Title
Measuring the influence of recurring sporting events on freeway characteristics

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Publication Date
2017-12-01

INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALITFORNIA, BERKELEY

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Report Series
UCB-ITS-RR-2017-03

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TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. UCB-ITS-RR-2017-03	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Measuring the influence of recurring sporting events on freeway characteristics		**5. Report Date** December 2017 **6. Performing Organization Code** Click to enter text or press Delete to remove all text. Enter any/all unique numbers assigned to the performing organization, if applicable.
7. Author(s) Joshua Seeherman PhD PE https://orcid.org/0000-0001-5167-1638 Paul Anderson https://orcid.org/0000-0003-2833-6668		**8. Performing Organization Report No.** UCB-ITS-RR-2017-03
9. Performing Organization Name and Address University of California, Berkeley Institute of Transportation Studies 109 McLaughlin Hall Berkeley CA 94720		**10. Work Unit No.** **11. Contract or Grant No.** n/a
12. Sponsoring Agency Name and Address California Department of Transportation Division of Research, Innovation, and System Information P.O. Box 942874, MS #83 Sacramento, CA 94274-0001		**13. Type of Report and Period Covered** Original Research, Summer 2014 **14. Sponsoring Agency Code**

15. Supplementary Notes

Research utilized data provided by the California Department of Transportation (Caltrans), the Bay Area Rapid Transit authority (BART), and the Orange County Transportation Agency (OCTA)

16. Abstract

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17. Key Words special events, baseball, freeway congestion, recurring congestion, California	**18. Distribution Statement** No restrictions.

19. Security Classif. (of this report)	**20. Security Classif. (of this page)**	**21. No. of Pages**	**22. Price**
Unclassified.	Unclassified.	30	

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December 15, 2016

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ABSTRACT

Freeway traffic is subject to the effects of recurring and non-recurring events. Changes in the traffic stream as a result of recurring special events, specifically sports, is an area that is not well researched. This study examined freeway detectors adjacent to two baseball stadiums in California to analyze the contribution of a baseball game to freeway flow and occupancy for weekday evening games. In addition, hourly volumes on local rail transit were analyzed in the San Francisco case. Findings include a statistically significant effect of baseball increasing the flow by approximately 1,000 vehicles over the afternoon commute in both locations. San Francisco volumes were influenced by day-of-week, type of opponent, as well as starting pitcher. Games on a Friday against their noted rival, the Los Angeles Dodgers produced the highest volumes with 4,000 vehicles more than the average weekday evening baseball game. Anaheim volumes were only affected by month-of-year. As cities explore transportation options to their sporting venues, it is important to take an inventory of the impact of events on the existing network.

Keywords: *Special events, baseball, freeways, traffic, California*

INTRODUCTION

Daily commuters face different causes of congestion every day, typically divided into two groups of recurring and non-recurring. Recurring congestion involves situations where demand exceeds capacity at a location such as a merge, lane drop, or work zone, or at a geometric feature such as an upgrade or curve. The majority of the congestion associated with non-recurring events is from crashes, breakdowns, or other hazards, with bad weather being another non-recurring cause. Straddling these two categories is the issue of special events. Some events, such as the annual state fair or a music festival are only once per year but professional sports games are recurring influences, and are sometimes referred to as "planned special events" or PSE's. However, while there is anecdotal evidence that sporting events increase congestion, literature is quite sparse on actual quantities, whether these quantities are significant, and if there are any sport-specific factors that might influence a change.

This research seeks to begin to fill this knowledge gap with the help of the California Performance Measurement System, known as PeMS (2014), which collects measurements at detectors across the state on most urban freeways and many freeway ramps. Among the major sports in California, traffic volumes related to baseball are the easiest to examine as baseball has the largest sample size with 81 games per year played at the home team venue, as well being the least affected by bad weather (since most bad weather in California occurs in the winter months). This research will examine the changes in traffic volumes for two baseball teams in California, the San Francisco Giants and the Los Angeles Angels of Anaheim, during the 2014 season. In addition, the analysis of the San Francisco case will also look at

volumes on the Bay Area Rapid Transit system (BART) in relationship to the presence of a game in an attempt to reveal whether transit is absorbing increased demand. After an empirical review of quantity changes, regression will be performed to try and examine significant effects. Different aspects of volume changes such as time of day, day of week, as well as type of opponent will be examined. Conclusions will helpfully reveal whether perceptions related to the contribution of sporting events to freeway congestion are valid or not.

BACKGROUND

Direct measurement of freeway congestion with sporting events is not commonly found in the literature. However, with the rapid expansion of social media, there has been a movement to improve special events travel forecasting by examining concentrations of social media usage or simulation, although this is largely confined to transit. Additionally, mode choice for sporting events is an emerging topic and assisted by social media concentration. This literature will discuss some of the new ways the estimate special event totals.

Skabardonis (2003) initially created a methodology for measuring the percent contributions to freeway congestion from recurring and non-recurring causes; in this case the contribution of crashes. This work was expanded by Kwon (2006) to not only include special events but weather and improved ramp metering. A case study within the report of the I-880 corridor in California revealed that sporting events (football and baseball in Oakland) contributed on average of 1000 vehicle-hours of delay in the northbound direction,

and 705 hours southbound. In creating a pie chart known as the "congestion pie" special events and crashes were lumped together and reported to be contributing to 18% of all congestion on I-880. A similar work was conducted by Bremmer (2004) translating this measurement technique to examine investment returns of incident response by its contribution to the overall congestion of freeways in Seattle.

Recently, there have been research efforts to identify congested corridors and transit ridership related to special events. In Europe Kwocek (2015) used a simulation to forecast congestion in and around a soccer stadium, utilizing a technique that removes the influence from other factors isolating the demand from the game alone. They were able to find that many fans use a different scheme that the researchers did not expect for approaching the stadium, through a side road. In the United States, a large research effort by Zhang (2016) examining locations of Twitter posts was able to predict transit mode share for New York Mets baseball games and the once-a-year US Tennis Open at Flushing Meadows, which utilizes the same subway station as the baseball team. They were able to use the social media data in a very powerful way; being able to "fill the gap between daily passenger volumes and abruptly changing non-recurrent event volumes." Rezende (2015) worked with students at Purdue and was able to define individual characteristics that would influence mode choice at Purdue football games by also using social networks; if one had a friend with a car they were more likely to carpool. Similarly, both Yan (2009) and Kuppam (2011) also created and validated modeling techniques to predict travel behavior at the Beijing Olympics and recurring special events in Phoenix, respectively. Modeling can also work in the opposite direction when evaluating congestion for evacuating a sporting event, for example Kwon (2005) examined the evacuation of the Metrodome stadium in Minneapolis and how

effective contra-flow freeway lanes would be. Wojtowicz (2010) performed a similar simulation for evacuation in Albany, NY.

Henao (2013) performed an extremely in-depth parking survey of all of the sporting venues in Denver, Colorado, trying to create a relationship between transit share, parking size, and location. The research looked at games played by four different teams. The important conclusion was that the amount of parking supply and mode choice was connected, and should be treated as such. Simply building a transit connection would not change the mode share if there are too many parking spaces, and most of the time that extra parking is a waste and underutilized.

Lastly, the most current version of the ITE Trip Generation Manual (2012) lacks sufficient data for sports arenas, as the information for the arena category has only one sample.

This research will examine sporting events from a different angle, by undertaking a deep examination of existing freeway and transit volumes and attempting to breakout individual characteristics that affect these volumes. To some degree, this is an extension of the Skabardonis (2003) and Kwon (2006) efforts, focusing specifically on one part of the congestion "pie."

Study Design

This research will analyze two different freeway characteristics, flow and occupancy, at important detectors across all lanes near the stadium venues of two baseball teams, the Los Angeles Angels of Anaheim and the San Francisco Giants. Flow and occupancy are the only two quantities that are directly measured, as the detectors are conventional wire loops. In the case of the team in Anaheim, data will be taken on a freeway that is normally uncongested but provides direct access of one of the Angels' main entrances. This will serve as a quasi-baseline for the study as there are very few confounding factors aside from freeway crashes, in which case that day's data will be removed. Conversely, the freeway data taken from San Francisco is on a freeway that is typically congested; in this case the examination will try to show whether a baseball game makes the traffic even worse. During the 2014 season, both teams were typically sold-out or above 95% attendance, eliminating the effect of varying attendance seen often at other baseball stadiums. For the San Francisco case, transit volumes on one specific rail system will also be examined to gain understanding of the transit share and how transit absorbs extra capacity.

Los Angeles Angels of Anaheim

For examining volumes from Angels' games, data was taken on the northbound SR 57 freeway immediately before the off-ramp to Orangewood Avenue, which is the gateway to the stadium's southeast entrance. This route is the primary option for fans attending the game and traveling north from the bulk of Orange County, home to most of the team's fan

base. This is an uncongested section of SR 57, as it is six lanes wide (with two lanes exclusively for the Orangewood ramp) and traffic is somewhat metered from a highly congested interchange directly to the south where it meets Interstate 5, an interchange known locally as the "Orange Crush." Annual average daily traffic (AADT) for 2014 on this northbound segment is 250,000 vehicles (Caltrans 2014). The authors would like to express that the freeways in this region tend to be highly congested during the peak periods but data revealed that this segment is typically uncongested during the study period. On northbound SR 57 the back of the daily queue is generally not reached for another four to five more kilometers to the north. The detector location is shown by the dashed circle in Figure 1.

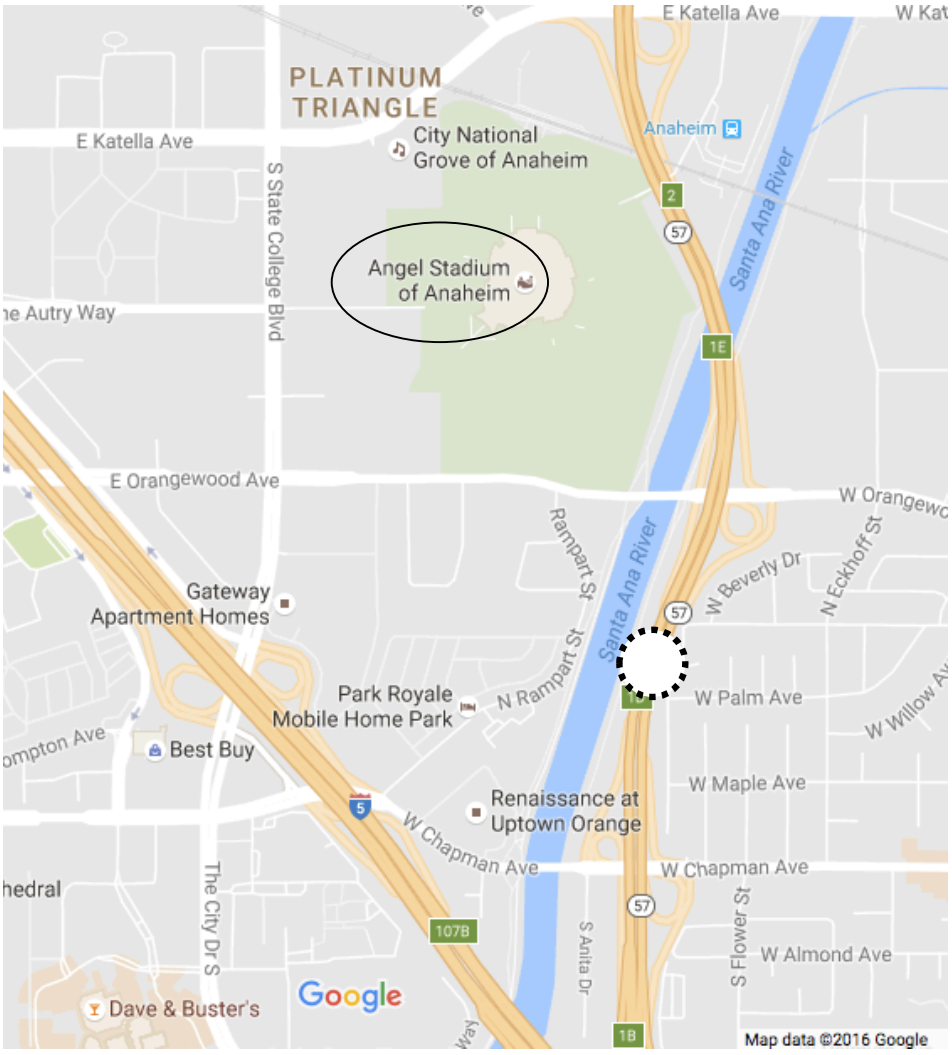

Fig. 1. Schematic of Angel Stadium and detector location

Angel Stadium is located in the City of Anaheim, a city of approximately 330,000 people in Orange County, California. With over 3 million people, Orange County is a separate employment and population center from Los Angeles, and supports both the Angels in the summer and a professional ice hockey team during the winter. The Angels have been in Orange County since 1966 when they moved from Los Angeles proper. In terms of getting to the ballpark, most of the attendees arrive via personal automobile as Angel Stadium has a surplus of parking, with over 12,000 spaces per baseball-pilgrimages.com, and easy access on-and-off multiple freeways. However, the Angels do have a measurable transit share from bus and regional rail. Anaheim Resort Transportation, the local bus network, runs shuttle buses to and from satellite lots so fans can avoid stadium congestion. Furthermore, the Anaheim train station is immediately adjacent to the stadium and the regional rail service, known as Metrolink, runs special trains for all weekday night games. According to the Orange County Transportation Authority, these special trains carried 91,000 passengers in 2013 (the most recent data available), or 1,000 to 2,000 people per weekday night game. The stadium has a seating capacity of approximately 45,000 people.

San Francisco Giants

The freeway detector used for the San Francisco Giants is in the middle of the San Francisco Bay Bridge on I-80 westbound, approximately 1 kilometer before the ramp to get to the

stadium. The westbound Bay Bridge had an AADT of 253,000 in 2014 (Caltrans 2014). Since the detector is on the bridge, there are no intermediate points of conflict between the detector and the ramp. There are a number of geometric issues on I-80 west in San Francisco, notably a bad weave at the Civic Center off-ramp (between exits 2A and 1C in Figure 2) and a bad merge with US 101 that can create congestion both during the morning and evening commute periods. The queue regularly backs up beyond the detector regardless of a baseball game or not. In Figure 2, the dashed circle again shows the detector location.

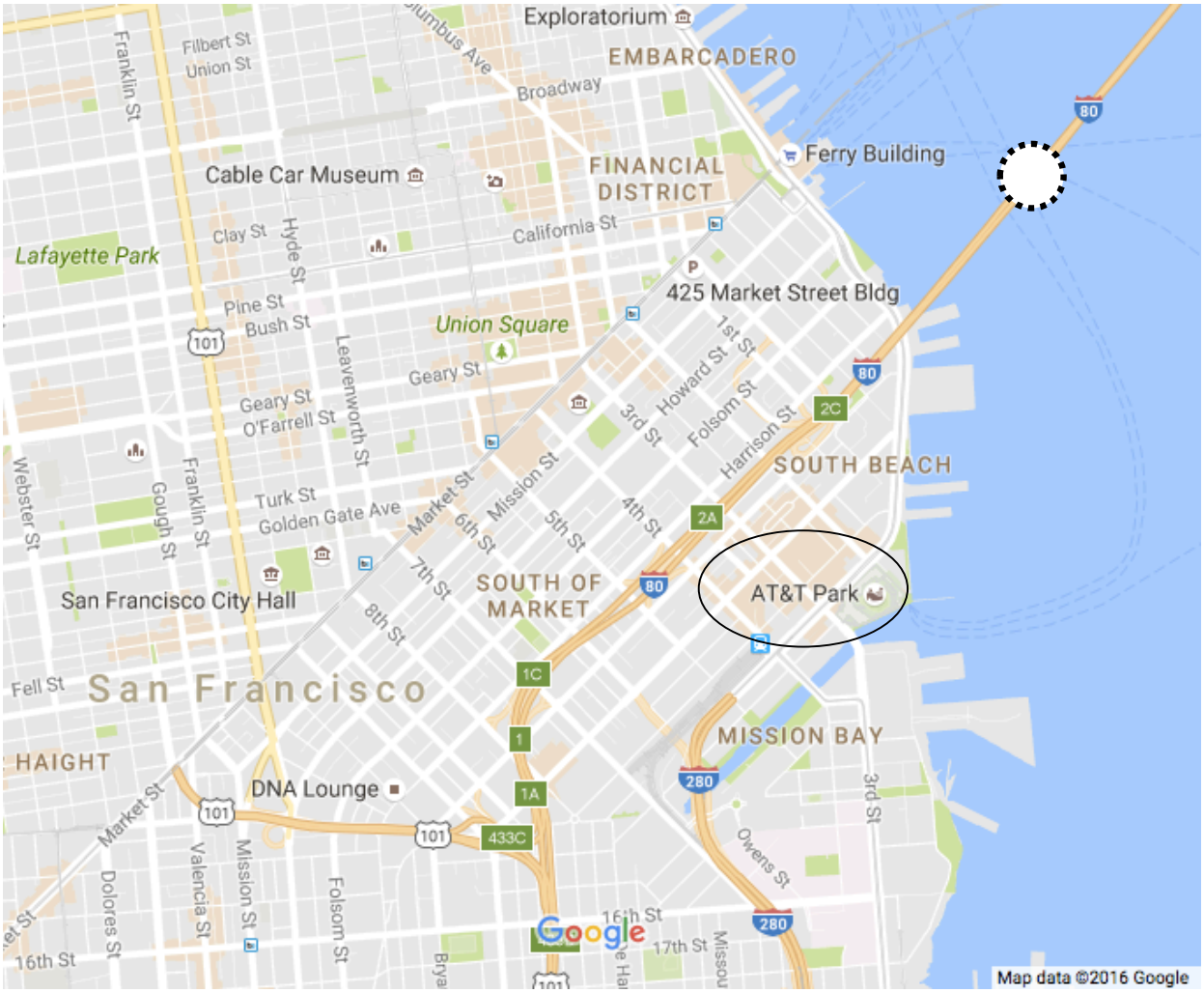

Fig. 2. Schematic of AT&T Park and detector location

AT&T Park is located within San Francisco and has a highly constrained parking situation resulting in a high non-automobile mode share. The Giants moved to AT&T from Candlestick Park in 2000 as part of a wave of baseball franchises moving their teams back to the respective downtowns of their fanbases. Those arriving at AT&T Park can take three different rail transit services, regional rail from the south (Caltrain), regional rail from the east and south (Bay Area Rapid Transit "BART") or local light rail ("Muni"). It was reported that the non-automobile share during the first season in 2000 was over 50% (Robbins 2001) and the Giants are only one of 12 baseball teams that enjoys more than a 10% non-automobile share (Boyle 2008). Recent volumes tend to support that this share is still quite high today; Caltrain alone reported over 500,000 trips for the 2013 season for both specific special trains and regularly scheduled ones, nearly 6,000 per game. All of BART's record ridership days have occurred either during World Series games or Giants championship parades. There are only 5,000 parking spaces at the stadium proper (Jones 2011). More information about BART ridership specifically from locations that also utilize the Bay Bridge will be presented in the section on San Francisco transit ridership. The current stadium capacity is approximately 42,000 people.

Data Collection

Data was taken at the respective detectors during the baseball season of 2014, from April 1 to September 30. The focus of the analysis is on the regular season weekday evening game,

starting at 19:00, which is the most common event. Data was taken from 15:00-20:00 for each weekday game from the PeMS system in 5 minute intervals. Information on start times, scores, and starting pitchers were taken from the data source baseball-reference.com. Unlike the other California baseball teams, the Angels and the Giants both enjoyed sell-out crowds during that season (the Angels were division champions, the Giants were World Series champions) eliminating the confounding factor of stadium attendance. For transit volumes, BART provides entrances and exits by the hour to the public. Pre-processing of data was important for accuracy; days with crashes and other special events were removed from the data. In both cases, the freeway data is the sum of all lanes.

FINDINGS

Empirical

Anaheim

Freeway data for Anaheim was, as expected, more consistent and easier to detect the presence of a baseball game. Figure 3 shows the flow differences in Anaheim across the 2014 season.

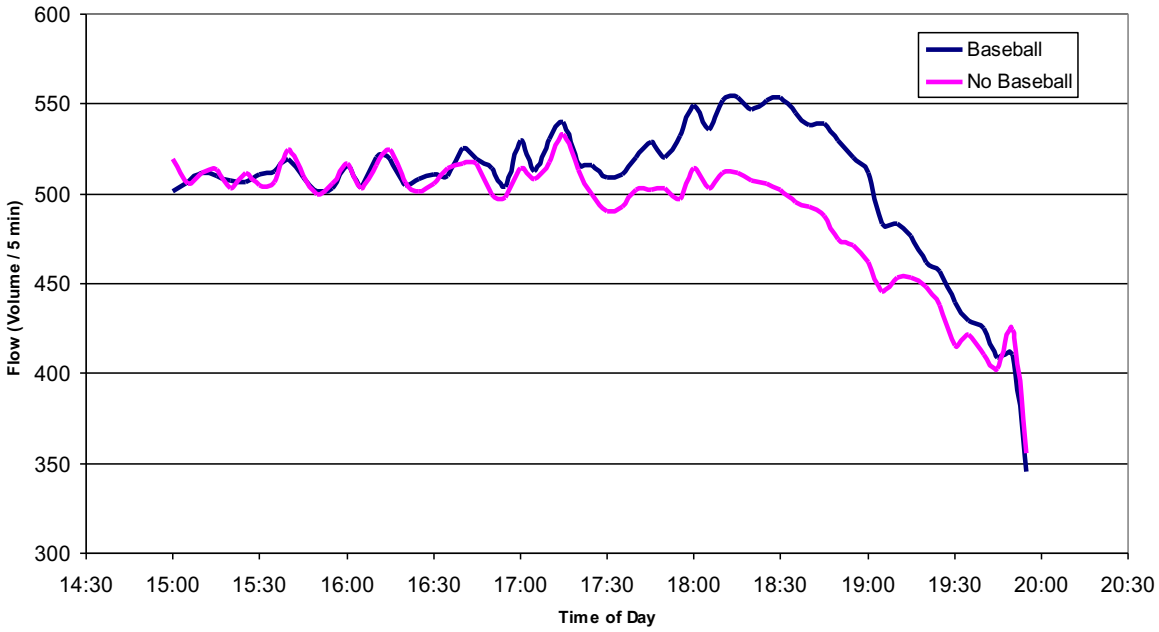

Fig. 3. Flows 15:00-20:00 in Anaheim

Across the entire 2014 season, weekday night games produced an average of 950 additional vehicles total per game spread among the five hours that were analyzed. Most of the additional vehicles crossed the detector between 17:30 and 19:30, indicating that daily commuters who drove on the freeway before 17:30 were largely unaffected.

San Francisco Bay Bridge

For the San Francisco Giants, since the bridge already is quite congested during the evening commute, analysis included both flow and occupancy. As the San Francisco Giants were the World Series champions, the data from their one weekday evening World Series game is also included, although it is important to note that the game started at 17:00, not at 19:00.

Figures 4 and 5 show the empirical results in San Francisco across the entire 2014 season with the exception of the one World Series game.

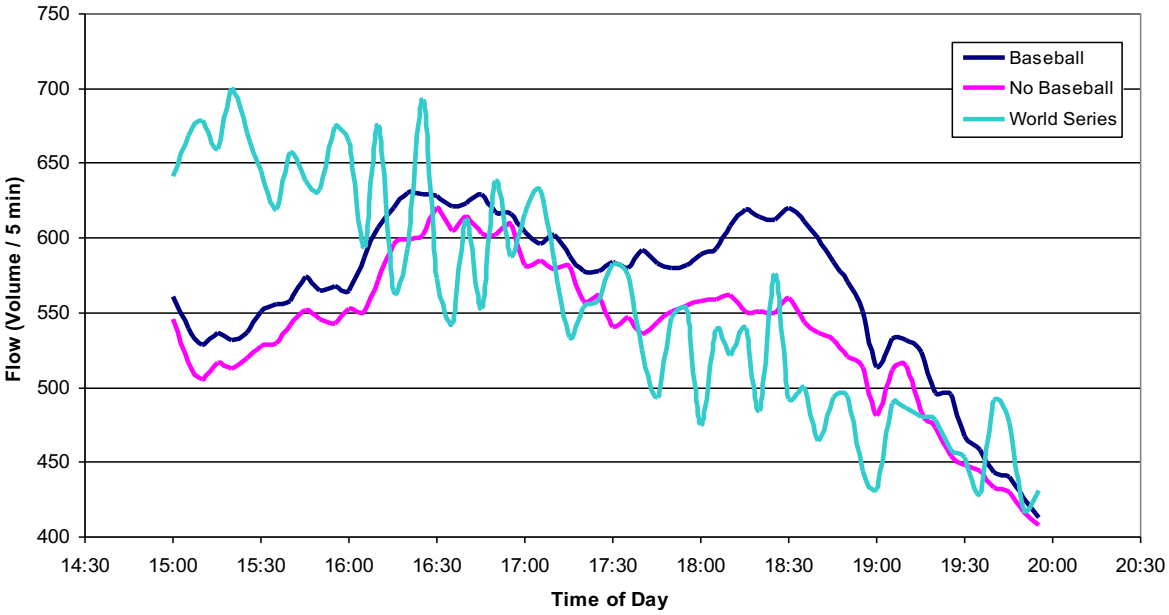

Fig. 4. Flows 15:00-20:00 in San Francisco

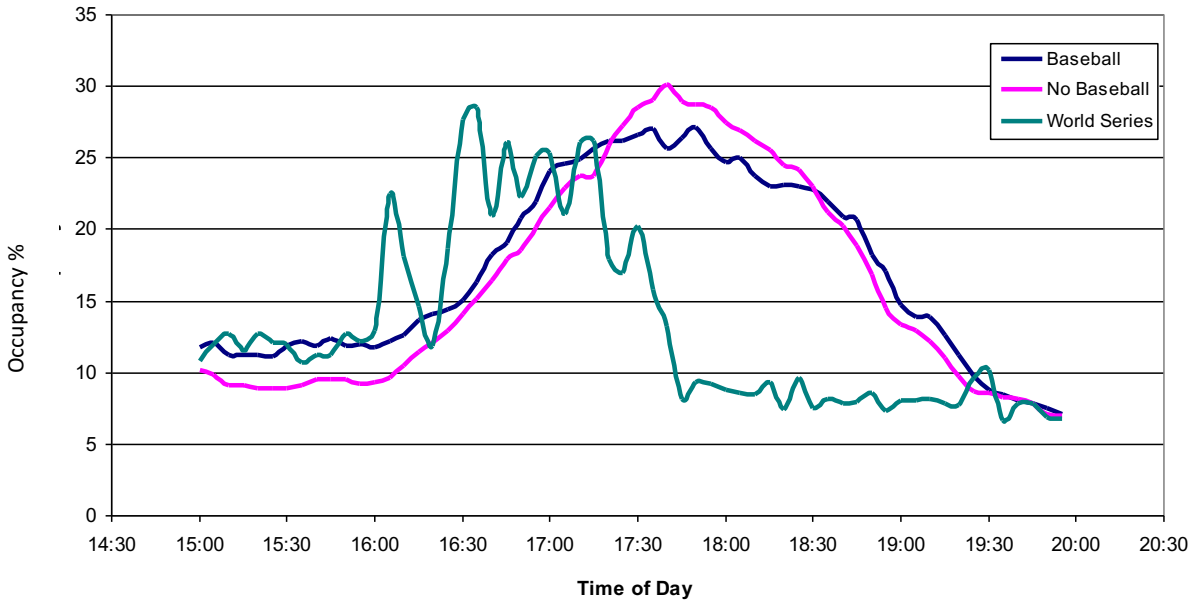

Fig. 5. Detector Occupancy 15:00-20:00 in San Francisco

There were approximately 1,700 more vehicles crossing the Bay Bridge on baseball days. Somewhat noteworthy is the occupancy graph, which shows a slightly broader period (10 minutes) with occupancy of 20% or greater but not any more severe. The increase in volume starts a little earlier, closer to 17:00, but congestion has already started on the bridge even on a non-baseball day. The World Series day shows very high volumes earlier in the day, but not any congestion more severe than the regular peak period. Those traveling at 18:00 found the bridge relatively empty as most of the region was watching the game!

San Francisco BART Transit

In the case of San Francisco, the Transbay tubes of the BART transit system parallel the Bay Bridge. With hourly origin-destination data, it is possible to formalize the increase in transit volumes and how transit absorbs additional travel that would instead be stuck in congestion on the bridge. The O-D pairs allow researchers to isolate the origin rail stations on the other side of bay; i.e. across the bridge. Figure 6 shows the differences in transit volumes on weekday evenings with or without baseball for the entire 2014 season. Exits were taken from the two stations nearest to AT&T Park, Montgomery and Embarcadero. Origins of transit trips were restricted to just those stations in communities where fans would have to cross the bridge to go to the stadium.

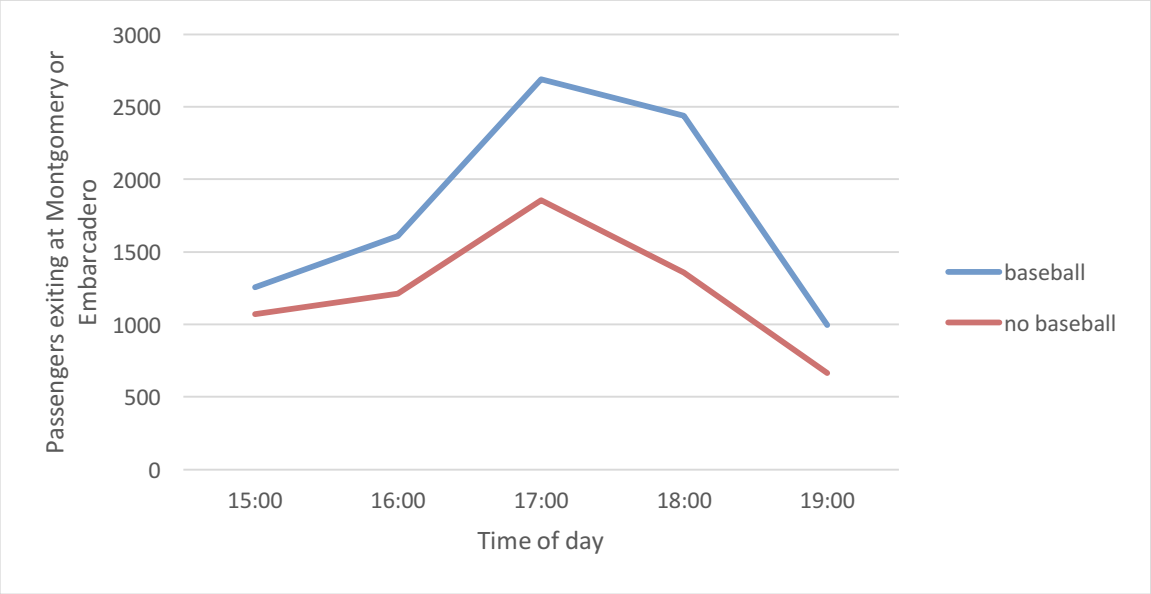

Fig. 6. BART weekday exits at two stations

On average across the 2014 baseball season, there was an average of 2,823 additional exits on days when there was a baseball game that evening. This corresponds to approximately 6% of the stadium capacity. Recall that the bridge averaged 1,700 additional cars on game days; with an average capacity of two people per car (for 3,400 people), this would indicate a rail transit share of over 40% from the direction where either the Bay Bridge or BART is required (a small number of fans also take the bus). With an average of three people per car, the rail transit share still exceeded 35% from this direction.

Statistical

A series of regressions was undertaken with the flow data to try to draw out the factors that affected volumes and congestion is a significant way. As a baseline, the first regression

shown in Table 1 included a dummy variable for baseball games and fixed effects of each weekday, with Wednesday as a control.

The data was a much better fit for San Francisco than for Anaheim, with four out of the five days having significant coefficients. This would indicate that a Friday with a baseball game would have an expected increase of 3,000 vehicles or 10% over an average Wednesday without a game. In Anaheim, although the baseball game itself was highly significant, the only weekday was Friday, and it had a peculiar negative sign. This may be an artifact of the data in 2014 and not have any meaning. The same exercise can be repeated by month, using April as the monthly control. Results are shown in Table 2.

The values by month tell a slightly different story. Although the presence of a baseball is still highly significant and similar in magnitude to that of the day-of-week data, the traffic varies much more in Anaheim, particularly in July, than in San Francisco where none of the variables were remotely significant. This July increase may be due to the proximity to Disneyland and other tourist destinations. Traffic on the Bay Bridge varied highly from day to day but not month to month. In terms of baseball, the month of the year would not be a major factor for potential congestion in San Francisco. In Anaheim, a July evening game does significantly increase flows by 2,600 vehicles, or almost 10% over the baseline of an April evening with no baseball.

In terms of performing regressions utilizing occupancy data, occupancy over 0.20 was used as an analog of duration. As one could see in the empirical graph, baseball was expected to be significant in relation to days-of-week or months, and it was not.

Unique Baseball Influences: The Dodgers Are Coming

Within baseball, there are additional factors that were hypothesized to affect the traffic to a game. These are the type of opponent and the starting pitcher for the home team. The starting pitcher is known in advance and high-profile pitchers are more popular. A casual spectator might be more likely to buy a ticket on the secondary market (both of the subject teams sell out) if a famous pitcher is starting the game. Similarly, if a rival opponent is playing, there is more publicity; additionally these rivalries are likely to bring opposing fan bases that enjoy traveling with their team. The Giants have a long rivalry with the Los Angeles Dodgers, as well as secondarily with the San Diego Padres, the third California team within the Giants' division (National League West). The Angels do not have such a prominent rival team as San Francisco does with Los Angeles. Results of the regression with division opponents are shown in Table 3, with starting pitchers shown in Table 4.

The most significant finding from the previous figures is the confirmation of the effect of a visit of the Los Angeles Dodgers on freeway traffic in San Francisco. A Dodger visit alone can increase flow by 10% over an afternoon commute period. In terms of pitchers, only Ryan Vogelsong of the Giants had strong significance and the authors struggle to obtain a rationale for that result. Vogelsong was not their best pitcher, and comparing his starts to that of the best pitcher (Madison Bumgarner), nothing particularly stands out except Vogelsong did pitch two Fridays toward the end of the season while Bumgarner only pitched once at home in September due to a quirk of the schedule. Additionally, Vogelsong pitched many more

games against teams within the Giants' division. With the Angels, no pitcher or division rival stands out as significant in any way.

To illustrate the effect of the Dodgers, the Figure 6 shows flows during an evening game against the Dodgers on a Friday in July, versus the season weekday average flows of baseball and no baseball. During this particular Friday, approximately 4,000 additional vehicles crossed the Bay Bridge between 15:00-20:00 as compared to an average day with an evening baseball game. Volumes dropped off quickly as the clock approached the start of the game.

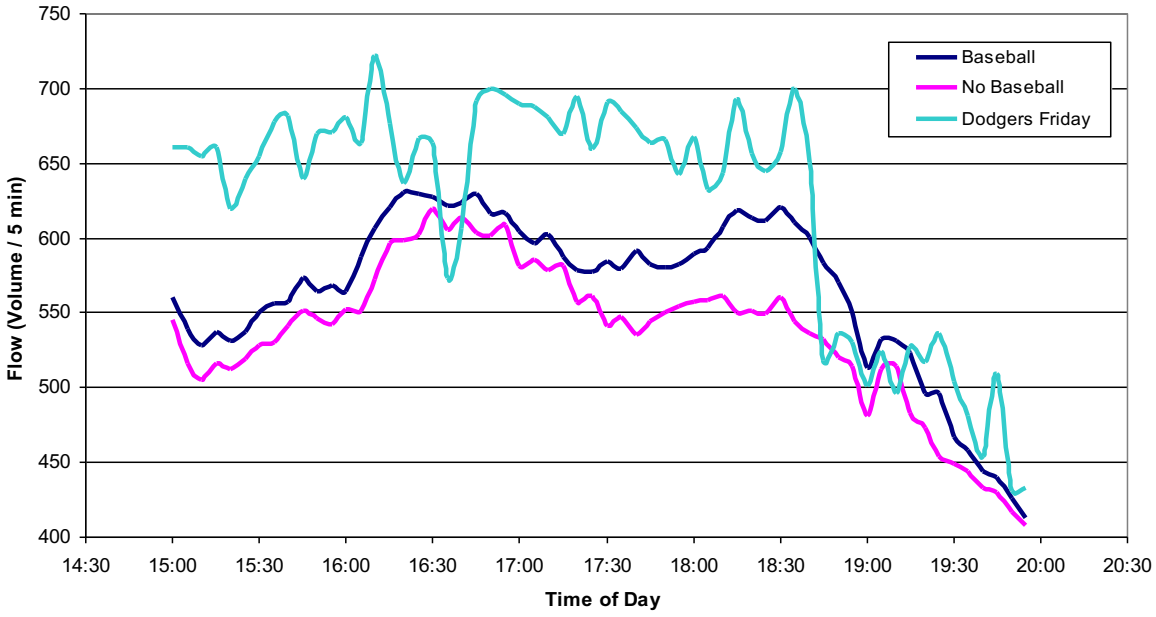

Fig. 7. San Francisco Flows on a Friday

with the Los Angeles Dodgers as an opponent

Finally, a number of regression runs were undertaken with sets of the aforementioned variables to create a "best-fit" regression. They are presented in Table 5. Take note that two

new variables are included for the Giants; the first being games against the new team in Washington DC. Although Washington is not in the division, there was significant sample size for their inclusion. Additionally, a variable indicating whether there had been a day game that weekday (e.g. a game at 12:45) was included as well.

In this final chart, the importance of a specific starting pitcher in San Francisco switched from Ryan Vogelsong to Madison Bumgarner. While Mr. Bumgarner makes more sense as he was, as previously stated, the team's best pitcher in 2014, the sign is a bit curious. Aside from fewer home starts in September, his appearances are not skewed to a specific day or month. Additionally, both of the new variables, Washington as an opponent and the presence of a day game, were both significant and had large volume changes. For the day game variable, this is likely because people are more willing to drive in the middle of the day because the traffic is generally lighter, although they would be faced with exiting San Francisco during the height of the evening commute (~16:00). Along those lines, the theoretical Washington weekday day game could result in a drop of 4000 vehicles. This makes sense as Washington is the newest team in the league and is geographically very far away; there is no rivalry and there is no local expat fan base. The day game variable was not significant for the Angels. The main conclusion from the best fit regressions is that it is much easier to discern influencing factors in the San Francisco data rather the data in Anaheim. The San Francisco regression has a high R-squared term of 0.76, reflecting this phenomenon.

Factors influencing transit

The same series of regressions were undertaken with BART rail transit volumes. Unlike the freeway data, there were many fewer statistically independent variables other than the presence of baseball itself. Monday and Tuesday did cause a drop in volumes, but none of the months of the year or the presence of division rivals affected transit volumes. Even the rival Los Angeles Dodgers did not cause a ridership increase that was significantly more than just the presence of a generic baseball game. When starting pitchers were used as regressors, three pitchers had P-values below 0.05 (Bumgarner, Cain, and Lincecum) but the magnitude of the coefficients were fairly small and did not seem practically significant. Similar to the freeway data, a "best fit" regression was prepared and is presented in Table 6. The presence of a baseball game raises transit volumes over 40%. The strength of the baseball game is enhanced by the fact that the direction is off-peak; inbound in the afternoon/evening. The 40% increase corroborates with anecdotal evidence by the authors that on weekday evening game days the number of baseball fans in the off-peak direction in the afternoon is sizable if one is to count the number of San Francisco Giants paraphernalia.

DISCUSSION

There were findings worthy of further argument. First, despite the dramatic difference in transit share between the two teams, the presence of a generic baseball game was significant in producing additional flow, and this quantity was fairly consistent throughout all of the regression runs. In both cases, a baseball game added approximately 1000 vehicles to the

15:00-20:00 period. However, in San Francisco, where there already exists daily congestion due to demand exceeding capacity on a typical day, baseball added flow but it was not significant enough to increase congestion either visually in the empirical graphs or in the statistical analysis. This may indicate that San Francisco's robust transit network can accommodate enough extra passengers to maintain the congestion status quo. Readers can take note again that to go to the baseball game in San Francisco, one would take transit in the off-peak direction where there is space to accommodate baseball fans. With World Series victories in 2010, 2012 and 2014, the team has become very popular.

The San Francisco data also revealed a strong variation day-by-day with Mondays being much better and Fridays being much worse. Additionally, the strong rivalry hypothesis proved to be true, as the presence of the Los Angeles Dodgers had the ability to produce as large as increase in volume as a generic Friday in the best-fit analysis. Games against the San Diego Padres and the Washington Nationals were also significant, but in a different way. San Diego is also a long-time division rival but the Washington team is so new (and far away) that it fails to generate any enthusiasm. Lastly, the empirical observation of the single World Series game supports a hypothesis in regards to the 1989 Loma Prieta earthquake. The earthquake occurred during the middle of a World Series game between the Giants and the Oakland Athletics, and some have speculated that since everyone was at the game or watching it on television, there were fewer drivers on the Bay Bridge when it collapsed, and miraculously only one person died as a direct result of that collapse. Flows were indeed lower for the 2014 World Series game than for a generic weekday.

For BART transit volumes on routes that parallel the bridge, aside from the presence of a baseball game only Monday or Tuesday were significant independent variables. Division

rivals, starting pitching, and months of the year were not significant. However, this limited group of three regressors (baseball, Monday, and Tuesday) had a very high R-squared indicating good predictive strength. BART, and likely all of the San Francisco-based transit providers, absorb significant passenger volumes that otherwise would be on the freeway. This is an important finding for planning agencies and ownership organizations who are considering locations for new stadia. Being near transit is clearly important and can dramatically reduce vehicle volumes, congestion, and the need for parking spaces.

By contrast, findings were limited with the data taken in Anaheim. This may be a byproduct of the lack of congestion on the particular segment of the freeway; it could be that these variables do generate significant changes but vehicles are being gently metered by the congestion at the Orange Crush interchange with I-5 to the south. However, the ramp from I-5 to SR 57 is not typically congested during the PM, although ramps from the third freeway in the Orange Crush, SR 22, are notably congested. More likely, there are multiple entrances to Angel Stadium and although Orangewood Avenue is the easiest for the majority of the fan base, people use different entrances depending on the traffic conditions. Although there were significant findings with the monthly variables, all of the baseball specific variables were largely insignificant. Whether this says something about the relaxed nature of the Angels fan base (that they enjoy the game regardless of opponent) versus the more historically rabid fan base of the Giants is out of the scope of this report. Both teams have had more than 3 million total fans visit the stadium each year in the last 10 years.

CONCLUSIONS

This research intended to investigate the effects of a recurring special event, in this case the weekday evening baseball game, at two different sites in California. With data provided by the California PeMS database, 5 minute flow and occupancy data were taken from entrances to the respective stadiums of the Los Angeles Angels of Anaheim and the San Francisco Giants. Data was taken on northbound SR 57 before the Orangewood exit (for the Anaheim team) and on the San Francisco Bay Bridge (for the San Francisco team) during the 15:00-20:00 period for a game start time of approximately 19:00. Regressions were taken with variable of day of week, month of year, as well as starting pitcher and divisional opponents. In case of San Francisco, transit volumes were also examined. The presence of baseball was significant in all cases. The authors hope this report adds to a dataset for planners to examine when designing new venues. Future research includes looking at different venues with different access and egress than the two in this report. In conclusion, while much of the existing literature focuses on transit share, the fact remains that except for a handful of stadia, many attendees at sporting events enter in a car and documenting the effects of these additional vehicles is still relevant.

Acknowledgments

The authors would like to thank Professor Alexander Skabardonis for his helpful comments and the Orange County Transportation Authority (OCTA) for information about the *Angels Express* special train.

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Fig. 1. Schematic of Angel Stadium and detector location

Fig. 2. Schematic of AT&T Park and detector location

Fig. 3. Freeway Flows 15:00-20:00 in Anaheim

Fig. 4. Freeway Flows 15:00-20:00 in San Francisco

Fig. 5. Detector Occupancy 15:00-20:00 in San Francisco

Fig. 6. BART weekday exits at two stations

Fig. 7. San Francisco Freeway Flows on a Friday with the Los Angeles Dodgers as an opponent

Table 1. Regression with Baseball Dummy and Day-of-Week Effects

	Anaheim		San Francisco	
Variable	Magnitude	P-Value	Magnitude	P-Value
Intercept	29260		32060	
Baseball	1122	<.01	941	<.01
Monday	-529	0.14	-1401	<.01
Tuesday	26	0.94	-945	0.01
Thursday	-458	0.20	403	0.28
Friday	-938	0.01	2086	<.01
R-Squared	0.23		0.56	

Table 2. Regression with Baseball Dummy and Month-of-Year Effects

	Anaheim		San Francisco	
Variable	Magnitude	P-Value	Magnitude	P-Value
Intercept	28100		31850	
Baseball	1177	<.01	1246	<.01
May	287	0.43	-156	0.80
June	630	0.09	-385	0.52
July	1517	<.01	288	0.64
August	1172	<.01	85	0.89
September	1068	<.01	404	0.50
R-Squared	0.31		0.13	

Table 3. Regression with Divisional Game Effects

	Anaheim			San Francisco	
Variable	Magnitude	P-Value	Variable	Magnitude	P-Value
Intercept	28880		Intercept	31910	
Baseball	1086	<.01	Baseball	668	<.01
Houston	116	0.85	Arizona	311	0.68
Oakland	127	0.82	Colorado	45	0.96
Seattle	397	0.46	Los Angeles	2771	<.01
Texas	-378	0.64	San Diego	1064	0.12
R-Squared	0.17			0.20	

Table 4. Regression with Starting Pitcher Effects

	Anaheim			San Francisco	
Variable	Magnitude	P-Value	Variable	Magnitude	P-Value
Intercept	28880		Intercept	31910	
Baseball	2229	<.01	Baseball	909	<.01
Weaver	-1375	0.10	Bumgarner	-530	0.37
Wilson	-1105	0.19	Hudson	-439	0.49
Richards	-1206	0.19	Vogelsong	1290	0.02
Shoemaker	61	0.94	Lincecum	798	0.16
Santiago	-1140	0.19	Cain	632	0.36
Skaggs	-1578	0.08	Peavy	-1123	0.20
			Petit	281	0.68
R-Squared	0.21			0.18	

Table 5. Best Fit Regressions

	Anaheim			San Francisco	
Variable	Magnitude	P-Value	Variable	Magnitude	P-Value
Intercept	28520		Intercept	32480	
Baseball	1191	<.01	Baseball	1397	<.01
July	1182	<.01	Monday	-1864	<.01
August	879	<.01	Tuesday	-1443	<.01
September	771	0.01	Friday	1349	<.01
Friday	-650	0.02	Day Game	-2373	<.01
			Los Angeles	1346	0.01
			San Diego	815	0.03
			Washington	-1760	<.01
			Bumgarner	-745	0.06
R-Squared	0.32		R-Squared	0.76	

Table 6. Best Fit Regression for Transit

	BART Volumes	
Variable	Magnitude	P-Value
Intercept	6476	
Baseball	2802	<.01
Monday	-1061	<.01
Tuesday	-513	<.01
R-Squared	0.81	