	25.7		35.2	27.5	22.4	30.3	24.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	189.4	31.6		13.4	0.5		37.2	213.8	2.9	7.9	67.6	
Delay (s)	224.0	61.3		47.0	26.2		72.3	241.4	25.3	38.2	91.6	
Level of Service	F	E		D	C		E	F	C	D	F	
Approach Delay (s)		99.5			30.6			168.3			79.9	
Approach LOS		F			C			F			E	

Intersection Summary			
HCM Average Control Delay	104.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	77.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	94	50	1067	262	90	711
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	102	54	1160	285	98	773
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)			1313			
pX, platoon unblocked						
vC, conflicting volume	2271	1302			1445	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2271	1302			1445	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	72			79	
cM capacity (veh/h)	35	196			469	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	157	1445	871
Volume Left	102	0	98
Volume Right	54	285	0
cSH	49	1700	469
Volume to Capacity	3.18	0.85	0.21
Queue Length 95th (ft)	Err	0	19
Control Delay (s)	Err	0.0	6.6
Lane LOS	F		A
Approach Delay (s)	Err	0.0	6.6
Approach LOS	F		

Intersection Summary			
Average Delay	635.5		
Intersection Capacity Utilization	127.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	450	250	711	451	130	300	606	579	196	30	565	210
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)	489	272	773	490	141	326	659	629	213	33	614	228
RTOR Reduction (vph)	0	0	328	0	0	186	0	0	66	0	0	36
Lane Group Flow (vph)	489	272	445	490	141	140	659	629	147	33	614	192
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	37.3	28.0	28.0	28.0	18.7	18.7	38.0	72.4	72.4	5.6	40.0	40.0
Effective Green, g (s)	37.3	28.0	28.0	28.0	18.7	18.7	38.0	72.4	72.4	5.6	40.0	40.0
Actuated g/C Ratio	0.25	0.19	0.19	0.19	0.12	0.12	0.25	0.48	0.48	0.04	0.27	0.27
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	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	3.0
Lane Grp Cap (vph)	854	348	295	330	232	197	448	899	764	66	497	422
v/s Ratio Prot	0.14	0.15		c0.28	0.08		c0.37	0.34		0.02	c0.33	
v/s Ratio Perm			c0.28			0.09			0.09			0.12
v/c Ratio	0.57	0.78	1.51	1.48	0.61	0.71	1.47	0.70	0.19	0.50	1.24	0.46
Uniform Delay, d1	49.4	58.1	61.0	61.0	62.2	63.1	56.0	30.3	22.1	70.8	55.0	45.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.94	0.81	1.00	1.00	1.00
Incremental Delay, d2	0.9	10.9	246.0	233.8	4.5	11.5	213.1	0.4	0.1	5.8	122.4	3.5
Delay (s)	50.3	69.0	307.0	294.8	66.6	74.6	265.2	29.0	18.1	76.7	177.4	49.4
Level of Service	D	E	F	F	E	E	F	C	B	E	F	D
Approach Delay (s)		183.0			186.2			131.1			140.2	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	159.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.41		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	114.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					1.00		1.00	1.00			1.00	
Frt					0.93		1.00	1.00			0.95	
Flt Protected					0.97		0.95	1.00			1.00	
Satd. Flow (prot)					1697		1770	1863			1761	
Flt Permitted					0.97		0.95	1.00			1.00	
Satd. Flow (perm)					1697		1770	1863			1761	
Volume (vph)	0	0	0	310	0	290	627	1091	0	0	1027	700
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)	0	0	0	337	0	315	682	1186	0	0	1116	761
RTOR Reduction (vph)	0	0	0	0	23	0	0	0	0	0	16	0
Lane Group Flow (vph)	0	0	0	0	629	0	682	1186	0	0	1861	0
Turn Type				Perm			Prot					
Protected Phases					8		5	2			6	
Permitted Phases				8								
Actuated Green, G (s)					28.0		26.0	114.0			84.0	
Effective Green, g (s)					28.0		26.0	114.0			84.0	
Actuated g/C Ratio					0.19		0.17	0.76			0.56	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					317		307	1416			986	
v/s Ratio Prot							c0.39	0.64			c1.06	
v/s Ratio Perm					0.37							
v/c Ratio					1.98		2.22	0.84			1.89	
Uniform Delay, d1					61.0		62.0	11.9			33.0	
Progression Factor					1.00		0.87	0.38			0.98	
Incremental Delay, d2					454.4		550.6	0.6			399.6	
Delay (s)					515.4		604.6	5.0			431.9	
Level of Service					F		F	A			F	
Approach Delay (s)		0.0			515.4			223.9			431.9	
Approach LOS		A			F			F			F	

Intersection Summary			
HCM Average Control Delay	355.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.97		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	210.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		1.00						1.00		1.00	1.00	
Frt		0.91						0.96		1.00	1.00	
Flt Protected		0.98						1.00		0.95	1.00	
Satd. Flow (prot)		1670						1788		1770	1863	
Flt Permitted		0.98						1.00		0.95	1.00	
Satd. Flow (perm)		1670						1788		1770	1863	
Volume (vph)	520	0	965	0	0	0	0	1198	505	330	1007	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	565	0	1049	0	0	0	0	1302	549	359	1095	0
RTOR Reduction (vph)	0	45	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	0	1569	0	0	0	0	0	1841	0	359	1095	0
Turn Type	Perm									Prot		
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)		57.0						66.0		15.0	85.0	
Effective Green, g (s)		57.0						66.0		15.0	85.0	
Actuated g/C Ratio		0.38						0.44		0.10	0.57	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		635						787		177	1056	
v/s Ratio Prot								c1.03		c0.20	0.59	
v/s Ratio Perm		0.94										
v/c Ratio		2.47						2.34		2.03	1.04	
Uniform Delay, d1		46.5						42.0		67.5	32.5	
Progression Factor		1.00						1.00		0.96	0.45	
Incremental Delay, d2		666.9						606.6		464.5	20.2	
Delay (s)		713.4						648.6		529.4	34.8	
Level of Service		F						F		F	C	
Approach Delay (s)		713.4			0.0			648.6			156.9	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	524.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.36		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	210.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	190	170	30	54	160	640	10	873	102	640	852	480
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)	207	185	33	59	174	696	11	949	111	696	926	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											720	
pX, platoon unblocked												
vC, conflicting volume	4071	3399	926	3413	3810	949	1448			1060		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4071	3399	926	3413	3810	949	1448			1060		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	90	0	0	0	98			0		
cM capacity (veh/h)	0	0	326	0	0	316	468			657		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	207	185	33	59	174	696	11	949	111	696	926	522
Volume Left	207	0	0	59	0	0	11	0	0	696	0	0
Volume Right	0	0	33	0	0	696	0	0	111	0	0	522
cSH	0	0	326	0	0	316	468	1700	1700	657	1700	1700
Volume to Capacity	Err	Err	0.10	Err	Err	2.20	0.02	0.56	0.07	1.06	0.54	0.31
Queue Length 95th (ft)	Err	Err	8	Err	Err	1311	2	0	0	468	0	0
Control Delay (s)	Err	Err	17.3	Err	Err	577.5	12.9	0.0	0.0	76.4	0.0	0.0
Lane LOS	F	F	C	F	F	F	B			F		
Approach Delay (s)	Err			Err			0.1			24.8		
Approach LOS	F			F								

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	113.7%	ICU Level of Service	H	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	655	290	130	118	340	40	130	290	81	70	442	424
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)	712	315	141	128	370	43	141	315	88	76	480	461

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	1168	541	545	1017
Volume Left (vph)	712	128	141	76
Volume Right (vph)	141	43	88	461
Hadj (s)	0.08	0.03	-0.01	-0.22
Departure Headway (s)	9.6	9.6	9.6	9.3
Degree Utilization, x	3.13	1.44	1.45	2.64
Capacity (veh/h)	386	385	387	395
Control Delay (s)	985.7	239.5	240.2	765.2
Approach Delay (s)	985.7	239.5	240.2	765.2
Approach LOS	F	F	F	F

Intersection Summary			
Delay	669.6		
HCM Level of Service	F		
Intersection Capacity Utilization	158.4%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	78	0	0	423	558	132
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	85	0	0	460	607	143
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	1066	607	750			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1066	607	750			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	100	100			
cM capacity (veh/h)	246	497	859			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1	SB 2
Volume Total	85	0	460	607	143
Volume Left	85	0	0	0	0
Volume Right	0	0	0	0	143
cSH	246	1700	859	1700	1700
Volume to Capacity	0.34	0.00	0.00	0.36	0.08
Queue Length 95th (ft)	37	0	0	0	0
Control Delay (s)	27.1	0.0	0.0	0.0	0.0
Lane LOS	D	A			
Approach Delay (s)	27.1		0.0	0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	73	12	12	90	14	60	14	290	70	90	350	118
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)	79	13	13	98	15	65	15	315	76	98	380	128
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	1059	1062	445	979	1088	353	509			391		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1059	1062	445	979	1088	353	509			391		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	50	94	98	50	92	91	99			92		
cM capacity (veh/h)	160	202	613	198	195	690	1056			1167		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	79	26	98	80	15	391	98	509
Volume Left	79	0	98	0	15	0	98	0
Volume Right	0	13	0	65	0	76	0	128
cSH	160	304	198	466	1056	1700	1167	1700
Volume to Capacity	0.50	0.09	0.50	0.17	0.01	0.23	0.08	0.30
Queue Length 95th (ft)	60	7	61	15	1	0	7	0
Control Delay (s)	48.0	18.0	39.9	14.3	8.5	0.0	8.4	0.0
Lane LOS	E	C	E	B	A		A	
Approach Delay (s)	40.6		28.3		0.3		1.3	
Approach LOS	E		D					

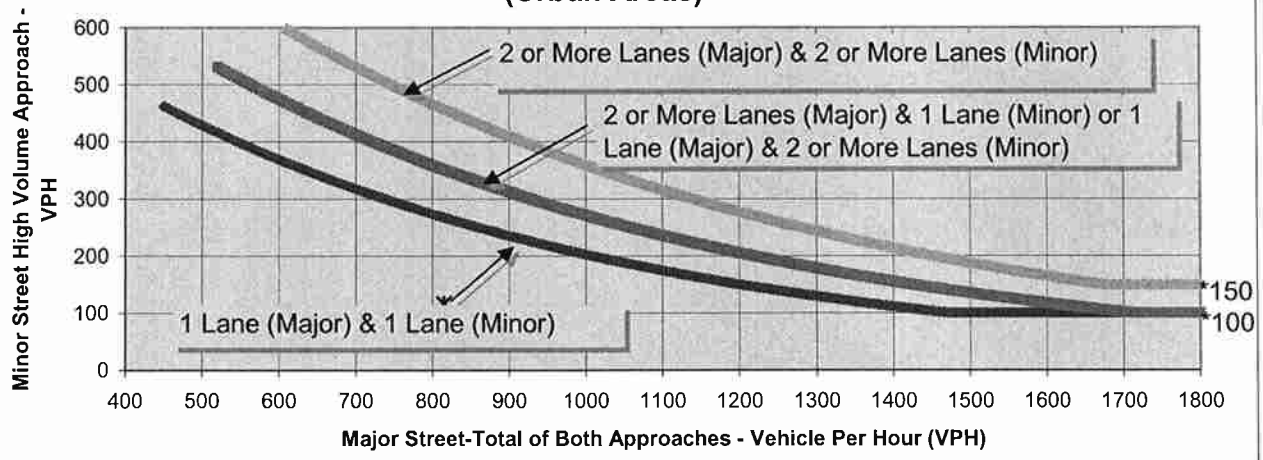
Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

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Subject Cumulative PP - AM
Airport Wy. & Site Access

Computed by Fehr & Peers Date 3/21/2007
Checked by Date
Approved by Date Sheet No 1 of 2

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		815	116	

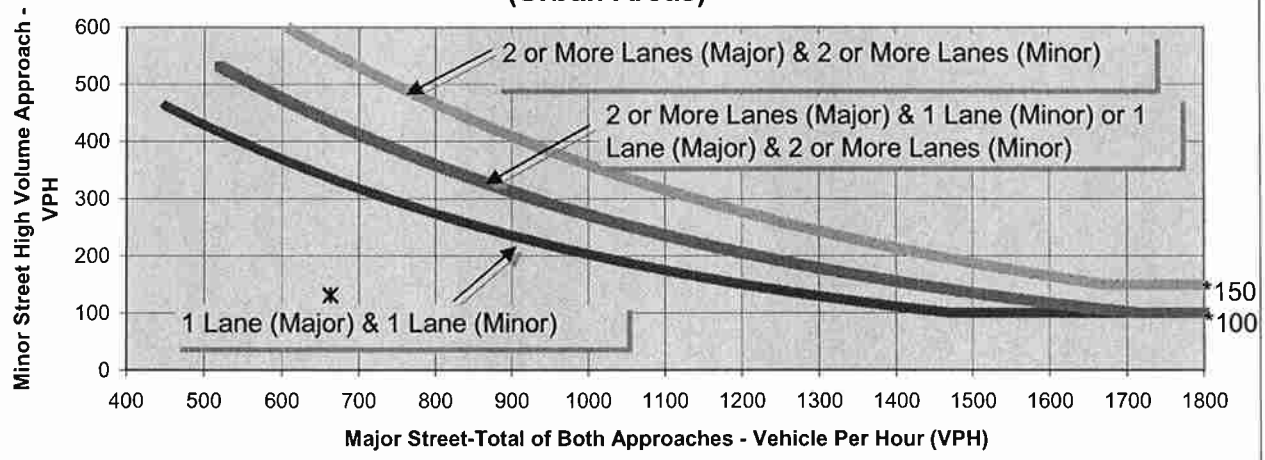
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☑ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Cumulative PP - AM
Approved by		Date			Airport Wy. & Peach Ave.
				Sheet No	2 of 2

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		663	131	

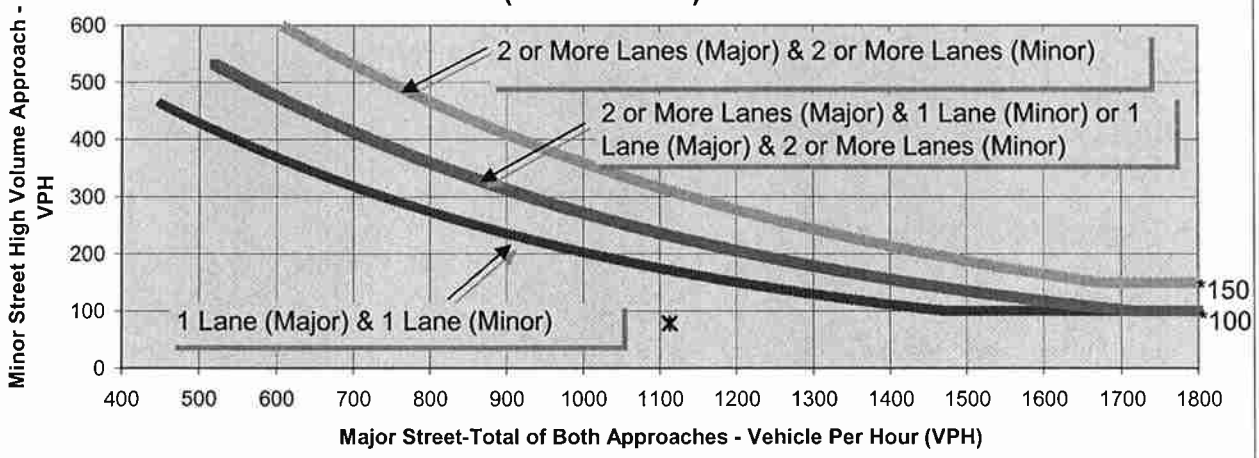
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☑ Cumulative Plus Project Conditions

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Project No	SA07-0092	Page No	1		
Subject	Cumulative PP - PM				
	Airport Wy. & Site Access				
Computed by	Fehr & Peers	Date	3/21/2007		
Checked by		Date			
Approved by		Date		Sheet No	1 of 2

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.
Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		1113	78	

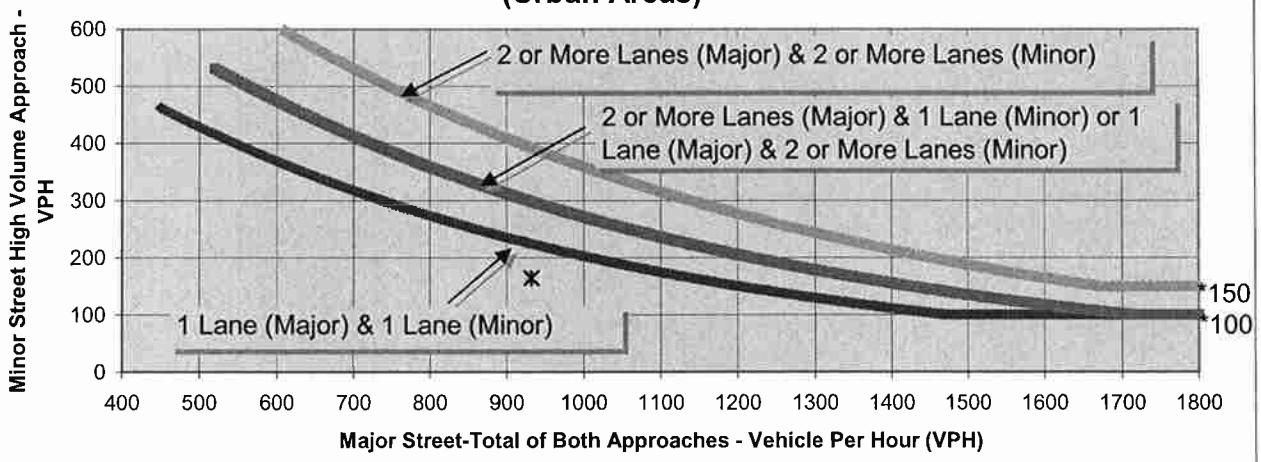
*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☑ Cumulative Plus Project Conditions

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TRANSPORTATION CONSULTANTS

Computed by	Fehr & Peers	Date	3/21/2007	Project No	SA07-0092 Page No 1
Checked by		Date		Subject	Cumulative PP - PM
Approved by		Date			Airport Wy. & Peach Ave.
				Sheet No	2 of 2

Figure 9-8
PEAK HOUR VOLUME WARRANT
(Urban Areas)



*Note: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Source: Traffic Manual, Caltrans 1996.

Name of Street		Major Street	Minor Street	Warrant Met
Number of Lanes	Two or More Lane (Y/N)	n	n	NO
	One Lane (Y/N)	y	y	
Traffic Volume (VPH) *		932	164	

*Note: Traffic Volume for Major Street is Total Volume of Both Approches.
Traffic Volume for Minor Street is the Volume of High Volume Approach.

- ☐ Existing Conditions
- ☐ Existing Plus Project Conditions
- ☐ Cumulative No Project Conditions
- ☑ Cumulative Plus Project Conditions

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3629	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1008	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2117	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2117	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	54.7	mi/h
Number of lanes, N	2	
Density, D	38.7	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3077	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	855	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1795	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1795	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	57.9	mi/h
Number of lanes, N	2	
Density, D	31.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6032	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1676	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3519	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3519	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	6145	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1707	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3585	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3585	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6165	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1713	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3596	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3596	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	5515	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1532	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	3217	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	3217	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	2	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone:
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Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	2920	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	811	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1703	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1703	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	58.0	mi/h
Number of lanes, N	2	
Density, D	29.4	pc/mi/ln

Level of service, LOS D

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3647	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1013	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2127	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	58.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2127	pc/h/ln
Free-flow speed, FFS	58.0	mi/h
Average passenger-car speed, S	54.5	mi/h
Number of lanes, N	2	
Density, D	39.0	pc/mi/ln

Level of service, LOS E

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3629	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1029	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	477	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	3629		1029		477		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1008		286		133		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	4234		1155		535		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 4234 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4234	4700	No
$v_{FO} = v - v_F - v_R$	3079	4700	No
v_R	1155	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4234	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 36.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable,	D_S = 0.532	
Space mean speed in ramp influence area,	S_R = 52.8	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 52.8	mph

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Phone: Fax:
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Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2600	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	477	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1029	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2600	477	1029	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	722	133	286	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3033	535	1155	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 1.000 Using Equation 0
$v_{12} = v_F (P_{FM})$ = 3033 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3568	4700	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34}	> 2700 pc/h?		No
Is v_3 or v_{av34}	> 1.5 v_{12} /2		No
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3033	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 29.9 pc/mi/ln
Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.424	
Space mean speed in ramp influence area,	S_R = 55.2	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 55.2	mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6032	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1042	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1155	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6032		1042		1155		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1676		289		321		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, E_T	1.5		1.5		1.5		
Recreational vehicle PCE, E_R	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7037		1169		1296		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 7037 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7037	4700	Yes
$v_{FO} = v - v_F - v_R$	5868	4700	Yes
v_R	1169	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	7037	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 60.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.533

Space mean speed in ramp influence area, S_R = 52.7 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 52.7 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4990	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1155	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1042	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4990	1155	1042	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1386	321	289	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, E_T	1.5	1.5	1.5	
Recreational vehicle PCE, E_R	1.2	1.2	1.2	
Heavy vehicle adjustment, f_{HV}	0.952	0.990	0.990	
Driver population factor, f_P	1.00	1.00	1.00	
Flow rate, vp	5822	1296	1169	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 5822 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		7118	4700	Yes
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	5822	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 57.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M_S = 5.099	
Space mean speed in ramp influence area,	S_R = -52.3	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S =	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6165	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1485	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	835	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6165		1485		835		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1713		413		232		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7193		1667		937		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 7193 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7193	4700	Yes
$v_{FO} = v - v_R$	5526	4700	Yes
v_R	1667	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	7193	4600	No

!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 61.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.578

Space mean speed in ramp influence area, S_R = 51.7 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 51.7 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4680	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	835	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1485	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4680	835	1485	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1300	232	413	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5460	937	1667	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 5460 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		6397	4700	Yes
$v_{3 \text{ or } av34}$		0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	5460	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 51.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 2.626

Space mean speed in ramp influence area, S_R = 4.6 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 4.6 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2920	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	600	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1327	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2920		600		1327		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	811		167		369		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3407		673		1489		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3407 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3407	4700	No
$v_{FO} = v_F - v_R$	2734	4700	No
v_R	673	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$	> 2700 pc/h?	No	
Is $v_{3 \text{ or } av34}$	> 1.5 $v_{12}/2$	No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3407	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 29.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.489

Space mean speed in ramp influence area, S_R = 53.8 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 53.8 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2320	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1327	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	600	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2320	1327	600	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	644	369	167	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2707	1489	673	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2707 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4196	4700	No
v_{3} or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34}	> 2700 pc/h?	No	
Is v_{3} or v_{av34}	> 1.5 v_{12} /2	No	
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	2707	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 34.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.545

Space mean speed in ramp influence area, S_R = 52.5 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 52.5 mph

Cumulative Plus Project Mitigation Analysis:

Intersection LOS
Freeway LOS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	0.95	0.95	1.00
Frt	1.00	0.90		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3197		1770	3206		1681	1748	1583	1681	1770	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3197		1770	3206		1681	1748	1583	1681	1770	1583
Volume (vph)	20	100	181	400	160	270	243	153	110	210	211	20
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)	22	109	197	435	174	293	264	166	120	228	229	22
RTOR Reduction (vph)	0	163	0	0	180	0	0	0	98	0	0	18
Lane Group Flow (vph)	22	143	0	435	287	0	210	220	22	228	229	4
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			6
Actuated Green, G (s)	2.0	12.6		17.5	28.1		13.1	13.1	13.1	13.6	13.6	13.6
Effective Green, g (s)	2.0	12.6		17.5	28.1		13.1	13.1	13.1	13.6	13.6	13.6
Actuated g/C Ratio	0.03	0.17		0.24	0.39		0.18	0.18	0.18	0.19	0.19	0.19
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)	49	553		425	1237		302	315	285	314	331	296
v/s Ratio Prot	0.01	0.04		c0.25	c0.09		0.12	c0.13		c0.14	0.13	
v/s Ratio Perm									0.01			0.00
v/c Ratio	0.45	0.26		1.02	0.23		0.70	0.70	0.08	0.73	0.69	0.01
Uniform Delay, d1	34.9	26.1		27.6	15.1		28.0	28.0	24.8	27.8	27.6	24.1
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	6.4	0.2		49.8	0.1		6.8	6.6	0.1	8.1	6.1	0.0
Delay (s)	41.3	26.3		77.4	15.2		34.8	34.6	24.9	35.9	33.8	24.2
Level of Service	D	C		E	B		C	C	C	D	C	C
Approach Delay (s)		27.3			45.2			32.6			34.4	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	37.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	72.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3489		1770	3464		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3489		1770	3464		1770	1863	1583	1770	1863	1583
Volume (vph)	105	123	13	250	639	106	18	30	30	62	130	335
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)	114	134	14	272	695	115	20	33	33	67	141	364
RTOR Reduction (vph)	0	11	0	0	16	0	0	0	30	0	0	286
Lane Group Flow (vph)	114	137	0	272	794	0	20	33	3	67	141	78
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	7.1	15.0		13.0	20.9		4.2	6.0	6.0	11.4	13.2	13.2
Effective Green, g (s)	7.1	15.0		13.0	20.9		4.2	6.0	6.0	11.4	13.2	13.2
Actuated g/C Ratio	0.12	0.24		0.21	0.34		0.07	0.10	0.10	0.19	0.21	0.21
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)	205	852		375	1179		121	182	155	329	401	340
v/s Ratio Prot	0.06	0.04		c0.15	c0.23		0.01	0.02		c0.04	c0.08	
v/s Ratio Perm									0.00			0.05
v/c Ratio	0.56	0.16		0.73	0.67		0.17	0.18	0.02	0.20	0.35	0.23
Uniform Delay, d1	25.7	18.3		22.5	17.3		26.9	25.4	25.0	21.2	20.5	19.9
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	3.2	0.1		6.8	1.5		0.6	0.5	0.1	0.3	0.5	0.3
Delay (s)	28.9	18.3		29.4	18.9		27.6	25.9	25.1	21.5	21.0	20.3
Level of Service	C	B		C	B		C	C	C	C	C	C
Approach Delay (s)		22.9			21.5			26.0			20.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	61.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (prot)	1770	3527		1770	3527			1770	1583		1706	
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00		0.97	
Satd. Flow (perm)	1770	3527		1770	3527			1770	1583		1706	
Volume (vph)	20	190	5	28	860	20	15	0	83	160	0	120
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)	22	207	5	30	935	22	16	0	90	174	0	130
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	81	0	47	0
Lane Group Flow (vph)	22	209	0	30	954	0	0	16	9	0	257	0
Turn Type	Prot			Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			
Actuated Green, G (s)	0.6	15.7		1.7	16.8			5.2	5.2		11.3	
Effective Green, g (s)	0.6	15.7		1.7	16.8			5.2	5.2		11.3	
Actuated g/C Ratio	0.01	0.31		0.03	0.34			0.10	0.10		0.23	
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)	21	1110		60	1187			184	165		386	
v/s Ratio Prot	0.01	0.06		c0.02	c0.27			c0.01			c0.15	
v/s Ratio Perm									0.01			
v/c Ratio	1.05	0.19		0.50	0.80			0.09	0.06		0.67	
Uniform Delay, d1	24.6	12.5		23.7	15.1			20.2	20.1		17.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	212.0	0.1		6.4	4.0			0.2	0.1		4.3	
Delay (s)	236.7	12.5		30.1	19.1			20.4	20.3		21.9	
Level of Service	F	B		C	B			C	C		C	
Approach Delay (s)		33.6			19.4			20.3			21.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	0.94		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3295		1770	3342		1770	3356		1770	3452	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3295		1770	3342		1770	3356		1770	3452	
Volume (vph)	50	200	170	171	170	100	180	367	193	90	712	140
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)	54	217	185	186	185	109	196	399	210	98	774	152
RTOR Reduction (vph)	0	154	0	0	82	0	0	66	0	0	17	0
Lane Group Flow (vph)	54	248	0	186	212	0	196	543	0	98	909	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	5.2	13.6		11.3	19.7		11.0	32.4		7.7	29.1	
Effective Green, g (s)	5.2	13.6		11.3	19.7		11.0	32.4		7.7	29.1	
Actuated g/C Ratio	0.06	0.17		0.14	0.24		0.14	0.40		0.10	0.36	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	114	553		247	813		240	1342		168	1240	
v/s Ratio Prot	0.03	c0.08		c0.11	0.06		c0.11	c0.16		0.06	c0.26	
v/s Ratio Perm												
v/c Ratio	0.47	0.45		0.75	0.26		0.82	0.40		0.58	0.73	
Uniform Delay, d1	36.6	30.3		33.5	24.8		34.0	17.4		35.1	22.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	0.6		12.2	0.2		18.9	0.9		5.1	3.9	
Delay (s)	39.7	30.9		45.7	24.9		52.9	18.3		40.2	26.4	
Level of Service	D	C		D	C		D	B		D	C	
Approach Delay (s)		31.9			33.0			26.7			27.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	81.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.98		1.00	1.00
Flt Protected	0.96		1.00		0.95	1.00
Satd. Flow (prot)	1732		3468		1770	3539
Flt Permitted	0.96		1.00		0.95	1.00
Satd. Flow (perm)	1732		3468		1770	3539
Volume (vph)	191	70	670	103	60	993
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	208	76	728	112	65	1079
RTOR Reduction (vph)	20	0	17	0	0	0
Lane Group Flow (vph)	264	0	823	0	65	1079
Turn Type					Prot	
Protected Phases	8		2		1	6
Permitted Phases						
Actuated Green, G (s)	12.3		23.0		3.2	30.2
Effective Green, g (s)	12.3		23.0		3.2	30.2
Actuated g/C Ratio	0.24		0.46		0.06	0.60
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	422		1579		112	2116
v/s Ratio Prot	c0.15		0.24		0.04	c0.30
v/s Ratio Perm						
v/c Ratio	0.63		0.52		0.58	0.51
Uniform Delay, d1	17.0		9.8		23.0	5.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	2.9		0.3		7.4	0.2
Delay (s)	19.9		10.1		30.4	6.1
Level of Service	B		B		C	A
Approach Delay (s)	19.9		10.1			7.4
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	40	50	133	164	140	20	590	713	350	150	834	200
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)	43	54	145	178	152	22	641	775	380	163	907	217
RTOR Reduction (vph)	0	0	21	0	0	18	0	0	216	0	0	67
Lane Group Flow (vph)	43	54	124	178	152	4	641	775	164	163	907	150
Turn Type	Prot		pm+ov	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	6.7	13.3	45.7	9.4	16.0	16.0	32.4	43.1	43.1	18.2	28.9	28.9
Effective Green, g (s)	6.7	13.3	45.7	9.4	16.0	16.0	32.4	43.1	43.1	18.2	28.9	28.9
Actuated g/C Ratio	0.07	0.13	0.46	0.09	0.16	0.16	0.32	0.43	0.43	0.18	0.29	0.29
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	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	3.0
Lane Grp Cap (vph)	230	248	787	323	298	253	1112	1525	682	322	1023	457
v/s Ratio Prot	0.01	0.03	0.05	c0.05	c0.08		c0.19	0.22		0.09	c0.26	
v/s Ratio Perm			0.03			0.00			0.10			0.09
v/c Ratio	0.19	0.22	0.16	0.55	0.51	0.01	0.58	0.51	0.24	0.51	0.89	0.33
Uniform Delay, d1	44.1	38.7	15.9	43.3	38.4	35.4	28.1	20.7	18.1	36.9	34.0	27.9
Progression Factor	1.07	0.77	0.88	1.00	1.00	1.00	0.88	1.01	1.45	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.4	0.1	2.0	1.5	0.0	0.6	1.1	0.7	1.3	11.3	1.9
Delay (s)	47.6	30.1	14.1	45.3	39.9	35.4	25.5	21.9	26.9	38.1	45.3	29.8
Level of Service	D	C	B	D	D	D	C	C	C	D	D	C
Approach Delay (s)		23.7			42.4			24.2			41.7	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	32.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.97	0.95	0.95	0.97	0.91			0.91	1.00
Frt				1.00	0.85	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				3433	1504	1504	3433	5085			5085	1583
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				3433	1504	1504	3433	5085			5085	1583
Volume (vph)	0	0	0	462	0	580	715	1073	0	0	691	440
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)	0	0	0	502	0	630	777	1166	0	0	751	478
RTOR Reduction (vph)	0	0	0	0	57	57	0	0	0	0	0	371
Lane Group Flow (vph)	0	0	0	502	258	258	777	1166	0	0	751	107
Turn Type				Split		Perm	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						8						6
Actuated Green, G (s)				23.9	23.9	23.9	41.8	68.1			22.3	22.3
Effective Green, g (s)				23.9	23.9	23.9	41.8	68.1			22.3	22.3
Actuated g/C Ratio				0.24	0.24	0.24	0.42	0.68			0.22	0.22
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)				820	359	359	1435	3463			1134	353
v/s Ratio Prot				0.15	c0.17		c0.23	0.23			c0.15	
v/s Ratio Perm						0.17						0.07
v/c Ratio				0.61	0.72	0.72	0.54	0.34			0.66	0.30
Uniform Delay, d1				33.9	35.0	35.0	21.9	6.6			35.4	32.4
Progression Factor				1.00	1.00	1.00	1.19	1.64			0.60	0.44
Incremental Delay, d2				1.4	6.7	6.7	1.2	0.2			2.0	1.4
Delay (s)				35.3	41.7	41.7	27.1	11.0			23.0	15.6
Level of Service				D	D	D	C	B			C	B
Approach Delay (s)		0.0			38.8			17.5			20.2	
Approach LOS		A			D			B			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95	0.88					0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1681	2787					5085	1583	1770	5085	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1681	2787					5085	1583	1770	5085	
Volume (vph)	540	0	489	0	0	0	0	1248	277	200	953	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	532	0	0	0	0	1357	301	217	1036	0
RTOR Reduction (vph)	0	0	148	0	0	0	0	0	80	0	0	0
Lane Group Flow (vph)	294	293	384	0	0	0	0	1357	221	217	1036	0
Turn Type	Prot		Perm						Perm	Prot		
Protected Phases	7	4						2		1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	30.0	30.0	30.0					42.7	42.7	15.3	62.0	
Effective Green, g (s)	30.0	30.0	30.0					42.7	42.7	15.3	62.0	
Actuated g/C Ratio	0.30	0.30	0.30					0.43	0.43	0.15	0.62	
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)	504	504	836					2171	676	271	3153	
v/s Ratio Prot	c0.17	0.17						c0.27		c0.12	0.20	
v/s Ratio Perm			0.14						0.14			
v/c Ratio	0.58	0.58	0.46					0.63	0.33	0.80	0.33	
Uniform Delay, d1	29.7	29.7	28.4					22.4	19.1	40.9	9.1	
Progression Factor	1.00	1.00	1.00					0.52	0.25	0.23	0.11	
Incremental Delay, d2	1.7	1.7	0.4					1.0	0.9	11.9	0.2	
Delay (s)	31.4	31.4	28.8					12.6	5.7	21.3	1.2	
Level of Service	C	C	C					B	A	C	A	
Approach Delay (s)		30.2			0.0			11.4			4.7	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.91		0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		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)	3433	1863	1583	1770	1863	1583	1770	5039		3433	5085	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)	3433	1863	1583	1770	1863	1583	1770	5039		3433	5085	1583
Volume (vph)	450	60	10	71	50	410	10	665	43	460	882	100
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)	489	65	11	77	54	446	11	723	47	500	959	109
RTOR Reduction (vph)	0	0	8	0	0	246	0	6	0	0	0	58
Lane Group Flow (vph)	489	65	3	77	54	200	11	764	0	500	959	51
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)	19.0	27.6	27.6	8.3	16.9	16.9	1.5	27.9		20.2	46.6	46.6
Effective Green, g (s)	19.0	27.6	27.6	8.3	16.9	16.9	1.5	27.9		20.2	46.6	46.6
Actuated g/C Ratio	0.19	0.28	0.28	0.08	0.17	0.17	0.02	0.28		0.20	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	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)	652	514	437	147	315	268	27	1406		693	2370	738
v/s Ratio Prot	c0.14	0.03		0.04	0.03		0.01	c0.15		c0.15	0.19	
v/s Ratio Perm			0.00			c0.13						0.03
v/c Ratio	0.75	0.13	0.01	0.52	0.17	0.75	0.41	0.54		0.72	0.40	0.07
Uniform Delay, d1	38.3	27.2	26.3	44.0	35.6	39.5	48.8	30.6		37.3	17.6	14.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.14	1.06	1.22
Incremental Delay, d2	4.8	0.1	0.0	3.3	0.3	10.8	9.7	1.5		3.5	0.5	0.2
Delay (s)	43.1	27.3	26.3	47.3	35.8	50.3	58.5	32.1		45.9	19.0	18.1
Level of Service	D	C	C	D	D	D	E	C		D	B	B
Approach Delay (s)		41.0			48.5			32.5			27.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	34.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.91	0.91		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.94		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.98		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1610	3260		1770	3333		1770	3460		1770	1863	1583
Flt Permitted	0.95	0.74		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1610	2464		1770	3333		1770	3460		1770	1863	1583
Volume (vph)	213	170	50	25	110	70	100	435	76	20	245	698
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)	232	185	54	27	120	76	109	473	83	22	266	759
RTOR Reduction (vph)	0	18	0	0	62	0	0	16	0	0	0	453
Lane Group Flow (vph)	116	337	0	27	134	0	109	540	0	22	266	306
Turn Type	Prot			Prot			Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	7.4	22.8		2.4	11.4		6.8	24.4		2.3	19.9	19.9
Effective Green, g (s)	7.4	22.8		2.4	11.4		6.8	24.4		2.3	19.9	19.9
Actuated g/C Ratio	0.12	0.37		0.04	0.19		0.11	0.40		0.04	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	194	1009		69	618		196	1373		66	603	512
v/s Ratio Prot	c0.07	0.04		0.02	0.04		c0.06	0.16		0.01	0.14	
v/s Ratio Perm		c0.08										c0.19
v/c Ratio	0.60	0.33		0.39	0.22		0.56	0.39		0.33	0.44	0.60
Uniform Delay, d1	25.6	13.9		28.8	21.3		25.9	13.3		28.9	16.4	17.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.9	0.2		3.6	0.2		3.4	0.2		3.0	0.5	1.9
Delay (s)	30.5	14.1		32.5	21.4		29.3	13.4		31.8	16.9	19.3
Level of Service	C	B		C	C		C	B		C	B	B
Approach Delay (s)		18.1			22.8			16.0			19.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	0.95	0.95	1.00
Frt	1.00	0.93		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3300		1770	3274		1681	1770	1583	1681	1770	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3300		1770	3274		1681	1770	1583	1681	1770	1583
Volume (vph)	70	310	254	270	190	190	282	422	450	250	324	90
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)	76	337	276	293	207	207	307	459	489	272	352	98
RTOR Reduction (vph)	0	155	0	0	147	0	0	0	268	0	0	79
Lane Group Flow (vph)	76	458	0	293	267	0	307	459	221	272	352	19
Turn Type	Prot			Prot			Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			6
Actuated Green, G (s)	6.8	18.6		16.0	27.8		26.1	26.1	26.1	19.0	19.0	19.0
Effective Green, g (s)	6.8	18.6		16.0	27.8		26.1	26.1	26.1	19.0	19.0	19.0
Actuated g/C Ratio	0.07	0.19		0.17	0.29		0.27	0.27	0.27	0.20	0.20	0.20
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)	126	641		296	951		458	483	432	334	351	314
v/s Ratio Prot	0.04	c0.14		c0.17	0.08		0.18	c0.26		0.16	c0.20	
v/s Ratio Perm									0.14			0.01
v/c Ratio	0.60	0.71		0.99	0.28		0.67	0.95	0.51	0.81	1.00	0.06
Uniform Delay, d1	43.1	36.1		39.8	26.2		31.0	34.2	29.4	36.7	38.4	31.1
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	7.9	3.8		49.0	0.2		3.8	28.7	1.0	14.1	48.8	0.1
Delay (s)	51.0	39.8		88.7	26.4		34.8	62.9	30.4	50.7	87.1	31.2
Level of Service	D	D		F	C		C	E	C	D	F	C
Approach Delay (s)		41.1			52.2			43.4			65.8	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	49.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	95.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3524		1770	3380		1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3524		1770	3380		1770	1863	1583	1770	1863	1583
Volume (vph)	450	669	19	150	336	144	15	190	290	207	60	160
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)	489	727	21	163	365	157	16	207	315	225	65	174
RTOR Reduction (vph)	0	2	0	0	57	0	0	0	256	0	0	116
Lane Group Flow (vph)	489	746	0	163	465	0	16	207	59	225	65	58
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases									8			4
Actuated Green, G (s)	22.3	26.8		11.8	16.3		1.1	15.7	15.7	13.4	28.0	28.0
Effective Green, g (s)	22.3	26.8		11.8	16.3		1.1	15.7	15.7	13.4	28.0	28.0
Actuated g/C Ratio	0.27	0.32		0.14	0.19		0.01	0.19	0.19	0.16	0.33	0.33
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)	472	1128		250	658		23	349	297	283	623	530
v/s Ratio Prot	c0.28	c0.21		0.09	0.14		0.01	c0.11		c0.13	0.03	
v/s Ratio Perm									0.04			0.04
v/c Ratio	1.04	0.66		0.65	0.71		0.70	0.59	0.20	0.80	0.10	0.11
Uniform Delay, d1	30.7	24.5		34.0	31.5		41.1	31.1	28.7	33.8	19.2	19.2
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	51.0	1.5		6.0	3.5		63.9	2.7	0.3	14.2	0.1	0.1
Delay (s)	81.7	26.0		40.0	34.9		105.0	33.8	29.0	48.1	19.3	19.3
Level of Service	F	C		D	C		F	C	C	D	B	B
Approach Delay (s)		48.0			36.1			33.1			33.3	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	83.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.96			1.00	0.85		0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)	1770	3531		1770	3380			1770	1583		1668	
Flt Permitted	0.95	1.00		0.95	1.00			0.95	1.00		0.98	
Satd. Flow (perm)	1770	3531		1770	3380			1770	1583		1668	
Volume (vph)	160	990	16	94	560	240	10	0	55	30	0	60
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)	174	1076	17	102	609	261	11	0	60	33	0	65
RTOR Reduction (vph)	0	2	0	0	74	0	0	0	57	0	56	0
Lane Group Flow (vph)	174	1091	0	102	796	0	0	11	3	0	42	0
Turn Type	Prot			Prot			Split		Perm	Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases									2			
Actuated Green, G (s)	6.3	20.3		3.1	17.1			2.1	2.1		7.0	
Effective Green, g (s)	6.3	20.3		3.1	17.1			2.1	2.1		7.0	
Actuated g/C Ratio	0.13	0.42		0.06	0.35			0.04	0.04		0.14	
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)	230	1478		113	1192			77	69		241	
v/s Ratio Prot	c0.10	c0.31		0.06	0.24			c0.01			c0.03	
v/s Ratio Perm									0.00			
v/c Ratio	0.76	0.74		0.90	0.67			0.14	0.04		0.18	
Uniform Delay, d1	20.4	11.9		22.6	13.3			22.3	22.2		18.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	13.2	2.0		55.0	1.4			0.9	0.2		0.4	
Delay (s)	33.6	13.8		77.6	14.7			23.2	22.5		18.6	
Level of Service	C	B		E	B			C	C		B	
Approach Delay (s)		16.5			21.3			22.6			18.6	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.94		1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3331		1770	3385		1770	3427	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3331		1770	3385		1770	3427	
Volume (vph)	230	630	120	124	280	180	110	715	292	200	557	150
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)	250	685	130	135	304	196	120	777	317	217	605	163
RTOR Reduction (vph)	0	18	0	0	121	0	0	48	0	0	26	0
Lane Group Flow (vph)	250	797	0	135	379	0	120	1046	0	217	742	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.0	24.0		8.8	19.8		8.6	27.1		11.0	29.5	
Effective Green, g (s)	13.0	24.0		8.8	19.8		8.6	27.1		11.0	29.5	
Actuated g/C Ratio	0.15	0.28		0.10	0.23		0.10	0.31		0.13	0.34	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	265	954		179	759		175	1056		224	1163	
v/s Ratio Prot	c0.14	c0.23		0.08	0.11		0.07	c0.31		c0.12	0.22	
v/s Ratio Perm												
v/c Ratio	0.94	0.84		0.75	0.50		0.69	0.99		0.97	0.64	
Uniform Delay, d1	36.6	29.6		38.0	29.2		37.8	29.8		37.8	24.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	39.9	6.4		16.4	0.5		10.6	25.5		50.7	2.7	
Delay (s)	76.5	36.0		54.4	29.7		48.4	55.3		88.4	26.9	
Level of Service	E	D		D	C		D	E		F	C	
Approach Delay (s)		45.5			35.0			54.6			40.4	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	45.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	86.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.95		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1719		3435		1770	3539
Flt Permitted	0.97		1.00		0.95	1.00
Satd. Flow (perm)	1719		3435		1770	3539
Volume (vph)	94	50	1067	262	90	711
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	54	1160	285	98	773
RTOR Reduction (vph)	33	0	23	0	0	0
Lane Group Flow (vph)	123	0	1422	0	98	773
Turn Type					Prot	
Protected Phases	8		2		1	6
Permitted Phases						
Actuated Green, G (s)	8.9		38.4		5.1	47.5
Effective Green, g (s)	8.9		38.4		5.1	47.5
Actuated g/C Ratio	0.14		0.60		0.08	0.74
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	238		2048		140	2610
v/s Ratio Prot	c0.07		c0.41		c0.06	0.22
v/s Ratio Perm						
v/c Ratio	0.52		0.69		0.70	0.30
Uniform Delay, d1	25.8		9.0		28.9	2.8
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.9		1.0		14.6	0.1
Delay (s)	27.7		10.0		43.5	2.9
Level of Service	C		A		D	A
Approach Delay (s)	27.7		10.0			7.5
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	64.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Volume (vph)	450	250	711	451	130	300	606	579	196	30	565	210
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)	489	272	773	490	141	326	659	629	213	33	614	228
RTOR Reduction (vph)	0	0	16	0	0	155	0	0	119	0	0	92
Lane Group Flow (vph)	489	272	757	490	141	171	659	629	94	33	614	136
Turn Type	Prot		pm+ov	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	19.6	21.9	54.5	19.6	21.9	21.9	32.6	50.6	50.6	6.9	24.9	24.9
Effective Green, g (s)	19.6	21.9	54.5	19.6	21.9	21.9	32.6	50.6	50.6	6.9	24.9	24.9
Actuated g/C Ratio	0.17	0.19	0.47	0.17	0.19	0.19	0.28	0.44	0.44	0.06	0.22	0.22
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	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	3.0
Lane Grp Cap (vph)	585	355	805	585	355	301	973	1557	697	106	766	343
v/s Ratio Prot	0.14	0.15	c0.27	c0.14	0.08		0.19	0.18		0.02	c0.17	
v/s Ratio Perm			0.21			0.11			0.06			0.09
v/c Ratio	0.84	0.77	0.94	0.84	0.40	0.57	0.68	0.40	0.13	0.31	0.80	0.40
Uniform Delay, d1	46.1	44.1	28.7	46.2	40.8	42.3	36.5	21.9	19.2	51.8	42.7	38.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.61	0.84	1.00	1.00	1.00
Incremental Delay, d2	10.0	9.5	18.8	10.1	0.7	2.5	1.8	0.7	0.4	1.7	8.7	3.4
Delay (s)	56.2	53.6	47.5	56.3	41.5	44.7	35.9	14.1	16.5	53.5	51.4	42.0
Level of Service	E	D	D	E	D	D	D	B	B	D	D	D
Approach Delay (s)		51.4			50.2			24.0			49.0	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM Average Control Delay	42.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.97	0.95	0.95	0.97	0.91			0.91	1.00
Frt				1.00	0.85	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				3433	1504	1504	3433	5085			5085	1583
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				3433	1504	1504	3433	5085			5085	1583
Volume (vph)	0	0	0	310	0	290	627	1091	0	0	1027	700
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)	0	0	0	337	0	315	682	1186	0	0	1116	761
RTOR Reduction (vph)	0	0	0	0	100	100	0	0	0	0	0	359
Lane Group Flow (vph)	0	0	0	337	57	58	682	1186	0	0	1116	402
Turn Type				Split		Perm	Prot					Perm
Protected Phases				8	8		5	2			6	
Permitted Phases						8						6
Actuated Green, G (s)				17.5	17.5	17.5	47.2	89.5			38.3	38.3
Effective Green, g (s)				17.5	17.5	17.5	47.2	89.5			38.3	38.3
Actuated g/C Ratio				0.15	0.15	0.15	0.41	0.78			0.33	0.33
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)				522	229	229	1409	3957			1694	527
v/s Ratio Prot				c0.10	0.04		c0.20	0.23			0.22	
v/s Ratio Perm						0.04						c0.25
v/c Ratio				0.65	0.25	0.25	0.48	0.30			0.66	0.76
Uniform Delay, d1				45.8	43.0	43.0	24.9	3.7			32.8	34.3
Progression Factor				1.00	1.00	1.00	0.25	0.15			1.15	1.46
Incremental Delay, d2				2.7	0.6	0.6	0.7	0.2			1.0	4.9
Delay (s)				48.6	43.5	43.6	7.0	0.7			38.5	55.1
Level of Service				D	D	D	A	A			D	E
Approach Delay (s)		0.0			46.1			3.0			45.2	
Approach LOS		A			D			A			D	

Intersection Summary			
HCM Average Control Delay	27.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor	0.95	0.95	0.88					0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1681	2787					5085	1583	1770	5085	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1681	1681	2787					5085	1583	1770	5085	
Volume (vph)	520	0	965	0	0	0	0	1198	505	330	1007	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	565	0	1049	0	0	0	0	1302	549	359	1095	0
RTOR Reduction (vph)	0	0	110	0	0	0	0	0	197	0	0	0
Lane Group Flow (vph)	283	282	939	0	0	0	0	1302	352	359	1095	0
Turn Type	Prot		Perm						Perm	Prot		
Protected Phases	7	4						2		1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	43.6	43.6	43.6					36.4	36.4	23.0	63.4	
Effective Green, g (s)	43.6	43.6	43.6					36.4	36.4	23.0	63.4	
Actuated g/C Ratio	0.38	0.38	0.38					0.32	0.32	0.20	0.55	
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)	637	637	1057					1610	501	354	2803	
v/s Ratio Prot	0.17	0.17						c0.26		c0.20	0.22	
v/s Ratio Perm			c0.34						0.22			
v/c Ratio	0.44	0.44	0.89					0.81	0.70	1.01	0.39	
Uniform Delay, d1	26.7	26.6	33.4					36.1	34.5	46.0	14.8	
Progression Factor	1.00	1.00	1.00					0.68	0.36	0.66	0.08	
Incremental Delay, d2	0.5	0.5	9.3					2.6	4.7	44.9	0.3	
Delay (s)	27.2	27.1	42.7					27.3	17.2	75.5	1.5	
Level of Service	C	C	D					C	B	E	A	
Approach Delay (s)		37.2			0.0			24.3			19.8	
Approach LOS		D			A			C			B	

Intersection Summary			
HCM Average Control Delay	27.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.91		0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		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)	3433	1863	1583	1770	1863	1583	1770	5005		3433	5085	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)	3433	1863	1583	1770	1863	1583	1770	5005		3433	5085	1583
Volume (vph)	190	170	30	54	160	640	10	873	102	640	852	480
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)	207	185	33	59	174	696	11	949	111	696	926	522
RTOR Reduction (vph)	0	0	24	0	0	336	0	11	0	0	0	251
Lane Group Flow (vph)	207	185	9	59	174	360	11	1049	0	696	926	271
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)	9.0	31.2	31.2	6.9	29.1	29.1	1.2	33.7		27.2	59.7	59.7
Effective Green, g (s)	9.0	31.2	31.2	6.9	29.1	29.1	1.2	33.7		27.2	59.7	59.7
Actuated g/C Ratio	0.08	0.27	0.27	0.06	0.25	0.25	0.01	0.29		0.24	0.52	0.52
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)	269	505	429	106	471	401	18	1467		812	2640	822
v/s Ratio Prot	c0.06	0.10		0.03	0.09		0.01	c0.21		c0.20	0.18	
v/s Ratio Perm			0.01			c0.23						0.17
v/c Ratio	0.77	0.37	0.02	0.56	0.37	0.90	0.61	0.71		0.86	0.35	0.33
Uniform Delay, d1	52.0	33.9	30.7	52.6	35.4	41.5	56.7	36.4		42.0	16.3	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.93	0.73	0.83
Incremental Delay, d2	12.4	0.5	0.0	6.2	0.5	21.9	48.7	3.0		7.0	0.3	0.8
Delay (s)	64.4	34.4	30.7	58.8	35.9	63.4	105.4	39.4		46.3	12.1	14.1
Level of Service	E	C	C	E	D	E	F	D		D	B	B
Approach Delay (s)		48.7			58.0			40.0			23.7	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM Average Control Delay	36.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.91	0.91		1.00	0.95		1.00	0.95		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	0.98		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1610	3231		1770	3484		1770	3423		1770	1863	1583
Flt Permitted	0.95	0.98		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1610	3231		1770	3484		1770	3423		1770	1863	1583
Volume (vph)	655	290	130	118	340	40	130	290	81	70	442	424
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)	712	315	141	128	370	43	141	315	88	76	480	461
RTOR Reduction (vph)	0	19	0	0	10	0	0	27	0	0	0	326
Lane Group Flow (vph)	382	767	0	128	403	0	141	376	0	76	480	135
Turn Type	Split			Split			Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	22.3	22.3		14.4	14.4		8.1	26.7		6.6	25.2	25.2
Effective Green, g (s)	22.3	22.3		14.4	14.4		8.1	26.7		6.6	25.2	25.2
Actuated g/C Ratio	0.26	0.26		0.17	0.17		0.09	0.31		0.08	0.29	0.29
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	417	838		296	583		167	1063		136	546	464
v/s Ratio Prot	0.24	c0.24		0.07	c0.12		c0.08	0.11		0.04	c0.26	
v/s Ratio Perm												0.09
v/c Ratio	0.92	0.91		0.43	0.69		0.84	0.35		0.56	0.88	0.29
Uniform Delay, d1	30.9	30.9		32.1	33.7		38.3	23.0		38.3	28.9	23.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	24.5	14.4		1.0	3.5		30.3	0.2		4.9	14.9	0.4
Delay (s)	55.4	45.3		33.1	37.2		68.7	23.2		43.2	43.9	23.8
Level of Service	E	D		C	D		E	C		D	D	C
Approach Delay (s)		48.6			36.3			35.0			34.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3629	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1008	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1411	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1411	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	23.7	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	3077	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	855	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1197	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1197	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	20.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6032	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1676	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2346	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2346	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone:
E-mail:

Fax:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6145	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1707	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2390	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2390	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.21

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Yosemite to Aiport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	6165	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1713	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2398	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2398	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Eastbound
From/To:	Airport to Union
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Flow Inputs and Adjustments

Volume, V	5515	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1532	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	2145	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2145	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	55.1	mi/h
Number of lanes, N	3	
Density, D	39.0	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone:
E-mail:

Fax:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Union to Airport
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	2920	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	811	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1136	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1136	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	19.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	Fehr & Peers
Agency or Company:	Fehr & Peers
Date Performed:	4/3/2007
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	SR 120 Westbound
From/To:	Airport to Yosemite
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions

Description: Machado Estates

Flow Inputs and Adjustments

Volume, V	3647	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1013	v
Trucks and buses	10	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.952	
Driver population factor, fp	1.00	
Flow rate, vp	1418	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	1.00	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Base	
FFS or BFFS	65.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	2.5	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	59.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1418	pc/h/ln
Free-flow speed, FFS	59.5	mi/h
Average passenger-car speed, S	59.5	mi/h
Number of lanes, N	3	
Density, D	23.8	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3629	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1029	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	477	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	3629		1029		477		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1008		286		133		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	4234		1155		535		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2541 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4234	7050	No
$v_{FO} = v_F - v_R$	3079	7050	No
v_R	1155	3800	No
$v_{3 \text{ or } av34}$	1693 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} =		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2541	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 12.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.532

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_O = 68.6 mph

Space mean speed for all vehicles, S = 58.1 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2600	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	477	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1029	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2600	477	1029	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	722	133	286	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3033	535	1155	pcph

Estimation of V12 Merge Areas

L_{EQ} = 413.75 (Equation 25-2 or 25-3)

P_{FM} = 0.591 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1794 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3568	7050	No
v_3 or v_{av34}	1239 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	1794	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.326	
Space mean speed in ramp influence area,	S_R = 57.5	mph
Space mean speed in outer lanes,	S_O = 62.3	mph
Space mean speed for all vehicles,	S = 59.1	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6032	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1042	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1155	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6032		1042		1155		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1676		289		321		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7037		1169		1296		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD}$ = 3810 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7037	7050	No
$v_{FO} = v - v_R$	5868	7050	No
v_R	1169	3800	No
$v_{3 \text{ or } av34}$	3227 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		Yes	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		Yes	
If yes, v_{12A} = 4337		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	4337	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 28.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.533

Space mean speed in ramp influence area, S_R = 52.7 mph

Space mean speed in outer lanes, S_O = 64.7 mph

Space mean speed for all vehicles, S = 56.8 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4990	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1155	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1042	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4990	1155	1042	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1386	321	289	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5822	1296	1169	pcph

Estimation of V12 Merge Areas

L_{EQ} = 1173.45 (Equation 25-2 or 25-3)

P_{FM} = 0.591 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 3444 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		7118	7050	Yes
v_3 or v_{av34}		2378 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34}	> 2700 pc/h?		No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3444	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 38.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	M_S = 0.732	
Space mean speed in ramp influence area,	S_R = 48.2	mph
Space mean speed in outer lanes,	S_O = 58.0	mph
Space mean speed for all vehicles,	S = 51.1	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6165	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1485	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	835	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	6165		1485		835		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	1713		413		232		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	7193		1667		937		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4154 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7193	7050	Yes
$v_{FO} = v_F - v_R$	5526	7050	No
v_R	1667	3800	No
$v_{3 \text{ or } av34}$	3039 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		Yes	
Is $v_{3 \text{ or } av34} > 1.5\ v_R/2$		No	
If yes, v_{12A} = 4493		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	4493	4600	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 29.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.578

Space mean speed in ramp influence area, S_R = 51.7 mph

Space mean speed in outer lanes, S_O = 64.7 mph

Space mean speed for all vehicles, S = 55.9 mph

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Eastbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4680	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	835	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1485	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4680	835	1485	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1300	232	413	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5460	937	1667	pcph

Estimation of V12 Merge Areas

L_{EQ} = 1019.16 (Equation 25-2 or 25-3)

P_{FM} = 0.591 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 3230 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6397	7050	No
v_3 or v_{av34}	2230 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34}	> 2700 pc/h?		No
Is v_3 or v_{av34}	> 1.5 v_{12} /2		No
If yes, v_{12A} =		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	3230	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 34.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.538	
Space mean speed in ramp influence area,	S_R = 52.6	mph
Space mean speed in outer lanes,	S_O = 58.8	mph
Space mean speed for all vehicles,	S = 54.6	mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2920	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	600	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1327	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2920		600		1327		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	811		167		369		v
Trucks and buses	10		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, E_T	1.5		1.5		1.5		
Recreational vehicle PCE, E_R	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.952		0.990		0.990		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	3407		673		1489		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1903 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3407	7050	No
$v_{FO} = v_F - v_R$	2734	7050	No
v_R	673	3800	No
v_3 or v_{av34}	1504 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	Yes	
If yes, v_{12A} = 1946		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?	
v_{12A}	1946	4600	No	!

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.489

Space mean speed in ramp influence area, S_R = 53.8 mph

Space mean speed in outer lanes, S_O = 69.5 mph

Space mean speed for all vehicles, S = 59.5 mph

HCS+: Ramps and Ramp Junctions Release 5.21

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Fehr & Peers
Agency/Co.:	Fehr & Peers
Date performed:	4/3/2007
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	SR 120 Westbound
Junction:	Airport Way
Jurisdiction:	Manteca/San Joaquin
Analysis Year:	Cumulative + Proj. Conditions
Description:	Machado Estates

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2320	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1327	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	600	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2320	1327	600	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	644	369	167	v
Trucks and buses	10	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.952	0.990	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2707	1489	673	pcph

Estimation of V12 Merge Areas

L_{EQ} = 548.14 (Equation 25-2 or 25-3)

P_{FM} = 0.591 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1601 pc/h

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		4196	7050	No
v_{3} or v_{av34}		1106 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34}	> 2700 pc/h?		No	
Is v_{3} or v_{av34}	> 1.5 v_{12} /2		No	
If yes, v_{12A} =			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?	
v_{12}	1601	4400	No	!

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.372

Space mean speed in ramp influence area, S_R = 56.5 mph

Space mean speed in outer lanes, S_O = 62.8 mph

Space mean speed for all vehicles, S = 58.0 mph