Memorandum

To:	County of San Luis Obispo	**Date:**	June 13, 2018
Attn:	Dave Flynn	**Project:**	Avila Beach Circulation Study
From:	Martin Inouye, Rosanna Southern		
Re:	Avila Beach Drive Capacity Metric & LOS Policy Evaluation	**Job No.:**	11151147
		File No.:	C1917MEM007.DOCX
CC:	Todd Tregenza		

Introduction

The County of San Luis Obispo has contracted Omni-Means, a GHD Company to re-evaluate the Level of Service (LOS) policy and capacity analysis metric for Avila Beach Drive. The previous LOS policy, as presented in the Avila Beach Specific Plan (and the Local Coastal Plan – San Luis Bay – Coastal Area Plan), is:

> **Avila Beach Drive and San Luis Bay Drive Level of Service**. The Level of Service (LOS) for Avila Beach Drive and San Luis Bay Drive shall be based on the average hourly weekday two-way 3:00 p.m. to 6:00 p.m. traffic counts to be conducted during the second week in May of each year. [Added 1995, Ord. 2702]

In the early 1990's, the 2nd week of May policy was chosen primarily to measure an average of peak hour volumes for weekday commute trips and, by design, omits weekend and summer traffic. The County's Board of Supervisors removed this practice in July 2016 and directed the Director of Public Works to develop a suitable analysis procedure. This memorandum presents background information relating to current traffic volumes on Avila Beach Drive, the deficiencies with utilizing the 2nd week of May as a specific week for conducting counts as a policy, a discussion on alternative methods/metrics for determining LOS, and a recommendation for which alternative metric to use in determining LOS and capacity on Avila Beach Drive between San Luis Bay Drive and San Luis Street.

Background and Current Traffic Volumes

Omni-Means collected traffic counts in Avila in September 2014 and August 2016. Additionally, the County installed a permanent count station on Avila Beach Drive west of San Luis Bay Drive in January of 2015. The permanent count station will allow the continued analysis of traffic volumes, and will support the refinement of analysis and policies as more data becomes available and regular seasonal fluctuations emerge versus anomalies or outliers in certain years. Since the permanent count station was installed, traffic volumes on Avila Beach Drive have become available on an hourly basis for 2015, 2016, and 2017. This data has been recorded, compared, and analyzed. Figure 1 compares the average daily traffic (ADT) volumes for each month over the past three years, and the 1992 average daily volumes, on Avila Beach Drive west of San Luis Bay Drive; the period when the 2nd week of May policy was adopted. Figure 2 presents the average daily volumes for 2017, on Avila Beach Drive throughout the week, comparing average summer traffic to average traffic throughout the year, and the average weekday and average weekend traffic volumes.

Figure 1 - Avila Beach Drive west of San Luis Bay Drive: Average Daily Volumes by Month

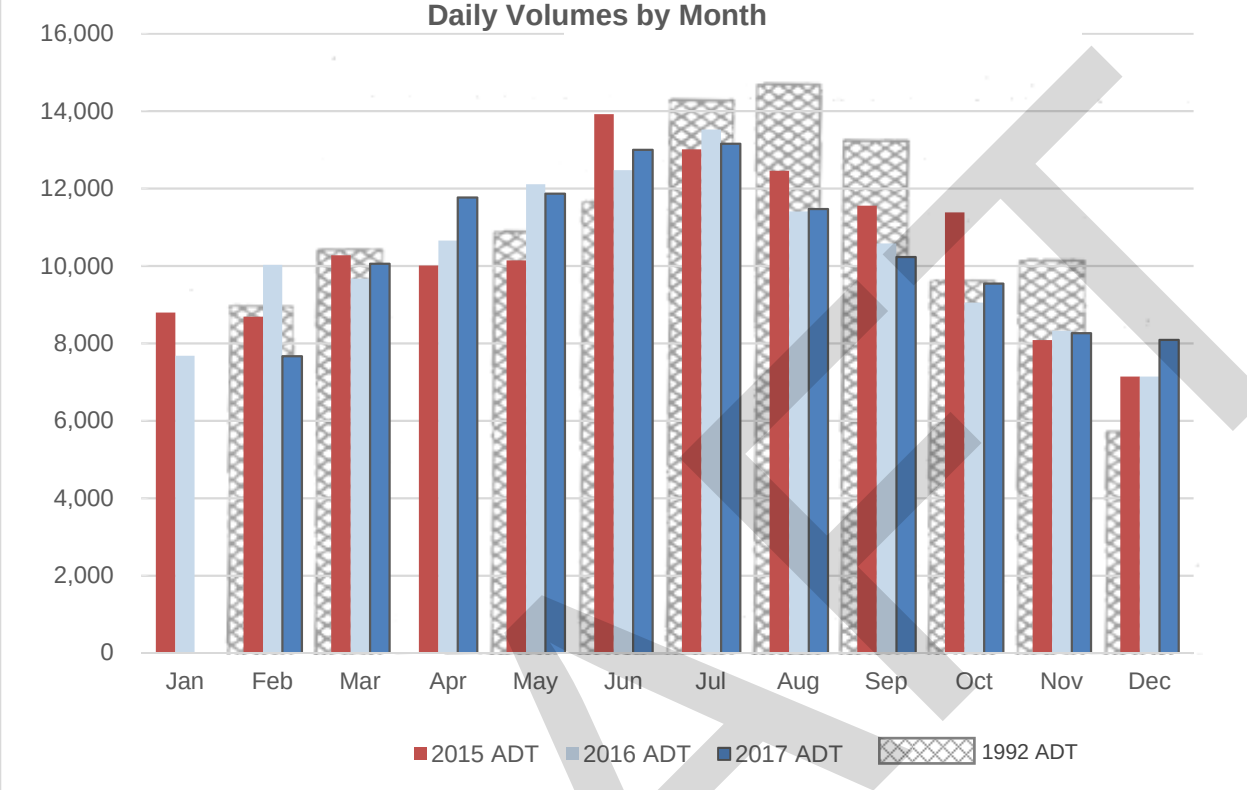
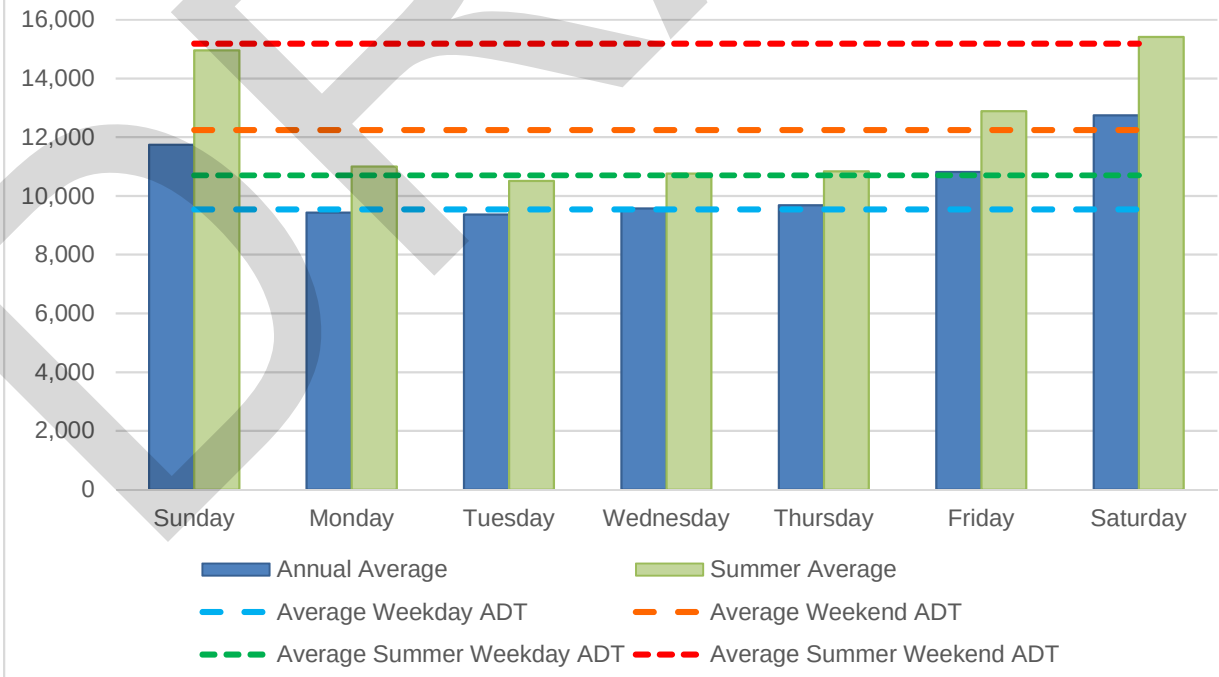


Figure 2 - Avila Beach Drive west of San Luis Bay Drive: Annual Average and Summer Average Daily Volumes by Day of Week



The ADT between 2015 and 2017 has remained fairly consistent, presenting the seasonal fluctuations of the summer and non-summer traffic. Interestingly, current volumes on Avila Beach Drive are generally consistent, if not lower than the volumes experienced in 1992, when the prior policy was established. This is likely due to traffic volumes declining during the period of Avila's downtown remediation project in 1999-2000, and the subsequent economic recession in 2008, which as shown, has since rebounded based on infill development within the town and general economic growth.

As shown in Figure 2, summer weekday traffic on Avila Beach Drive is 12% higher, on average, than weekday traffic year-round, and summer weekend traffic is 24% higher, on average, than the weekend traffic year-round. Both during the summer peak season and off-peak, weekend traffic is higher than weekday traffic. However, during the peak summer season, weekend traffic volumes are considerably higher relative to annual average weekend conditions than summer weekday traffic volumes are to annual average weekday conditions. Average weekend traffic is 28% higher than average weekday traffic, annually. Summer weekend traffic is 42% higher than summer weekday traffic volumes. In short, weekend travel fluctuates considerably more than weekday traffic over the year, notwithstanding weekday seasonal variation.

Average Daily Traffic (ADT) and Peak Hour Capacity

San Luis Obispo County currently has daily roadway capacity thresholds that are representative for typical/standard roadways based on number of lanes, turn lanes, shoulder width, functionality, etc. These thresholds also have underlying assumptions of directionality, with the directionality typically being more evenly split (40%-60%). However, based on the existing traffic counts at the permanent count station on Avila Beach Drive, the directionality is less evenly distributed, with weekdays consistently experiencing an average 32%-68% split. This pronounced directionality spikes further during particularly popular events or holiday weekends.

Another consideration with using standard average daily traffic (ADT) volume thresholds as an LOS metric for Avila Beach Drive specifically is that ADT thresholds assume typical "K" factors, or peak hour factors, and may not adequately represent the critical seasonal peak hour capacity constraints in Avila. In order to account for these seasonality effects, the performance metric for determining LOS on Avila Beach Drive should be based on local data rather than Countywide or industry-standard "K" (peak) and "D" (directionality) factors. These factors are considered in the 1992 roadway segment LOS thresholds for Avila Beach Drive (Table 1 herein).

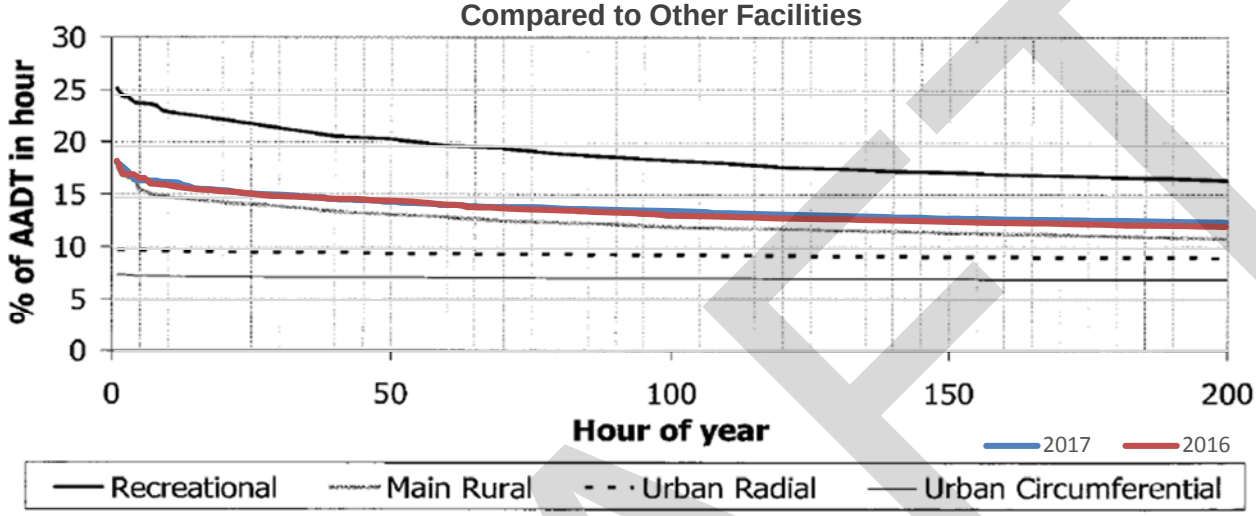
Capacity and other traffic analyses typically focus on average weekday peak hour traffic conditions because they represent reasonably common critical periods for operations without including particularly high-volume events or weekend travel. The peak hour volume, however, is not a constant value from day-to-day or from season-to-season[1]. Rural and recreational routes, much like Avila Beach Drive, often show a wide variation in peak-hour volumes with several extremely high volumes occurring on a few select weekends or in other peak periods, and traffic during the rest of the year flowing at much lower volumes[2]. Therefore, average weekday peak hour conditions may not accurately represent "reasonably common" travel conditions during the busier half of the year, from April to September.

Figure 3 shows the hourly volume relationships to the Annual Average Daily Traffic (AADT) measured on Avila Beach Drive for 2016 and 2017, and compared to a recreational, main rural,

[1] *HCM 2010: Highway Capacity Manual, Fifth Edition. Washington, D.C.: Transportation Research Board,* 2010.
[2] *HCM 2010: Highway Capacity Manual, Fifth Edition. Washington, D.C.: Transportation Research Board,* 2010.

and urban highway (as shown in the 2010 Highway Capacity Manual (HCM) Exhibit 3-7). The graph is ranked from the highest hourly volume to the lowest hourly volume. As shown, the diagram shows a recreational highway having 25% of AADT in the highest hour and 16.3% of AADT in the 200th-highest hour, and a rural highway having 17.3% of AADT in the highest hour and 10.8% of AADT in the 200th-highest hour.

Figure 3 - Percent of AADT in Hourly Volume for Avila Beach Drive Compared to Other Facilities



Notes: Recreational, US-2 near Stevens Pass (AADT = 3,862); main rural, I-90 near Moses Lake (AADT = 10,533); urban radial, I-90 in Seattle (AADT = 120,173); urban circumferential, I-405 in Bellevue (AADT = 141,550).
Source: Washington State DOT, 2006.

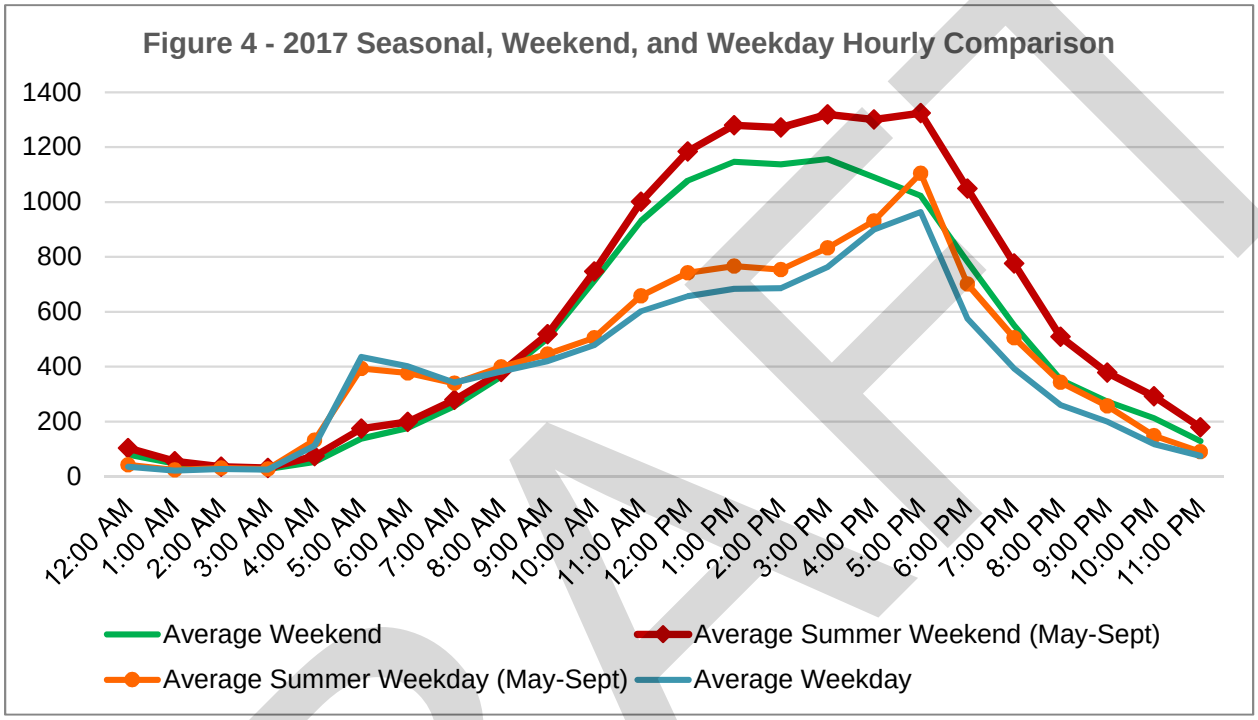
As shown in Figure 3, Avila Beach Drive has about 18.5% of AADT in the highest hour and 12.1%-12.5% of AADT in the 200th-highest hour (for both years). This presents that Avila Beach Drive volume characteristics are between a recreational route and a rural route. Avila Beach Drive functions as a recreational route during the peak summer season due to the heavy recreational traffic, and as a rural route during the lower volume times of the year.

Although traffic volumes inevitably vary on an annual, monthly, and weekly basis due to a wide variety of local, regional, and national factors, some specific factors that have been found to particularly influence travel demand in Avila include:

- Diablo Canyon power plant and other weekday commuter traffic
- Seasonal recreation and beach traffic during the summer, on weekends, and holidays
- Special event traffic throughout the year (festivals and concerts)
- Port San Luis Pier, Farmers market, and other local/regional commercial uses
- Prevailing weather and beach conditions

These elements all measurably affect the travel demand in Avila, particularly when two or more elements coincide, such as a summer holiday weekend concert, for example. Based on the traffic data collected at the permanent count station on Avila Beach Drive, commuter traffic for Diablo Canyon during the weekdays consistently have an early AM peak westbound (inbound at 5:00 am) and a PM peak eastbound (outbound at 5:00 pm), with the majority of vehicles traveling in one direction during weekday peak hours along Avila Beach Drive. Weekend traffic throughout the year is mainly contributed by recreational, beachgoer, and tourist travel, and on average, generates a longer travel demand peak throughout mid-day and into the evening.

The travel patterns have shown that the directionality of the inbound and outbound traffic volumes during the weekend peak hour are more evenly split compared to weekday commuter traffic. Figure 4 shows the average weekday, average weekend, summer weekday, and summer weekend traffic volumes on Avila Beach Drive over the course of the day. Based on the hourly data, the PM peak hour regularly experiences the highest amount of traffic, but the start and duration of that peak differs by day of the week.



Impact of Event Traffic

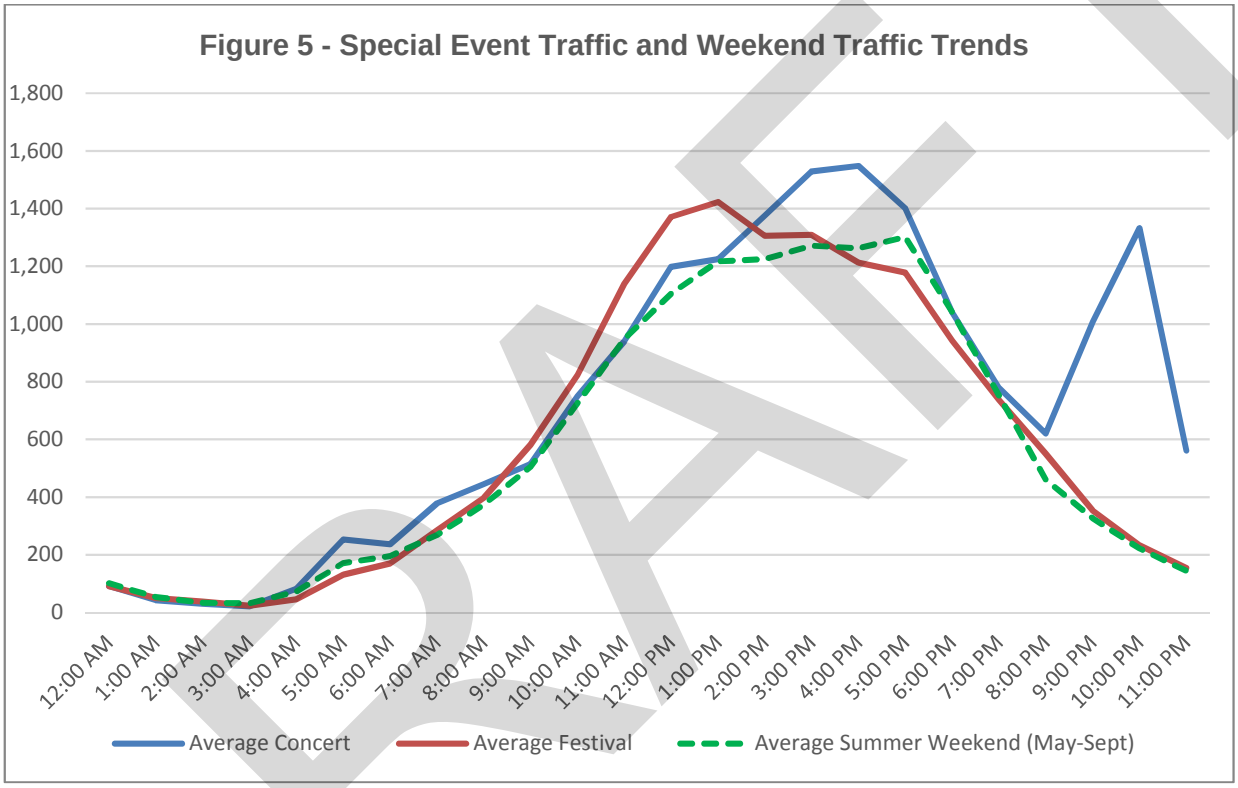
In November 2017, Kirk Consulting provided a listing of on-going entertainment activities, including estimated attendance, which occurred at the Avila Beach Golf Resort since 2007. This listing, as well as available event listings on the Resort's website and Port San Luis Pier's website, was used to identify which days special events occurred and how the traffic volumes were affected. For 2016 and 2017, events occurred May through November, with concert attendance ranging between 2,000 and 5,000, and festival attendance ranging between 1,000 and 3,500.

The majority of events, especially larger events like concerts and festivals, occurred on the weekends at the Resort, with parking available on the golf course via 1st Street. In 2017, the highest daily traffic volumes on Avila Beach Drive reached 20,980 vehicles per day (vpd) on a Saturday during the summer, with a large concert (5,000 attendance). The average daily volume for the days with a concert is 15,641 vpd and the average daily volume for days with a festival is 14,123 vpd.

The concerts tended to occur during the evening, and ending around 10:00 p.m., resulting in a mix of beachgoer and concertgoer traffic mid-day, and "spike" of outbound volumes when the concert is over. The festivals tended to have a similar peak trend as the average weekends, with the highest volumes experienced during the middle of the day through the afternoon. The average daily volumes on Avila Beach Drive (west of San Luis Bay Drive) for concert days were 28% higher than the average weekend daily traffic volumes (12,247 vpd). The average daily

volumes on Avila Beach Drive for festival days were 15% higher than the average weekend daily traffic.

The impact of events however, is subject to many variables including time of day, month, beach and weather conditions, and the potential overlap of beachgoers, and event-goers. The average summer weekend traffic volumes, without events, is 13,811 vpd. Based on the traffic data for 2017, during the summer, average concert days experienced 16,843 vpd and average festival days experienced 15,405 vpd. Therefore, during the summer, on average, concert days were 22% higher and festival days were 12% higher than average summer weekend traffic without events. Figure 5 presents a comparison of hourly volumes for the average concert, festival, and summer weekend during the day.

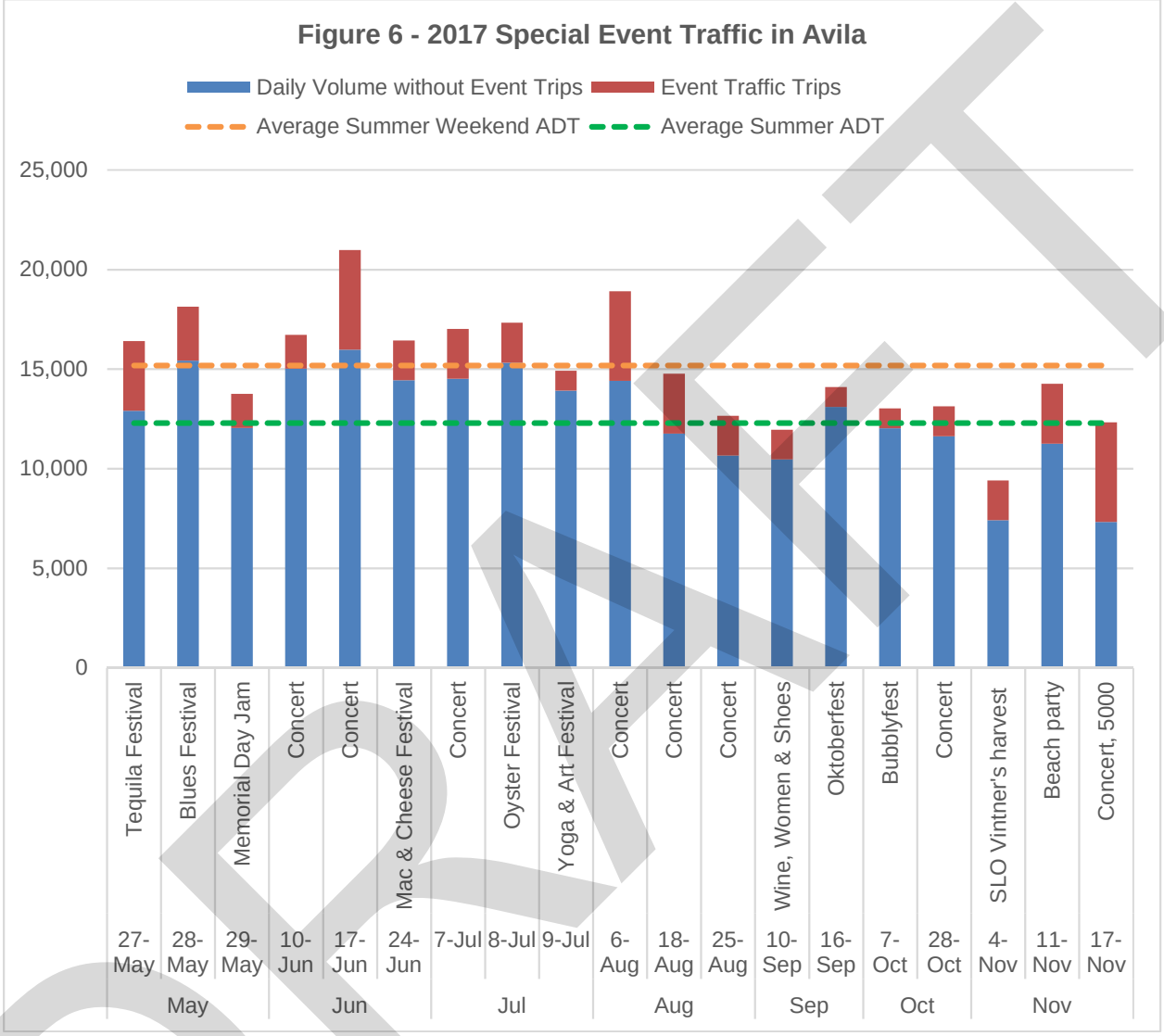


Event Traffic Directionality

On an hourly basis, special event traffic creates significant congestion inbound when the event begins, and outbound after the event is over. Throughout the day, and especially on holidays, this effect is compounded as attendees arrive to an already congested system. Once parking has reached saturation in Avila, vehicles circling areas looking for parking exacerbate circulation issues significantly. Excessive delay and queuing at the Avila Beach Drive / San Luis Bay Drive intersection is of heightened concern due to it being the only ingress/egress point into and out of Avila.

Figure 6 presents the daily volume and estimated event demand on specific event days in 2017. Event traffic trips were estimated assuming 2 trips per attendee, and 2 persons per vehicle on average. As shown in Figure 6, highly attended events in the peak summer season added trips that resulted in daily volumes well over 15,000 vehicles, resulting in over-capacity conditions in Avila. However, larger events in the off-peak season (November) resulted in traffic volumes similar to average summer daily traffic volumes. In addition to the recommendations for changing the LOS policy on Avila Beach Drive, implementation of TDM measures in Avila will be

key for continued permitting of special events and improved traffic operations along Avila Beach Drive. Details of specific TDM program or policy options will be discussed in a subsequent study.



Related Traffic Volumes on Avila Beach Drive and San Luis Bay Drive

As a reference for this memorandum, provided are the average weekday traffic volumes along other segments of Avila Beach Drive, and San Luis Bay Drive, which both provide access to US 101 and serve Avila. The traffic volumes were taken in September 2014.

- Avila Beach Drive west of US 101 Southbound Ramps – 9,631 vpd
- Avila Beach Drive east of Lighthouse Road – 2,413 vpd
- San Luis Bay Drive north of Avila Beach Drive – 6,301 vpd
- San Luis Bay Drive west of Ontario Road – 8,010 vpd

These volumes are lower than the average daily count volume taken on Avila Beach Drive west of San Luis Bay Drive, with 11,136 vpd in September 2014, but due to the closed nature of the local transportation system, increase and decrease in proportion with fluctuations observed at the permanent count station (Avila Beach Drive west of San Luis Bay Drive).

Deficiencies of Prior 2nd Week of May LOS Policy

The prior policy aimed to approximate the 345th annual highest hour as the "baseline" measure for capacity evaluation. The 1992 requirement to conduct traffic counts during the second week of May presents implementation challenges when an operational capacity analysis needs to be performed, for the following reasons:

- Commercial and residential development has occurred since 1992 in the Avila Valley and beachfront areas, changing the May baseline,
- Increase in special events throughout the year, increasing not only the population, but also the amount of visitors Avila Beach experiences throughout the year,
- Traffic volumes on Avila Beach Drive for this very specific week fluctuates from year to year, and are particularly affected by the weather or special events within Avila,
- Relying solely on the 2nd week of May volume for a particular year does not necessarily represent average weekday peak hour conditions, or the 345th highest hour.
- Given the year to year and seasonal volume fluctuations, the 2nd week of May count could potentially mask capacity issues occurring during the peak season, or during an "average" year if volumes are collected during an unusually low traffic week.
- If development and traffic continues to increase throughout the year and the "2nd week of May" volumes exceed the LOS C threshold, this will likely result in significantly over capacity conditions during the peak summer season in June and July and on the "shoulders" of the peak, including April, May, August, and September.

Based on counts conducted in 2015, during the 2nd week of May, the daily traffic volume was 10,651 and the peak hour volume was 924 vehicles. The average weekday peak hour volume during the second week of May for 2016 was 1,110, and for 2017 it was 1,024. Based on the peak roadway volume threshold capacity table presented in the 1992 Willbur Smith Associates Resource (WSA) Capacity Study, also shown in Table 1 below, this equates to a LOS A or B. However, this did not represent weekday peak hour traffic conditions, on an average monthly basis, throughout half of the year (April through September). The same relationship was deducted for the 2015, 2016, and 2017 count data. As such, the County is seeking re-evaluation of this May policy.

TABLE 1: PEAK HOUR LOS CRITERIA FOR AVILA BEACH DRIVE

Level of Service	Service Flow (Peak Direction)	Estimated 2-Way Flow	Estimated Travel Speed
A	< 670	< 985	> 43 mph
B	670 -770	985 – 1,130	37 – 43 mph
C	770 – 870	1,130 – 1,280	30 – 37 mph
D	870 – 980	1,280 – 1,440	23 – 30 mph
E	980 – 1,100	1,440 – 1,615	15 – 23 mph
F	> 1,100	> 1,615	< 15 mph

Note: Two-way service flow rate ranges assume existing directional split characteristics of 68% - 32% traffic during the weekday peak period. Estimated travel speeds are given for comparative purposes only.

Alternative Metrics for determining LOS on Avila Beach Drive

The following discusses the different performance metric options for determining LOS and analyzing capacity conditions on Avila Beach Drive.

Signalized Intersection Operations

The traffic signal at Avila Beach Drive and San Luis Bay Drive can function as a control point for access to Avila Beach, especially during peak periods of heavy inbound or outbound travel. Peak hour throughput is limited and metered by the effectiveness of the traffic signal. On the weekends, especially during an event/holiday in the summer (i.e. Memorial Day Weekend) inbound traffic is split between Avila Beach Drive and San Luis Bay Drive, from the respective U.S. 101 interchanges, and excessive queues are often experienced where they merge at their intersection together, particularly westbound along Avila Beach Drive.

There is a measurable relationship between the capacity of the signalized intersection and the adjacent roadway capacity, on a peak hour basis. However, the relationship does not necessarily mean the segment LOS is equivalent to the intersection LOS. Based on peak hour intersection turning movement counts taken on Tuesday, September 16, 2014, the intersection operates at LOS B. The amount of traffic in both directions approaching and departing the traffic signal, west of San Luis Bay Drive was **1,387** vph during the PM peak hour (4:30-5:30 p.m.). This segment volume represents LOS D based on peak hour segment thresholds.

The roadway capacity, however, can be reasonably related to the peak hour queueing conditions (95th percentile) at the Avila Beach Drive / San Luis Bay Drive traffic signal. The September 2014 count indicated an eastbound left turn queue approaching the turn pocket capacity. Queuing spillback into the roadway mainline can cause significant spillback, at times blocking egress from Avila. Additional intersection counts will need to be collected and analyzed to draw clearer conclusions between the relationship of segment volume and anticipated signal operations at Avila Beach Drive / San Luis Bay Drive. Table 2 presents the intersection and operational data for the two dates collected during the PM peak hour.

TABLE 2: AVILA BEACH DRIVE/SAN LUIS BAY DRIVE INTERSECTION OPERATIONS

Collection Date	PM Peak Hour Segment Volume west of Intersection (vph)	Peak Hour Factor (PHF)	Segment Hourly LOS	Directionality (% on Eastbound Approach)	Intersection LOS (per HCM 6)	% of Eastbound Left Turn Queue Storage (290')
September 16, 2014	1,387	0.93	D	76%	B	84%
August 16, 2016	1,113	0.87	B	73%	B	60%

Note: Analysis based on limited data available. Directionality and hourly volume may not be representative of average weekday conditions in September and August. Additional data needed to draw conclusions.

For the PM peak hour conditions of the September intersection count, the majority of vehicles are heading eastbound and the 95th percentile queue for the eastbound left turn pocked is estimated to be 84% of the storage capacity (290' storage), and the eastbound through lane queues beyond the left turn lane.

Based on the roadway counts conducted between September 14-20, 2014 the average weekday PM peak hour traffic volume (Tuesday through Thursday, collected on an hourly basis, 4:00-5:00 p.m.) on Avila Beach Drive west of San Luis Bay Drive was **1,148** vph. The variation between the intersection and adjacent roadway counts shows how much traffic volumes can vary not only a weekday basis, but also during the 15-minute count intervals. These peaking characteristics are typical of commute patterns of an average weekday in Avila and require further evaluation in order to draw clear conclusions between intersection and segment LOS.

30th Highest Hour (K30)

The 30th Highest Hour is also known industrywide as the design hour factor. This is the factor used for design and analysis of traffic flow on highways. Unless otherwise stated, it is the proportion of AADT occurring in the 30th highest hour of the year. K factors can only be calculated at continuous count stations that have a full year of data. The K30 factor is critical in project traffic forecasting. The K factor has three general characteristics: 1) K generally decreases as AADT increases; 2) K generally decreases as development density increases; 3) K generally is highest on recreational facilities, next highest on rural suburban, and lowest on urban[5].

The selection of an appropriate hour for planning, design, and operational purposes is a compromise between providing an adequate LOS for almost every hour of the year and providing economic efficiency. Customary practice in the United States is to base rural highway design on the 30th-highest hour of the year[6]. This is due to the fact that rural highways typically experience few hours with higher volumes, and many hours with volumes that are not much lower than the 30th highest hour. However, Avila Beach Drive experiences many hours throughout the year that are much lower than the 30th highest hour.

Since Avila Beach Drive is mainly a recreational facility, due to the high influx of seasonal peak traffic during the summer months and on the weekends, using the 30th highest hour (K30) would result in a peak hour volume that is representative of weekend or summer volumes. As noted in the #3 characteristic of K30 (FDOT description), this factor tends to be the much higher for recreational facilities, and based on the permanent count station data, this statement is true.

The 30th Highest Hour for 2015 was **1,555** vehicles per hour (vph), for 2016 it was **1,543** vph, and for 2017 it was **1,601** vph. The K30 for 2015 was estimated based on limited data available from March to August. For all three years, the 30th Highest Hour occurred on a Saturday, and for 2016 occurred during the summer. The 30th highest hour for the past three years results in LOS E on Avila Beach Drive. If the 30th Highest Hour is used to calculate the existing LOS on Avila Beach Drive, it would represent much higher traffic volumes than what occurs during the average weekday. Additionally, it represents unacceptable conditions based on the current Avila LOS policy, which would indicate an immediate need to widen Avila Beach Drive.

100th Highest Hour (K100)

This is the proportion of AADT occurring during the 100th highest hour of the year, and is commonly known as the Planning Analysis Hour Factor. This is also referenced in the FDOT Traffic Monitoring Handbook, 2007. In urbanized areas, the K100 largely reflects a compromise

[5] "Statistics Abbreviations and Definitions" *Florida Department of Transportation*. Traffic Monitoring Handbook. October 30, 2007.

[6] *HCM 2010: Highway Capacity Manual, Fifth Edition. Washington, D.C.: Transportation Research Board,* 2010.

between the "design hour" concept of K30 and a typical driver's perception during a weekday commute trip.[7]

Based on the permanent count station data, the 100th Highest Hour volume for 2015 was **1,415** vph, which occurred on Saturday, June 6th at 1:00 p.m., for 2016 it was **1,347** vph, which occurred on Saturday, July 16th at 3:00 p.m., and for 2017 it was **1,436** vph, which occurred on Wednesday, April 19th at 5:00 p.m. The K100 for 2015 was estimated based on limited data available from March through August. For the three years, the LOS for the K100 volume on Avila Beach Drive represents LOS D conditions. On average between 2016 and 2017, the weekend peak hour volumes for April, May, August, and September are very close to the 2016 100th Highest Hour. The average weekend volume for these 'shoulder' months was 1,330 vph. Coincidentally, the PM peak hour (4:30-5:30 p.m.) volumes from the September 2014 intersection counts were most similar to the K100 volumes on Avila Beach Drive west of San Luis Bay Drive for 2016, at 1,387 vph.

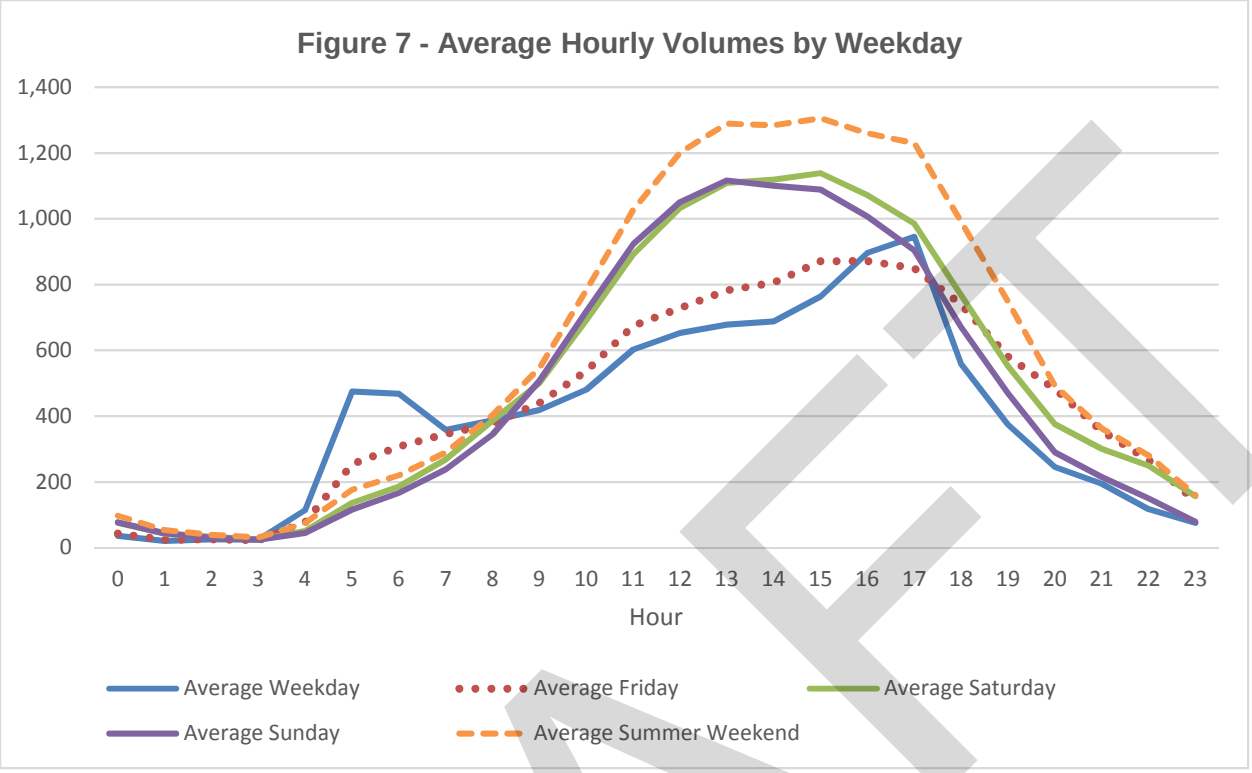
Other Metrics

200th Highest Hour (K200) – the proportion of AADT occurring during the 200th highest hour of the year. For 2015, this was estimated to be 1,267 vph (Sunday, August 9th at 4:00 p.m.), for 2016 K200 was 1,234 vph (Friday, January 1st at 1:00 p.m.), and for 2017 this was 1,314 vph (Wednesday, July 19th at 5:00 p.m.).

Use of the 200th Highest Hour as a metric for measuring the capacity on Avila Beach Drive presents traffic volumes that have less of a variance over the three years. The K200 metric results in LOS C/D on Avila Beach Drive. The K200 representation of peak hour volume would occur during the peak summer or on a holiday, however, it does not represent the peak hour volume during these days. During the summer (May-September), peak hour volumes in this K200 range were present only 2% of the time. The peak hour volume during the summer is generally higher than K200. Also, the peak hour volume on days throughout the rest of the year is generally lower than the K200. Based on a monthly average between 2016 and 2017, the K200 would likely occur on weekends between April and September, or any day between July and August. Use of the 200th Highest Hour would likely result in analysis of roadway conditions that do not represent peak hour conditions.

Summer, Weekend, or Friday Peak Hour – Based on the permanent count station data over the past three years, the traffic volumes on Avila Beach Drive are much higher during the summer months, and on weekends. The peak summer season for Avila Beach is represented by the increase in traffic volumes between May and September, with June and July having the highest traffic volumes throughout the year, especially on weekends. As discussed previously, the 30th highest hour for Avila Beach Drive is typical of summer weekend peak hour traffic and does not account for seasonality or any outliers, representing very high traffic volumes and poor LOS. Friday daily traffic volumes are usually higher than the rest of the weekday traffic cumulatively, having a longer peaking characteristic over the afternoon similar to weekends, but a PM peak hour volume very similar to, if not lower than, weekday PM peak hour volumes. Figure 7 presents the average hourly volumes throughout the day for the average weekday (Tuesday – Thursday), on Fridays, Saturdays, Sundays, and summer weekends. The average summer weekend is defined as the hourly average for both Saturday and Sunday. The annual average for Saturdays and Sundays are shown separately for comparing the difference between the two days, as well as the increase during the summer months.

[7] "Draft Issue Paper on Improving Florida's Transportation Planning and Design Analysis Time Period Process (Adopting Standard K Factors and Level of Service Standards throughout FDOT)", *Florida Department of Transportation*. February 28, 2011.



As shown in Figure 7, the hourly volume trends for Saturdays and Sundays, year-round, are very close, with Saturdays typically being just a little higher. The average summer weekend combines Saturday and Sunday, and is shown to be much higher than the year-round average. Use of the summer weekend peak hour volumes would result in LOS E or F operations, especially in June and July, suggesting a need to widen Avila Beach Drive to improve LOS.

Summary of Metric Options

Table 3 presents a summary of 'pros' and 'cons' for each metric described above.

TABLE 3: PROS AND CONS FOR EACH METRIC OPTION

Metric	Pros	Cons
Peak Hour Intersection Operations at Avila Beach Drive and San Luis Bay Drive	• Standardized method (HCM) • Factors in capacity and throughput of intersections that meter flow • Can consider delay & queuing	• LOS dependent on volume collected on specific days • "Average" delay may not represent drive perception for worst movement
30th Highest Hour (K30)	• Standard method for rural highway design • Represents peak summer season and weekends • Plan for "worst case"	• Requires period refinement based on updated annual traffic counts • Establishes LOS E/F conditions during peak summer as "baseline" • Would indicate need to widen Avila Beach Drive today

100th Highest Hour (K100)	• Used for planning analysis • Compromise between design hour and typical driver's perception • Represents transition between lower off-peak season and higher peak summer volumes • Establishes LOS D conditions during "shoulder" months as "baseline"	• Requires period refinement based on updated annual traffic counts • Accepts LOS E/F conditions during outlier peak hours • May insufficiently address local concerns about "peak" conditions during <100th highest hours.
200th Highest Hour (K200)	• Has less variance over the years than K30 or K100 • Typically occurs during summer, average weekends • Establishes LOS C as "baseline" condition	• Requires period refinement based on updated annual traffic counts • Does not represent perception of congestion during peak hours • Lower than many weekends
Specific Day, Friday, Summer Weekends	• Temporal consistency in data collection periods between years • Simplifies requirements and guidelines for impact studies • Easily relatable standard	• Friday peak hour volumes for Avila is on average lower than weekday volumes • Could establish "worst-case" conditions as "Baseline" if conducted during peak summer weekends • Annual weekly and monthly variation difficult to account for

Recommended Thresholds and Policy for Measuring LOS on Avila Beach Drive

The San Luis Obispo County Board of Supervisors' policy is to retain LOS C in rural areas and LOS D in urban areas for an average weekday, measured between Tuesday and Thursday 4:00-6:00 p.m. Avila Beach Drive is currently defined as a rural segment. Recommendations to revisions of the policy, specifically applicable to Avila, would be the outcome of this study.

Capacity Thresholds

The peak hour LOS thresholds outlined within the 1992 WSA Resource Capacity Study for Avila Beach Drive is presented in Table 4. These peak hour thresholds still apply to Avila Beach Drive because the peak directionality has remained the same as the assumptions presented for the thresholds in the 1992 study.

TABLE 4: PEAK HOUR LOS CRITERIA FOR AVILA BEACH DRIVE

Level of Service	Service Flow (Peak Direction)	Estimated 2-Way Flow	Estimated Travel Speed
A	< 670	< 985	> 43 mph
B	670 -770	985 – 1,130	37 – 43 mph
C	770 – 870	1,130 – 1,280	30 – 37 mph
D	870 – 980	1,280 – 1,440	23 – 30 mph
E	980 – 1,100	1,440 – 1,615	15 – 23 mph
F	> 1,100	> 1,615	< 15 mph

Note: Two-way service flow rate ranges assume existing directional split characteristics of 68% - 32% traffic during the weekday peak period. Estimated travel speeds are given for comparative purposes only.

The capacities above are based on Highway Capacity Manual (HCM) methodologies, adjusted for local conditions, including directionality. Capacity analysis throughout for the Avila community should continue to utilize HCM methodologies when quantifying intersection level of service, roadway segment level of service, and multimodal level of service, as necessary for a specific impact study. Table 5 presents a summary of the Highest Hourly Volumes based on the permanent count station data at Avila Beach Drive.

Table 6 presents the average weekday, Friday, and weekend traffic volumes for each month, averaging both 2016 and 2017, and the associated LOS. As shown in the color-coded table, red represents higher traffic volumes during the summer, and blue represents lower traffic volumes during the non-summer months. The transition months, or "shoulders" of the peak, of April, May, August, and September are also representative of the 100th Highest Hourly volume.

TABLE 5: HOURLY DATA SUMMARY FOR AVILA BEACH DRIVE

Hourly Data	2015 (March-August)		2016 (January-December)		2017 (February-December)	
Highest Hour	**1,833 vph** *(LOS F)*	June 13, 3:00 p.m. (Saturday)	**1,894 vph** *(LOS F)*	Feb. 14, 2:00 p.m. (Sunday)	**1,939 vph** *(LOS F)*	June 17, 3:00 p.m. (Saturday)
30th Highest Hour	**1,555 vph** *(LOS E)*	March 14, 2:00 p.m. (Saturday)	**1,543 vph** *(LOS E)*	June 18, 1:00 p.m. (Saturday)	**1,601 vph** *(LOS E)*	March 11, 1:00 p.m. (Saturday)
100th Highest Hour	**1,415 vph** *(LOS D)*	June 6, 1:00 p.m. (Saturday)	**1,347 vph** *(LOS D)*	July 16, 3:00 p.m. (Saturday)	**1,436 vph** *(LOS D)*	April 19, 5:00 p.m. (Wednesday)
Summer Weekend Peak Hour	**1,347 vph** *(LOS D)*	*Average* 3:00 p.m.	**1,296 vph** *(LOS D)*	*Average* 1:00 p.m.	**1,326 vph** *(LOS D)*	*Average* 5:00 p.m.
200th Highest Hour	**1,267 vph** *(LOS C)*	August 9, 4:00 p.m. (Sunday)	**1,234 vph** *(LOS C)*	January 1, 1:00 p.m. (Friday)	**1,314 vph** *(LOS D)*	July 19, 5:00 p.m. (Wednesday)

TABLE 6: 2016-2017 AVERAGE WEEKDAY, FRIDAY, & WEEKEND HOURLY VOLUMES

Month	Tues-Thurs	*LOS*	Friday	*LOS*	Weekend	*LOS*
January	921	*A*	865	*A*	821	A
February	903	*A*	716	*A*	1,170	C
March	994	*B*	894	*A*	1,111	B
April	1,131	*C*	1,014	*B*	1,270	C
May	1,062	*B*	1,242	*C*	1,357	D
June	1,104	*B*	1,072	*B*	1,486	E
July	1,208	*C*	1,211	*C*	1,473	E
August	1,068	*B*	1,085	*B*	1,365	D
September	969	*A*	889	*A*	1,331	D
October	908	*A*	836	*A*	1,109	B
November	824	*A*	1,065	*B*	965	A
December	826	*A*	679	*A*	736	A

As shown in Table 5, the K100 volume observed in Avila in 2016 was 1,347, and in 2017 was 1,436 (average 1,392). This represents LOS D conditions on the Avila Beach Drive segment west of San Luis Bay Drive. Today, conditions similar to K100, meaning LOS D conditions, fall on the "shoulders" of the summer (June / July) weekend peak season. As shown in Table 6, the "shoulders" of the summer peak occur in May, August, and September. K100, or LOS D, conditions are not reported during any month on an average Friday or weekday (Tuesday to Thursday).

Use of the K100, or "peak shoulders" weekend conditions, as a baseline for planning-level analysis will account for seasonal fluctuations that impact roadway capacities in Avila without including outliers for particularly well-attended events or the absolute "peak" weekend use, which currently exceeds LOS E thresholds. Average Friday peak hour conditions are also shown, typically being lower or similar to the average weekday peak hour, except during May and November, representing possible large event-related outliers.

Based on the average monthly peak hours in 2016 and 2017, as shown in Table 6 above, it is evident that congested conditions fluctuate seasonally and with special events. On average, during most months of the year, weekend peak hour conditions are currently LOS D or better. During special events, isolated congestion occurs when hourly capacities are exceeded. On average, weekend peak hours exceed LOS D standards and the K100 volume in June and July. Based on our analysis of the available hourly data from the permanent count station, conditions exceeding LOS D, and exceeding the K100 volume, occur during fewer than 100 hours of the year (8,760 hours in a common year). By establishing a performance standard at LOS D during weekends outside of June and July, consistent with the observed K100 volume, the County would be taking a step to ensure that LOS E conditions do not occur more frequently throughout the year.

A weekend LOS D threshold for acceptable operations would allow remaining adopted General Plan land uses to develop, and economic growth to continue, so long as new project-generated traffic falls outside peak months and below LOS D. A project would not be able to develop if it is anticipated to increase traffic volumes beyond LOS D conditions, without requiring mitigating measures. Mitigating measures could take the form of physical roadway and/or intersection improvements, travel demand management programs and/or policies, and/or restrictions on use (such as events) during certain time periods.

For weekday conditions, LOS C should continue to be used as the standard threshold for impact determination. This ensures that residents are afforded a quality of service that is acceptable to local circulation needs during most times of year, outside of visitor months and weekend events. As shown in Table 6, most weekday peak conditions fall at or below LOS C today. Should weekday peak hour traffic increase above LOS C thresholds, weekend conditions may continue to worsen proportionally and exceed acceptable operational thresholds (LOS E/F) outside of June and July. An LOS C weekday policy provides an additional "backstop" to safeguard against development to occur without mitigation, which may cause cumulative traffic impacts.

Policies in other Jurisdictions

The City of Pismo Beach recently approved an update to their Circulation Element on June 5, 2018. The LOS policy for the City of Pismo Beach is to maintain LOS C or better for roadways and intersections outside of Downtown during weekday peak hours, and maintain LOS D or better for roadways and intersections during non-summer weekday peak hours within their Downtown area. This recognizes that service levels during holidays, weekends, or special events will operate beyond this threshold, specifically in the Downtown area. The City of Pismo Beach recognizes that achieving a lower LOS goal during these higher volumes periods would require a circulation system with oversized features to accommodate summer beach traffic. The City has chosen to provide a circulation system that is sized to meet the needs of the local residents and businesses while preserving the local character.

Policy Recommendations for Avila Beach Drive

***Recommended Goal*: Traffic volumes on Avila Beach Drive shall strive to maintain LOS D conditions during the 3-year average 100th highest hour (K100), measured annually.**

***Recommended Policy*: LOS C shall be the standard for roadway and intersection operations during weekday PM peak hour conditions (adjusted for seasonality). LOS D shall be the standard for roadway and intersection operations during weekend peak hour conditions (adjusted for seasonality).**

***Recommended Implementation Option 1*: County to develop and maintain "Master Synchro Networks" for weekday and weekend PM peak hour conditions.[8] The Master Synchro Networks would represent conditions at the shoulders of the summer peaks in Avila, including at minimum the key intersection of Avila Beach Drive at San Luis Bay Drive, intersections located in downtown Avila, and intersections at U.S. 101 ramp terminals. The Master Synchro Networks would represent "baseline" conditions, annually adjusted based on the permanent count station, for all traffic impact analyses, and could include future near-term and buildout conditions as well[9].**

[8] Synchro is a traffic simulation software program that provides macroscopic analysis and can implement the HCM 6 analysis methodologies. Synchro takes into account intersection signal timings, signal phasing and queuing constraints when calculating delay, capacity, and estimated queue lengths. The Master Synchro Networks would provide a standard for existing, or "baseline", conditions for analysis, with County approved assumptions including intersection control, geometry, signal timings, peak hour factors, heavy vehicle percentages, and multimodal volumes.

[9] "Baseline" conditions refer to conditions on which added traffic from a proposed development project would be added. A Master Synchro Network would allow all future development projects to be measured against the same "baseline" conditions. The County could develop "Master" near-term and buildout scenario networks as well. Near-term may represent a 10 to 15-year horizon, including "approved / pending" land development and infrastructure projects. Buildout would represent complete absorption of General Plan land uses and buildout of General Plan circulation element improvements.

***Recommended Implementation Option 2*: Require traffic data collection during shoulders of the summer peaks (April, May, August, or September) on days without special events or other extraordinary conditions (weather, road closures, etc.). Analysis to include at minimum the intersection of Avila Beach Drive at San Luis Bay Drive, key intersections in downtown Avila, and intersections at U.S. 101 ramp terminals.**

***Recommended Implementation Option 3*: Accept traffic data collection during any time of year, on days without special events or other extraordinary conditions (weather, road closures, etc.). Collected data outside of the shoulders of the summer peak (April, May, August, or September) will require adjustment to account for seasonality, according to pre-established adjustment factors. Analysis to include at minimum the intersection of Avila Beach Drive at San Luis Bay Drive, key intersections in downtown Avila, and intersections at U.S. 101 ramp terminals.**

Note: Preliminary adjustment factors are provided in Table 7. These are based on analysis of two years of data (2016 and 2017). The 2017 data required manual adjustment to account for detector failure. Additional data, at minimum 3 and preferably 5, is required to make final adjustment recommendations and ensure the underlying data is free of anomalies, outliers, or other unusual conditions.

Seasonality adjustment factors were determined utilizing the Avila permanent count station, considering two years of data (2016 to 2017). As additional data is collected, these seasonality adjustment factors should be monitored and updated as necessary. These percentages should be considered "placeholders" until at minimum 3, and preferably 5, full years of data have been input and considered in the adjustments.

For weekday peak hour conditions, the "baseline" for adjustments was taken to be the average peak hour volume between April and August, which is currently representative of LOS C conditions. Counts taken during the weekday peak hour outside of these months should be adjusted by the percentages noted below in order to analyze project impacts and facility capacity as they would be during these busier times of year.

For weekend peak hour conditions, the "baseline" for adjustments was taken to be the "shoulders" of the peak summer season. The "shoulders" generally represent volumes similar to the current K100 condition, and are representative of LOS D conditions. The months are April through September, excluding June and July, which fall above the K100 threshold during peak hours and are understood to exceed capacity thresholds. Counts taken on weekends, outside the months of April through September, should be adjusted by the percentages below. Additionally, due to the peak nature of June and July weekend conditions, counts are not recommended for impact analysis and planning purposes during these outlier months.

Table 7 presents the seasonality adjustment factors for each month.

TABLE 7: ADJUSTMENT FACTOR FOR COUNTS BY MONTH

Month	Tues-Thurs	Weekend
January	20%	60%
February	25%	15%
March	10%	20%
April	0%	0%
May	0%	*0%*
June	0%	*Counts Not*
July	*0%*	*Recommended*
August	0%	*0%*
September	15%	0%
October	25%	20%
November	35%	40%
December	35%	80%

Additionally, special events such as concerts and festivals should require additional analysis, and conditions that exceed LOS E, especially during the peak summer months of June and July, should require Transportation Demand Management (TDM) at minimum. TDM measures should be implemented, especially for special events, to help mitigate congestion and potential safety hazards caused by road blockages, during these periods. TDM measures could include participation in publicly or privately organized shuttle systems in designated parking areas that remove passenger cars from the transportation system and replace them with bus or trolley options. The County should also adopt impact significant thresholds for Avila Beach, and require the key intersection of Avila Beach Drive at San Luis Bay Drive to be included in any analysis of transportation impacts within Avila.

Next Steps

- Finalize analysis of relationship between peak hour intersection conditions at Avila Beach Drive / San Luis Bay Drive intersection with additional intersection turning movement count data.
- Finalize analysis of K30, K100, K200, and other annual average data from the permanent count station with a minimum 3 years of full data.
- Finalize adjustment factors for data collected outside summer peak “shoulders” with additional permanent count station data.
- Analyze and consider relationship between hourly data from permanent count station relative to “highest consecutive 15-minute interval” peak hours at intersections.
- Test proposed recommendations and implementation options against “real world” scenarios to ensure applicability.
- If available, consider parking capacity of Avila relative to roadway capacity thresholds and ensure reasonable correlation.
- Evaluate TDM measures for efficacy, implementation feasibility, and recommend plan to incorporate in development impact study requirements.
- Evaluate improvement needs at Avila Beach Drive/San Luis Bay Drive intersection using weekend peak hour data collected on the shoulders of the summer peak.
    - Evaluation would include potential need for additional eastbound lane, isolated intersection geometric improvements, or intersection control modification.
    - Evaluation may consider not only vehicular congestion and traffic operations, but emergency response times and/or preparedness for evacuation scenarios.