

Traffic Impact Study for the Elm Tree Station Project



Prepared for the
City of Santa Rosa



Submitted by

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Executive Summary

The proposed Elm Tree Station project consists of a community grocery store, a gasoline station with fueling and electric vehicle charging, open space and a bicycle path, a small commercial building, and a single apartment to be located on a currently vacant site on North Wright Road, between Sebastopol Road and State Route (SR) 12.

The proposed project is expected to generate an average of 1,506 net new daily trips after deductions are made for the pass-by component, with 73 of these trips during the morning peak hour and 91 during the evening peak hour. The study intersections of SR 12/Fulton Road and Sebastopol Road/South Wright Road are currently operating acceptably and are expected to continue doing so upon the addition of project-generated traffic. Both are currently experiencing collisions at a rate that is below the statewide average for similar facilities. Under future conditions, both intersections are expected to operate deficiently both without and with project traffic added. However, planned improvements in the Santa Rosa General Plan are assumed to improve both intersections to acceptable operation.

Existing facilities for non-vehicular modes of transportation are largely provided by the Joe Rodota Trail. However, connectivity between North Wright Road and the Joe Rodota Trail is generally lacking. To improve access, the project will add a pedestrian and bicycle path to connect the existing sidewalk along the project frontage to the Joe Rodota Trail. Bike racks are included as part of the project plan.

Sight distance at the project's driveway is adequate, though landscaping should be maintained to ensure continued adequate sight lines. The project will have two access driveways: the north for egress only and the south for both ingress and egress. The existing two-way left-turn lane on North Wright Road is expected to serve inbound traffic.

Introduction

Introduction

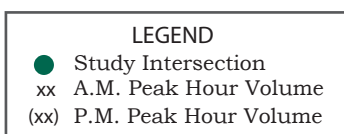
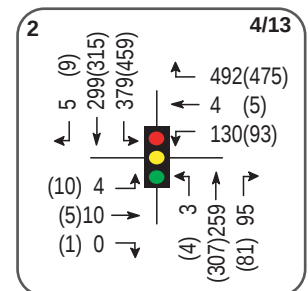
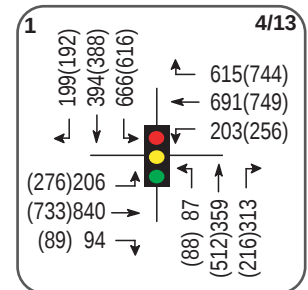
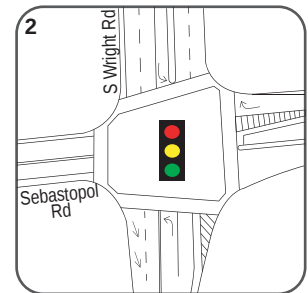
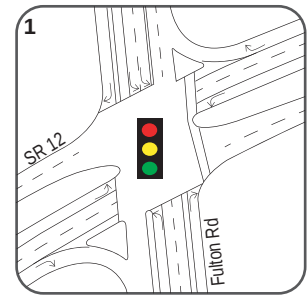
This report presents an analysis of the potential traffic impacts that would be associated with development of the proposed Elm Tree Station project, which includes a community grocery store, a gasoline station with fueling and electric vehicle charging, open space and a bicycle path, a small commercial building, and a single apartment. The traffic study was completed in accordance with the criteria established by the City of Santa Rosa, and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required in order to mitigate these impacts to a level of insignificance as defined by the City's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to safety, including for pedestrians and bicyclists, and to transit are also addressed.

Project Profile

The proposed Elm Tree Station project would be located on the east side of North Wright Road adjacent to the Joe Rodota Trail in the City of Santa Rosa, as shown in Figure 1. The site is located south of SR 12 and north of Sebastopol Road. The proposed project would develop an approximately 3,500 square foot community grocery store, a gasoline station with twelve fueling positions and four electric vehicle charging stations along with an approximately one-quarter acre open space and bicycle path with a small commercial building (approximately 432 square feet). Additionally, a single apartment would be constructed on the site which is planned to be occupied by a site caretaker employee.



Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections:

1. SR 12/Fulton Road
2. Sebastopol Road/South Wright Road

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

Study Intersections

SR 12/Fulton Road is a four-legged signalized intersection with protected left-turn phasing on all approaches as well as free right-turn lanes on both SR 12 approaches. A pedestrian phase and crosswalk are provided across the eastern leg.

Sebastopol Road/South Wright Road is a signalized four-legged intersection with protected left-turn phases for the northbound and southbound approaches and split phasing for the eastbound and westbound approaches. Crosswalks and pedestrian phases are provided for all approaches.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Study Roadways

Wright Road is a north-south Regional/Arterial street with two travel lanes in each direction north of Sebastopol Road and one travel lane in each direction to the south. South Wright Road becomes North Wright Road at the intersection with Sebastopol Road and terminates at the City's southern limits. The posted speed limit is 40 mph.

Fulton Road runs north-south, beginning at its intersection with SR 12 and terminating at Old Redwood Highway south of the Town of Windsor. The regional/arterial street has two travel lanes in each direction and a posted speed limit of 45 mph.

Sebastopol Road is an east-west road that runs across the southwest quadrant of the City of Santa Rosa, terminating at US 101. The regional/arterial street has one travel lane in each direction and a posted speed limit of 40 mph.

SR 12 is a major east-west divided highway that runs through the County of Sonoma and is operated by California Department of Transportation (Caltrans).

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California

Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is July 2006 through June 2011.

As presented in Table I, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2009 Collision Data on California State Highways*, Caltrans. Both study intersections were equal to or below the statewide average collision rate. The injury rate for SR 12/Fulton Road was 68.8 percent, which is higher than the statewide average. Rear-end collisions were the most common collision type and the primary collision factor was speeding. SR 12 is a major regional highway with speeds of 55 mph. The high injury rate is likely due to high speeds, which can cause more severe collisions. Calculations for the collision rates are provided in Appendix A.

Table I
Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2006-2011)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. SR 12/Fulton Rd	32	0.36	0.36
2. Sebastopol Rd/S Wright Rd	1	0.03	0.36

Note: c/mve = collisions per million vehicles entering

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, sidewalk gaps can be found along some of the roadways connecting to the project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points.

- *Wright Road* – Intermittent sidewalk coverage is provided on Wright Road with significant gaps on both sides of the street south of Sebastopol Road and continuous sidewalks provided on the east side north of Sebastopol Road. Sidewalks are provided along developed property frontages. Curb ramps and crosswalks at side street approaches are intermittent, non-existent, or not compliant with current ADA standards.
- *Sebastopol Road* – No sidewalks are provided on Sebastopol Road, except for a segment approximately 100 feet on the north side, east of its intersection with Wright Road. Curb ramps and crosswalks are provided at its intersection with Wright Road.
- *SR 12* – No sidewalks are provided on SR 12. However, curb ramps and a crosswalk exist on the east leg at its intersection with Fulton Road.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2006, classifies bikeways into three categories:

- *Class I Multi-Use Path*: a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- *Class II Bike Lane*: a striped and signed lane for one-way bike travel on a street or highway.
- *Class III Bike Route*: signing only for shared use with motor vehicles within the same travel lane on a street or highway.

In the project area, a Class I multi-use path exists along the north frontage of the project site. In addition Class II bike lanes are available on Fulton Road-Wright Road between Sebastopol Road and the northern city limit. A Class III bike route runs along Sebastopol Road west of Wright Road to fill the existing gap between segments of the Joe Rodota Trail. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Also, a “bike box” is demarcated on the westbound approach of Sebastopol Road/South Wright Road. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the 2010 *Santa Rosa Bicycle and Pedestrian Master Plan*.

Table 2
Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Joe Rodota Bikeway	I	6.3	Petaluma Ave (<i>Sebastopol</i>)	Prince Memorial Greenway
Fulton Rd-Wright Rd	II	4.4	Sebastopol Rd	Northern City Limit
Sebastopol Rd	III	0.2	Joe Rodota Trail	Wright Rd
Planned				
Wright Rd	II	1.6	SR 12	Ludwig Ave
Sebastopol Rd	II	0.1	Joe Rodota Trail	Leddy Ave
Joe Rodota Trail Connector	I	0.2	Joe Rodota Trail/ Sebastopol Rd	Joe Rodota Trail/ Wright Rd

Note: The Joe Rodota Bikeway operates between Sebastopol and the City of Santa Rosa. All other bikeways are located within the City of Santa Rosa.

Source: *Santa Rosa Bicycle and Pedestrian Master Plan*, 2010

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

Both study intersections are controlled by a traffic signal and were therefore evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using optimized signal timing.

The ranges of delay associated with the various levels of service are indicated in Table 3.

Table 3
Signalized Intersection Level of Service Criteria

LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2000

Traffic Operation Standards

Standards of Significance

The following standards of significance are based on the CEQA Guidelines as well as criteria established by the City of Santa Rosa. The project would result in a significant impact on transportation if it would:

- I. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including

but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

Caltrans is responsible for the maintenance and operation of State routes and highways. Within the project study area, Caltrans' facilities include SR 12. Caltrans maintains a volume monitoring program and reviews local agencies' planning documents to assist in its forecasting of future volumes and congestion points. The Guide for the Preparation of Traffic Impacts Studies (January 2001) published by Caltrans is intended to provide a consistent basis for evaluating traffic impacts to State facilities. According to this document, Caltrans strives to maintain service levels on State facilities at the transition between LOS C and LOS D. In cases where this level of service is not feasible the lead agency should consult with Caltrans to establish an appropriate level of service threshold. If an existing state highway facility is operating worse than the appropriate target LOS, the existing Measures of Effectiveness (MOE) should be maintained.

2. Substantially increase hazards due to a design feature.
3. Result in inadequate emergency access.
4. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.
 - A significant impact would occur if the project violates alternative transportation policies set forth in the City of Santa Rosa General Plan and/or if the project precludes bicycle improvements identified in the City of Santa Rosa Bicycle and Pedestrian Plan from being implemented.
 - The project would have a significant impact if it would result in unsafe conditions for bicyclists and pedestrians.
 - The project would have a significant impact if it would cause a substantial delay in transit service or create barriers to travel for pedestrians walking to transit terminals and bus stops.
5. The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in Santa Rosa General Plan 2035. Standard TD-1 states that the City will try to maintain a Level of Service (LOS) D or better along all major corridors. Although the City's standard does not specify criteria for intersections, for the purposes of this study a minimum operation of LOS D for the overall operation of the study intersection was applied.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected April 17, 2013.

Intersection Levels of Service

Under existing conditions, both study intersections operate at acceptable Levels of Service. The existing traffic volumes are shown in Figure 1. A summary of the intersection level of service calculations is contained in Table 4, and copies of the Level of Service calculations are provided in Appendix B.

Table 4
Existing Peak Hour Intersection Levels of Service

Study Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. SR 12/Fulton Rd	39.7	D	39.6	D
2. Sebastopol Rd/ S Wright Rd	21.3	B	22.4	C

Notes: Delay is measured in average seconds per vehicle
LOS = Level of Service; **Bold** text = deficient operation

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from Sonoma County's gravity demand model and translated to turning movement volumes at each of the study intersections using the "Furness" method. The Furness method is an iterative process that employs existing turn movement data, existing link volumes and future link volumes to project likely turning future movement volumes at intersections.

Under the anticipated Future volumes both study intersections are expected to operate unacceptably during the both the a.m. and p.m. peak hours. Future operating conditions are summarized in Table 5 and traffic volumes are shown in Figure 2.

Table 5
Future Peak Hour Intersection Levels of Service

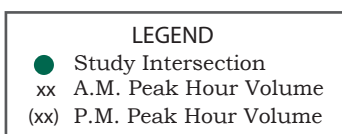
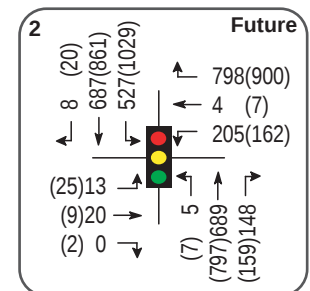
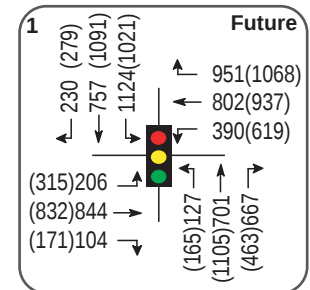
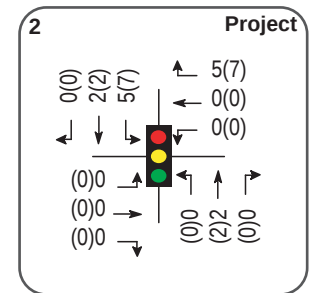
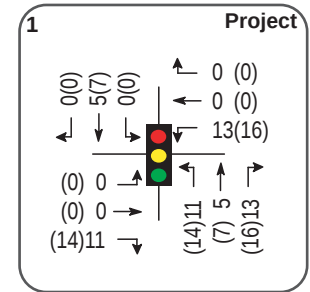
Study Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. SR 12/Fulton Rd	113.9	F	>120	F
2. Sebastopol Rd/S Wright Rd	60.1	E	119.9	F

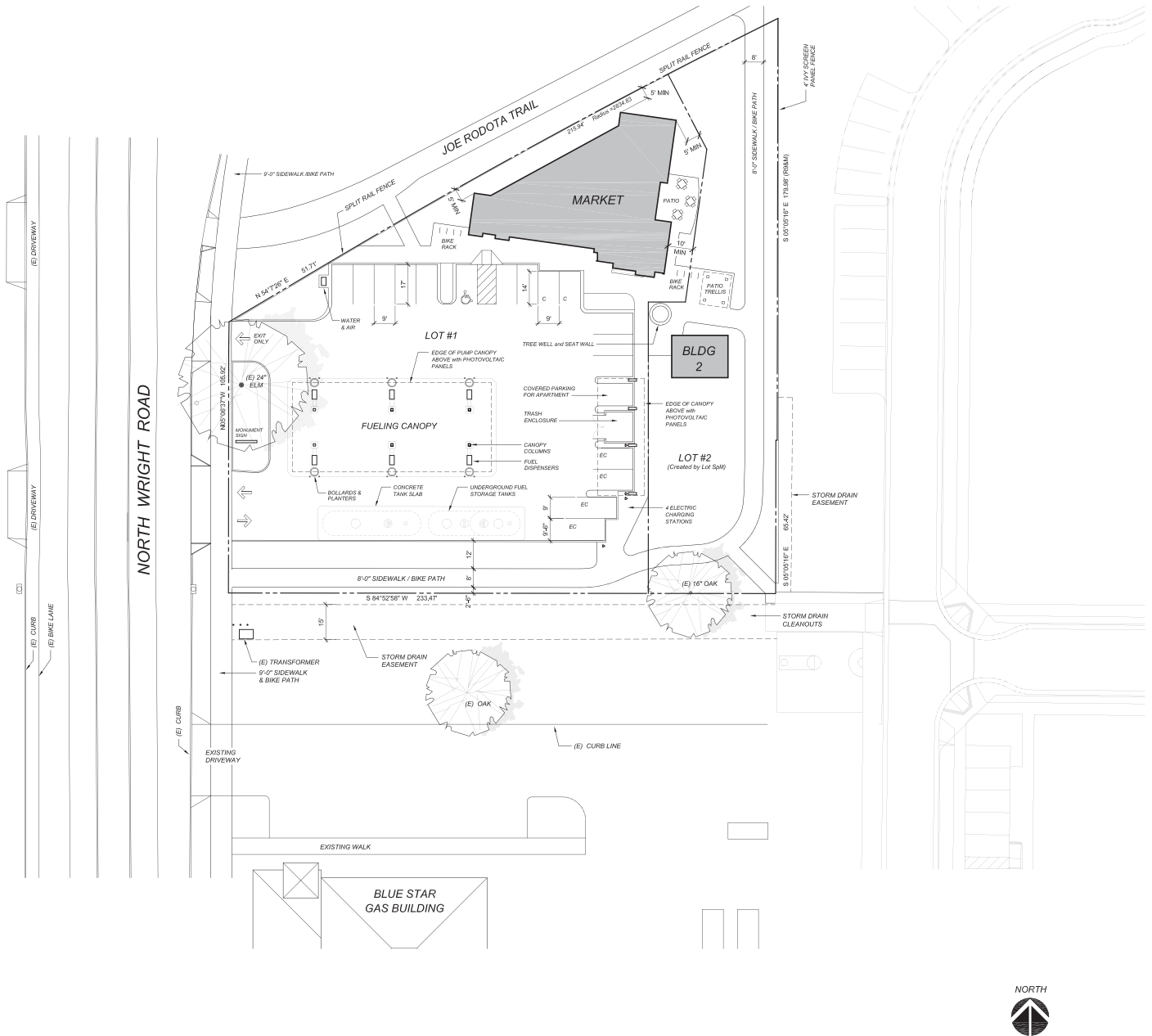
Notes: Delay is measured in average seconds per vehicle
LOS = Level of Service; **Bold** text = deficient operation

According to the 2035 Santa Rosa General Plan, the SR 12/Fulton Road intersection is expected to be converted to an interchange and Sebastopol Road is planned to be widened to four lanes through the study area.

Project Description

The project would develop an approximately 3,500 square-foot community grocery store, a gasoline station with twelve fueling positions and four electric vehicle charging stations along with an approximately one-quarter acre open space and bicycle path with a small commercial building (approximately 432 square feet). Additionally, a single apartment would be constructed on the site which is planned to be occupied by a site caretaker employee. The proposed project site plan is shown in Figure 3.





Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition, 2012, for a Convenience Market with gas pumps (Land Use #853) and Single Family Residence (Land Use #210). Consideration was given to using the ITE Land Use Category for a Supermarket (Land Use #850); however, all data points published for a supermarket were for study locations that were considerably larger than the proposed use (the smallest being approximately 15,000 square feet, about five times the size of the proposed project), so this use was determined not to be a more accurate representation of the project. It is understood that the market is not a convenience store, but instead a small format neighborhood grocery store; however, due to its size as well as the inclusion of the gas pumps, the proposed development most closely matches the ITE category for Convenience Market with gas pumps. The total commercial building size for both the main community grocery store and the small commercial building in the open space area were combined and used to develop trip generation projections.

The proposed project would include electric vehicle charging stations; however, such a use is not included in the ITE publication. In general, it takes several hours for an electric vehicle to fully recharge, resulting in a very low turnover potential and therefore little to no impact on peak period traffic volumes. Because of this together with the conservatism of the trip rates applied to the primary components of the project, no adjustments were made to the trip generation projections to account for the electric vehicle charging station. Finally, the proposed open space with a small walk-up commercial use is expected to be an additional amenity for the project site's customers or Joe Rodota Trail users, and not a generator of traffic in and of itself; therefore, no additional traffic is projected to be generated by open space use.

While the residential unit would be occupied by a caretaker employee, it is reasonable to assume that this apartment would have a lower than typical trip generation potential as the occupant would not be traveling off-site for work. However, to provide a conservative analysis, no such deduction was applied.

Pass-by Trips

Some portion of the traffic associated with the commercial uses would be drawn from existing traffic on nearby streets. These vehicle trips are not considered "new," but are instead comprised of drivers who are already driving on the adjacent street and choose to make an interim stop. These trips are referred to as "pass-by." The percentage of these pass-by trips was based on information also provided in the *Trip Generation Manual*. The pass-by data presented by ITE is in the range of 48 to 87 percent of total trips. To ensure a conservative analysis, a pass-by rate at the lower end of the range of published data of 50 percent was applied to this analysis.

Total Project Trip Generation

The expected trip generation potential for the proposed project is indicated in Table 6, with deductions taken for pass-by trips. The proposed project is expected to generate an average of 1,506 trips per day, including 73 trips during the a.m. peak hour and 91 during the p.m. peak hour.

Table 6
Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Convenience Market w/gas pumps	3.54 ksf	845.6	2,993	40.92	145	72	73	50.92	180	90	90
<i>Pass-by Component</i>		-50%	-1,497	-50%	-73	-36	-37	-50%	-90	-45	-45
Single Family Residence	1 du	9.52	10	0.75	1	0	1	1.00	1	1	0
Total Primary Trips			1,506		73	36	37		91	46	45

Notes: ksf = thousand square feet, du = dwelling units

Trip Distribution

The pattern used to allocate new project trips to the street network was based on the location of likely trip origins and destinations as well as knowledge of local travel trends near the project site. The applied distribution assumptions and resulting trips are shown in Table 7.

Table 7
Trip Distribution Assumptions

Route	Percent	Daily Trips	AM Trips	PM Trips
SR 12 to/from the west	30%	452	22	27
SR 12 to/from the east	35%	527	26	32
Wright Rd to/from the south	5%	75	3	4
Fulton Rd to/from the north	15%	226	11	14
Sebastopol Rd to/from the east	15%	226	11	14
TOTAL	100%	1,506	73	91

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to operate acceptably. These results are summarized in Table 8. Project traffic volumes are shown in Figure 2.

Table 8
Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection	Existing Conditions				Existing plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 12/Fulton Rd	39.7	D	39.6	D	40.9	D	40.5	D
2. Sebastopol Rd/S Wright Rd	21.3	B	22.4	C	21.4	C	22.5	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Bold text = deficient operation

Finding: The study intersections are expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes the study intersections are expected to continue operating deficiently. The Future plus Project operating conditions are summarized in Table 9.

Table 9
Future and Future plus Project Peak Hour Intersection Levels of Service

Study Intersection	Future Conditions				Future plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. SR 12/Fulton Rd	113.9	F	>120	F	117.8	F	>120	F
2. Sebastopol Rd/ S Wright Rd	60.1	E	119.9	F	61.0	E	>120	F

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Bold text = deficient operation

Finding: Both study intersections will continue operating unacceptably during both peak hours, but at the same Levels of Service with the project as without it.

Recommendation: SR 12/Fulton Road is planned to be converted to an interchange and Sebastopol Road is planned to be widened according to the 2035 Santa Rosa General Plan. It is assumed that with these planned improvements acceptable operation would be achieved. The applicant should pay applicable traffic impact fees in order to help fund these planned improvements.

Alternative Modes

Alternative Modes

Pedestrian Facilities

Given the proximity of residential uses surrounding the site, it is reasonable to assume that some project patrons and employees will want to walk, bicycle, and/or utilize transit to reach the grocery market portion of the site.

Project Site – Sidewalks separated from the road by landscaping exist along the project frontage. As part of the project, a pedestrian and bicycle path is proposed that would connect to the sidewalk along the project frontage and the Joe Rodota Trail and would be located along the southern and eastern edges of the project.

Finding: Pedestrian facilities serving the project site are expected to be adequate.

Bicycle Facilities

Existing bicycle facilities, including the Joe Rodota Trail, bike lanes on Wright Road and Sebastopol Road, together with shared use of minor streets, provide adequate access for bicyclists.

Bicycle Storage

Short-term bicycle parking is to be provided at the site by bike racks which are to be located near the entrance to the proposed neighborhood market.

Finding: Bicycle facilities serving the project site are expected to be adequate.

Access and Circulation

Site Access

The site will be accessed by two driveways along the frontage of the project on North Wright Road. The south driveway will have full access, with vehicles allowed to enter and exit, while the north driveway will be limited to egress only. Southbound vehicles making left-turn movements will be able to use the existing two-way left-turn lane on North Wright Road. The north driveway serves exiting vehicles only.

Sight Distance

At driveways a substantially clear line of sight should be maintained between the driver of a vehicle waiting to cross or enter the street and the driver of a vehicle approaching on that street. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed. Sight distance along Wright Road at the project driveway was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distances for driveways are based on stopping sight distance, which use the approach travel speeds as the basis for determining the recommended sight distance. Based on a design speed of 45 mph, the posted speed limit of North Wright Road in the vicinity of the proposed project, the minimum stopping sight distance needed is 360 feet.

From a review of the proposed site plan, it appears that existing trees located near the site's frontage would be removed, with the exception of an elm tree located approximately 60 feet south of the Joe Rodota Trail. Provided that the tree does not impede sight lines for vehicles leaving the project site, the sight distance for vehicles exiting the project site is expected to be adequate. In order to maintain adequate sight lines for vehicles leaving the site, it is recommended that the elm tree and other landscaping be trimmed such that tree canopies are at least seven feet above the ground; other landscaping should be limited to low-lying vegetation no greater than three feet in height. In addition, signs and monuments planned along the project's frontage should be placed in a manner that does not obstruct sight distance at the project driveways.

Finding: Adequate sight distance is available provided that trees and other landscaping are trimmed to maintain clear sight lines.

Recommendation: The elm tree and other landscaping should be maintained such that foliage stays above seven feet and below three feet from the ground. Signs or monuments to be installed along the project frontage should be placed so that sight distance is not obstructed at the project driveways.

Access Analysis

A two-way left-turn lane is provided for southbound traffic turning left into the proposed project driveway. It is expected that the two-way left-turn lane will be able to accommodate all peak hour traffic making this turning movement.

On-Site Circulation

Two driveways will be provided along the frontage of the project on North Wright Road. The north driveway is for egress only. Vehicles will be able to enter and exit the site at the south driveway.

Plans provided indicate that the AutoTURN application was used to analyze AASHTO design vehicle types P (passenger car) and WB-50 (intermediate semi trailer). The two design vehicles were used because the site's main traffic generator is passenger vehicles and the intermediate semi-trailer will be used for delivering gas. Based on the information provided, circulation is expected to be adequate.

Conclusions and Recommendations

Conclusions

- The project is expected to generate an average of 1,506 trips on a daily basis, including 73 in the a.m. peak hour, and 91 in the p.m. peak hour.
- Both study intersections are expected to operate acceptably at LOS D or better under existing plus project conditions.
- Under future conditions, both without and with the project, SR 12/Fulton Road is expected to operate at LOS F. Also under future volumes, Sebastopol Road/South Wright Road is expected to operate deficiently during both peak hours. Improvements included in the City of Santa Rosa's General Plan are assumed to result in acceptable operating conditions at both of these intersections.
- Pedestrian and bicycle facilities to be provided as part of the project offer additional connectivity to the Joe Rodota trail.
- Vehicle access to the project site is to be from North Wright Road, with one driveway for egress only and the other for ingress and egress. Southbound vehicles traveling along North Wright Road will be able to use the existing two-way left-turn lane to access the site.
- Passenger vehicles and intermediate semi-trailer design vehicles were used to determine that on-site circulation is adequate.

Recommendations

- The applicant should pay traffic impact fees to help fund planned future improvements at SR 12/Fulton Road and road widening on Sebastopol Road.

Study Participants and References

Study Participants

Principal in Charge:	Dalene J. Whitlock, PE, PTOE
Engineer:	Tony Henderson, PE
Assistant Engineer:	Smadar Boardman, EIT
Technician/Graphics:	Deborah J. Mizell
Editing/Formatting:	Angela McCoy
Report Review:	Dalene J. Whitlock, PE, PTOE

References

2009 Collision Data on California State Highways, California Department of Transportation, 2009
Highway Capacity Manual, Transportation Research Board, 2000
Highway Design Manual, 6th Edition, California Department of Transportation, 2006
Santa Rosa Bicycle and Pedestrian Master Plan, City of Santa Rosa, 2010
Santa Rosa City Code, Quality Code Company, 2013
Santa Rosa General Plan 2035, City of Santa Rosa, 2009
Statewide Integrated Traffic Records System (SWITRS), California Highway Patrol, 2006-2011
Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, 2012

SRO330



Appendix A

Intersection Collision Rate Calculations

INTERSECTION COLLISION RATE CALCULATIONS

City of Santa Rosa

Intersection # 1: State Route 12 & Fulton Rd/Wright Rd

Date of Count: Wednesday, April 17, 2013

Number of Collisions: 32

Number of Injuries: 22

Number of Fatalities: 1

ADT: 48500

Start Date: July 1, 2006

End Date: June 30, 2011

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS} \times 1 \text{ MILLION}}{\text{ADT} \times 365 \text{ DAYS PER YEAR} \times \text{NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{32}{48,500} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.36 c/mve	3.1%	68.8%
Statewide Average*	0.36 c/mve	0.5%	39.5%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2009 Collision Data on California State Highways, Caltrans

Intersection # 2: Sebastopol Rd & Wright Rd

Date of Count: Wednesday, April 17, 2013

Number of Collisions: 1

Number of Injuries: 0

Number of Fatalities: 0

ADT: 17600

Start Date: July 1, 2006

End Date: June 30, 2011

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS} \times 1 \text{ MILLION}}{\text{ADT} \times 365 \text{ DAYS PER YEAR} \times \text{NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{1}{17,600} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.03 c/mve	0.0%	0.0%
Statewide Average*	0.36 c/mve	0.5%	39.5%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2009 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

AM Peak Hour - Existing Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report

2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.847
Loss Time (sec): 8 Average Delay (sec/veh): 39.7
Optimal Cycle: 78 Level of Service: D

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected
Rights: Include Include Ignore Ignore Ignore Ignore
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 7:30 - 8:30 am
Base Vol: 87 359 313 666 394 199 206 840 94 203 691 615
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 87 359 313 666 394 199 206 840 94 203 691 615
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94
PHF Volume: 93 384 334 712 421 213 220 897 0 217 738 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 93 384 334 712 421 213 220 897 0 217 738 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 93 384 334 712 421 213 220 897 0 217 738 0

Saturation Flow Module:

Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:

Vol/Sat: 0.05 0.11 0.21 0.20 0.22 0.13 0.12 0.25 0.00 0.12 0.20 0.00
Crit Moves: ****
Green/Cycle: 0.09 0.24 0.24 0.24 0.39 0.39 0.16 0.29 0.00 0.14 0.27 0.00
Volume/Cap: 0.56 0.43 0.85 0.85 0.56 0.33 0.75 0.85 0.00 0.85 0.75 0.00
Delay/Veh: 48.0 32.3 51.5 44.3 24.7 21.5 50.2 39.7 0.0 64.0 36.5 0.0
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 48.0 32.3 51.5 44.3 24.7 21.5 50.2 39.7 0.0 64.0 36.5 0.0
LOS by Move: D C D D C C D D A E D A
HCM2k95thQ: 5 10 19 24 19 9 15 28 0 17 22 0

Note: Queue reported is the number of cars per lane.

PM Peak Hour - Existing Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report

2000 HCM Operations Method (Base Volume Alternative)

Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.797
Loss Time (sec): 8 Average Delay (sec/veh): 39.6
Optimal Cycle: 64 Level of Service: D

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected
Rights: Include Include Ignore Ignore Ignore Ignore
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 4:45 - 5:45 pm
Base Vol: 88 512 216 616 388 192 276 733 89 256 749 744
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 88 512 216 616 388 192 276 733 89 256 749 744
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93
PHF Volume: 95 554 234 666 419 208 298 792 0 277 810 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 95 554 234 666 419 208 298 792 0 277 810 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 95 554 234 666 419 208 298 792 0 277 810 0

Saturation Flow Module:

Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:

Vol/Sat: 0.05 0.15 0.14 0.19 0.22 0.13 0.17 0.22 0.00 0.15 0.22 0.00
Crit Moves: ****
Green/Cycle: 0.08 0.19 0.19 0.24 0.35 0.35 0.21 0.29 0.00 0.20 0.28 0.00
Volume/Cap: 0.63 0.80 0.75 0.80 0.63 0.37 0.80 0.76 0.00 0.76 0.80 0.00
Delay/Veh: 53.0 44.9 48.0 41.2 29.3 24.8 49.0 35.9 0.0 46.9 37.8 0.0
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 53.0 44.9 48.0 41.2 29.3 24.8 49.0 35.9 0.0 46.9 37.8 0.0
LOS by Move: D D D D C C D D A D D A
HCM2k95thQ: 6 16 13 22 21 10 20 24 0 18 25 0

Note: Queue reported is the number of cars per lane.

AM Peak Hour - Existing Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.607
Loss Time (sec): 8 Average Delay (sec/veh): 21.3
Optimal Cycle: 39 Level of Service: C

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Include Split Phase
Rights: Include Include Ovl
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 0 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 7:30 - 8:30 am
Base Vol: 3 259 95 379 299 5 4 10 0 130 4 492
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 3 259 95 379 299 5 4 10 0 130 4 492
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91
PHF Volume: 3 286 105 418 330 6 4 11 0 143 4 542
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 3 286 105 418 330 6 4 11 0 143 4 542
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 3 286 105 418 330 6 4 11 0 143 4 542

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.96 0.96 0.95 0.95 0.99 0.99 1.00 0.95 0.95 0.85
Lanes: 1.00 0.73 0.27 1.00 1.97 0.03 0.29 0.71 0.00 0.97 0.03
Final Sat.: 1805 1335 489 1805 3544 59 535 1338 0 1758 54 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.21 0.21 0.23 0.09 0.09 0.01 0.01 0.00 0.08 0.08 0.34
Crit Moves: ****
Green/Cycle: 0.01 0.35 0.35 0.38 0.72 0.72 0.01 0.01 0.00 0.17 0.17 0.55
Volume/Cap: 0.13 0.61 0.61 0.61 0.13 0.13 0.61 0.61 0.00 0.47 0.47 0.61
Delay/Veh: 51.0 28.3 28.3 26.4 4.3 4.3 84.6 84.6 0.0 38.5 38.5 16.2
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 51.0 28.3 28.3 26.4 4.3 4.3 84.6 84.6 0.0 38.5 38.5 16.2
LOS by Move: D C C A A F F A D B
HCM2k95thQ: 0 19 19 20 3 3 3 3 0 9 9 21

Note: Queue reported is the number of cars per lane.

PM Peak Hour - Existing Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.683
Loss Time (sec): 8 Average Delay (sec/veh): 22.4
Optimal Cycle: 46 Level of Service: C

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Include Split Phase
Rights: Include Include Ovl
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 0 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 5:00 - 6:00 pm
Base Vol: 4 307 81 459 315 9 10 5 1 93 5 475
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 4 307 81 459 315 9 10 5 1 93 5 475
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84
PHF Volume: 5 365 96 546 375 11 12 6 1 111 6 565
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 5 365 96 546 375 11 12 6 1 111 6 565
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 5 365 96 546 375 11 12 6 1 111 6 565

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.97 0.97 0.95 0.95 0.95 0.96 0.96 0.96 0.96 0.85
Lanes: 1.00 0.79 0.21 1.00 1.94 0.06 0.63 0.31 0.06 0.95 0.05
Final Sat.: 1805 1457 384 1805 3496 100 1142 571 114 1722 93 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.25 0.25 0.30 0.11 0.11 0.01 0.01 0.01 0.06 0.06 0.35
Crit Moves: ****
Green/Cycle: 0.02 0.37 0.37 0.44 0.79 0.79 0.02 0.02 0.02 0.09 0.09 0.54
Volume/Cap: 0.14 0.68 0.68 0.68 0.14 0.14 0.68 0.68 0.68 0.68 0.68
Delay/Veh: 50.0 29.6 29.6 24.7 2.5 2.5 101.2 101.2 101.2 54.7 54.7 18.2
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 50.0 29.6 29.6 24.7 2.5 2.5 101.2 101.2 101.2 54.7 54.7 18.2
LOS by Move: D C C A A F F F D B
HCM2k95thQ: 1 23 23 25 3 3 3 3 3 10 10 23

Note: Queue reported is the number of cars per lane.

AM Existing plus Project Wed May 8, 2013 10:51:51										Page 2-1									
AM Peak Hour - Existing plus Project Conditions										PM Existing plus Project Wed May 8, 2013 10:51:55									
Elm Tree Station Traffic Analysis										PM Peak Hour - Existing plus Project Conditions									
City of Santa Rosa										Elm Tree Station Traffic Analysis									
City of Santa Rosa										City of Santa Rosa									
Trip Generation Report										Trip Generation Report									
Forecast for am										Forecast for pm									
Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total % Of Trips	Total % Of Trips	Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total % Of Trips	Total % Of Trips
1		3.54	Convenience	Ma	20.46	20.46	72	72	144 200.0	1		3.54	Convenience	Ma	25.46	25.46	90	90	180 197.8
1		-1.00	Passby		36.00	37.00	-36	-37	-73 -101.1	1		-1.00	Passby		45.00	45.00	-45	-45	-90 -98.9
1		1.00	SFR		0.19	0.56	0	1	1 1.4	1		1.00	SFR		0.63	0.37	1	0	1 1.1
	Zone 1 Subtotal						36	36	72 100.0		Zone 1 Subtotal					46	45	91 100.0	
TOTAL										TOTAL									
							36	36	72 100.0							46	45	91 100.0	

AM Peak Hour - Existing plus Project Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.864
Loss Time (sec): 8 Average Delay (sec/veh): 40.9
Optimal Cycle: 84 Level of Service: D

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected Protected Protected
Rights: Include Include Include Include Include Include Include Include
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1 1 0 2 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 7:30 - 8:30 am
Base Vol: 87 359 313 666 394 199 206 840 94 203 691 615
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 87 359 313 666 394 199 206 840 94 203 691 615
Added Vol: 11 5 13 0 0 5 0 0 0 11 13 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 98 364 326 666 399 199 206 840 105 216 691 615
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94 0.94
PHF Volume: 105 389 348 712 426 213 220 897 0 231 738 0
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 105 389 348 712 426 213 220 897 0 231 738 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 105 389 348 712 426 213 220 897 0 231 738 0

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:
Vol/Sat: 0.06 0.11 0.22 0.20 0.22 0.13 0.12 0.25 0.00 0.13 0.20 0.00
Crit Moves: ****
Green/Cycle: 0.10 0.25 0.25 0.24 0.38 0.38 0.16 0.29 0.00 0.15 0.27 0.00
Volume/Cap: 0.58 0.43 0.86 0.86 0.58 0.34 0.75 0.86 0.00 0.86 0.75 0.00
Delay/Veh: 47.8 31.9 53.3 46.2 25.6 22.1 50.2 41.5 0.0 65.8 36.5 0.0
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 47.8 31.9 53.3 46.2 25.6 22.1 50.2 41.5 0.0 65.8 36.5 0.0
LOS by Move: D C D C C D D A E D A
HCM2k95thQ: 8 11 24 25 20 9 15 29 0 18 22 0

PM Peak Hour - Existing plus Project Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)
Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.799
Loss Time (sec): 8 Average Delay (sec/veh): 40.5
Optimal Cycle: 65 Level of Service: D

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected Protected Protected
Rights: Include Include Include Include Include Include Include Include
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 4:45 - 5:45 pm
Base Vol: 88 512 216 616 388 192 276 733 89 256 749 744
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 88 512 216 616 388 192 276 733 89 256 749 744
Added Vol: 14 7 16 0 0 7 0 0 0 14 16 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 102 519 232 616 395 192 276 733 103 272 749 744
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93 0.93
PHF Volume: 110 561 251 666 427 208 298 792 0 294 810 0
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 110 561 251 666 427 208 298 792 0 294 810 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 110 561 251 666 427 208 298 792 0 294 810 0

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:
Vol/Sat: 0.06 0.16 0.16 0.19 0.22 0.13 0.17 0.22 0.00 0.16 0.22 0.00
Crit Moves: ****
Green/Cycle: 0.09 0.19 0.19 0.24 0.34 0.34 0.21 0.28 0.00 0.21 0.28 0.00
Volume/Cap: 0.66 0.80 0.80 0.80 0.66 0.38 0.80 0.78 0.00 0.78 0.80 0.00
Delay/Veh: 53.3 44.9 51.8 41.4 30.6 25.4 49.2 37.3 0.0 47.9 37.9 0.0
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 53.3 44.9 51.8 41.4 30.6 25.4 49.2 37.3 0.0 47.9 37.9 0.0
LOS by Move: D D D D C C D A D A D
HCM2k95thQ: 9 20 18 22 22 10 20 24 0 19 25 0

AM Peak Hour - Existing plus Project Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.612
Loss Time (sec): 8 Average Delay (sec/veh): 21.4
Optimal Cycle: 39 Level of Service: C

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R
Control: Protected Protected Include Split Phase
Rights: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Min. Green: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Y+R: 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 1 0 0 1
Lanes: 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 1 0 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 7:30 - 8:30 am
Base Vol: 3 259 95 379 299 5 4 10 0 130 4 492
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 3 259 95 379 299 5 4 10 0 130 4 492
Added Vol: 0 2 0 0 5 2 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 3 261 95 384 301 5 4 10 0 130 4 497
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91
PHF Volume: 3 288 105 423 332 6 4 11 0 143 4 548
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 3 288 105 423 332 6 4 11 0 143 4 548
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 3 288 105 423 332 6 4 11 0 143 4 548

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.96 0.96 0.95 0.95 0.99 0.99 1.00 0.95 0.95 0.85
Lanes: 1.00 0.73 0.27 1.00 1.97 0.03 0.29 0.71 0.00 0.97 0.03 1.00
Final Sat.: 1805 1337 487 1805 3544 59 535 1338 0 1758 54 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.22 0.22 0.23 0.09 0.09 0.01 0.01 0.00 0.08 0.08 0.34
Crit Moves: ****
Green/Cycle: 0.01 0.35 0.35 0.38 0.72 0.72 0.01 0.01 0.00 0.17 0.17 0.55
Volume/Cap: 0.13 0.61 0.61 0.61 0.13 0.13 0.61 0.61 0.00 0.48 0.48 0.61
Delay/Veh: 51.0 28.5 28.5 26.4 4.3 4.3 86.0 86.0 0.0 38.5 38.5 16.3
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 51.0 28.5 28.5 26.4 4.3 4.3 86.0 86.0 0.0 38.5 38.5 16.3
LOS by Move: D C C A C A F A D D B
HCM2k95thQ: 0 19 19 20 3 3 3 3 0 9 9 21

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to W-TRANS, Santa Rosa, CA

PM Peak Hour - Existing plus Project Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 0.689
Loss Time (sec): 8 Average Delay (sec/veh): 22.5
Optimal Cycle: 47 Level of Service: C

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R
Control: Protected Protected Include Split Phase
Rights: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Min. Green: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Y+R: 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0 1
Lanes: 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0 0 0 1

Volume Module: >> Count Date: 17 Apr 2013 << 5:00 - 6:00 pm
Base Vol: 4 307 81 459 315 9 10 5 1 93 5 475
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 4 307 81 459 315 9 10 5 1 93 5 475
Added Vol: 0 2 0 0 7 2 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 4 309 81 466 317 9 10 5 1 93 5 482
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84 0.84
PHF Volume: 5 368 96 555 377 11 12 6 1 111 6 574
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 5 368 96 555 377 11 12 6 1 111 6 574
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 5 368 96 555 377 11 12 6 1 111 6 574

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.97 0.97 0.95 0.95 0.95 0.95 0.96 0.96 0.96 0.85
Lanes: 1.00 0.79 0.21 1.00 1.94 0.06 0.63 0.31 0.06 0.95 0.05 1.00
Final Sat.: 1805 1459 382 1805 3496 99 1142 571 114 1722 93 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.25 0.25 0.31 0.11 0.11 0.01 0.01 0.01 0.06 0.06 0.36
Crit Moves: ****
Green/Cycle: 0.02 0.37 0.37 0.45 0.79 0.79 0.02 0.02 0.02 0.09 0.09 0.54
Volume/Cap: 0.14 0.69 0.69 0.69 0.14 0.14 0.69 0.69 0.69 0.69 0.69 0.66
Delay/Veh: 50.0 29.9 29.9 24.7 2.4 2.4 103.4 103 103.4 55.3 55.3 18.4
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 50.0 29.9 29.9 24.7 2.4 2.4 103.4 103 103.4 55.3 55.3 18.4
LOS by Move: D C C C A A F F F E B
HCM2k95thQ: 1 23 23 25 3 3 3 3 3 10 10 24

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to W-TRANS, Santa Rosa, CA

AM Peak Hour - Future Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.287
Loss Time (sec): 8 Average Delay (sec/veh): 113.9
Optimal Cycle: 180 Level of Service: F

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected Protected Protected
Rights: Include Include Ignore Ignore Ignore Ignore Ignore Ignore
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1 1 0 2 0 1

Volume Module:
Base Vol: 127 701 667 1124 757 230 206 844 104 390 802 951
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 127 701 667 1124 757 230 206 844 104 390 802 951
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 127 701 667 1124 757 230 206 844 0 390 802 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 127 701 667 1124 757 230 206 844 0 390 802 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 127 701 667 1124 757 230 206 844 0 390 802 0

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:
Vol/Sat: 0.07 0.19 0.41 0.32 0.40 0.14 0.11 0.23 0.00 0.22 0.22 0.00
Crit Moves: 0.09 0.32 0.32 0.25 0.48 0.48 0.12 0.18 0.00 0.17 0.23 0.00
Green/Cycle: 0.82 0.61 1.29 1.29 0.82 0.29 0.96 1.29 0.00 1.29 0.96 0.00
Volume/Cap: 73.3 29.5 177.1 175.2 28.1 15.7 94.4 181 0.0 193.3 60.3 0.0
Delay/Veh: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
User DelAdj: 73.3 29.5 177.1 175.2 28.1 15.7 94.4 181 0.0 193.3 60.3 0.0
AdjDel/Veh: 12 19 64 57 37 8 19 46 0 41 31 0
LOS by Move: E C F C B F F A F E A
HCM2k95thQ: 12 19 64 57 37 8 19 46 0 41 31 0

Note: Queue reported is the number of cars per lane.

PM Peak Hour - Future Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #1 SR 12/Fulton Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.347
Loss Time (sec): 8 Average Delay (sec/veh): 148.9
Optimal Cycle: 180 Level of Service: F

Street Name: Fulton Rd SR 12
Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R
Control: Protected Protected Protected Protected Protected Protected Protected Protected
Rights: Include Include Ignore Ignore Ignore Ignore Ignore Ignore
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 2 0 1 2 0 1 0 1 1 0 2 0 1

Volume Module:
Base Vol: 165 1105 463 1021 1091 279 315 832 171 619 937 1068
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 165 1105 463 1021 1091 279 315 832 171 619 937 1068
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 165 1105 463 1021 1091 279 315 832 0 619 937 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 165 1105 463 1021 1091 279 315 832 0 619 937 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 165 1105 463 1021 1091 279 315 832 0 619 937 0

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.95 0.85 0.92 1.00 0.85 0.95 0.95 1.00 0.95 0.95 1.00
Lanes: 1.00 2.00 1.00 2.00 1.00 1.00 1.00 2.00 1.00 1.00 2.00 1.00
Final Sat.: 1805 3610 1615 3502 1900 1615 1805 3610 1900 1805 3610 1900

Capacity Analysis Module:
Vol/Sat: 0.09 0.31 0.29 0.29 0.57 0.17 0.17 0.23 0.00 0.34 0.26 0.00
Crit Moves: 0.07 0.25 0.25 0.24 0.43 0.43 0.17 0.17 0.00 0.25 0.25 0.00
Green/Cycle: 1.35 1.21 1.13 1.21 1.35 0.41 1.02 1.35 0.00 1.35 1.02 0.00
Volume/Cap: 247.1 142 123.2 143.1 193 20.3 97.7 208 0.0 207.3 72.0 0.0
Delay/Veh: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
User DelAdj: 247.1 142 123.2 143.1 193 20.3 97.7 208 0.0 207.3 72.0 0.0
AdjDel/Veh: 22 53 41 49 104 12 27 48 0 63 37 0
LOS by Move: F F F F C F C F A F E A
HCM2k95thQ: 22 53 41 49 104 12 27 48 0 63 37 0

Note: Queue reported is the number of cars per lane.

AM Peak Hour - Future Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.048
Loss Time (sec): 8 Average Delay (sec/veh): 60.1
Optimal Cycle: 180 Level of Service: E

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R
Control: Protected Protected Protected Split Phase Split Phase
Rights: Include Include Include Ovl
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 0 0 1

Volume Module:
Base Vol: 5 689 148 527 687 8 13 20 0 205 4 798
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 5 689 148 527 687 8 13 20 0 205 4 798
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 5 689 148 527 687 8 13 20 0 205 4 798
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 5 689 148 527 687 8 13 20 0 205 4 798
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 5 689 148 527 687 8 13 20 0 205 4 798

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.97 0.97 0.95 0.95 0.95 0.98 0.98 1.00 0.95 0.95 0.85
Lanes: 1.00 0.82 0.18 1.00 1.98 0.02 0.39 0.61 0.00 0.98 0.02 1.00
Final Sat.: 1805 1522 327 1805 3561 41 734 1130 0 1776 35 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.45 0.45 0.29 0.19 0.19 0.02 0.02 0.00 0.12 0.12 0.49
Crit Moves: ****
Green/Cycle: 0.01 0.43 0.43 0.28 0.70 0.70 0.02 0.02 0.00 0.19 0.19 0.47
Volume/Cap: 0.28 1.05 1.05 1.05 0.28 0.28 1.05 1.05 0.00 0.60 0.60 1.05
Delay/Veh: 57.2 73.7 73.7 89.5 5.6 5.6 224.7 225 0.0 39.7 39.7 72.5
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 57.2 73.7 73.7 89.5 5.6 5.6 224.7 225 0.0 39.7 39.7 72.5
LOS by Move: E E F A F A F A D E
HCM2k95thQ: 1 57 57 40 8 8 6 6 0 13 13 55

Note: Queue reported is the number of cars per lane.

PM Peak Hour - Future Conditions
Elm Tree Station Traffic Analysis
City of Santa Rosa

Level of Service Computation Report
2000 HCM Operations Method (Base Volume Alternative)
Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.303
Loss Time (sec): 8 Average Delay (sec/veh): 119.9
Optimal Cycle: 180 Level of Service: F

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R
Control: Protected Protected Protected Split Phase Split Phase
Rights: Include Include Include Ovl
Min. Green: 0 0 0 0 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 0 0 1

Volume Module:
Base Vol: 7 797 159 1029 861 20 25 9 2 162 7 900
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 7 797 159 1029 861 20 25 9 2 162 7 900
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 7 797 159 1029 861 20 25 9 2 162 7 900
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0
Reduced Vol: 7 797 159 1029 861 20 25 9 2 162 7 900
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Final Volume: 7 797 159 1029 861 20 25 9 2 162 7 900

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.98 0.98 0.95 0.95 0.95 0.95 0.96 0.96 0.96 0.95 0.85
Lanes: 1.00 0.83 0.17 1.00 1.95 0.05 0.69 0.25 0.06 0.96 0.04 1.00
Final Sat.: 1805 1544 308 1805 3517 82 1264 455 101 1738 75 1615

Capacity Analysis Module:
Vol/Sat: 0.00 0.52 0.52 0.57 0.24 0.24 0.02 0.02 0.02 0.09 0.09 0.56
Crit Moves: ****
Green/Cycle: 0.01 0.40 0.40 0.44 0.82 0.82 0.02 0.02 0.02 0.07 0.07 0.51
Volume/Cap: 0.30 1.30 1.30 1.30 0.30 0.30 1.30 1.30 1.30 1.30 1.30 1.10
Delay/Veh: 55.9 177 176.6 173.9 2.2 2.2 324.6 325 324.6 227.8 228 85.1
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 55.9 177 176.6 173.9 2.2 2.2 324.6 325 324.6 227.8 228 85.1
LOS by Move: E F F A F A F A F F F
HCM2k95thQ: 1 89 89 95 7 7 7 7 7 22 22 65

Note: Queue reported is the number of cars per lane.

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.052
Loss Time (sec): 8 Average Delay (sec/veh): 61.0
Optimal Cycle: 180 Level of Service: E

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R

Control: Protected Protected Split Phase Split Phase
Rights: Include Include Include Include
Min. Green: 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 1 0 0 0 1 0 0 1 0 0 1

Volume Module:
Base Vol: 5 689 148 527 687 8 13 20 0 205 4 798
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 5 689 148 527 687 8 13 20 0 205 4 798
Added Vol: 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 5 691 148 532 689 8 13 20 0 205 4 803
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 5 691 148 532 689 8 13 20 0 205 4 803
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 5 691 148 532 689 8 13 20 0 205 4 803

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.97 0.97 0.95 0.95 0.95 0.95 0.98 0.98 1.00 0.95 0.95 0.95 0.85
Lanes: 1.00 0.82 0.18 1.00 1.98 0.02 0.39 0.61 0.00 0.98 0.02 1.00
Final Sat.: 1805 1524 326 1805 3561 41 734 1130 0 1776 35 1615
Capacity Analysis Module:
Vol/Sat: 0.00 0.45 0.45 0.29 0.19 0.19 0.02 0.02 0.00 0.12 0.12 0.50
Crit Moves: ****
Green/Cycle: 0.01 0.43 0.43 0.28 0.70 0.70 0.02 0.02 0.00 0.19 0.19 0.47
Volume/Cap: 0.28 1.05 1.05 1.05 0.28 0.28 1.05 1.05 0.00 0.60 0.60 1.05
Delay/Veh: 57.3 75.0 75.0 90.5 5.6 5.6 226.3 226 0.0 39.8 39.8 73.6
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 57.3 75.0 75.0 90.5 5.6 5.6 226.3 226 0.0 39.8 39.8 73.6
LOS by Move: E E F A A F A D E
HCM2k95thQ: 1 58 58 41 8 8 6 6 0 13 13 56

Level of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #2 Sebastopol Rd/S Wright Rd

Cycle (sec): 100 Critical Vol./Cap.(X): 1.309
Loss Time (sec): 8 Average Delay (sec/veh): 121.7
Optimal Cycle: 180 Level of Service: F

Street Name: S Wright Rd Sebastopol Rd
Approach: North Bound South Bound East Bound West Bound
Movement: L - - T - - R L - - T - - R L - - T - - R L - - T - - R

Control: Protected Protected Split Phase Split Phase
Rights: Include Include Include Include
Min. Green: 0 0 0 0 0 0 0 0
Y+R: 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0
Lanes: 1 0 0 1 0 1 0 1 0 0 0 1 0 0 0 1 0 0 1

Volume Module:
Base Vol: 7 797 159 1029 861 20 25 9 2 162 7 900
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 7 797 159 1029 861 20 25 9 2 162 7 900
Added Vol: 0 2 0 0 0 0 0 0 0 0 0 0 0 0
PasserByVol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Initial Fut: 7 799 159 1036 863 20 25 9 2 162 7 907
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
PHF Volume: 7 799 159 1036 863 20 25 9 2 162 7 907
Reduced Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PCE Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
MLF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
FinalVolume: 7 799 159 1036 863 20 25 9 2 162 7 907

Saturation Flow Module:
Sat/Lane: 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900 1900
Adjustment: 0.95 0.98 0.17 1.00 1.95 0.95 0.69 0.25 0.06 0.96 0.94 1.00
Lanes: 1.00 0.83 0.17 1.00 1.95 0.05 0.69 0.25 0.06 0.96 0.94 1.00
Final Sat.: 1805 1545 307 1805 3518 82 1264 455 101 1738 75 1615
Capacity Analysis Module:
Vol/Sat: 0.00 0.52 0.52 0.57 0.25 0.25 0.02 0.02 0.02 0.09 0.09 0.56
Crit Moves: ****
Green/Cycle: 0.01 0.40 0.40 0.44 0.82 0.82 0.02 0.02 0.02 0.07 0.07 0.51
Volume/Cap: 0.30 1.31 1.31 1.31 0.30 0.30 1.31 1.31 1.31 1.31 1.31 1.10
Delay/Veh: 56.0 179 179.0 176.1 2.2 2.2 327.0 327.0 230.1 230.1 230.1 87.5
User DelAdj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
AdjDel/Veh: 56.0 179 179.0 176.1 2.2 2.2 327.0 327.0 230.1 230.1 230.1 87.5
LOS by Move: E F F A A F A F F F F F F
HCM2k95thQ: 1 89 89 96 7 7 7 7 7 22 22 66
