

Appendix 2

Panoche Solar Farm Traffic Study

November 2014



HEXAGON TRANSPORTATION CONSULTANTS, INC.



Panoche Solar Farm Traffic Study



Prepared for:

Aspen Environmental Group



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1. Introduction

Hexagon Transportation Consultants, Inc. has completed this traffic study for a proposed solar farm in the Panoche Valley of San Benito County. The study was completed in response to concerns regarding safety and effects of construction traffic, primarily truck activity, at intersections and roadways serving the project site. The purpose of the traffic study is to identify potential safety and operational issues on the roadways and to explore improvement options to address those issues.

The study focuses on Panoche Road, between SR 25 and Interstate 5, and Little Panoche Road between Panoche Road and Interstate 5. The study included an evaluation of roadway geometrics, pavement conditions, vehicular speeds, vehicle composition, sight distance, and existing signage along each of the roadways. Intersection levels of service analysis and signal warrant checks also were completed at the intersections of SR 25 and Panoche Road and Panoche Road and Little Panoche Road.

Proposed Solar Farm Operations and Access

The project as proposed will consist of a 247-megawatt solar energy generation facility on a 2,506-acre site located along Little Panoche Road as shown in Figure 1.

The workforce at the project site will vary based on the work activities conducted and time of year. However a peak of approximately 550 employees per day, that includes supervisors and office staff, is expected on site at any one time during the construction of the solar farm. During the construction period, employees will work a 12-hour daytime shift with a maximum of 50 employees on site at night. Nighttime work hours would occur between 9:00 PM and 5:00 AM. Nighttime activities would be restricted to minimize impacts to biological resources, sensitive receptors, and land use and recreationalists. These activities would be limited to the following:

- minor non-ground-disturbing activities such as commissioning and maintenance activities to be performed when PV arrays are not energized
- interior use of the operations and maintenance facility
- unanticipated emergencies (defined as an imminent threat to life or a significant property interest), including non-routine maintenance that requires immediate attention
- special status species impact avoidance and minimization activities and research (e.g., giant kangaroo rat trapping and San Joaquin kit fox radio telemetry), and
- security patrols.

No ground disturbing activities (including but not limited to grading, pile driving, trenching) would take place at night.

Employees would originate from the primary workforce areas of Hollister/San Benito County and Fresno County which are located between 10-60 miles from the site. It is expected that the employees would

carpool at a rate equivalent to 1.2 employees per vehicle. It is anticipated that approximately 100 large trucks would access the site on a daily basis to deliver material and equipment to the site. A few trucks containing oversized loads also will access the site, but will be infrequent when compared to daily truck traffic. Delivery of material and equipment are anticipated to be delivered from within a 100-mile radius (occasionally from a greater distance) but on the average of less than 100 miles away. The types and estimated daily trips anticipated to be generated by the project during construction of project is presented in Table 1.

Access to the site will be provided exclusively from Little Panoche Road. Staff will utilize Panoche Road to and from SR 25 and Little Panoche Road to and from Interstate 5. Truck traffic will be restricted to the use of Little Panoche Road to and from Interstate 5.

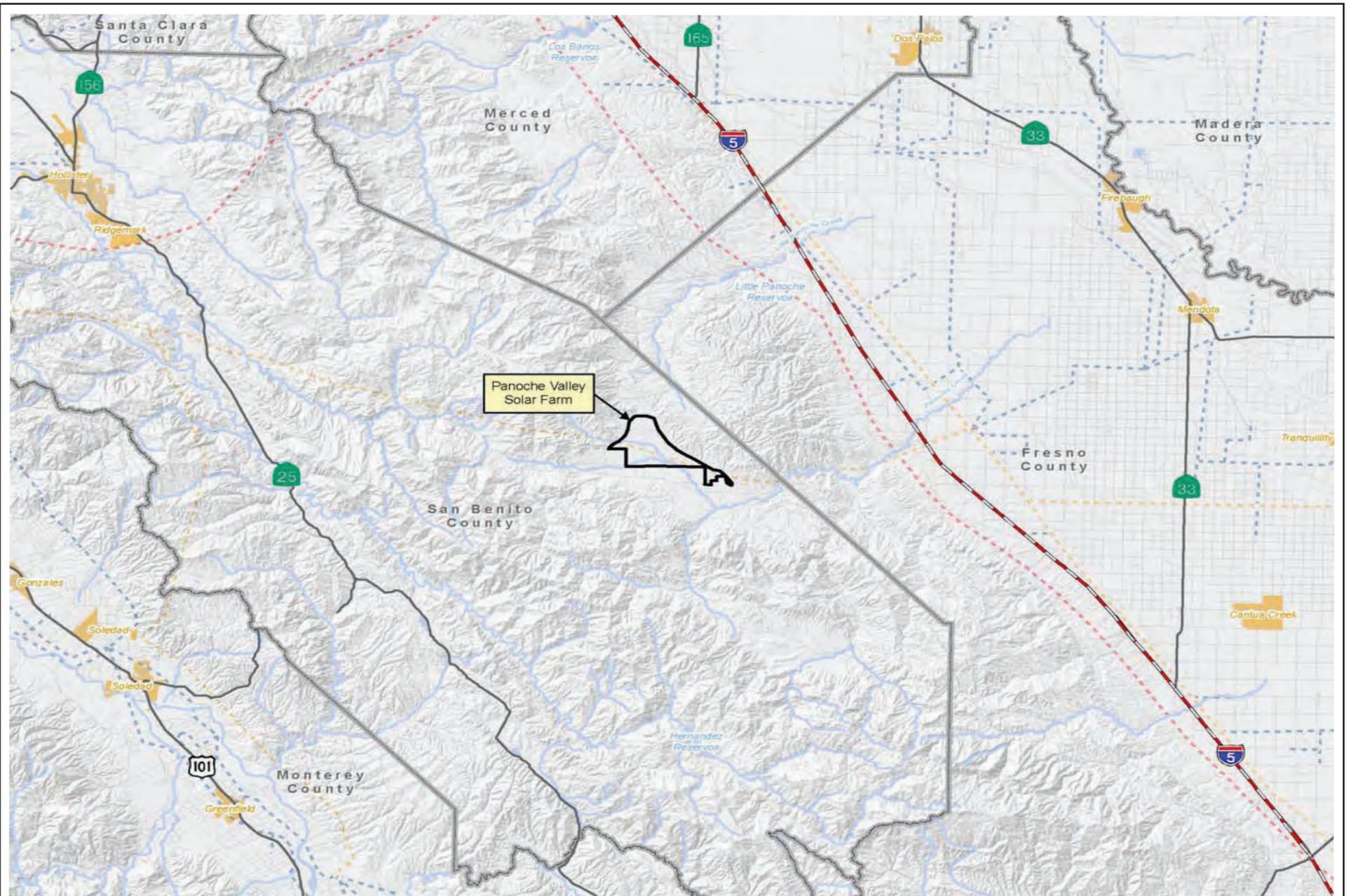


Figure 1
Site Location
Panoche Valley Solar Farm

Table 1
Project Trips and Origins

	Approximate Distance ¹	Daily Trips
Employees	~10-60 miles	550
Employee Daily Trips ²		950
Daily Material Delivery	~40-100 miles	200
Total Daily Trips		1150

Source: Workforce, work shift, and material delivery information provided by project applicant and includes; Peak workforce of 550 employees and 100 truck material deliveries per day.

Notes:

¹ Distances assumed from a city of residence, port of entry, or manufacturing site to the project.

² Assumes carpool rate of 1.2 employees per vehicle.

2. Existing Conditions

The existing geometrics and traffic patterns of the study roadways were measured and observed in the field. Traffic volume, vehicle composition and speed data also were collected on each of the roadways along with peak hour counts at critical intersections. The existing geometry and traffic characteristics of each roadway are discussed in this chapter.

Roadway Geometrics and Field Observations

Panoche Road

Panoche Road is a two-lane county roadway that generally runs in an east-west direction and extends from SR 25 in Paicines to Interstate 5 in Fresno County. Pavement ends along Panoche Road approximately 6 miles east of Little Panoche Road and the roadway changes designation to Jackass Grade. The unpaved grade traverses mountainous terrain for approximately 10 to 15 miles east towards Interstate 5. Pavement once again begins approximately 1.25 miles west of Interstate 5.

Though the roadway connects SR 25 and Interstate 5, the roadway is not intended to serve as a link between the highways. The primary purpose of Panoche Road is to provide access to adjacent properties of the roadway. The pavement width of Panoche Road at approximately 1,000 ft. east of SR 25 was measured to be 23 feet with centerline striping and no shoulders. The pavement on Panoche Road narrows to generally 20 feet in width as it traverses east with some sections as narrow as 18 feet with no centerline striping through its mountainous sections. The pavement width was measured to be 20 feet wide with one foot shoulders 1,000 feet west of Little Panoche Road. Though shoulders are not provided along the extent of Panoche Road some sections do have clear zones of dirt. At some points through the mountainous section of the roadway, slopes, rocks and trees are located immediately adjacent to the roadway.

Approximately 15 miles east of SR 25, Panoche Road traverses mountainous terrain. The horizontal alignment of much of the roadway through the mountain results in sharp curves with poor sight distance due to slopes and vegetation obstructing the view of both travel ways. There are several narrow bridges along Panoche Road that provide as little as 14 feet of travel way that does not provide adequate width for two-way travel. Portions of the roadway are also traversed by water (streams/creeks); therefore the roadway may be impassible during seasonal rain. The pavement conditions along Panoche Road vary with some sections in poor condition and deteriorating.

Little Panoche Road

Little Panoche Road is also a two-lane county roadway that extends northeast from Panoche Road to Interstate 5. A full access interchange is provided at its junction with Interstate 5. Little Panoche Road was measured to be 20 feet in width with one foot shoulders approximately 1,000 feet north of Panoche

Road. Approximately four miles north of Panoche Road, Little Panoche Road traverses mountainous terrain and pavement width narrows to as little as 16 feet with no shoulders. Though shoulders are not provided along the majority of Little Panoche Road, there is clear zone provided throughout.

Sight distance along Little Panoche Road is adequate since its horizontal alignment is generally straight with very little vegetation. Though sharp curves are located along the roadway views from both lanes are unobstructed. Pavement along Little Panoche Road is generally in fair condition, but a five mile segment beginning four miles north of Panoche Road and traversing the mountainous terrain is in very poor condition. There is temporary signage in place warning of the poor pavement conditions.

Existing Signage

The location of posted speed and safety signs along the roadways were noted. Both roadways are adequately signed with warning and advisory curve speed signs in advance of sharp curves.

Traffic Volumes and Vehicle Composition

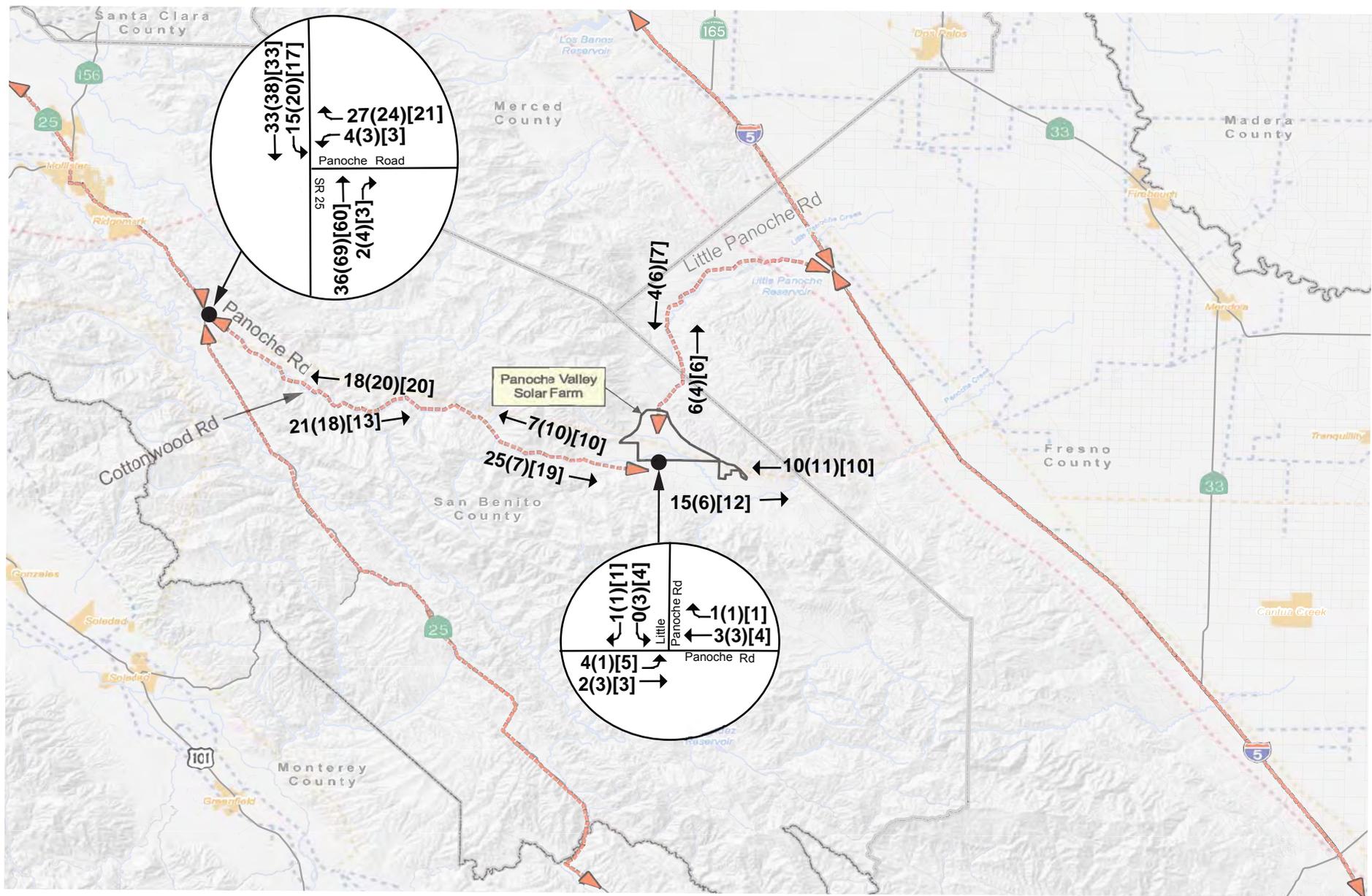
Traffic counts were collected in March 2010 when this traffic analysis was begun. The traffic study is now being completed after being placed on hold for several years. New 2014 counts were not collected at the study facilities since there has been no development in the area that would result in a significant change in traffic conditions on study facilities. The study facilities also do not provide access to major developed areas.

Twenty-four-hour traffic volume data was collected at four locations along Panoche and Little Panoche Roads: (A) Little Panoche Road, north of Panoche Road, (B) Panoche Road, east of Little Panoche Road, (C) Panoche Road, west of Little Panoche Road, and (D) Panoche Road, east of Cottonwood Road. The collected data indicate daily volumes ranging between 66 and 322 vehicles per day and peak bi-directional volumes ranging from 7-38 vehicles during the AM, PM and Mid-day peak hours. Table 2 and Figure 2 present the peak hour volumes along Panoche and Little Panoche Roads. Since traffic signals and other control devices are not located along either roadway, the roadways have the capacity to serve 600-1,200 vehicles per hour. Therefore, the existing peak hour volumes along the roadways are well within the service capacities of the roadways.

In addition, twenty-four-hour vehicle composition data was also collected along Panoche and Little Panoche Roads at the same locations that volume data was collected. Table 3 shows a summary of vehicle composition traveling along each of the roadways. Based on the collected data, 10 (15.2%) daily vehicles traveling along Little Panoche Road are classified as trucks (heavy vehicles) with 3 or more axles. The composition of heavy trucks along Panoche Road ranges between 59 (17.5%) and 66 (43.1%) daily vehicles. Though the composition of truck traffic along each of the roadways is large compared to typical percentages on local roadways of 2-5%, the heavy trucks have a negligible effect on roadway operations due to the very low auto volumes along each of the roadways.

Vehicle Speed

Twenty-four-hour vehicle speed data was collected at the same four locations identified above. There is no posted speed limit along either of the roadways, thus the speed limit for each roadway is 55 mph. The 85th percentile is considered to be the prevailing speed, the speed at which vehicles generally travel under optimum pavement, weather, visibility and traffic volume. Table 4 summarizes vehicular speed along Panoche and Little Panoche Roads. Based on the collected data, the 85th percentile speed of vehicles traveling along Panoche Road at the three count locations ranges between 57 mph and 66 mph. The average 85th percentile speed along Panoche Road is 61 mph. The 85th percentile speed of vehicle traveling along Little Panoche Road is 55 mph. Thus, data indicates that the majority of vehicles traveling along each of the roadways are traveling faster than the 55 mph speed limit. Guidelines require that the posted speed limit be established at the nearest 5 mph increment to the measured 85th percentile speed. Thus, the posted speed limit would need to be 60 mph based on the calculated 85th percentile speed. However, the guidelines do allow for a reduction in speed of 5 mph based upon safety concerns and roadway conditions. Therefore, the existing 55 mph speed limit along the corridor is adequate.



LEGEND

XX(XY)[ZZ] = AM(PM)[Midday] Peak-Hour Volumes

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Figure 2

Existing Traffic Volume Data

Panoche Valley Solar Farm

Table 2
Existing Average Daily Traffic

Location	Direction ¹	Existing Conditions			
		ADT ²	AM Peak ³	PM Peak ⁴	Mid-Day Peak ⁵
(A) Little Panoche Road, North of Panoche Road	NB	32	6	4	6
	SB	34	1	6	5
	Total	66	7	10	11
(B) Panoche Road, East of Little Panoche Road	EB	76	15	5	12
	WB	76	10	11	10
	Total	152	25	16	22
(C) Panoche Road, West of Little Panoche Road	EB	95	25	6	19
	WB	81	7	10	10
	Total	176	32	16	29
(D) Panoche Road, East of Cottonwood Road	EB	159	21	18	13
	WB	163	17	20	20
	Total	322	38	38	33

Notes:
¹ Direction of travel along Panoche Road and Little Panoche Road
² ADT = Daily Volume
³ Highest AM peak-hour volume of the two surveyed dates (6:00 AM - 9:00 AM)
⁴ Highest PM peak-hour volume of the two surveyed dates (3:00 PM - 6:00 PM)
⁵ Highest mid-day peak-hour volume of the two surveyed dates (11:00 AM - 2:00 PM)

**Table 3
Existing Vehicular Composition**

Location	Class	Both Directions	
		Existing Conditions	
		Volume ¹	Ratio
(A) Little Panoche Road, North of Panoche Road	A	33	50.0%
	B	23	34.8%
	C	10	15.2%
	Total	66	100.0%
(B) Panoche Road, East of Little Panoche Road	A	45	29.6%
	B	41	27.0%
	C	66	43.4%
	Total	152	100.0%
(C) Panoche Road, West of Little Panoche Road	A	54	30.7%
	B	57	32.4%
	C	65	36.9%
	Total	176	100.0%
(D) Panoche Road, East of Cottonwood Road	A	134	41.6%
	B	129	40.1%
	C	59	18.3%
	Total	322	100.0%
Notes:			
¹ 24-hour total volume, both directions.			
Class Types			
A Motorcycles and Passenger Cars			
B 2-Axle Bus and Medium Sized Trucks			
C 3-Axle and Larger Trucks			

**Table 4
Existing Vehicular Speed Data**

Location	Speed	Both Directions	
		Volume ¹	Ratio
(A) Little Panoche Road, North of Panoche Road	0 - 25 mph	1	1.5%
	25 - 45 mph	21	31.8%
	>45 mph	44	66.7%
	Total	66	100%
	85 th Percentile Speed =		55 MPH
(B) Panoche Road, East of Little Panoche Road	0 - 25 mph	2	1.3%
	25 - 45 mph	56	36.8%
	>45 mph	94	61.8%
	Total	152	100%
	85 th Percentile Speed =		61 MPH
(C) Panoche Road, West of Little Panoche Road	0 - 25 mph	9	5.1%
	25 - 45 mph	79	44.9%
	>45 mph	88	50.0%
	Total	176	100%
	85 th Percentile Speed =		57 MPH
(D) Panoche Road, East of Cottonwood Road	0 - 25 mph	6	1.9%
	25 - 45 mph	24	7.5%
	>45 mph	292	90.7%
	Total	322	100%
	85 th Percentile Speed =		66 MPH
Note: ¹ 24-hour total volume			

3.

Project Conditions

Proposed Solar Farm Operations and Access

The project as proposed will consist of a 247-megawatt solar energy generation facility on a 2,506-acre site located along Little Panoche Road.

The workforce at the project site will vary based on the work activities conducted and time of year. However a peak of approximately 550 employees per day, that includes supervisors and office staff, is expected on site at any one time during the construction of the solar farm. During the construction period, employees will work a 12-hour daytime shift with a maximum of 50 employees on site at night. Nighttime work hours would occur between 9:00 PM and 5:00 AM. Nighttime activities would be restricted to minimize impacts to biological resources, sensitive receptors, and land use and recreationalists. These activities would be limited to the following:

- minor non-ground-disturbing activities such as commissioning and maintenance activities to be performed when PV arrays are not energized
- interior use of the operations and maintenance facility
- unanticipated emergencies (defined as an imminent threat to life or a significant property interest), including non-routine maintenance that requires immediate attention
- special status species impact avoidance and minimization activities and research (e.g., giant kangaroo rat trapping and San Joaquin kit fox radio telemetry), and
- security patrols.

No ground disturbing activities (including but not limited to grading, pile driving, trenching) would take place at night.

Employees would originate from the primary workforce areas of Hollister/San Benito County and Fresno County which are located between 10-60 miles from the site. It is expected that the employees would carpool at a rate equivalent to 1.2 employees per vehicle. It is anticipated that approximately 100 large trucks would access the site on a daily basis to deliver material and equipment to the site. A few trucks containing oversized loads also will access the site, but will be infrequent when compared to daily truck traffic. Delivery of material and equipment are anticipated to be delivered from within a 100-mile radius (occasionally from a greater distance) but on the average of less than 100 miles away. The types and estimated daily trips anticipated to be generated by the project during construction of project is presented in Table 1.

Access to the site will be provided exclusively from Little Panoche Road. Staff will utilize Panoche Road to and from SR 25 and Little Panoche Road to and from Interstate 5. Truck traffic will be restricted to the use of Little Panoche Road to and from Interstate 5.

Traffic associated with the project after completion of the construction period is expected to be minimal. Therefore, the analysis presented within this chapter evaluates the effects of project traffic under a worst-case peak construction period during its approximately 18-month construction period.

Project Traffic

The magnitude of traffic produced by a new development is typically estimated by applying the size of the project to the applicable trip generation rate contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual. However, the ITE manual does not include trip generation rates for solar farm facilities. Therefore, the amount of traffic generated by the proposed project was estimated based on information obtained from the applicant, which includes number of employees, employee shift times, and anticipated daily truck activity at the site. The vehicular trips associated with the proposed project were separated into two components: 1) auto trips and 2) truck trips.

Auto Trips

Auto trips simply refer to all passenger vehicle trips that would be generated by the proposed project. These trips would mainly represent employee trips to and from the site throughout their work shifts. It is anticipated that the proposed project would employ a peak total of 550 employees that will work a 12-hour daytime shift (generally between 7:00 AM to 7:00 PM) with a maximum of 50 employees on site at night. Nighttime work hours would occur between 9:00 PM and 5:00 AM. Nighttime activities would be restricted to minimize impacts to biological resources, sensitive receptors, and land use and recreationalists.

The daily traffic generated by the project's employees was estimated based on work shift information and the assumption that employees would carpool at a rate equivalent to 1.2 employees per vehicle. Based on the provided information and assumptions, it is estimated that the proposed project would generate a total of 950 daily auto trips. Based on the proposed start and end times of the daytime work shift, the project would not generate auto trips during the standard AM and PM peak hours. The project would generate the greatest amount of auto traffic, 448 trips, from 6:00 – 7:00 AM during the arrival of employees for the daytime work shift and 7:00 – 8:00 PM during the departure of employees of the daytime work shift. Based upon existing count data, the identified peak of project traffic would not coincide with the peak of existing traffic along surrounding roadways.

Truck Trips

The expected truck traffic generated by the proposed project would mainly be composed of trucks delivering materials and equipment to the site. It is anticipated that approximately 100 large trucks would access the site on a daily basis to deliver materials and equipment. It was assumed that the trucks would arrive to the site evenly distributed between the hours of 6:00 AM -6:00 PM. Thus, it is estimated that the proposed project would generate a total of 200 daily truck trips, with a maximum of 18 truck trips occurring during any one hour between 6:00 AM -6:00 PM.

Overall, the project is estimated to generate a total of 1,150 daily trips, with 16 (8 inbound and 8 outbound) trips occurring during the typical AM and PM peak hours. The project would generate the greatest amount of traffic, 448 trips, between 6:00 – 7:00 AM which falls outside of the typical AM commute period. The daily project vehicular activity and trip generation estimates are presented in Table 5.

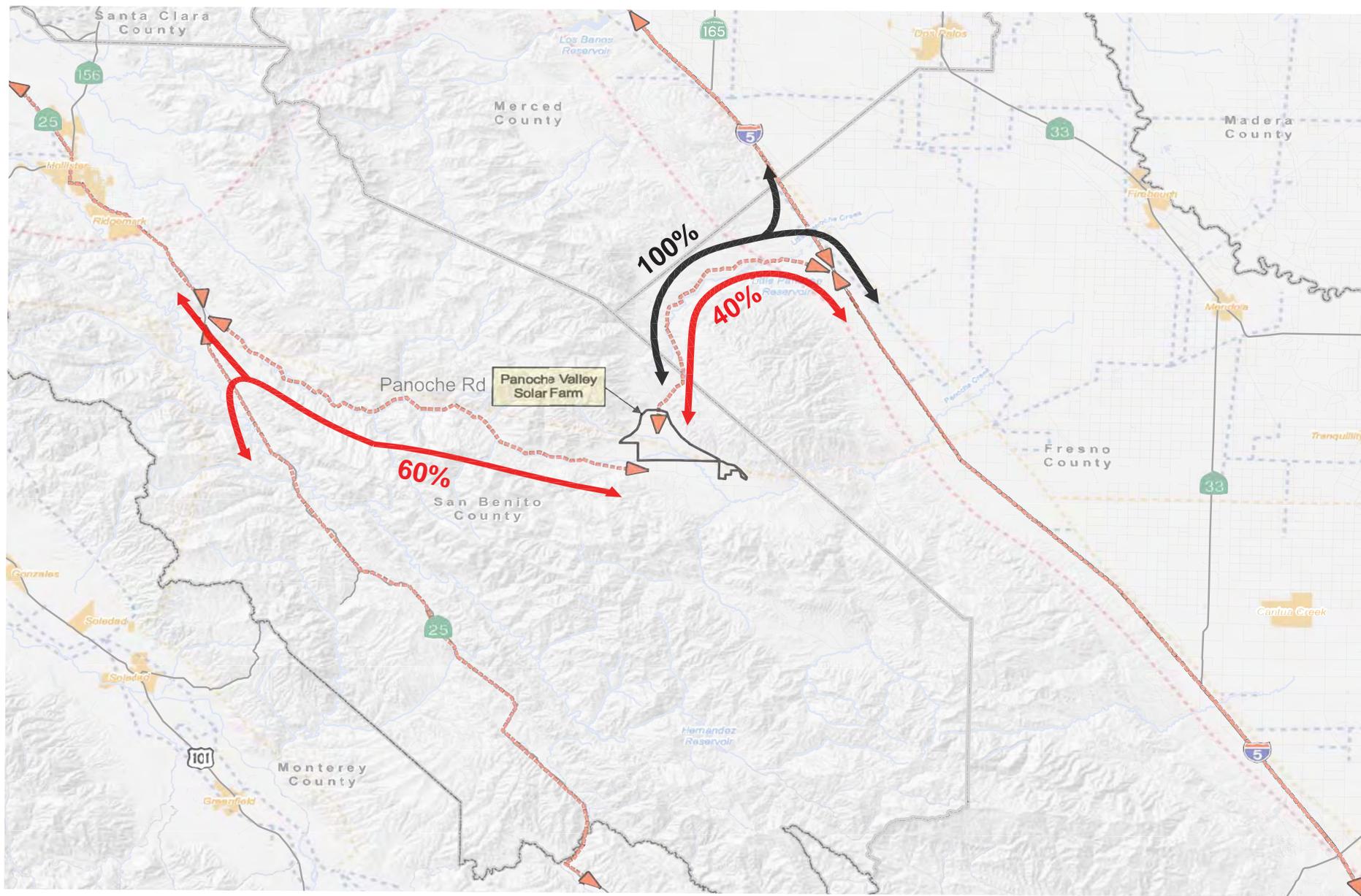
Trip Distribution and Assignment

All project traffic would access the project site via either Panoche Road or Little Panoche Road. It was assumed that 60 percent of the employees would originate from San Benito County and utilize Panoche Road from SR 25, the remaining 40 percent were assumed to utilize Little Panoche Road from Interstate 5. All heavy truck traffic will be restricted to the use of Little Panoche Road from Interstate 5. No truck traffic was assumed to use Panoche Road from SR 25 due to its existing geometrics as explained in more detail in the following section. No project traffic was assumed to utilize the unpaved section of Panoche Road/Jackass Grade. The assumed distribution of project traffic is presented in Figure 3. Project traffic on the roadway system is presented in Figure 4.

**Table 5
Estimated Project Vehicular Activity**

Hours of Operation	Solar Farm		Auto Trips		Truck Trips		Total Trips		
	Auto Trips	Delivery Trucks	In	out	In	out	In	Out	Total
12:00 AM to 1:00 AM	7 departures		0	7	0	0	0	7	7
1:00 AM to 2:00 AM	7 departures		0	7	0	0	0	7	7
2:00 AM to 3:00 AM			0	0	0	0	0	0	0
3:00 AM to 4:00 AM			0	0	0	0	0	0	0
4:00 AM to 5:00 AM			0	0	0	0	0	0	0
5:00 AM to 6:00 AM			0	0	0	0	0	0	0
6:00 AM to 7:00 AM	432 arrivals	8 arrivals 8 departures	432	0	8	8	440	8	448
7:00 AM to 8:00 AM		8 arrivals 8 departures	0	0	8	8	8	8	16
8:00 AM to 9:00 AM		8 arrivals 8 departures	0	0	8	8	8	8	16
9:00 AM to 10:00 AM		8 arrivals 8 departures	0	0	8	8	8	8	16
10:00 AM to 11:00 AM		9 arrivals 9 departures	0	0	9	9	9	9	18
11:00 AM to 12:00 PM		9 arrivals 9 departures	0	0	9	9	9	9	18
12:00 PM to 1:00 PM		9 arrivals 9 departures	0	0	9	9	9	9	18
1:00 PM to 2:00 PM		9 arrivals 9 departures	0	0	9	9	9	9	18
2:00 PM to 3:00 PM		8 arrivals 8 departures	0	0	8	8	8	8	16
3:00 PM to 4:00 PM		8 arrivals 8 departures	0	0	8	8	8	8	16
4:00 PM to 5:00 PM		8 arrivals 8 departures	0	0	8	8	8	8	16
5:00 PM to 6:00 PM		8 arrivals 8 departures	0	0	8	8	8	8	16
6:00 PM to 7:00 PM	8 arrivals		8	0	0	0	8	0	8
7:00 PM to 8:00 PM	7 arrivals 432 departures		7	432	0	0	7	432	439
8:00 PM to 9:00 PM	8 departures		7	8	0	0	7	8	15
9:00 PM to 10:00 PM	7 arrivals 7 departures		7	7	0	0	7	7	14
10:00 PM to 11:00 PM	7 arrivals 7 departures		7	7	0	0	7	7	14
11:00 PM to 12:00 AM	7 arrivals 7 departures		7	7	0	0	7	7	14
TOTAL									
DAILY TRIPS:	950	200	475	475	100	100	575	575	1150

Source: Based on information from applicant.



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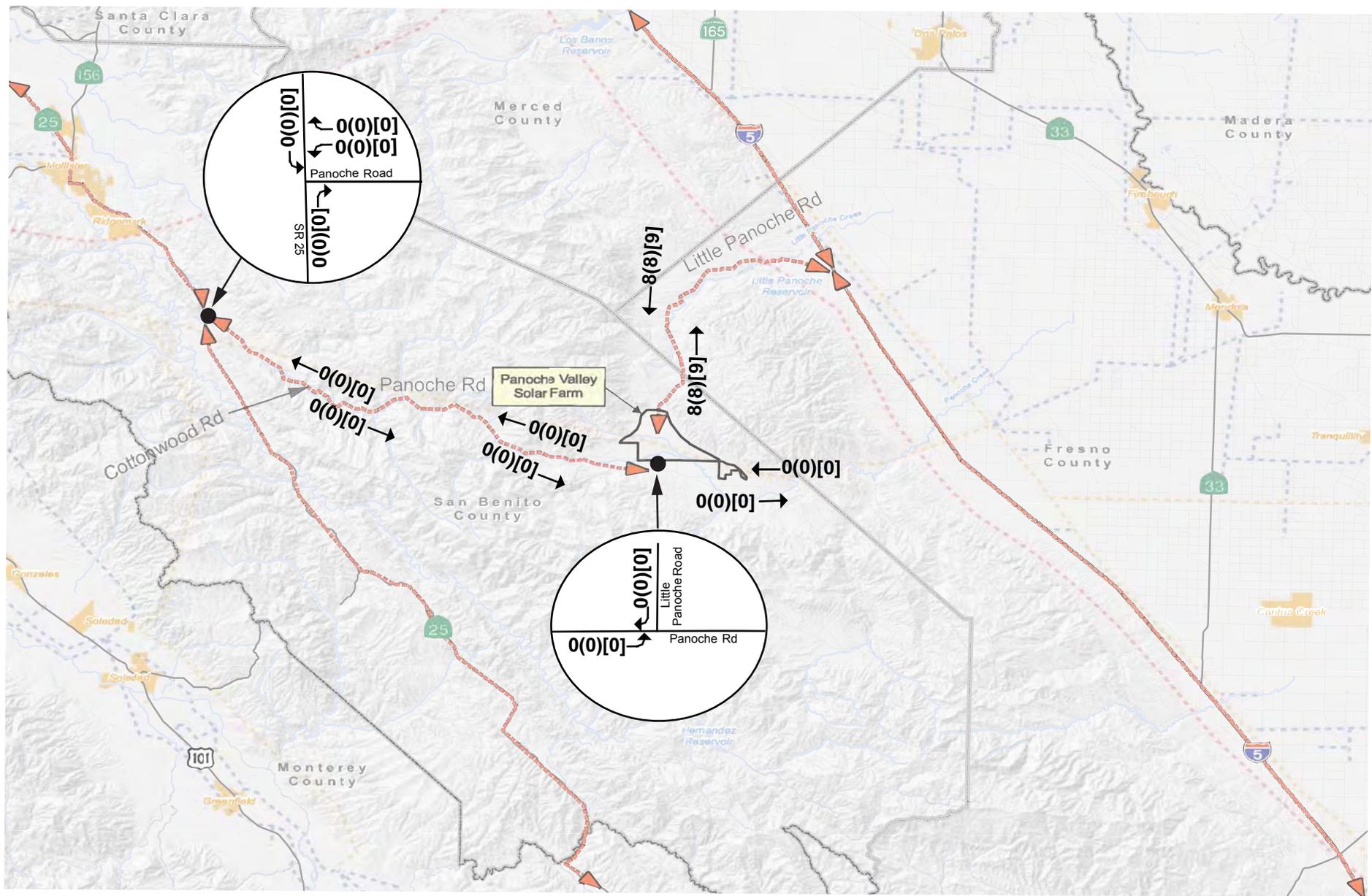
— = Employee/Shuttle Routes — = Truck Routes

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Figure 3

Assumed Trip Distribution

Panoche Valley Solar Farm



LEGEND

XX(XX)[XX] = AM(PM)[Midday] Peak-Hour Volumes

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Figure 4

Project Trips

Panoche Valley Solar Farm

Project Conditions Roadway System Analysis and Evaluation

The effects of project traffic on the study roadways and critical intersections were evaluated based on projected roadway volume increases, intersection levels of service analysis and signal warrant checks. Since truck trips do not have the same effect on the transportation network as auto trips, the estimated project truck traffic was factored up using a heavy vehicle adjustment factor of 1.5 to yield passenger-vehicle equivalent trips (a truck trip is considered to represent 1.5 passenger-vehicle trips) for the analysis of project conditions. An assessment of the adequacy of the existing roadways to serve project traffic was also completed. Each of the components of the analysis is described in the following sections.

Roadway Traffic Operations

The volume data collected along Panoche and Little Panoche Roads showed volumes that were well below capacities of each of the roadways. The project is projected to add between 570 to 580 daily trips to the roadways and result in daily traffic volumes along the roadways ranging from 152 to 892 daily vehicles. Though the project traffic will result in an increase in traffic along each of the roadways, the increase will have little effect on roadway operations and will still be well within the roadway capacities. The project traffic on each of the study roadways and intersections is presented in Table 6.

The increase in truck traffic associated with the project will result in seven times as many heavy vehicles utilizing Little Panoche Road. The pavement along Little Panoche Road on a five-mile segment beginning four miles north of Panoche Road is deteriorating and the addition of large trucks associated with the project will have a negligible effect on roadway operations, but will worsen the pavement conditions. Heavy trucks bound for the project site were not assumed to use Panoche Road due to its physical characteristics and safety concerns as explained in the following section. Table 7 presents projected vehicle composition along each of the studied roadways.

Intersection Level of Service Analysis

Level of service calculations were performed for those intersections identified to be of critical importance. The key intersections analyzed are:

- 1 SR 25 and Panoche Road
- 2 Little Panoche Road and Panoche Road

Level of Service is a qualitative description of operating conditions ranging from LOS A, or free-flow conditions with little or no delay, to LOS F, or jammed conditions with excessive delays. The intersections were analyzed using TRAFFIX software, which is based on the *Highway Capacity Manual (HCM) 2000* method for computing level of service at intersections. TRAFFIX is a commonly used software program to calculate intersection delay and is available to the public. Both intersections are two-way stop controlled unsignalized intersections. Unsignalized intersection levels of service are evaluated on the basis of worst-case delay for each stop-controlled approach at the intersection. All intersections within the County are required to meet the County's LOS standard of LOS C.

Results of the level of service analysis indicate that both study intersections currently operate at LOS A conditions during the AM, PM, and Mid-day peak hours (See Table 8). Based on the proposed start and end times of the daytime work shift, the project would not generate auto trips during the standard AM and PM peak hours. Thus, the project will have no significant impact on intersections levels of service.

Signal Warrant Analysis

An assessment was made of the need for signalization of each of the intersections. This assessment was made on the basis of the Peak-hour Volume Signal Warrant (Warrant #3 – Part B) described in the *California Manual on Uniform Traffic Control Devices (MUTCD)*, adopted in September 2010. This method makes no evaluation of intersection level of service, but simply provides an indication whether peak-hour traffic volumes would be sufficient to justify installation of a traffic signal. The signal warrants were checked using the existing and project traffic volumes.

Table 6
Project Conditions Roadway Traffic Volume Summary

Location	Direction ¹	Existing Conditions				Project Trips				Project Conditions			
		ADT	AM	PM	Mid-Day	ADT ²	AM	PM	Mid-Day	ADT ²	AM	PM	Mid-Day
(A) Little Panoche Road, North of Panoche Road	NB	32	6	4	6	290	8	8	9	322	14	12	15
	SB	34	1	6	5	290	8	8	9	324	9	14	14
	Total	66	7	10	11	580	16	16	18	646	23	26	29
(B) Panoche Road, East of Little Panoche Road	EB	76	15	5	12	0	0	0	0	76	15	5	12
	WB	76	10	11	10	0	0	0	0	76	10	11	10
	Total	152	25	16	22	0	0	0	0	152	25	16	22
(C) Panoche Road, West of Little Panoche Road	EB	95	25	6	19	285	0	0	0	380	25	6	19
	WB	81	7	10	10	285	0	0	0	366	7	10	10
	Total	176	32	16	29	570	0	0	0	746	32	16	29
(D) Panoche Road, East of Cottonwood Road	EB	159	21	18	13	285	0	0	0	444	21	18	13
	WB	163	17	20	20	285	0	0	0	448	17	20	20
	Total	322	38	38	33	570	0	0	0	892	38	38	33
Notes:													
¹ Direction of travel along Panoche Road and Little Panoche Road													
² ADT = Daily Volume													

**Table 7
Project Conditions Vehicle Composition Summary**

Location	Class	Both Directions				
		Existing Conditions		Project	Project Conditions	
		Volume ¹	Ratio	Trips ¹	Volume ¹	Ratio
(A) Little Panoche Road, North of Panoche Roac	A	33	50.0%	380	413	63.9%
	B	23	34.8%	0	23	3.6%
	C	10	15.2%	200	210	32.5%
	Total	66	100.0%	580	646	100.0%
(B) Panoche Road, East of Little Panoche Road	A	45	29.6%	0	45	29.6%
	B	41	27.0%	0	41	27.0%
	C	66	43.4%	0	66	43.4%
	Total	152	100.0%	0	152	100.0%
(C) Panoche Road, West of Little Panoche Roac	A	54	30.7%	570	624	83.6%
	B	57	32.4%	0	57	7.6%
	C	65	36.9%	0	65	8.7%
	Total	176	100.0%	570	746	100.0%
(D) Panoche Road, East of Cottonwood Road	A	134	41.6%	570	704	78.9%
	B	129	40.1%	0	129	14.5%
	C	59	18.3%	0	59	6.6%
	Total	322	100.0%	570	892	100.0%

Notes:
¹ 24-hour total volume, both directions.
 Class Types
 A Motorcycles and Passenger Cars
 B 2-Axle Bus and Medium Sized Trucks
 C 3-Axle and Larger Trucks

Table 8
Project Conditions Intersection Operations Summary

Study Number	Intersection Name	Existing Control	Peak Hour	Count Date	Existing Conditions			Project Conditions		
					Worst Delay	LOS	Warrant Met?	Worst Delay	LOS	Warrant Met?
1	Little Panoche Road and Panoche Road	TWSC	AM	03/30/10	8.5	A	No	8.5	A	No
			PM	03/30/10	8.3	A	No	8.3	A	No
			Mid	03/30/10	8.6	A	No	8.6	A	No
2	SR 25 and Panoche Road	TWSC	AM	03/30/10	8.6	A	No	8.6	A	No
			PM	03/30/10	8.8	A	No	8.8	A	No
			Mid	03/30/10	8.7	A	No	8.7	A	No

Notes: 1. Intersection Control based on existing conditions
 - TWSC = two-way stopped controlled intersection
 2. Reported delay and corresponding level of service for TWSC intersections are based on the stop-controlled approach with the highest delay.

The analysis showed that, based on the existing and projected traffic volumes, the peak-hour volume warrants would not be met at either intersection during the AM, MIDDAY, nor PM peak hours (it should be noted that the warrant used for the analysis is only one potential check out of eleven possible warrants). Hexagon concludes that the existing stop control at each intersection is appropriate. The signal warrant analysis sheets are included in the Appendix.

Roadway Dimensions and Use Recommendations

The adequacy of the geometric design of Panoche and Little Panoche Roads to serve project traffic was evaluated based on roadway functionality and design standards presented in American Association of State Highway and Transportation Officials (AASHTO) Geometric Design Manual. Both Panoche and Little Panoche Roads are county designated roadways that serve very low volumes and primary purpose is to provide access to properties adjacent to the roadways. Therefore, the direct application of design standards intended for urban roads that serve through traffic are not solely appropriate for either roadway. AASHTO provides supplemental design guidelines in their *Geometric Design of Very Low-Volume Local Roads (ADT<400)* publication that provides guidance in the evaluation of roadway geometrics for roadways similar to Panoche and Little Panoche Roads. The roadways meet the criteria outlined in the supplemental guidelines in that they currently serve less than 400 vehicles per day and their primary purpose is to provide access to residences and farms rather than through traffic.

The guidelines provide design standards for both new roadway construction and improvement of existing roads, but the guidelines discourage implementation of unnecessary geometric improvements to existing roadways. Factors including field data and observations, speeds, and volumes in addition to crash data should be considered when determining the need for improvement. Since neither of the roadways is anticipated to serve a significant increase in traffic volumes due to future development, other than the temporary construction traffic from the proposed project, it is not practical to implement costly permanent geometric roadway improvements. Improvement of the roadways to serve a temporary 18-month condition during the construction of the project is not feasible. Additionally, the improvement of Panoche and Little Panoche Roads would likely encourage the use of the roadways as thoroughfares and may result in the creation of operational and safety problems due to increased volumes and speeds. Therefore, the recommendations outlined below to serve project traffic focus on avoidance of areas with operational and safety problems and implementation of temporary improvement measures. The geometric characteristic of each of the roadways and recommendations to serve project traffic is discussed below.

Panoche Road

Based on the supplemental guidelines, Panoche Road between SR 25 and Little Panoche Road is classified as rural major access road since it serves very low volumes, encounters between vehicles that pose opportunities for crashes are rare, and most motorists are familiar with the roadways and there features. The segment of Panoche Road east of Little Panoche Road that is unpaved would be classified as either a rural industrial/agricultural road or rural resource recovery road. The industrial/agricultural and rural resource recovery road classification is intended for use by traffic associated with farming, logging, mining, etc. activities. The vehicles are typically large tractors and trucks whose drivers are familiar with the roadway and in some cases use radios to communicate with each other to negotiate through the sub-standard roadway.

The guidelines specify a minimum roadway width of 18-20 feet for rural major access roadways with design speeds of 35-45 mph. As stated previously Panoche Road is generally 18 – 20 feet wide, but there are bridges that narrow to as little as 14 feet wide. The minimum widths also do not account for maneuverability and off-tracking of large trucks. There are several sharp curves through the mountainous sections of Panoche Road in which sight distance is restricted by mountain slopes and vegetation. The maneuverability of trucks through the mountainous sections of Panoche Road will pose operational and safety issues that will require extensive traffic control and possible costly improvement of the roadway itself at and near bridge crossings. The use of the unpaved section of Panoche Road by employees should be restricted and appears to be inadequate for use by large trucks bound for the project site due to the length of travel (approximately 10-15 miles) required along a sub-standard road.

Recommendation: The use of Panoche Road from SR 25 will be restricted to employees utilizing private autos. The use of the unpaved section of Panoche Road east of Little Panoche Road will not be used by either employees or large trucks bound for the project site.

Little Panoche Road

Similar to Panoche Road, Little Panoche Road is classified as a rural major access road. Field measurements indicated sections of the roadway that were as narrow as 16 feet. As stated above, guidelines recommend a minimum roadway width of 18 feet. Typical width of large trucks is 8.5 feet. Thus, the sections of roadway are narrower than the recommended 18 feet would not be adequate to accommodate two-way travel of large trucks. It will be necessary to implement signage and flaggers along each segment that is narrower than 18 feet. Since there does not appear to be evidence of curve related crashes and operating speeds are within 20 mph of the design speed, as recommended by guidelines, along the roadway there is no need to make permanent geometric improvements to Little Panoche Road to serve project traffic. With the operational and safety issues along Panoche Road that were described above, Little Panoche Road will be the sole route utilized by large trucks to access the project site. Temporary construction traffic control should be implemented to improve safety along the roadway during construction of the proposed project.

Recommendation: Little Panoche Road will be utilized as the only route for large trucks and employees traveling via auto from Interstate 5. Traffic control (flaggers, signage, and use of lead vehicles) should be implemented along each of the segments that have sub-standard roadway width (less than 18 feet). Roadway striping should also be rehabilitated at a minimum through each curve, but preferably along the entire length of Little Panoche Road between Interstate 5 and Panoche Road.

Intersection Truck Turning

The intersections of SR 25/Panoche Road and Little Panoche Road/Panoche Road were checked to determine whether large trucks could complete turning maneuvers through the intersections. Turning templates were checked for both typical delivery trucks: SU-30 (single unit trucks with a wheelbase of 30 feet) and large tractor-trailers: WB-50 (wheelbase of 50 feet). The truck turning templates show that the intersections would be adequate to accommodate the turning movements of semi-trailer trucks, emergency vehicles, garbage trucks, and delivery vehicles.

Adequacy of Pavement Structure

Heavy trucks, such as eighteen wheel semi-trailers, produce disproportionate wear and tear on the roadway system. As described above, the construction of the project is expected to result in additional truck trips on at least Little Panoche Road. A traffic index assessment was conducted to determine the required pavement structure for the additional truck trips. The traffic index is a measure of the number of Equivalent Single Axle Loads (ESAL) expected in a design lane over the design period. Standard Caltrans methodology was used to calculate the traffic index. Since the additional truck traffic will only occur over an approximately 18-month construction period, the 10-year design period recommended by Caltrans was utilized for the analysis.

The collected daily volumes and vehicle composition data were used for the traffic index analysis. The truck counts were categorized as 2-axle, 3-axle, 4-axle, and 5 and 6-axle vehicles. For purposes of calculating adequate pavement standards, buses were included as 2-axle vehicles.

The traffic index assessment shown in Table 9 indicates that Little Panoche Road currently requires a traffic index of 6.0 to handle the existing traffic volumes. The additional truck trips associated with the project will require a traffic index of 8.5, for a design life of 10 years. A pavement engineer will need to conduct field tests to determine the existing traffic index along Little Panoche Road. Based upon, the results of the field testing, additional asphalt overlay may be required to provide the necessary 8.5 traffic

index to accommodate project traffic. The addition of project traffic to the remaining roadways was shown to result in no change to the required traffic index since passenger cars and smaller trucks have a negligible effect on pavement service life.

The traffic index is just one tool to evaluate the structural adequacy of the roadway to serve project traffic loads. As stated earlier, a five mile segment of Little Panoche Road beginning four miles north of Panoche Road and traversing the mountainous terrain is in very poor condition. There is temporary signage in place warning of the poor pavement conditions. The addition of project traffic will worsen the deterioration of the roadway; therefore the pavement along the 5-mile section should be improved. The improvement may consist of rehabilitation or full reconstruction. The rehabilitation of the roadway will require the removal and replacement of surface course, while reconstruction would require the complete removal of and replacement of the sub-base and surface course. Should rehabilitation be deemed adequate, the roadways should be monitored and preventive maintenance be implemented during the construction of the proposed project.

Recommendation: It is recommended that Little Panoche Road between Interstate 5 and Panoche Road be tested to determine current traffic index and be improved, if necessary, to achieve a traffic index of 8.5. The improvements may require additional asphalt overlay. As with all pavement overlays, the improvement will require temporary closure of the roadway segment. Additionally, portions of pavement along Little Panoche Road are currently deteriorating. The addition of large trucks will worsen conditions. Rehabilitation of those pavement sections in poor condition should be investigated. The adequacy of the pavement on Little Panoche Road will need to be evaluated by a pavement engineer to ensure that the roadway with recommended improvement can accommodate the projected traffic load.

**Table 9
Traffic Index Analysis**

Location	Existing Conditions			Total Daily Project Trips	Project Conditions		
	Total Daily Trips /a/	ESAL - 10 Year Constant /b/	Total 10 Year ESAL /b/		Total Daily Trips /a/	ESAL - 10 Year Constant /b/	Total 10 Year ESAL /b/
	(A) Little Panoche Road, North of Panoche Road						
2-Axle Trucks	8	690	5,520	0	8	690	5,520
3-Axle Trucks	1	1,840	1,840	0	1	1,840	1,840
4-Axle Trucks	0	2,940	0	100	100	2,940	294,000
5&6-Axle Trucks	9	6,890	62,010	100	109	6,890	751,010
Gross Total - 2 Ways	18		69,370	200	218		1,052,370
Total Per Lane	9		34,685	100	109		526,185
Recommended Traffic Index /c/			6.0				8.5
(B) Panoche Road, East of Little Panoche Road							
2-Axle Trucks	20	690	13,800	0	20	690	13,800
3-Axle Trucks	3	1,840	5,520	0	3	1,840	5,520
4-Axle Trucks	0	2,940	0	0	0	2,940	0
5&6-Axle Trucks	63	6,890	434,070	0	63	6,890	434,070
Gross Total - 2 Ways	86		453,390	0	86		453,390
Total Per Lane	43		226,695	0	43		226,695
Recommended Traffic Index /c/			7.5				7.5
(C) Panoche Road, West of Little Panoche Road							
2-Axle Trucks	24	690	16,560	0	24	690	16,560
3-Axle Trucks	2	1,840	3,680	0	2	1,840	3,680
4-Axle Trucks	0	2,940	0	0	0	2,940	0
5&6-Axle Trucks	63	6,890	434,070	0	63	6,890	434,070
Gross Total - 2 Ways	89		454,310	0	89		454,310
Total Per Lane	45		227,155	0	45		227,155
Recommended Traffic Index /c/			7.5				7.5
(D) Panoche Road, East of Cottonwood Road							
2-Axle Trucks	47	690	32,430	0	47	690	32,430
3-Axle Trucks	2	1,840	3,680	0	2	1,840	3,680
4-Axle Trucks	0	2,940	0	0	0	2,940	0
5&6-Axle Trucks	57	6,890	392,730	0	57	6,890	392,730
Gross Total - 2 Ways	106		428,840	0	106		428,840
Total Per Lane	53		214,420	0	53		214,420
Recommended Traffic Index /c/			7.5				7.5
/a/ Include buses							
/b/ Equivalent Single Axle Loads							
/c/ Recommended Traffic Index is calculated by taking the total 10 year ESAL's per lane and comparing the output to the Caltrans Highway Design Manual, 2006 Table 613.3C Conversion of ESAL to Traffic Index.							

4. Cumulative Conditions

This chapter presents a summary of the traffic conditions that would occur under cumulative conditions. It includes descriptions of nearby pending developments. The analysis of cumulative growth conditions was conducted at the request of San Benito County staff and is in conformance with the California Environmental Quality Act CEQA.

Cumulative Development

Foreseeable (cumulative) future development projects in the vicinity of the project site were assessed in order to identify potential cumulative impacts as a result of the additional traffic added to the roadway network by the proposed project in conjunction with other cumulative projects. A list of cumulative projects in the general proposed project area is included in Table 10.

The cumulative projects identified in Table 10 include three oil wells and three power plants. All of these projects, with the exception of the Panoche Ranch Solar Farm, are currently under review by the lead agency. The status of the Panoche Ranch Solar Farm, project proposed by the same applicant as the proposed project, is uncertain. The three oil wells would be located within 10 miles south of the proposed project site. The Panoche Ranch Solar Farm power plant would be located 10 miles northeast of the project site, while the other two power plants would be located approximately 100 miles southeast of the project site.

Construction and operations of oil wells require relatively low volumes of traffic. Therefore traffic generated by the potential oil wells would not be negligible. Construction of power plants, however, usually require up to several hundred workers and up to 50 or more truck deliveries per day. Of the three power plants identified, two would be located east of I-5, approximately 100 miles southeast of the project site. Although the construction schedules of the cumulative projects are unknown, these two power plants, which are anticipated to generate a significant amount of traffic during their construction phase, are generally located a great distance from the project site and are not expected to add traffic to the roadway network in the vicinity of the project site. The third power plant, the Panoche Ranch Solar Farm, would be located in Fresno County, approximately 10 miles north of the proposed project site. The only roadways to which both the proposed project and the Panoche Ranch Solar Farm project (Fresno County) could potentially add traffic to would be I-5 and the portion of Little Panoche Road located within Fresno County. However, traffic added to these facilities by both the proposed and cumulative project would be minimal, and is not expected to create any significant impact on the study roadway network.

**Table 10
Cumulative Projects List**

Project	Location	Type	Distance from Proposed Project	Status
Use Permit 1030-10A	Off New Idria Road, south of Griswold Hills	Oil Well	Approx. 6.5 miles south	Use permit under review by San Benito County
Use Permit 1030-10B	Off New Idria Road, south of Griswold Hills	Oil Well	Approx. 7.5 miles south	Use permit under review by San Benito County
Use Permit 1030-10C	Off New Idria Road, south of Griswold Hills	Oil Well	Approx. 8 miles south	Use permit under review by San Benito County
Panoche Ranch Solar Farm Solar Energy, Inc.	2,600 acres at Township 13S, Range 11E Sections 20,21,28,29, and 30 (Fresno County)	Solar PV (250 MW)	Approx. 10 miles northeast	Uncertain
California Valley Solar Ranch (SunPower)	100 miles south of the project within the California Valley; on 4,365 acres	Solar PV (250 MW)	Approx. 100 miles southeast	Under environmental review by San Luis Obispo County. Construction estimated to take approx 3 years.
Topaz Solar Project (First Solar)	Approx. 4.85 miles west of the proposed project; up to 8,000 acres	Solar PV (550 MW)	Approx. 100 miles southeast	Under environmental review by the County. Construction estimated to take 3 years.

Source: Fresno County, 2010; County, 2010.

Cumulative Traffic Conditions

As described above, each of the identified potential developments are projected to generate only a minimal amount of trips. The addition of traffic generated by each of the potential developments as well as the proposed project to roadways surrounding the proposed project would not result in significant cumulative impacts.

5. Conclusions

Hexagon Transportation Consultants, Inc. has completed this traffic study for a proposed solar farm in the Panoche Valley of San Benito County. The study was completed in response to concerns regarding safety and effects of construction traffic, primarily truck activity, at intersections and roadways serving the project site. The study focused on Panoche Road, between SR 25 and Interstate 5, and Little Panoche Road between Panoche Road and Interstate 5. The study included an evaluation of roadway geometrics, pavement conditions, vehicular speeds, vehicle composition, sight distance, and existing signage along each of the roadways. Intersection levels of service analysis and signal warrant checks also were completed at the intersections of SR 25 and Panoche Road and Panoche Road and Little Panoche Road.

The analysis results indicated that though the project traffic will result in an increase in traffic along each of the studied roadways and intersections, the increase will have little effect on roadway and intersection operations and will still be well within the roadway and intersection capacities. Therefore, no permanent physical geometric changes to the roadways or intersections are recommended.

A review of the routes to and from the project site and potential haul routes for the delivery of materials and equipment by large trucks to the project site indicated several operational/safety concerns. The use of the roadways will require traffic control along roadway segments that are sub-standard. Also, the increase in truck traffic associated with the project will result in an increase in heavy vehicles utilizing Little Panoche Road. The pavement along Little Panoche Road on a five-mile segment beginning four miles north of Panoche Road is deteriorating and the addition of large trucks associated with the project will worsen the pavement conditions. To accommodate the auto and truck traffic associated with the project, the following recommendations are made.

Recommendation: The use of Panoche Road from SR 25 will be restricted to employees utilizing private autos. The use of the unpaved section of Panoche Road east of Little Panoche Road will not be used by either employees or large trucks bound for the project site.

Recommendation: Little Panoche Road will be utilized as the only route for large trucks and employees traveling via auto from Interstate 5. Traffic control (flaggers and use of lead vehicles) should be implemented along each of the segments that have sub-standard roadway width (less than 18 feet). Roadway striping should also be rehabilitated at a minimum through each curve, but preferably along the entire length of Little Panoche Road between Interstate 5 and Panoche Road.

Recommendation: It is recommended that Little Panoche Road between Interstate 5 and Panoche Road be tested to determine current traffic index and be improved, if necessary, to achieve a traffic index of 8.5. The improvements may require additional asphalt overlay. As with all pavement overlays, the improvement will require temporary closure of the roadway segment. Additionally, portions of pavement

along Little Panoche Road are currently deteriorating. The addition of large trucks will worsen conditions. Rehabilitation of those pavement sections in poor condition should be investigated. The adequacy of the pavement on Little Panoche Road will need to be evaluated by a pavement engineer to ensure that the roadway with recommended improvement can accommodate the projected traffic load.