TRAFFIC IMPACT STUDY

ECC BANK AND ANTIOCH HAND CAR WASH

CITY OF ANTIOCH

Prepared for:
City of Antioch
Community Development Department
Third and "H" Streets
Antioch, CA 94531
Attn: Mindy Gentry

Prepared by:
Abrams Associates
1660 Olympic Boulevard, Suite 210
Walnut Creek, CA 94596
Tel: 925.945.0201

Abrams Associates
TRAFFIC ENGINEERING, INC.

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TRANSPORTATION AND CIRCULATION

The proposed project, named the ECC Bank and Antioch Hand Car Wash project, is located on the northwest corner of Lone Tree Way and Country Hills Drive and is planned to be developed with a bank (ECC Bank) and a car wash. The project site plan is presented in **Figure 1**. This report describes the existing transportation and circulation conditions around the project site and addresses the potential traffic impacts of the project. The impacts have been reviewed in terms of intersection level of service as well as trip generation, traffic distribution, traffic assignment, and potential intersection and roadway improvements needed to mitigate expected future deficiencies. The study has also included a review of on-site circulation and parking, as well as the access from Lone Tree Way.

The project's potential effects on transit services, pedestrian, and bicycle facilities in the project area are also evaluated. Measures that would mitigate these impacts to a less-than-significant level are recommended, where appropriate.

1. Setting

The setting for the transportation and circulation issues and the scope of the analysis are described below. The remainder of the section presents the analysis methodologies and a discussion of the existing near-term and future traffic conditions.

a. Scope of Study. This study was conducted according to the requirements of the City of Antioch. The basis of analysis is peak hour level of service calculations for key intersections in the vicinity of the proposed project. The hours identified as the "peak" hour are between 8:00 a.m. and 9:00 a.m. and 5:00 p.m. and 6:00 p.m. for each of the transportation facilities described. Throughout this section, these peak hours will be identified as the AM and PM peak hours, respectively. In addition to the intersection analysis, this study includes a review of on site traffic circulation, queuing at the bank and car wash, and site access.

Selection of Intersections. The proposed project is expected to generate new vehicular trips that will change the traffic volume patterns on the nearby street network, particularly on Lone Tree Way. In order to assess the changes in traffic conditions associated with the project, the project trip generation was estimated, as well as the trip distribution. Based on the City of Antioch's General Plan, all signalized intersections where 50 or more project trips might be added were considered for analysis, which generally covered Lone Tree Way from James Donlan to the west to Hillcrest Avenue to the east. Based on anticipated project traffic distribution and direction from City staff, five (5) intersections were selected for the analysis. These are listed below and are also noted in **Figure 2**.

Study Intersections

1. Lone Tree Way and James Donlan Blvd (signalized)
2. Lone Tree Way and Dallas Ranch Road (signalized)
3. Lone Tree Way and Country Hills Way (Mokelumme Drive (signalized)
4. Lone Tree Way and Deer Valley Road (signalized)
5. Lone Tree Way and Hillcrest Avenue (signalized)

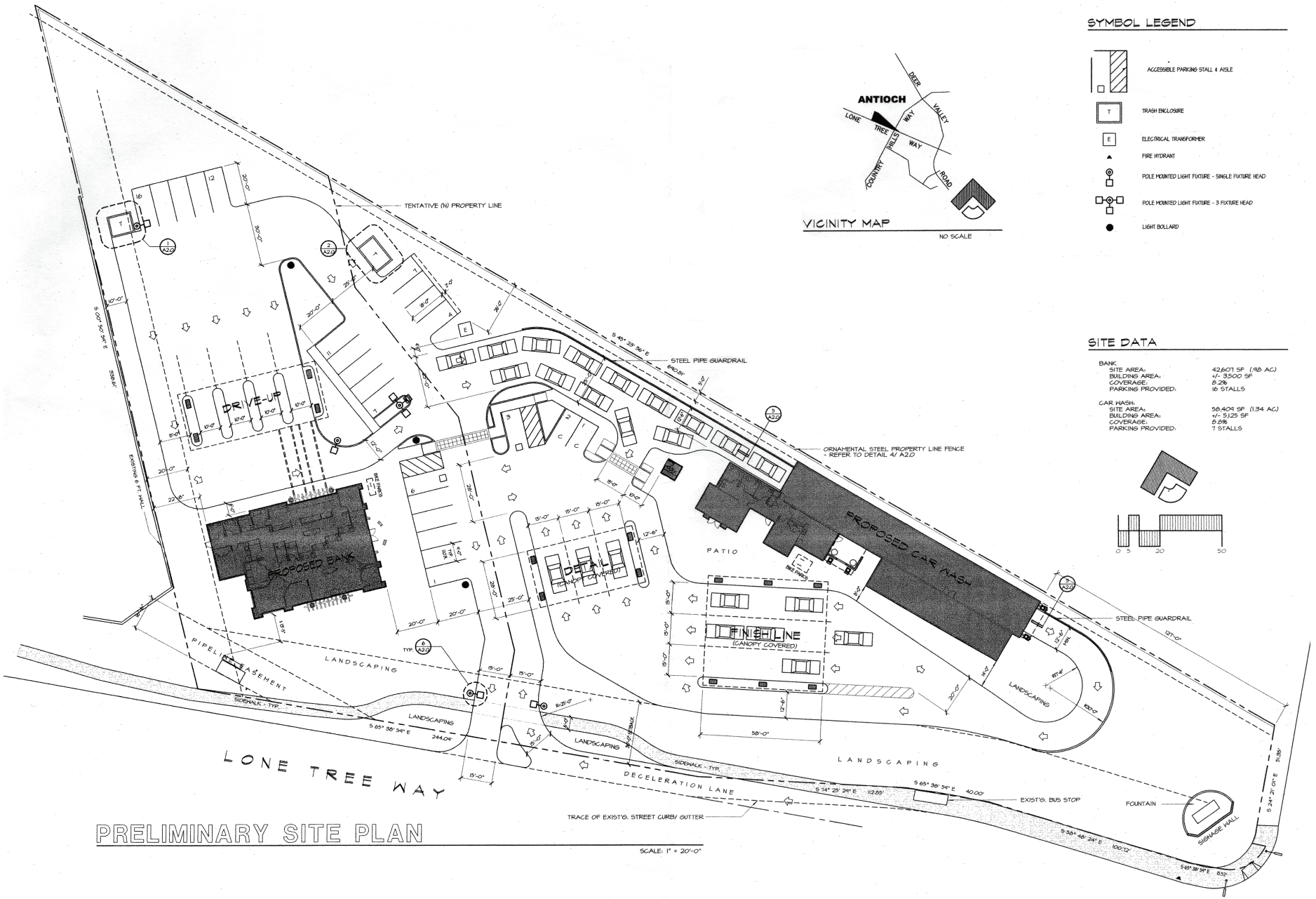

FIGURE 1 | SITE PLAN
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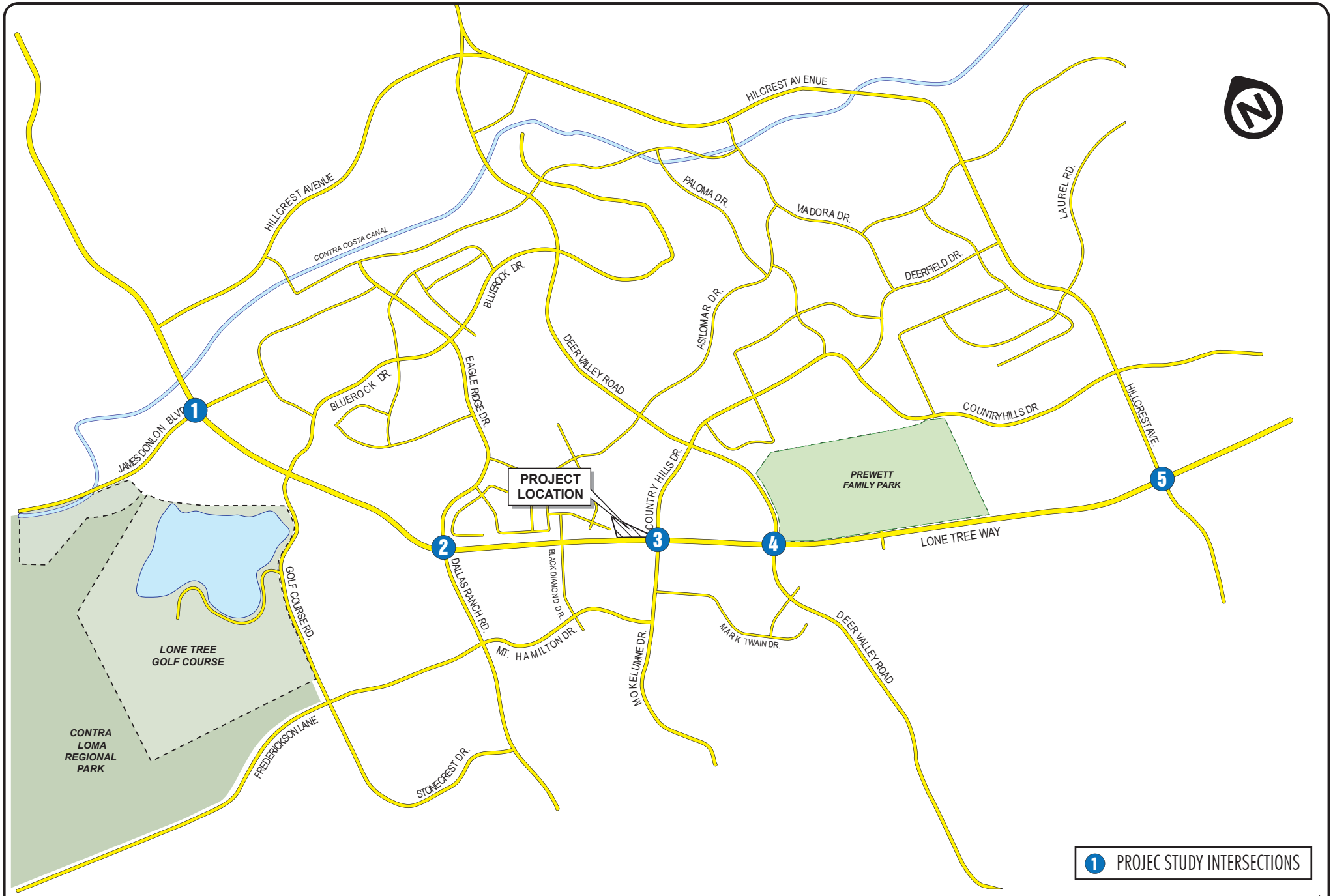

FIGURE 2 | PROJECT LOCATION
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Traffic Scenarios. The following scenarios were evaluated for this study:

- ***Existing Conditions.*** *Existing Condition* traffic counts for each of the study area intersections were collected in May and June of 2008. At that time, schools were not in session and traffic conditions were adjusted to reflect average conditions during the school year.
- ***Existing Plus Proposed Project Conditions.*** The *Existing Plus Proposed Project Condition* traffic forecasts were developed by adding project-related traffic to the Existing Condition volumes. The traffic from proposed projects in the Lone Tree Way corridor have also been added.
- ***Cumulative (Year 2030) Without the Proposed Project Conditions.*** The *Cumulative (Year 2030) Without the Proposed Project Condition* traffic forecasts were developed based on Contra Costa Transportation Authority's (CCTA) area wide traffic model that incorporates build out and land use assumptions for all County jurisdictions' General Plans, including the City of Antioch. In certain cases, the change in link volumes was used to estimate intersection turning movements.
- ***Cumulative (Year 2030) Plus Proposed Project Conditions.*** The *Cumulative (Year 2030) Plus Proposed Project Condition* traffic forecasts were developed by adding project-related traffic volumes to the CCTA 2030 Without the Proposed Project condition volumes.

b. Study Methods. This section presents the methods used to evaluate the traffic conditions for each scenario described above. It includes descriptions of the data requirements, analysis methodologies, and applicable level of service standards.

(1) Data Requirements. Several types of data were collected for the traffic analysis, including: intersection and roadway lane configurations and intersection turning movement counts. Traffic counts were conducted in May and June of 2008 at three of the project study intersections and calibrated with data from other recent EIR' s and traffic studies.

(2) Analysis Methodologies and Level of Service Standards. Consistent with the requirements of the City of Antioch's Policy and Procedures Traffic Impact Analysis and Mitigation Requirements, the existing level of service analysis for signalized intersections was conducted based on the requirements of the Contra Costa Transportation Authority (CCTA) Critical Movement Analysis Methodology, described in Transportation Research Board Circular 212. The "critical" movement of traffic in this methodology refers to the most congested traffic flow from each signal phase. This methodology defines the level of service (LOS) for signalized intersections in terms of the ratio of critical movement traffic volumes to an estimate of the maximum capacity for critical volume at an intersection. Critical movements at an intersection are calculated by determining the maximum traffic volumes for conflicting traffic movements (i.e., left-turns plus opposing through traffic) per single stream of traffic (by lane). For the Critical Movement Methodology, the LOS for intersections is determined by the ratio of critical movement volume to critical movement capacity (i.e., volume-to-capacity or "v/c" ratio) for the entire intersection. Please note that additional analysis of Traffic Service Objectives (TSO's) would not be required for this project because there is no General Plan amendment required and no expectation that the project will change the previous modeling assumptions used to forecast traffic conditions in the study area. Levels of service for *signalized* intersections were calculated using the CCTA LOS Program (Version 2.35) computer software required by the Critical Movement Analysis Methodology. The relationship of volume-to-capacity (v/c) and level of service at signalized intersections used by the CCTA methodology and City of Antioch is summarized in **Table 1**.

Table 1
Level of Service Definitions—Signalized and Unsignalized Intersections

Level of Service (LOS)	Description of Level of Service	Signalized Intersection **Volume-to-Capacity Ratio(V/C) Range**	Unsignalized Intersection **Seconds of Delay per Vehicle**
A	Relatively free flow. If signalized, conditions are such that no vehicle phase is fully utilized by traffic and no vehicle waits through more than one red indication (signal). No delay is experience and unsignalized intersections.	< 0.59	≤10
B	Stable flow. If signalized, an occasional approach phase is fully utilized; vehicle platoons are formed. Short delays are experienced at unsignalized intersections.	0.60 to 0.69	>10 and ≤15
C	Stable flow or operation. If signalized, drivers occasionally may have to wait through more than one red indication. Moderate, acceptable delay at unsignalized intersections.	0.70 to 0.79	>15 and ≤25
D	Approaching unstable flow or operation. If signalized, queues develop but quickly clear. Tolerable delay. At unsignalized intersections, long delays are experienced.	0.80 to 0.89	>25 and ≤35
E	Unstable flow with operating conditions at or near the capacity level at signalized intersections. Very long delays and vehicle queuing at unsignalized intersections.	0.90 to 1.00	>35 and ≤50
F	Forced flow or operation. If signalized, intersection operations below its vehicular capacity resulting in stop and go traffic, jammed traffic conditions. Excessive long delays and vehicle queuing at both signalized and unsignalized intersections.	≥1.00	>50

Note: Forecasted demands for signalized intersections can exceed the actual capacity of the roadway, as indicated in v/c ratios greater then 1.0. Actual measured traffic volumes cannot, theoretically, exceed the capacity of the roadway because once at full capacity (that is, v/c at 1.0), traffic conditions are jammed and the roadway cannot accommodate any additional traffic. Further, because traffic inefficiencies arise at capacity demand conditions, the calculated v/c ratios for LOS F conditions can be reached below the v/c ratio of 1.0.

Source: Abrams and Associates, 2008.

Table 1 also provides the operational characteristics associated with each level of service for both signalized and unsignalized intersections. Traffic conditions in the study area are assessed through the evaluation of peak hour levels of service at critical intersections.

Unsignalized intersections were analyzed using the 2000 Highway Capacity Manual methodology that is based on the average delay, in seconds, of vehicles waiting to cross through the intersection (i.e., seconds per vehicle). The capacity of each unsignalized intersections approach (i.e., the direction from which the vehicular traffic is arriving at the intersection) is estimated as a function of the proportion of traffic on each approach, the number of lanes on each approach, and the proportion of turning movements on the opposing and conflicting approaches. Once the average total for each approach is collected, the levels of service for each approach as well as the entire intersection can be determined. Unsignalized intersection levels of service were analyzed for the peak hours using TRAFFIX software, Version 7.7. Table 1 also provides operational characteristics associated with each level of service for unsignalized intersections, as assessed through evaluation of peak hour traffic delay conditions.

Traffic signals may be justified when traffic operations fall below acceptable levels of service and when one or more signal "warrants" are satisfied. Consistent with City of Antioch and Caltrans standards, traffic volumes at unsignalized intersections were compared to the peak hour warrant in the *Manual of Uniform Traffic Control Devices* published by the U.S. Department of Transportation. Traffic Signal Warrant 3 (i.e., peak hour volume warrant) is satisfied when traffic volumes on major and minor roadway approaches exceed level of service thresholds for one hour of the day. This is generally the first warrant to be satisfied. The warrant applies to traffic conditions during a 1-hour peak that are high enough that minor street traffic experiences excessive delay in entering and crossing the street. Other warrants, such as minimum vehicle volumes, interruption of continuous traffic, and traffic progression generally are satisfied at any intersection meeting peak hour warrants.

Level of service is an expression, in the form of a scale, of the relationship between the capacity of an intersection or roadway segment to accommodate the volume of traffic moving through it at any given time. The level of service scale describes traffic flow with six ratings ranging from A to F, with "A" indicating relatively free flow of traffic and "F" indicating stop-and-go traffic characterized by traffic jams. As the amount of traffic moving through a given intersection or roadway segment increases, the traffic flow conditions that motorists experience rapidly deteriorate as the absolute capacity of the intersection or roadway segment is reached. Under such conditions, there is general instability in the traffic flow, which means that relatively small incidents (e.g., momentary engine stall) can cause considerable fluctuations in speeds and delays that lead to traffic congestion. This near-capacity situation is labeled level of service (LOS) E. Beyond LOS E, the intersection or roadway segment capacity has been exceeded, and arriving traffic will exceed the ability of the intersection to accommodate it.

Consistent with the City of Antioch's General Plan, the Contra Costa Transportation Authority (CCTA), classifies Deer Valley Road and Lone Tree Way as routes of regional significance. As such, intersections along the route require analysis utilizing Growth Management Program procedures outlined in CCTA Technical Procedures, September 17, 1997. The CCTA Technical Procedures require the use of CCTALOS software to determine intersection operation levels based on the Intersection Capacity Utilization (ICU) methodology. The methodology describes the operation of an intersection in terms of Level of Service (LOS) based on corresponding volume to capacity (v/c) ratio. As noted previously, levels of service are represented by a letter scale from LOS A to LOS F, with LOS A representing the best performance and LOS F representing the poorest performance under significantly congested conditions. CCTA set maximum levels of congestion for routes of regional significance such as intersections along Deer Valley Road and Lone Tree Way. According to the CCTA requirements, LOS D (i.e. v/c up to 0.85) is an acceptable level of traffic operation at intersections on the routes of regional significance in the study area. Furthermore, intersections to be evaluated under CCTA requirements include signalized intersections that are expected to be affected by 50 or more project trips in a peak period.

c. Existing Transportation Setting. The project site location and study area network are shown in **Figure 2**. The following discussion describes the transportation system in the project study area, including key elements of the roadway, public transportation, pedestrian, and bicycle networks.

(1) Roadway System. The roadway system that has been studied includes Lone Tree Way and various intersecting roadways in southwest Antioch. These intersecting roadways include Mokelumne Drive/Country Hills Drive, Dallas Ranch Road/Eagle Ridge Drive and Deer Valley Road. The system includes a number of regional and local roadways. These routes are described below.

- ***Lone Tree Way*** is a four and six-lane arterial route that extends east-west through the City of Antioch, and is the major thoroughfare in southeast Antioch. All major intersections are signalized, and there are several bus routes on Lone Tree Way. The average daily traffic (ADT) ranges between 25,000 and 35,000 vehicles per day.
- ***Country Hills Drive/Mokelumne Drive.*** Country Hills Drive is an arterial route that crosses Deer Valley Road to the northeast of the project site. It is generally four lanes in width with additional turn lanes at intersections. In the vicinity of Lone Tree Way, its ADT is about 15,000 vehicles per day. Country Hills Drive changes to Mokelumne Drive south of Lone Tree Way. Mokelumne Drive is a collector street that serves a residential area, and provides access to the west end of the Deer Valley Plaza shopping center.
- ***Deer Valley Road.*** Deer Valley Road is a major north-south arterial that extends from Highway 4 to the southern city limits of Antioch. It is generally four-lanes in width with a median and has a number of signalized intersections.
- ***Dallas Ranch Road/Eagle Ridge Drive.*** Dallas Ranch Road is an arterial road to the south of Lone Tree Way. It is generally four-lanes in width with a median and has a number of signalized intersections. Dallas Ranch Road changes to Eagle Ridge Drive north of Lone Tree Way, which is considered to be a local street that serves the residential neighborhood.
- ***Hillcrest Avenue.*** Hillcrest Avenue is an arterial that runs north south from Jacobsen Street in the north to the southern City limits. Hillcrest is generally four lanes in width with a median and a number of signalized intersections.

(2) Public Transportation. The project area is served by the Tri-Delta Transit public bus system which provides major bus routes along Lone Tree Way. These routes provide commute hour regional service to the BART system, as well as Deer Valley High School, the Kaiser Hospital, Prewett Park and the many retail and commercial activities on Lone Tree Way. This project is not expected to significantly increase bus transit ridership, with the exception of some trips by employees of the bank and carwash. There are also bus routes that travel on Deer Valley Road and Hillcrest Avenue. The locations of the nearest bus stops to the project are on Lone Tree Way:

Eastbound – On Lone Tree Way west of Country Hills Drive.
Westbound – On Lone Tree Way east of Mokelumne Drive.

(3) Pedestrian and Bicycle Facilities. There are numerous bicycle and pedestrian facilities on Lone Tree Way in the vicinity of the project. There are sidewalks on all streets in the area. Bike lanes are provided on each side of Lone Tree Way in the vicinity of the project and Lone Tree Way has been designated as a bike route. The Mokulumne Trail is a multi-use trail for pedestrians and bicyclists is just north of the project site but no direct connections to this trail are planned at this time.

(4) Other Traffic and Transportation Features. Recent regional traffic adjustments have affected the traffic patterns in this area. The new direct connector ramps to the Highway 4 Bypass have resulted in a reduction of through traffic on both Hillcrest Avenue and to a lesser extent on Lone Tree Way. This portion of the bypass project was opened in the spring of 2008.

(5) Planned Improvements. Several roadway improvements are planned for the study area intersections in the near-term and long-term 2030. It should be noted that a recent improvement project has been completed on Lone Tree Way at James Donlon Boulevard to lengthen left turn lanes. In addition at Country Hills Drive and Lone Tree Way there are currently plans to improve the side

street traffic operations by implementing split phasing and it is assumed that this would be completed before the proposed project would be open.

In the near-term the City plans to restripe Lone Tree Way to three lanes in each direction from Country Hills Drive to Hillcrest Avenue. The roadway is currently wide enough for three lanes in each direction, but is only striped for two lanes and right turn bays. According to the City of Antioch the project has not been scheduled yet since the costs for the conversion are not fully funded but the project can apparently be implemented at relatively low cost because it does not require widening of Lone Tree Way. The City also currently has plans to make some substantial improvements to the Lone Tree Way intersections at Deer Valley Road and at Hillcrest Avenue within the next two years. At Hillcrest Avenue a second southbound left-turn lane will be added and the eastbound left-turn pocket will be lengthened by about 150 feet. At Deer Valley Road the City is planning to construct a second left-turn lane on the southbound approach and the westbound left-turn pocket will be lengthened by about 275 feet.

In the long-term there is the possibility of an additional northbound right turn lane for Deer Valley Road. The right turn lane has been reviewed but it is currently assumed that this improvement would not be implemented due to the potential impacts on the existing bike lane and pedestrian operations at the intersection. Similarly, there is the potential for additional lanes being added on the northbound Hillcrest Avenue approach to Lone Tree Way but for the purposes of this analysis this has not been assumed.

(6) Existing Lane Configurations. Information on the existing lane configurations and traffic control devices at the study intersections was compiled during field studies of the site. The existing lane geometry and traffic features of the study intersections are illustrated in **Figure 3.** Where applicable the length of the left turn lanes has also been noted.

(7) Existing Traffic Volumes. *Existing Condition* traffic counts for each of the study area intersections were collected in May and June of 2008. During most of this time period, schools were not in session. In addition, traffic counts recently conducted (May, 2008) for the proposed Wal-Mart Expansion project were obtained for use at the Deer Valley Road and Hillcrest Avenue intersections with Lone Tree Way.

All project study intersections were analyzed for weekday AM and PM peak hour traffic conditions. Peak weekday conditions occur from 8:00 a.m. to 9:00 a.m. and from 5:00 p.m. to 6:00 p.m. The existing peak hour traffic volumes and turning movements at the study area intersections are shown on **Figure 4**. AM and PM peak hour intersection service levels have been calculated using existing turning movements and lane configurations. The results of the existing conditions scenario are provided in **Table 2**.

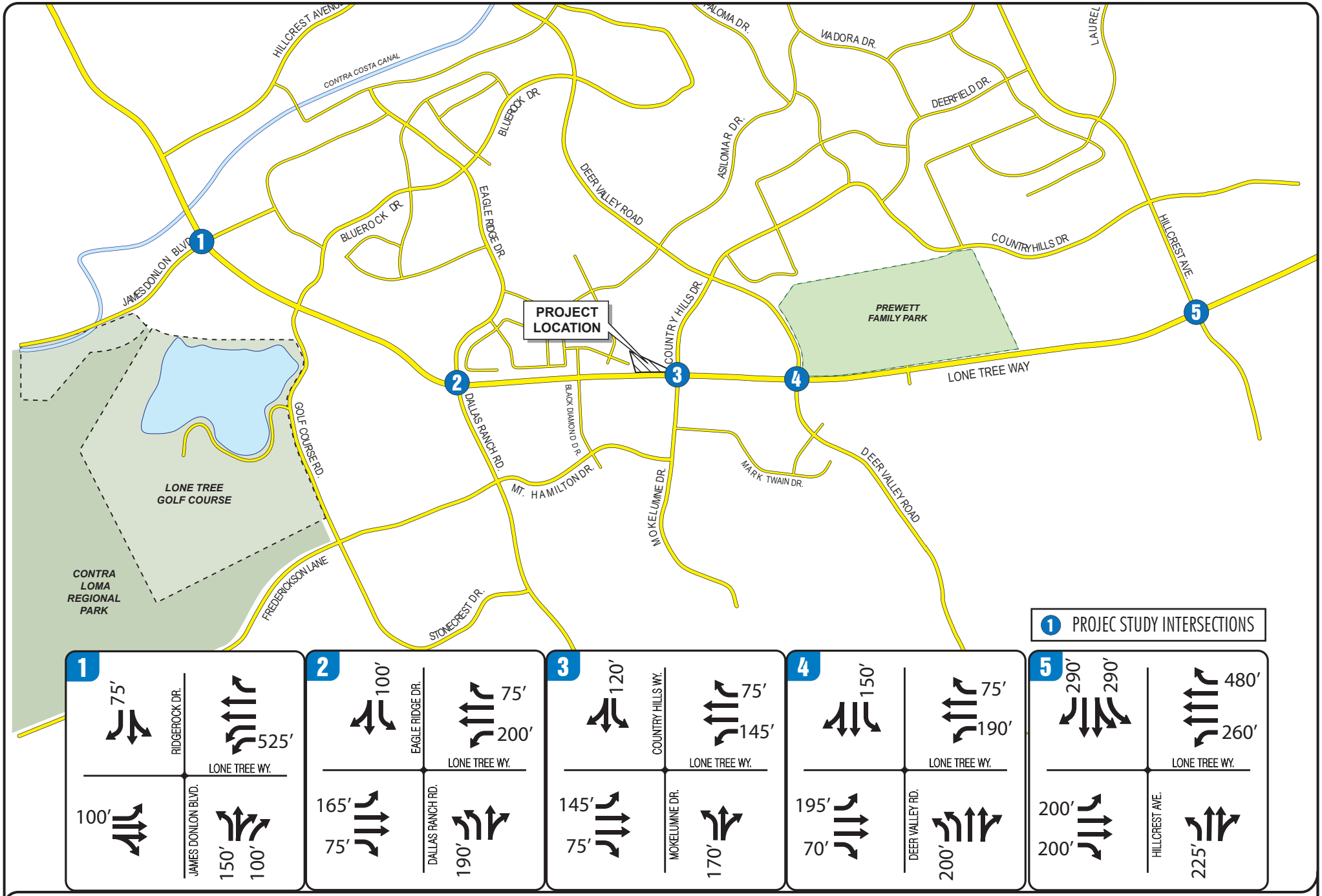

FIGURE 3 | EXISTING LANE CONFIGURATIONS AND LENGTHS OF TURN POCKETS

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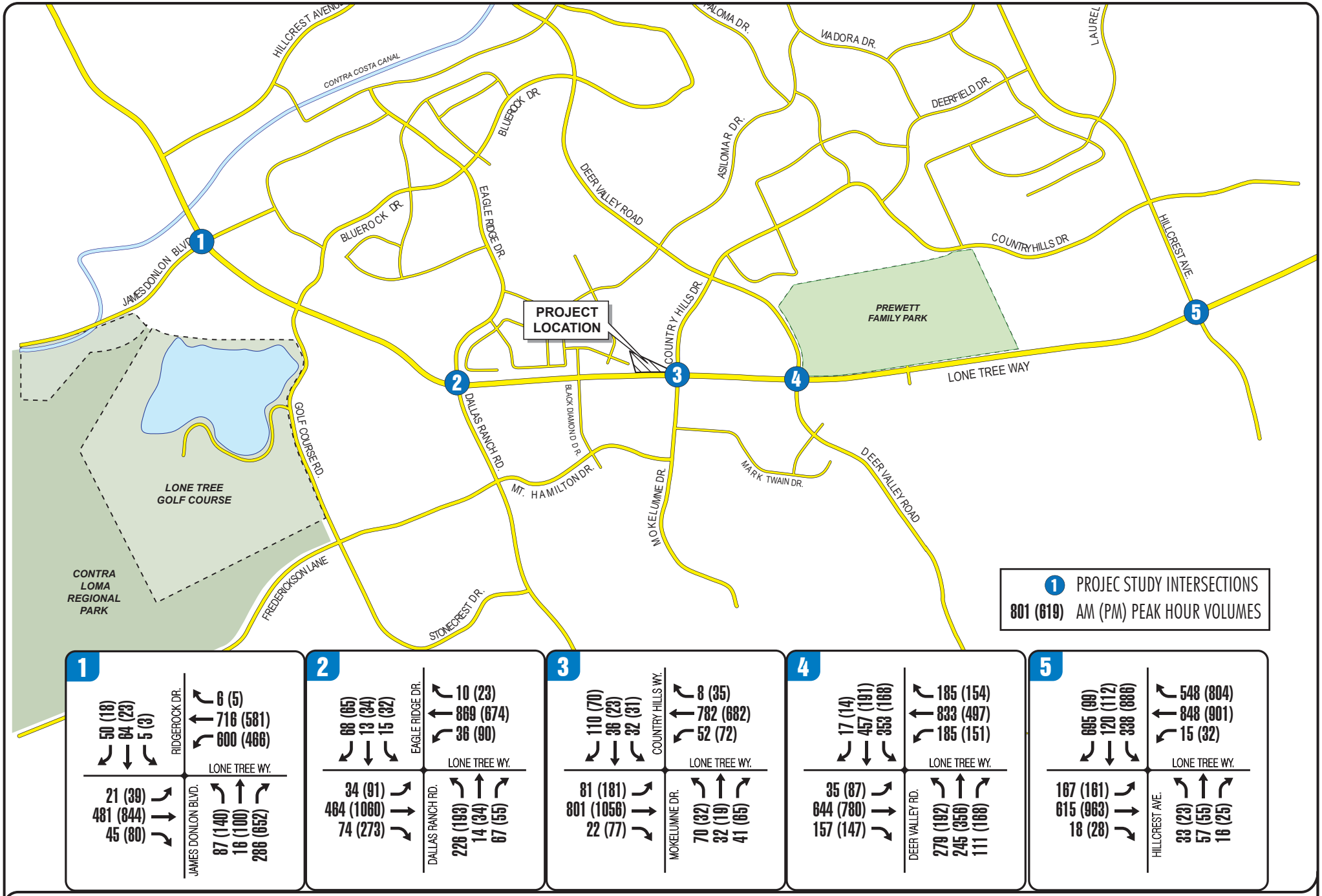

FIGURE 4 | EXISTING AM(PM) TRAFFIC VOLUMES

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Table 2
Existing AM/PM Peak Hour Intersection Levels of Service

No.	Intersection	Traffic Control Device	AM Peak Hour		PM Peak Hour	
			LOS	V/C Ratio	LOS	V/C Ratio
1	Lone Tree Way and James Donlon Blvd	Signal	A	0.45	A	0.60
2	Lone Tree Way and Dallas Ranch Road	Signal	A	0.41	A	0.50
3	Lone Tree Way and Country Hills Drive (Mokelumne)	Signal	A	0.42	A	0.44
4	Lone Tree Way and Deer Valley Road	Signal	B	0.63	A	0.59
5	Lone Tree Way and Hillcrest Avenue	Signal	B	0.66	B	0.63

Notes: Signalized intersections are analyzed in terms of v/c ratio (LOS) and delay.

The capacity analysis for the existing conditions indicates that all the locations currently operate at acceptable LOS. There are specific issues where a particular intersection approach may have a limitation given some unusual traffic characteristics. The specific issues at each intersection are as follows:

1.) Lone Tree Way and James Donlon Boulevard – This intersection operates at LOS "A" during both AM and PM peak hours. The AM peak has more critical conditions due to the left turn from Lone Tree Way to James Donlon Boulevard. With this left turn lane being recently lengthened, the capacity conditions have been significantly improved.

2.) Lone Tree Way and Dallas Ranch Road – This intersection operates at LOS "A" during both AM and PM peak hours. With continuing development, there will be growing volumes on the side streets. However, there is adequate capacity to accommodate these changes.

3.) Lone Tree Way and Country Hills Drive This intersection also operates at LOS "A" during both AM and PM peak hours. There will be increasing development north of this intersection as development continues. It is understood that this will be changed to split phase operation on Country Hills Drive/Mokelumne Drive and this is expected to be completed before the proposed project would open.

4.) Lone Tree Way and Deer Valley Road. This intersection operates at LOS "B" in the AM and "A" in the PM. There is split phase operation. It is anticipated that within the next year that southbound Deer Valley Road will receive a second southbound left turn lane. With this additional turn lane the existing capacity will be improved.

5.) Lone Tree Way and Hillcrest Avenue – This intersection operates at LOS "B" during both AM and PM peak hours. These counts suggest that some traffic has shifted to the Highway 4 Bypass. However, there continue to be very heavy turns from north to east in the PM.

d. Regulatory Considerations. The City of Antioch General Plan and Municipal Code include goals, objectives, policies and other regulatory guidance applicable to the proposed project. Each of these regulatory documents is described below.

(1) Antioch General Plan and Zoning Ordinance. The Antioch General Plan contains the Growth Management (GM) and Transportation and Circulation (T) Element policies that are applicable to the proposed project. The Antioch Municipal Code establishes the procedure by which the Community Development Director determines if the installation and maintenance of new traffic signals are warranted in order to prevent or relieve traffic congestion, in accordance with the State Department of Public Works Division of Highways traffic engineering and safety standards and warrants. The State traffic signal warrant procedure is the standard.

(2) Traffic Impact Analysis and Mitigation Requirements. The Municipal Code provides the process for which proposed development projects are to be evaluated for traffic and transportation impacts to the City's roadway network, including traffic study requirements, roadway improvements, and payment of traffic impact fees.

2. Impacts and Mitigation Measures

This section identifies the project trip generation, distribution and traffic assignments. Traffic impacts and appropriate mitigation measures have also been defined. Significant impacts are identified according to the significance criteria set forth for this study. The significance criteria are presented below followed by a discussion of the project's less-than-significant and significant traffic and circulation impacts.

Criteria of Significance. In the City of Antioch, the proposed project would create a significant traffic impact if it would:

- Degrade the intersection operation to a base case that is less than mid-range LOS D (v/c ratio = 0.85) conditions
- Increase a pre-existing unacceptable LOS operation by 0.02 or greater, **or**
- The development's internal circulation system design does not meet City standards.

From a CEQA standpoint, there would be a significant impact if the project would:

- Exceed, either individually or cumulatively, a level of service standard established by a county congestion management agency (i.e., CCTA) for designated roads or highways, or exceed the minimum level of service standard of LOS D for major arterials established by the City of Antioch.
- Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- Result in inadequate emergency access;
- Result in inadequate parking capacity;
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks) or generate pedestrian, bicycle, or transit travel demand that would not be accommodated by current pedestrian facilities, bicycle development plans, or long-range transit plans; **or**
- Result in a projected future over-capacity freeway condition where current long-range planning studies show an under-capacity condition.

a. Trip Generation, Distribution, and Assignment: Project trips were estimated using trip rates derived from the Institute of Transportation Engineers, *Trip Generation Manual*, 7th Edition. These trip rates along with the estimates of trip distribution and assignment were reviewed by the City of Antioch, and were discussed in a meeting held in July.

The proposed project would have two separate components that would generate trips, the bank and its drive-through operation, and the car wash. The two land uses will have independent trip generation characteristics. There may be some shared or linked trips between these two components, but the total trip generation has not been adjusted to account for this factor.

Carwash

The trip generation rates for a carwash have been documented by the ITE in Land Use (LU) Codes 947 and 948. LU Code 947 is based on the number of car washing stalls and LU Code 948 is based on the square footage of the car wash, which calculated a trip rate of about 11.64 trips per 1,000 square feet. It should be noted that the ITE data has been carefully reviewed with other data (described below) because neither of these ITE categories exactly represents what is proposed and they are based on very few data points.

ITE Trip Generation Factors for a Carwash.

1.) Trip Rate per wash stall: AM – not reported,
PM – 5.54 trips per wash stall
ADT - not reported.

2.) Trip Rate per 1,000 sq ft: AM not reported,
PM – 11.64 per 1,000 sq ft,
ADT not reported.

The proposed car wash has a covered area of about 5,400 sq ft which would equate to a trip generation of 62 trips per hour. Based on a review of the planned operations of the project a car wash with about seven (7) stalls is estimated to describe the proposed Antioch Hand Car Wash. With seven stalls, the PM peak trip generation is estimated to be 38 trips.

Other recent sources of trip generation data more applicable to this project include a study of a Prestige Car Wash in Walnut Creek, where the driveway count was a total of 70 vehicle trips during the peak hour on a Saturday, which is typically higher than the weekday PM peak hour volumes. This business is more of an auto detailing business, but the number of vehicles served per hour is comparable to the proposed Antioch Hand Car Wash. The traffic count that was used also reflected a day with good weather and a continuous flow of customers, and resulted in a day where about 200 customers had been served. At this rate, it can be expected that a maximum of about 25 to 30 vehicles would be served during the PM peak hour.

It should also be noted that the daily variability of a car wash business can be quite high depending on the day of the week (Fridays are generally the highest weekday), weather factors, and seasonal fluctuations. The day of heaviest activity is typically a Sunday. Another characteristic is that the car wash will rarely have any business before 9 am, so the weekday AM peak period is not expected to generate many vehicle trips. For the purposes of this analysis, the AM peak has been estimated at 13 vehicle trips (8 in, 5 out) and this has been used in the traffic capacity calculations. For the PM peak hour, the ITE rate for seven car wash stalls has been used, which equates to a peak hour trip generation of 38 trips. Again, this was estimated based on the most comparable ITE rates available for this kind of car wash using the comparison of about seven (7) car wash stalls. This data was verified with observations at other existing car wash facilities. It should be noted that the use of the "Automated Car Wash" trip rates (based on building square footage) was not recommended in part due to the fact that the rates were based on just two trip generation studies conducted over five years ago in New Jersey and New York.

As a final note, observations were also made of an existing car wash in Brentwood. This site has a layout similar to the proposed project in Antioch with a wash tunnel, a drying area, and a similar size property. A driveway count indicated a PM peak hour traffic flow of 24, with 10 vehicles entering and 14 leaving. There was sufficient area for entering vehicles to queue while waiting to be served.

Drive-In Bank

The trip generation rates for a drive-in bank are contained in the ITE manual in Land Use Code 912. The ITE trip generation has been measured using two variables. The first is in terms of gross floor area of the bank building, while the second is based on the number of drive-in lanes. These trip rates are as follows:

ITE Trip Generation Factors for a Drive-in Bank
1.) Drive-in Bank (per 1,000 sq ft) – AM – 12.34 veh./hr., PM – 45.74 veh./hr., ADT = 246.49
2.) Drive-in Bank (per lane) AM – 19.38 veh./hr., PM – 51.08 veh./hr. ADT = 411.17

Based on the bank building size of 3,500 sq ft, the PM peak hour would amount to 157 vehicle trips. Assuming the planned operation with four (4) drive-in lanes, the trip generation would be 204 trips. The applicant, ECC Bank, reports that the current plan is to use two of these drive-in lanes as a normal practice. Additional lanes may be opened if the demand is there, but the bank does not expect these to be frequently used. However, for the purposes of the traffic analysis it was assumed that all four lanes would be in full operation.

To further verify these trip estimates, Abrams Associates conducted traffic counts at an existing bank in Brentwood with similar characteristics to the proposed project. At this location, during a typical afternoon peak hour, about 20 to 25 cars were serviced. This peak occurred between 2 and 4 PM. During the commute peak period, the volumes were considerably lower.

Pass-by Reductions.

For this estimate the ITE pass-by data was used. The Second Edition of the ITE Trip Generation Handbook (March, 2001) provides pass-by data for a range of retail businesses. For the car wash, a pass-by rate of 15% was chosen as a conservative assumption based on comparable data. For example, a gas station is listed as having an average pass-by rate of 42% in the PM peak hour and shopping centers are listed with a rate of 34%. For a drive-in bank the ITE Trip Generation Handbook identifies and average pass-by rate of 47% but to be conservative a rate of 40% was applied. These rates were considered to be representative in terms of the location and the traffic volumes on adjacent streets. These rates have been applied to the total site trip generation. The net result of these estimates is shown in Table 3.

Table 3
ECC Bank and Antioch Hand Car Wash Development
Trip Generation Using ITE Rates

				AM Peak Hour			PM Peak Hour		
Land Use	**ITE Code**	**Size**	**ADT**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Automated – Self Service Car Wash									
Car Wash	946	7 Wash Stalls	470	8	5	13	18	20	38
Pass-By Reduction (15%)			71	1	0	1	2	3	5
Subtotals			399	7	5	12	16	17	33
Bank with Drive-Through Site Trip Generation									
Bank	912	3,500 sq ft	861	25	20	45	75	82	157
Pass-by Reduction (40%)			344	10	8	18	30	33	63
Subtotals			517	15	12	27	45	49	94
Total Trip Generation	**---**	**----**	**1,331**	**33**	**25**	**58**	**93**	**102**	**195**
External Trip Generation w/ Reductions for Pass-by			**916**	**22**	**17**	**39**	**61**	**66**	**127**

Note: The total trip generation reflects all vehicle trips that would be counted at the project driveway, both inbound and outbound. The net new trip generation represents the traffic that would be added to the existing traffic stream of the adjacent streets.

Table 3 provides a summary of trip generation rates applied to the proposed project. Table 4 provides a summary of the vehicular trips that would result from the proposed project. Figure 4 depicts the AM and PM peak hour trips generated by the proposed project at each study area intersection.

The site would generate a total of 195 tips during the PM Peak Hour. At the project driveway, there would be 93 trips entering and 102 vehicles leaving the site. Of this total, 127 would be new trips on Lone Tree Way, and 68 would be considered to be pass-by traffic that is attracted from the existing stream of traffic on Lone Tree Way. The number of new vehicle trips at each study intersection during the PM peak hour is also shown in **Figure 5**.

Table 4
ECC Bank and Antioch Hand Car Wash Development – Lone Tree Way
Forecast Trip Generation (PM peak hour vehicles)

Land Use	**Total Trip Generation**	**Pass-by and Linked Trips**	**Net New Trip Generation**
Bank	157	40%	94
Car Wash	38	15%	33
	195 trips	----	127

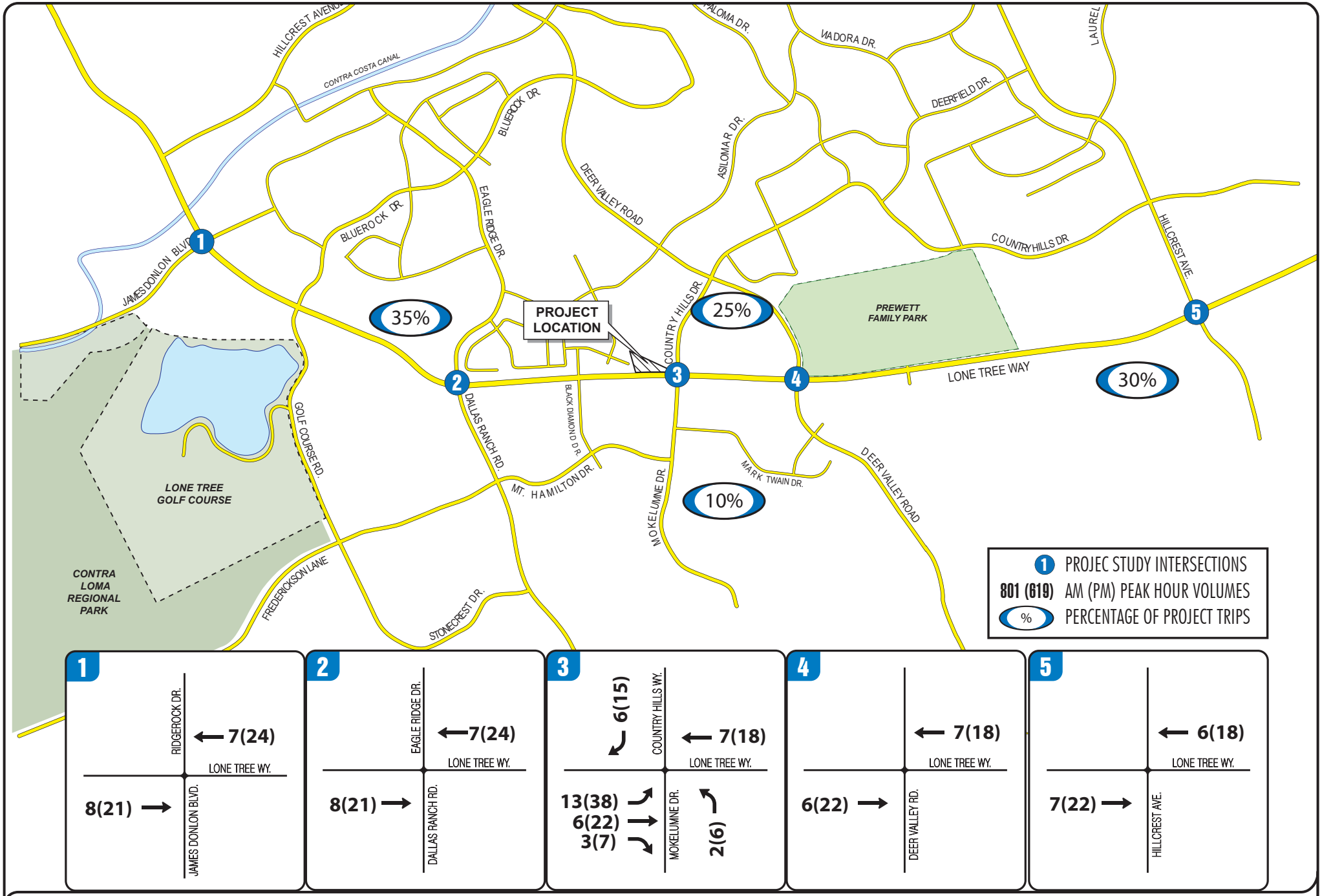

FIGURE 5 | PROJECT TRIP DISTRIBUTION

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(2.) Trip Distribution. The estimated trip distribution for the project was based on the service area that has been anticipated by these businesses, and the relative population density in the vicinity of the site. Based on these factors, it is estimated that 35% will come from the west, 30% to the east, 25% to the north, and 10% to the south. The overall trip distribution is estimated to be the following:

Direction	Percent	PM Peak Hour Trips
To the areas north of Lone Tree Way	25%	32 trips
To the east on Lone Tree Way	30%	38 trips
To the west on Lone Tree Way	35%	44 trips
To the areas south of Lone Tree Way	10%	13 trips
Totals	100%	127 trips

(3.) Assignment. The trip generation from the project has been added to each of the three basic traffic conditions, 1) existing, 2) near-term and 3) cumulative (2030).

b. Near-Term Project Impacts

An estimate of the trips generated by the approved and pending projects was derived from information provided by the City of Antioch. The near-term projects are those that may be implemented within about three years and represents the traffic conditions in the year 2011. In many cases data on trip generation, distribution and assignment was obtained directly from city-provided information. Where no data was available, particularly for small projects, Abrams Associates calculated trip generation from the ITE and used engineering judgment to assign traffic to the study intersections.

The approved and pending projects that have been included in this analysis are the following:

Project Name	Location	Size	Status
Oncology Center	Dallas Ranch Road	40,000 sf	Completed
Commons at Dallas Ranch	4751 Dallas Ranch Rd	25 apartments, 77,000 sq ft	Completed
Medical Office Building	Hillcrest Avenue	36,000 sf	Completed

Existing volumes were combined with the estimated vehicle trips that will be generated by the approved and pending projects to identify the near-term cumulative traffic volumes. Figure 6 illustrates the near-term traffic volumes at the study intersections.

(1) Near-Term Traffic Conditions. The *Near-Term Plus Proposed Project* traffic forecasts were developed by adding project-related traffic to the Near-Term traffic volumes. These volumes were developed from data on traffic forecast from various approved projects in the area and are presented in **Figure 6**.

(2) Near-Term Plus Project Intersection Traffic Impacts. The Existing Plus Proposed Project intersection level of service and traffic volume conditions are provided in Table 5 and the traffic volumes used are shown in **Figure 7**.

Table 5
Level of Service: Near-Term Conditions With and Without the Proposed Project

No.	Intersection	Traffic Control Device	Near-Term Without Project				Near-Term With Project			
			AM Peak		PM Peak		AM Peak		PM Peak	
			LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
1	Lone Tree Way and James Donlan Blvd	Signal	A	0.54	B	0.68	A	0.54	B	0.68
2	Lone Tree Way and Dallas Ranch Road	Signal	A	0.44	A	0.55	A	0.44	A	0.55
3	Lone Tree Way and Country Hills Drive (Mokelumne)	Signal	A	0.44	A	0.47	A	0.46	A	0.49
4	Lone Tree Way and Deer Valley Road	Signal	D	0.83	C	0.80	D	0.83	D	0.86
5	Lone Tree Way and Hillcrest Avenue	Signal	B	0.68	C	0.72	B	0.68	C	0.72

The capacity analysis for the existing conditions indicates that all locations currently operate at acceptable LOS. There are, however, specific issues where a particular intersection approach may have a limitation, or there are some unusual traffic characteristics. The specific issues at each intersection are as follows:

1.) Lone Tree Way and James Donlan Boulevard – This intersection operates at LOS "B" or better during both AM and PM peak hours. The AM peak has more critical conditions due to the left turn from Lone Tree Way to James Donlon Boulevard. With the left turn lane being recently lengthened, the traffic operations conditions have been significantly improved.

2.) Lone Tree Way and Dallas Ranch Road – This intersection operates at LOS "A" during both AM and PM peak hours. With continuing development, there will be growing volumes on the side streets. However, there is adequate capacity to accommodate the traffic from these developments.

3.) Lone Tree Way and Country Hills Drive This intersection also operates at LOS "A" during both AM and PM peak hours. There will be development north of this intersection as

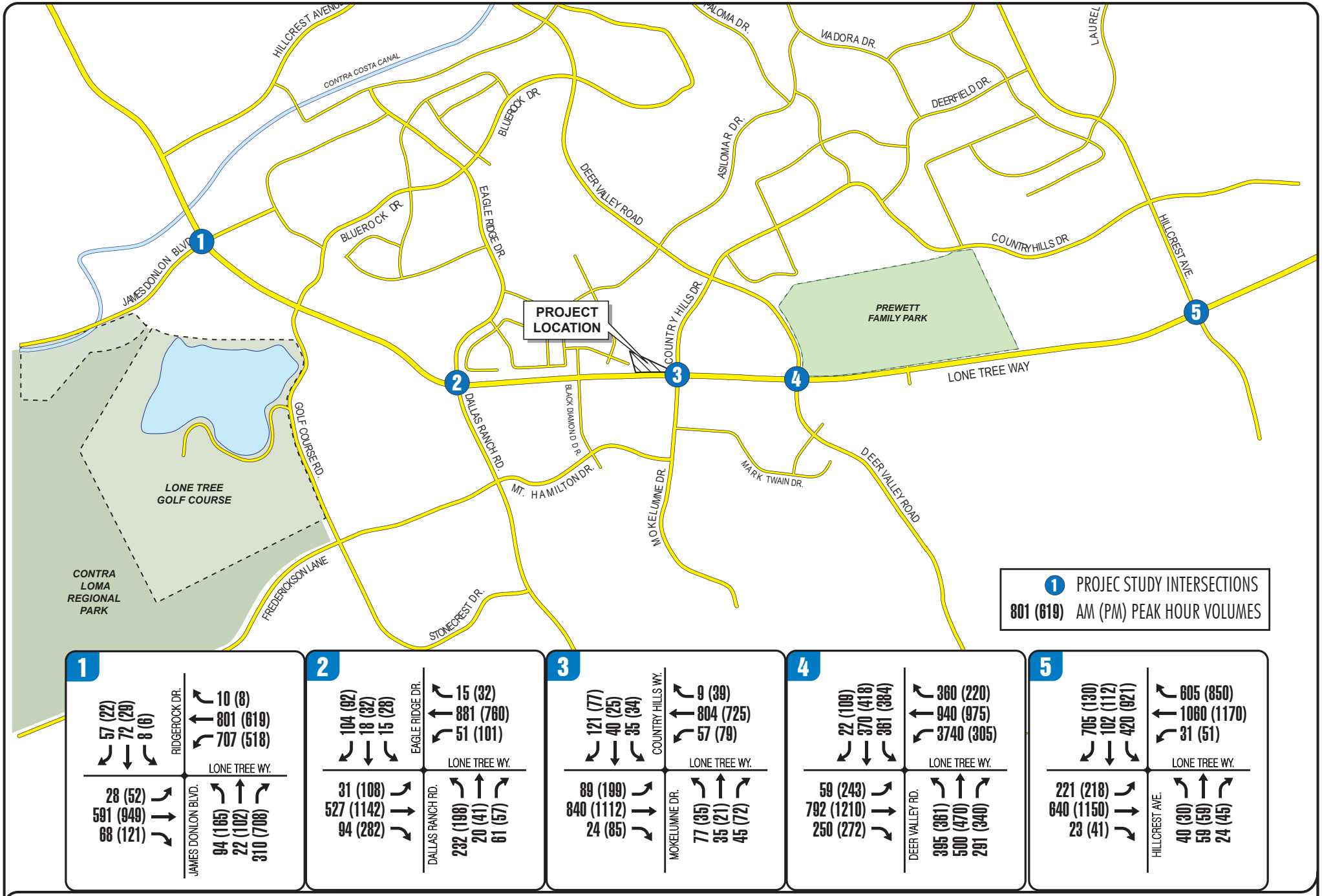

FIGURE 6 | NEAR TERM AM(PM) TRAFFIC VOLUMES

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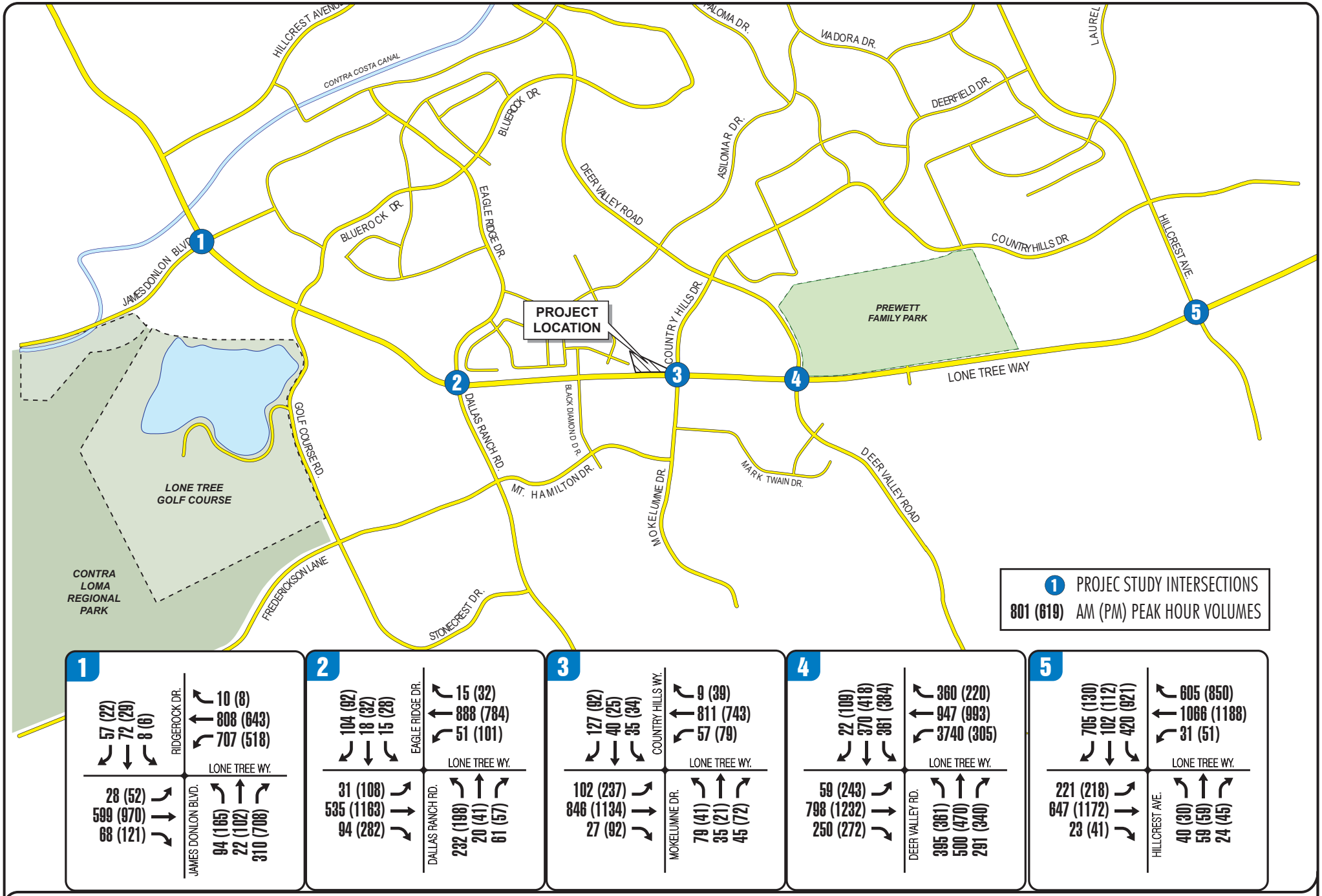

FIGURE 7 | NEAR TERM PLUS PROJECT AM(PM) TRAFFIC VOLUMES

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development continues. It is understood that this will be changed to split phase operation on Country Hills Drive/Mokelumne Drive, which will improve the operations at this intersection under all scenarios.

4.) Lone Tree Way and Deer Valley Road. This intersection operates at LOS "D" in the AM and PM peak hours. It is anticipated that on Deer Valley Road a second southbound left turn lane will be added by additional development projects as they develop. The existing southbound shared through-right lane will be restriped to a through lane. The conversion of the right turn lanes on Lone Tree Way to shared through-right lanes is also a planned improvement. With these improvements the existing capacity will be improved and will meet the City and CCTA LOS Standards.

5.) Lone Tree Way and Hillcrest Avenue – This intersection operates at LOS "B" during the AM peak hour and "C" during the PM peak hour. The latest traffic counts suggest that some traffic has shifted to the Highway 4 Bypass. However, there continues to be very heavy turns from north to east in the PM peak hour. A second southbound left-turn lane is planned for Hillcrest Avenue and the southbound left-shared- through lane will be changed to a through lane. In addition, the existing turn bays for eastbound and westbound left-turns on Lone Tree Way will be lengthened. These improvements have been funded by other approved projects in the area and are currently in the design phase.

Queue Lengths for Intersection Turn Lanes

Vehicle Queuing

The queuing of vehicles in the turn lanes at intersections has been evaluated to determine the impacts that would be caused by the addition of project traffic. The queue lengths measure the distance that vehicles will backup on the approach to a signalized intersection. The 95th percentile queue represents the condition where the queuing will be at, or less than the distance determined by the analysis 95% of the time. A typical vehicle spacing of 25 feet is used in the queuing analysis.

As summary of the queuing results has been prepared and is presented in **Table 6**. The results indicate where the estimated queuing may exceed the storage limits. The results are shown for the five study intersections on Lone Tree Way for the AM and the PM periods, and for the near-term and cumulative scenarios. The left turn lanes on Lone Tree Way are the focus of the study. For the most part, the analysis did not identify any queuing problems on the side streets, and the project did not cause the need for any side street left turn lane modifications.

Table 6
Adequacy of Left Turn Bays on Lone Tree Way

Lone Tree Way Intersection	Existing Left-Turn Storage (feet)		Period	Near-Term + Project Queue Length (feet)		Cumulative + Project Queue Length (feet)	
	Eastbound	Westbound		Eastbound	Westbound	Eastbound	Westbound
1. James Donlan Boulevard	100	525 (2)	AM	53	347	72	>300
			PM	84	246	130	>300
2. Dallas Ranch Road	165	200	AM	53	73	74	77
			PM	146	134	195	153
3. Country Hills Drive	145	145	AM	108	73	215	148
			PM	216	104	291	266
4. Deer Valley Road	195	190	AM	113	>300	80	>500
			PM	>300	>300	165	>500
5. Hillcrest Avenue	200	260	AM	>300	58	>300	190
			PM	>300	103	>300	>500

Notes: Queue Lengths are the 95th percentile. Shaded entries represent problem conditions.

As shown in **Table 6**, the storage length of some turn pockets would already be exceeded under near-term and cumulative conditions without the proposed project. The conditions are the same both with and without the bank and car wash project. The queuing deficiencies are mainly due to the traffic from other approved projects to be developed near the intersections. The queuing for the Lone Tree Way left turn pockets at each of the study intersections will operate as listed below:

1. James Donlan Boulevard – OK
2. Eagle Ridge/Dallas Ranch – OK
3. Country Hills Drive – PM problems with the EB Left Turn
4. Deer Valley Road – Problems in AM and PM in both directions
5. Hillcrest Avenue - AM and PM problems with the EB Left Turn

Vehicle queues that extend longer than the length of the turn pockets can interfere with through traffic and create additional delay and cause potential rear-end type collisions. Beyond the adjacent intersection of Country Hills Drive the project was not considered to be a significant factor in the impacts at the above locations.

On-Site Circulation and Parking

On-site Circulation, Site Access, and Parking Impacts. The project will have a single driveway entrance to the site on Lone Tree Way that will be located about 300 feet west of Country Hills Drive. The site plan is shown on **Figure 1**. A deceleration lane will be constructed along the project

frontage that will also serve as a bus bay for Tri-Delta Transit. The deceleration lane will safely clear vehicles entering the site on Lone Tree Way, and there will be no queuing issues at this driveway. With the proposed deceleration lane, the proposed driveway on Lone Tree Way should operate safely. The property will be efficiently served with a single driveway. Due to the traffic characteristics and median on Lone Tree Way, this driveway will be restricted to right turns only. At the driveway, it is recommended that there not be a raised pork chop island on Lone Tree Way.

Within the site, the traffic patterns have been designed safely and effectively, especially given the triangular shape of the parcel. The driveway to the site will have a traffic volume of 93 vehicles entering and 102 vehicles leaving the site during the PM peak hour. The Antioch Hand Car Wash will be on the east side of the site, and will have areas for vehicles entering the washing area, drying and detailing, and for temporary storage. The bank will be located on the west side of the site and will feature a drive-through area with five lanes.

Parking Conditions. The total site will have about 23 parking spaces, with about 16 spaces on the site of the bank, and 7 spaces on the site of the car wash. The bank building is estimated to be 3,500 square feet. At a zoning requirement of 4 spaces per 1,000 square feet, this would equate to the need for 14 parking spaces for the bank. Per the Zoning Ordinance, there is no specific parking requirement for this particular type of car wash. Based on the activities at the existing sites we reviewed, there is generally a need for about four formal parking spaces for employees and visitors. There are several reasons the parking requirement has been observed to be relatively low. The first is that customers would very rarely need to park because once their vehicles complete the car wash process they will have already paid and almost everyone simply gets in their vehicle and immediately leaves the site. In addition, although the jobs at a car wash like the one proposed typically pay over the minimum wage, the majority of workers are essentially entry-level employees who have very low car ownership levels. Based on our review of other facilities and discussions with the project applicant it appears to be typical for the majority of Car Wash employees to arrive by either bicycle, transit, or be dropped off.

It should be noted that there is also the need for some area where cars that have completed the wash process can be temporarily parked if the customer is not ready to leave. This would likely occur near the detail area and there is ample area on the site to store the occasional vehicle that is not retrieved by a customer. With the potential for walking/bicycle trips, carpool/drop-off trips, and the available transit service in the area the proposed parking supply is expected to adequately accommodate the employee vehicles that are typically associated with a car wash.

Near-Term Plus Project Bicycle and Pedestrian Impacts. The proposed project would not have a significant impact on any existing or proposed bicycle/ pedestrian facilities, including bike lanes, routes, or paths. There are no mitigation measures required for bicycle and pedestrian circulation.

Near-Term Plus Project Bus Transit Impacts. The proposed project would not significantly impact any bus transit routes. The existing bus stops and turnout adjacent to the site will be retained. No other changes are required.

3. Cumulative Traffic Impacts

a. Cumulative Traffic Volumes. Cumulative traffic conditions in the study area were analyzed for Year 2030 using CCTA traffic model forecasts, which are based on the adopted General Plans of Contra Costa County jurisdictions, including the City of Antioch. It should be noted that the future roadway network assumed for 2030 does not contain any new links within the study area. **Figure 8** shows the cumulative lane configurations in the project study area and **Figure 9** shows the cumulative (no project) traffic volumes in the area.

Year 2030 intersection turning movements were estimated in the traffic study as follows:

1.) Establish 2008 existing traffic volumes via intersection counts.

2.) Add traffic volume from approved and proposed projects anticipated by 2008.

3.) Calculate and add traffic from proposed project to each study area intersection.

4.) Utilizing CCTA 2030 CCTA peak hour forecasts, add net new growth from proposed project and external sources to each of the through traffic movements on major streets in study area.

5.) Individually study and adjust side street movements and minor traffic movements to reflect any local changes in traffic generation.

b. Cumulative Plus Project Intersection Traffic Impacts. As mentioned above, the *Cumulative (Year 2030)* traffic forecasts were developed based on Contra Costa Transportation Authority's (CCTA) area wide traffic model. The cumulative plus project traffic volumes used in the analysis are shown on **Figure 10**.

A summary of the level of service results for Cumulative Without and Cumulative Plus Project conditions are provided in **Table 7**.

Table 7
Cumulative (Year 2030) Without and Plus Proposed Project
Intersection Levels of Service and Delay

No.	Intersection	Traffic Control Device	Cumulative *Without* Project				Cumulative *Plus* Project			
			AM Peak		PM Peak		AM Peak		PM Peak	
			LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
1	Lone Tree Way and James Donlan Blvd	Signal	B	0.61	C	0.72	B	0.61	C	0.73
2	Lone Tree Way and Dallas Ranch Road	Signal	A	0.60	B	0.65	A	0.60	B	0.65
3	Lone Tree Way and Country Hills Drive (Mokelumme)	Signal	D	0.83	D	0.81	D	0.84	D	0.83
4	Lone Tree Way and Deer Valley Road	Signal	D	0.84	E	0.95	D	0.84	E	0.95
5	Lone Tree Way and Hillcrest Avenue	Signal	C	0.73	E	0.91	C	0.73	E	0.92

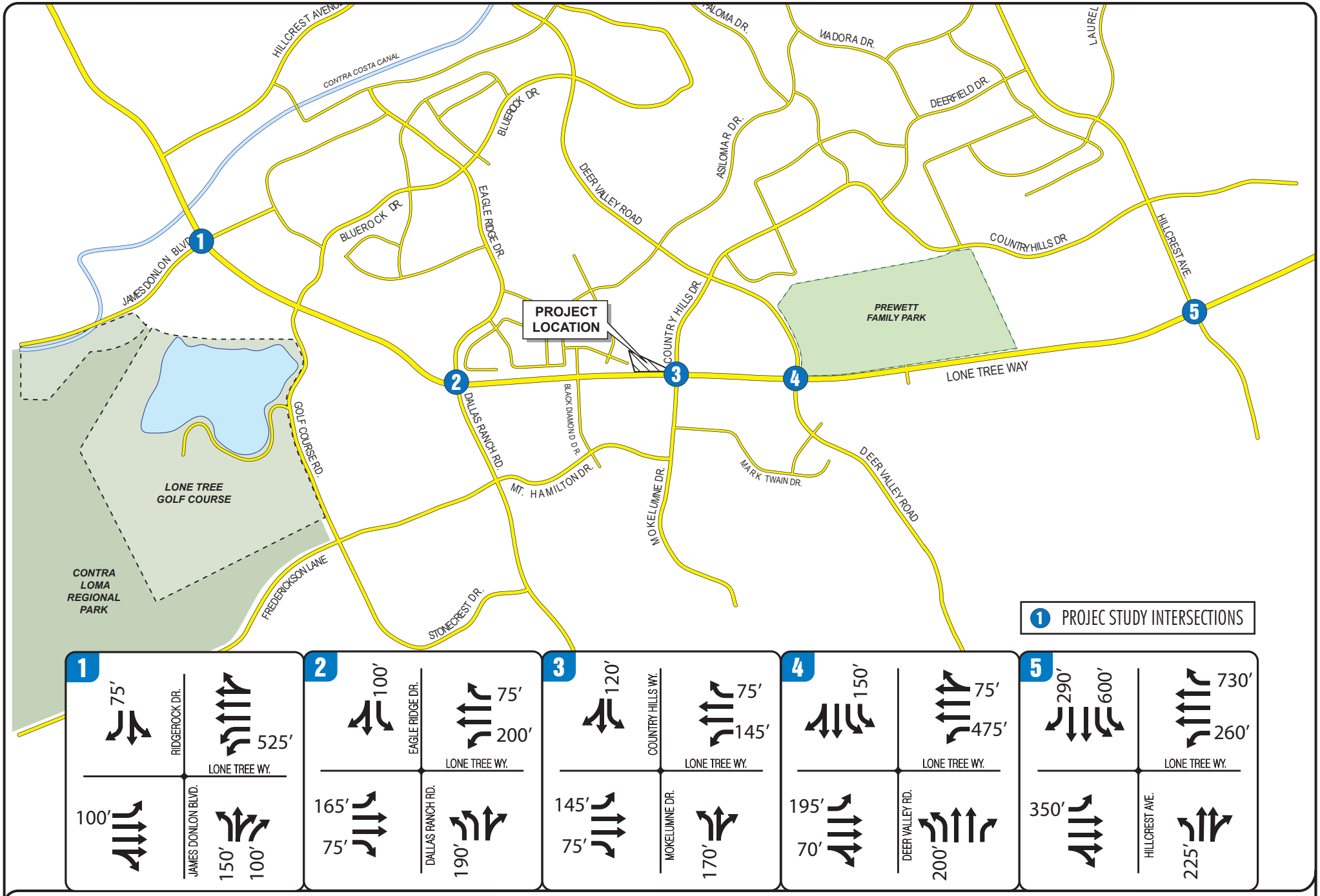

FIGURE 8| CUMULATIVE (2030) LANE CONFIGURATIONS AND LENGTHS OF TURN POCKETS

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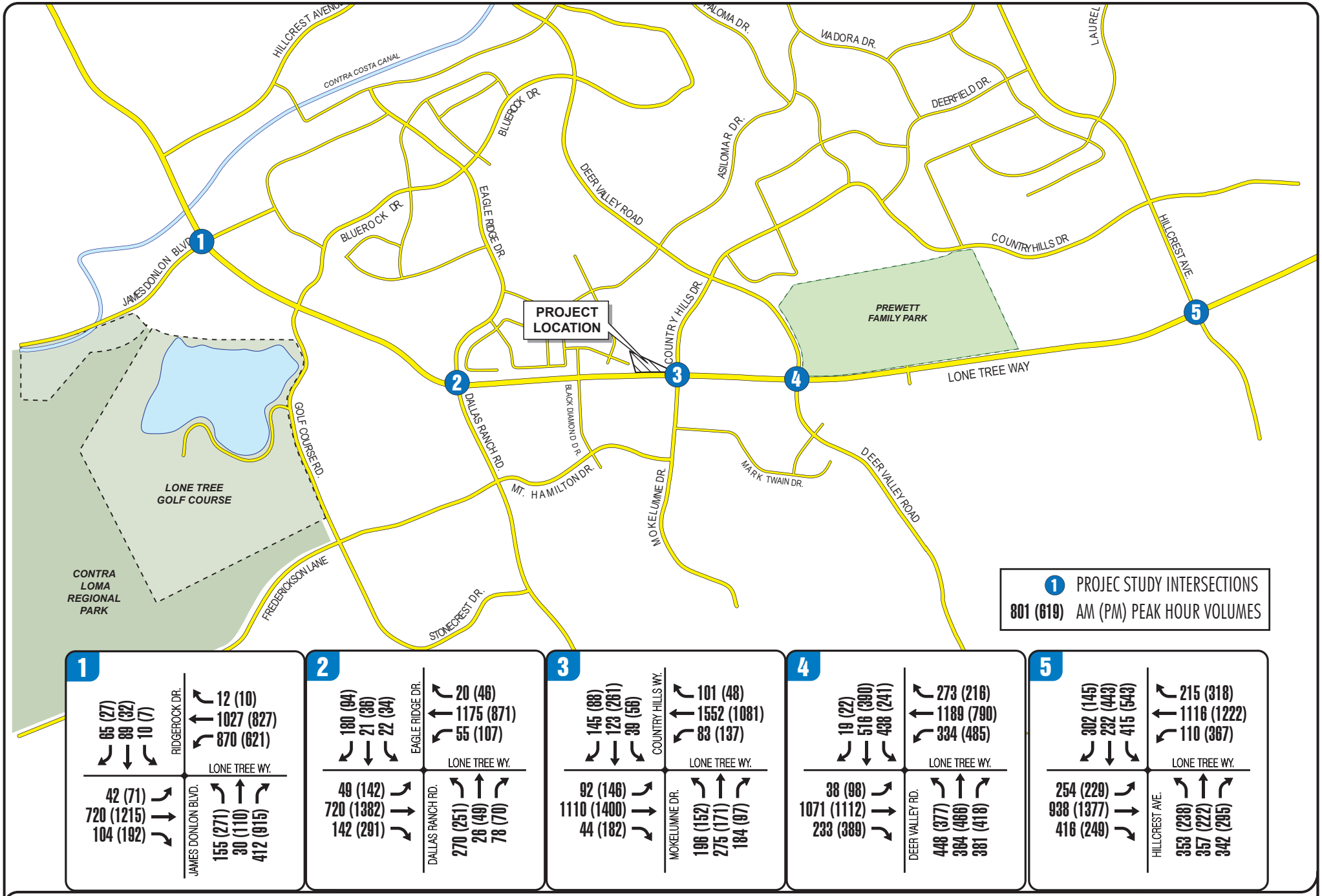

FIGURE 9 | CUMULATIVE 2030 AM(PM) TRAFFIC VOLUMES

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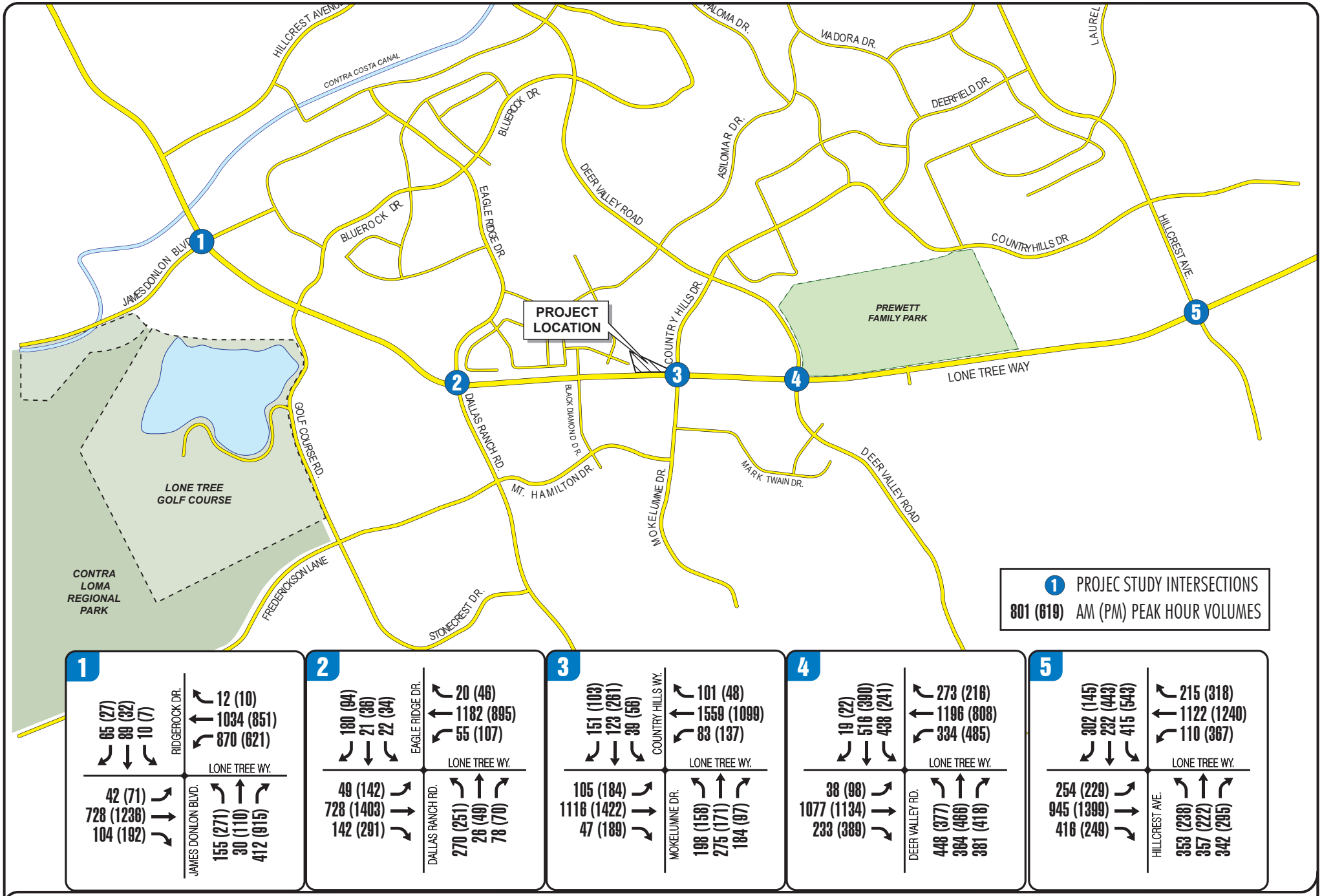

FIGURE 10 | CUMULATIVE 2030 PLUS PROJECT AM(PM) TRAFFIC VOLUMES

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Bank & Carwash

City of Antioch

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Table 7 provides the 2030 Cumulative Without and Plus Proposed Project conditions for each of the study intersections. There are no mitigations planned for any of the five study intersections. **Table 7** shows that the analysis indicates that all intersections currently operate at acceptable LOS. The intersections have the following characteristics.

All of the intersections studied as a part of this project will operate at an acceptable Level of Service D or better (>0.85) with the exception of the intersections of Hillcrest Avenue and Deer Valley Road with Lone Tree Way. These conditions would occur regardless of the implementation of the proposed project so no specific mitigations have been proposed. There are, however, some specific issues where a particular intersection approach may have queuing exceed in the turn lanes. The specific issues at each intersection are as follows:

1.) Lone Tree Way and James Donlon Boulevard – This intersection operates at LOS "B" during the AM peak and "C" during the PM peak hour. The AM peak has more critical conditions due to the left turn from Lone Tree Way to James Donlon Boulevard. With the northbound left turn lane having recently been lengthened, the capacity conditions will continue to meet the applicable City and CCTA Standards.

2.) Lone Tree Way and Dallas Ranch Road – This intersection operates at LOS "A" during the AM peak and "B" during the PM peak hour. With continuing development, volumes will increase on the side streets. Despite the increase, there is adequate capacity to accommodate these changes.

3.) Lone Tree Way and Country Hills Drive This intersection operates at LOS "D" during both AM and PM peak hours. There will be additional development north of this intersection as development continues. The traffic signal will be changed to split phase operation on Country Hills/Mokelumne Drives, but will continue to operate at an acceptable level of service after this change.

4.) Lone Tree Way and Deer Valley Road. This intersection operates at LOS "D" in the AM peak hour but would operate at LOS "E" during the PM peak hours. This is expected to occur regardless of whether the proposed project is approved. As mentioned previously, it is anticipated that on Deer Valley Road a second southbound left turn lane and an exclusive northbound right turn lane will be added. The City plans to restripe the existing right turn lanes on Lone Tree Way to shared through-right lanes within the next year. With these improvements the level-of-service standards still will be exceeded under Cumulative conditions. However, the proposed project would not be considered to have a significant impact on these conditions since the project would only increase the volume to capacity ratio by less than 0.01 and would increase the cumulative traffic volumes by less than one percent.

5.) Lone Tree Way and Hillcrest Avenue – This intersection is forecasted to have acceptable operations during the AM peak hour but would operate at LOS "E" during the PM peak hour. This is expected to occur regardless of whether the proposed project is approved. The proposed project would not be considered to have a significant impact on these conditions since the project would only increase the volume to capacity ratio by 0.01 and would increase the cumulative traffic volumes by less than one percent.

c. Cumulative Circulation, Access and Parking Impacts. In the cumulative analysis, the proposed project would not affect project circulation, access, or parking. No site circulation or access

issues have been identified that would cause a traffic safety problem or any unusual traffic congestion or delay.

d. Cumulative Plus Project Queue Lengths for Lone Tree Way Left Turn Lanes. The length of left turn lanes were evaluated for both the near-term plus project scenario and also for cumulative plus project conditions. The results of this analysis are shown in **Table 6**. As shown, the queues at the three of the project study intersections on Lone Tree Way would exceed the length of the existing turn pockets but only the adjacent intersection at Country Hills Drive would experience increased queues as a result of the project. At Deer Valley Road and Hillcrest Avenue the City already has plans to address the turn pocket deficiencies and the project would not exacerbate or otherwise change the expected queues at these intersections. However, at the intersection of Country Hills Drive the eastbound left-turn pocket would need to be lengthened by approximately 150 feet to accommodate the traffic volumes that are forecast to occur under the cumulative plus project scenario.

In addition it is expected that the City may ultimately require a deceleration lane for westbound Lone Tree Way at the project entrance. The design of the deceleration lane will need to be coordinated with the redesign of the adjacent bus turnout. There are currently no plans for this improvement so this would be the responsibility of the project applicant. With this and other planned turn lane improvements all turn lanes would be sufficient to accommodate the 95th percentile queues from the project and from cumulative traffic forecast for the area.

Cumulative Bicycle and Pedestrian Impacts. In the cumulative analysis, the proposed project would not affect any existing bicycle and pedestrian facilities, including bike lanes, routes, or paths.

Cumulative Bus Transit Impacts. In the cumulative analysis, the proposed project would not affect any of the bus transit routes on Lone Tree Way.

e. Conclusions

This study shows that there will be no degradation in traffic capacity or safety that will be caused by this project on nearby intersections beyond some queuing problems with the eastbound left-turn at Lone Tree Way and Country Hills Drive. As a result of the proposed mitigation measures, each of the intersections will meet the City of Antioch and CCTA standards. With the proposed deceleration lane, the proposed driveway on Lone Tree Way should operate safely and single access will adequately serve the project site. Because of the existing median on Lone Tree Way this driveway will be restricted to right turns only. This would not be expected to change in the future since there are no plans or expectation that the median would ever be opened to allow left-turns in this area.

Traffic Operations. The peak hour trip generation of the project will be 195 vehicles per hour. This amount of traffic is not expected to cause any substantial changes to vehicle delay or congestion at any of the intersections on Lone Tree Way. With cumulative (2030) traffic conditions, the installation of the planned third through lane on Lane Tree Way at Country Hills Drive and at Deer Valley Road will be required to improve the LOS to acceptable levels. This project will not have any significant traffic capacity impacts and no other off-site traffic mitigations would be required beyond the left-turn lane improvement described below.

Parking. The parking demand created by the bank-car wash will be adequately met by the on-site parking that will be provided. With this amount of parking the proposed project will have

sufficient on-site parking and is not expected to create negative parking impacts on any of the surrounding properties. With the potential for walking/bicycle trips, carpool/drop-off trips, and the available transit service in the area the proposed parking supply is expected to adequately accommodate the employee vehicles that are typically associated with a car wash.

Left Turn Lane Storage. The analysis of the queue lengths for the baseline and the cumulative conditions indicates that the eastbound left turn lane at the intersection of Lone Tree Way at Country Hills Drive (adjacent to the project site) will need to be lengthened by about 150 feet and include adequate space for deceleration in order to accommodate the future traffic conditions forecast for the intersection.