Putting a Price on Truck Parking: A Planning & Public Health Policy Perspective

A Preliminary Analysis of Fatigue-Related Collisions and Truck Parking Availability along California Interstate 5 & Exploration of Pricing Parking at Public Rest Areas

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Marta Polovin

Collaborative Sciences Center for Road Safety (CSCRS) Fellow, Fall 2019

UC Berkeley SafeTREC

Introduction & Problem Statement

Across the U.S., and particularly in California, transportation practitioners and scholars have identified a lack of freight truck parking (Banerjee et al. 2009; Caltrans 2001; Giuliano et al. 2018; Rodier et al. 2010). With increasing amounts of freight vehicles on the road and limited parking capacity particularly around metropolitan centers, truck operators are faced with mounting safety challenges (Giuliano et al. 2018; Rodier et al. 2010). Furthermore, as many metropolitan areas have limited land capacity (especially in California around major metropolitan areas), it is difficult and costly to build and maintain additional parking inventory for freight vehicles (Giuliano et al. 2018). In addition, approximately ten to twenty percent of large truck or bus collisions involve a fatigued driver; commercial drivers who travel long distances have the highest risk of operating while fatigued (California OTS 2019). The repercussions of operator fatigue, along with parking in potentially prohibited and/or dangerous areas, result in harmful and deadly collisions as documented by numerous state and federal-level reports (Banerjee et al. 2009; Caltrans 2001; Rodier et al. 2010; GHSA 2016; NHTSA 2017). Safety campaigns and regulations have often targeted driver behavior; however, from a systems-based perspective, there is widespread recognition that truck parking is vastly undersupplied and often difficult to find when operators are most in need of rest. In the past few years, private truck stops have established pay-to-park systems due to the growing scarcity of truck parking nationally (Overdrive 2015).

There have also been technological efforts taken to provide parking availability data to drivers for better trip management; however, they have not explored demand-responsive paid parking (ATP 2019). Demand-responsive parking, adjusting the price of parking to match demand, has been explored at the municipal level to assure target parking occupancy rates and to limit vehicle cruising (Shoup 2005). This paper aims to determine how accessible parking is along the I-5 interstate and its relationship to fatigue-related collisions. Additionally, this research will analyze how feasible it would be, from an equity and policy-based perspective, to utilize demand-based pricing at I-5 public rest areas in California. The I-5, the main corridor that connects the greater

Los Angeles region to the Bay Area, currently has the highest shortage of truck parking in the state (Giuliano et al. 2018). By implementing paid parking and adjusting parking rates according to demand, more truck parking could be made available at peak times by potentially increasing parking spot turnover and availability, thus increasing the odds of finding parking for fatigued operators. Collected revenues could possibly be reinvested into building and maintaining truck parking infrastructure. A parking demand management approach towards rest area parking maybe part of a broader public health policy toolkit to address limited truck parking and fatigue-related collisions.

Background

Governmental & Systems Overview - How Parking Demand has not Kept up with Supply

Rest areas were developed during the rise of the national Interstate Highway System around the mid-20th century (Rodier and Shaheen 2007). Their purpose was (and still is) to provide respite for travelers driving long distances, reducing drowsy driving and illegal parking along dangerous corridors (Caltrans 2019). Since then, trucking industries have grown and shifted, outpacing the expansion of rest areas and private truck stops. One study estimated that approximately ten percent of all truck parking spaces were in public rest areas versus ninety percent at commercial truck stops (Chen et al. 2002). This is partly because after the 1960s and 1970s, rest areas have had to compete with other transportation needs seen as more politically pressing (such as road maintenance, traffic congestion and highway safety) to obtain federal funding (Kress and Dornbusch 1991). This lack of guaranteed federal support has resulted in a lack of rest areas nationally and has shifted much of the responsibility and management of these systems onto states.

Further trucking industry deregulation in the 1980s worsened the availability of truck parking overall due to increased demand; more trucking businesses were able to operate under more lax entry regulations (Chen et al. 2002). It was estimated that prior to deregulation, there were only 20,000 motor carriers nationally (Chen et al. 2002). By 2017, this number has increased by 270 percent for a total of 543,061 operators (FMCSA 2018). Additionally, there are federal mandates

(hours of service regulations) that limit the amount of time drivers are allowed to operate for safety purposes. Drivers delivering freight (non-passenger) are allowed to drive for eleven hours after ten consecutive hours off-duty, thus, their vehicles need to be parked somewhere for ten hours (FMCSA 2019). While these regulations are strictly enforced, parking is not guaranteed nor sufficient for these operators to meet these necessary requirements (Martin and Shaheen 2013). These economic conditions, along with federal safety standards, have cemented the need for truck parking. Put simply, nationally and in California, supply has not kept up with demand for many reasons.

The lack of truck parking within California is particularly acute. According to Caltrans's 2020 Freight Mobility Plan, the state's transportation system has some of the highest total freight volumes and boasts some of the most extensive, high capacity freight systems in the nation (Caltrans 2019). According to the Caltrans 2011 Safety Roadside Rest Area Master Plan, each rest area has an average parking space deficiency of twenty spaces (Caltrans 2011). Further, forty-six percent of rest areas along Interstate 5 are predicted to have a deficit of truck parking by 2030 (Caltrans 2011, see Appendix Item A).[1] Of the eighty-seven operational rest areas in California, a majority of them were constructed prior to 1970--thus, there has not been significant expansion of rest areas in four decades (Caltran 2019). Other research efforts have also concluded that California's lack of truck parking, particularly around major corridors like I-5, is significant and poses numerous health and safety risks (Giuliano et al. 2018; Rodier et al. 2010). Parking availability is critical for the safety and wellbeing of truck operators, yet there has been a lack of actions taken to address the overall parking deficit.

Preliminary Data Analysis

Current Parking Conditions along I-5

Given that I-5 is one of the busiest freight corridors in the state, this analysis endeavors to further illustrate the need for truck parking in the state of California by using data collected by Caltrans and the California Highway Patrol (CHP) on fatigue-related collisions. I-5 is nearly eight hundred miles long and passes through sixteen counties within California, stretching from the

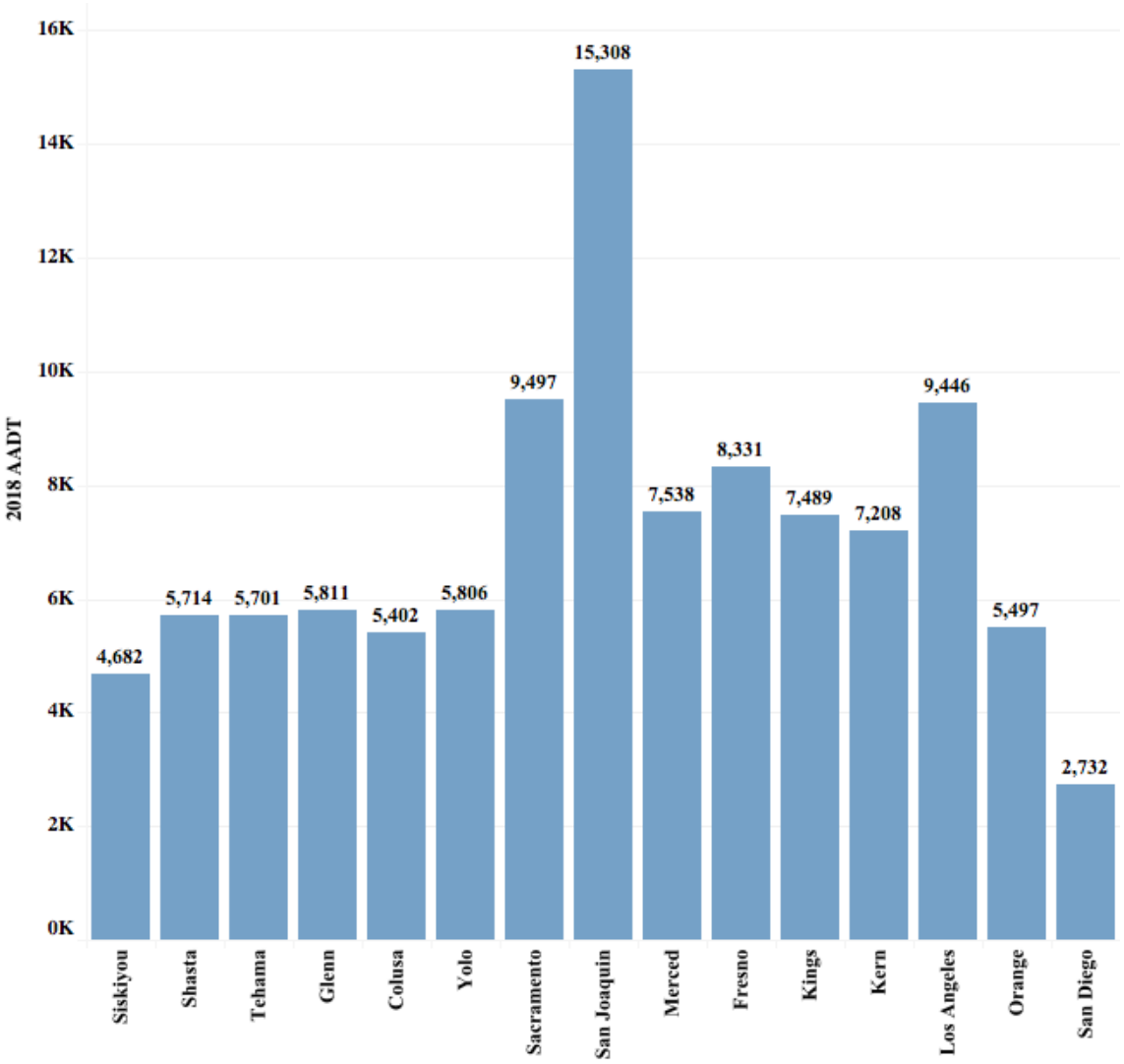
[1] Caltrans calculated these figures using modeling data from the Highway Design Guide.

southern border between Mexico and the U.S. all the way to Oregon. Within California, I-5 provides crucial connections between large metropolitan areas like Los Angeles, Sacramento, San Diego, and the Bay Area broadly. Given its role in linking these megaregions and economic hubs, there is significant truck traffic volume on I-5. Per Caltrans's traffic volumes census there are well over one hundred thousand trucks driving daily on I-5 (see Figure 1).[2] When visualized, it is clear that there are regional differences in terms of truck volumes, which help show clear trends in parking demand. San Joaquin County by far has the highest volumes (likely due its position near the Bay Area), followed by Sacramento and Los Angeles counties.

Needless to say, given the current capacity and anticipated industry growth, there are significant parking challenges particularly in high-volume, more urbanized areas. As mentioned prior, by Caltrans's estimates, nearly half of all rest areas on I-5 will have parking deficits in approximately ten years (see Appendix Item A). Overall, there are twenty-eight rest areas immediately adjacent to I-5 (and if counting rest areas serving both northbound and southbound directions, there are only sixteen in total). Using truck stop data gathered from Caltrans, along with data from truck stop search engine "Truck Master Fuel Finder," "Allstays", and "American Truck Parking,"[3] there are an estimated 46 truck stops adjacent to I-5.[4]

[2] See Appendix Item D for a comparison of 2015 freight volumes on I-5 to 2018.
[3] Caltrans truck stop data was incomplete, therefore it was necessary to use a private search engine to verify truck stop data. In addition, all data collected were verified via online search and referring to up-to-date aerial imagery from Google Maps to ensure accuracy.
[4] Rest areas refer exclusively to truck parking that is publicly managed by Caltrans, whereas truck stops refer to parking that is privately owned and operated.

Figure 1. 2018 Average Annual Daily Truck Traffic Counts on I-5 by County

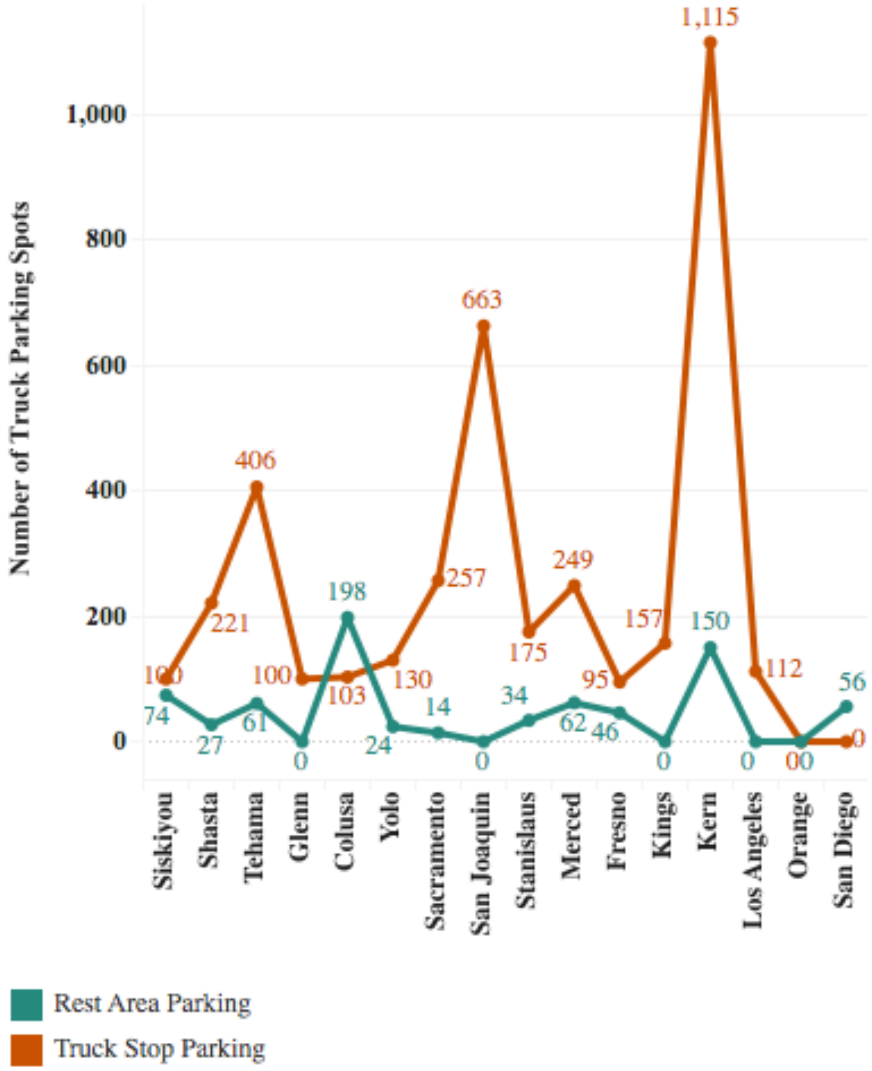


Source: Caltrans Traffic Census, 2018. Counts are calculated for vehicles with 5+ axles and averaged by county. Data not available for Stanislaus county.

In total, there are 746 rest area parking spaces versus approximately 3890 truck stop parking spaces; rest areas roughly comprise 19% of the total parking supply along I-5 (see Figure 2 and Appendix Item B). It is important to emphasize that, broadly, privately-owned and operated truck stops manage a majority of the total truck parking supply in the U.S.; research has also found that drivers, in general, prefer to park at truck stops due to the wider breath of amenities that traditional rest areas do not supply (i.e. fuel, showers, dining and etc.)(Chen et al. 2002). Thus,

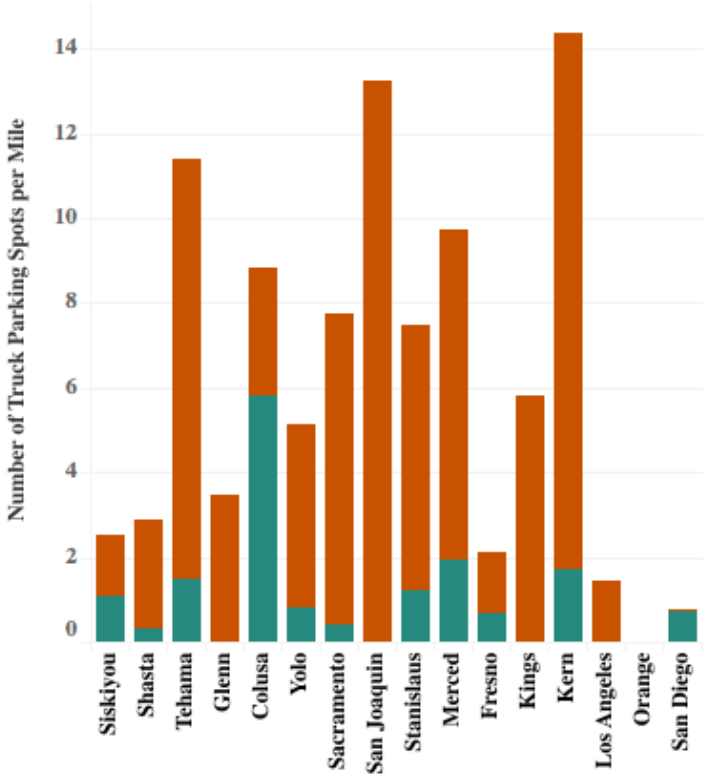
this is not necessarily a surprising finding but does showcase the crucial role truck stops plays in providing parking access for drivers needing rest.

Figure 2. Total Estimated Supply of Truck Parking along I-5 by County (North to South)



Source: Caltrans rest area parking data, 2019 & Caltrans truck stop data, 2019. Caltrans truck stop data was cross-verified using data from Truck Master Fuel Finder 2011, Allstays 2019 and Google Maps 2019. Rest areas numbers reflect rest areas that may be temporarily closed. Actual truck stop parking numbers may be higher or lower as parking counts are difficult to report for unpaved lots. Parking counted if within 1 roadway mile of I-5.

Figure 3. Estimated Number of Truck Parking Spots per Mile by County on I-5 (North to South)



Source: Caltrans rest area parking data, 2019 & Caltrans truck stop data, 2019. Caltrans truck stop data was cross-verified using data from Truck Master Fuel Finder 2011, Allstays 2019 and Google Maps 2019. Rest areas numbers reflect rest areas that may be temporarily closed. Actual truck stop parking numbers may be higher or lower as parking counts are difficult to report for unpaved lots. Parking counted if within 1 roadway mile of I-5.

There are strong disparities in overall parking supply between counties (see Figures 2 and 3). Notably, some of the counties with the highest freight volumes on I-5 (like Los Angeles, Orange, Sacramento and San Diego counties) have the lowest truck parking availability. Kern County, which includes the City of Bakersfield, has the highest number and density of truck parking per mile along I-5, followed by San Joaquin County (which is nearest to the Bay Area, but is largely rural). On the other hand, Los Angeles and Orange counties do not have any rest area parking whatsoever despite having high freight traffic volumes (particularly Los Angeles); and Orange county does not have any easily accessible truck parking from I-5. These disparities may have to do with the difficulty and cost of developing truck parking in more urbanized areas (Giuliano et al. 2018). Per Caltrans, building new rest areas between Sacramento and San Diego is a high

priority (Caltrans 2011). Overall, from this analysis, there seems to be stark differences not only in public versus private supply, but also with regards to rural and urban areas.

Fatigue-Related Collisions between 2015 and 2018 on I-5

In order to further understand how a lack of parking may be affecting the safety of drivers and those sharing the road with them, a preliminary collision data analysis was conducted. Using the methodology from Banerjee et al. 2009, truck collision data from California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS)[5] was analyzed to determine which collisions classified as fatigue-related. There are two primary ways of classifying fatigue-related collisions, either as a "strict definition" or "expanded definition."[6] Using these definitions, from 2015 from 2018, there were thirty-six fatigue related truck collisions on I-5, comprising a small percentage of all truck-involved collisions (see Appendix Item C and Figure 4). There were forty-nine reported injuries and six fatalities as a result of truck operator fatigue. Overall, Los Angeles county has the highest number of fatigue-related collisions while having some of the lowest parking availability and highest freight volumes (see Figures 4, 3 and 1). Additionally, Los Angeles county was the only county where fatalities were reported. Conversely, San Joaquin county only had one reported fatigue-related collision despite having the highest freight volumes (it also had one of the highest truck parking to mile ratios). There were two reported collisions for Kern county which had the most ample truck parking supply in total and per mile.

[5] SWITRS data was accessed using UC Berkeley SafeTREC's Transportation Injury Mapping System.

[6] From Banerjee et al. 2009, for the strict definition, the primary collision factor was "fell asleep" or driver was reported as being fatigued. The expanded definition includes,"Those in which the party was at fault, was not drunk or speeding, experienced no vehicle defect, and either ran off the road, crossed into an opposing lane or struck another vehicle/fixed object between the hours of 2 a.m. and 6 a.m. or 2 p.m . and 4 p.m."

Figure 4. Truck Operator Fatigue-Related Collisions by County on I-5 (North to South)

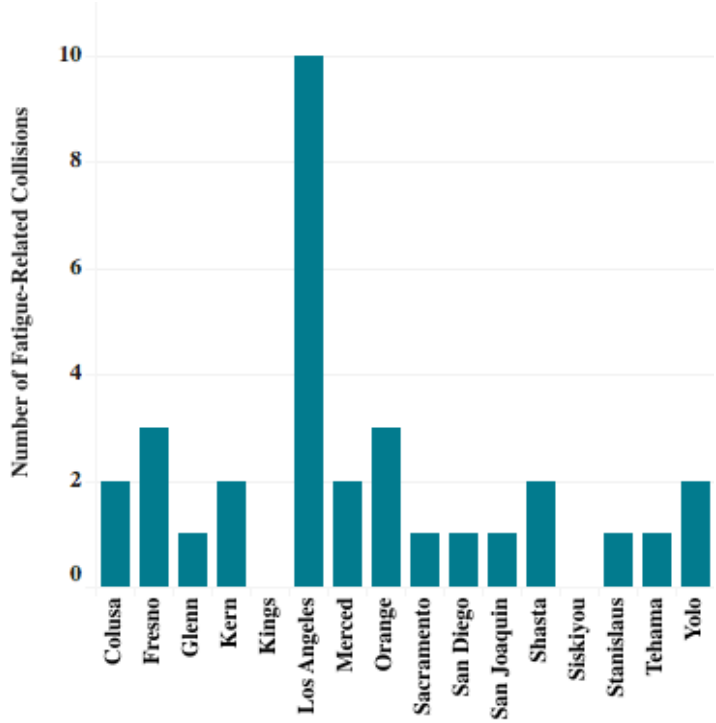
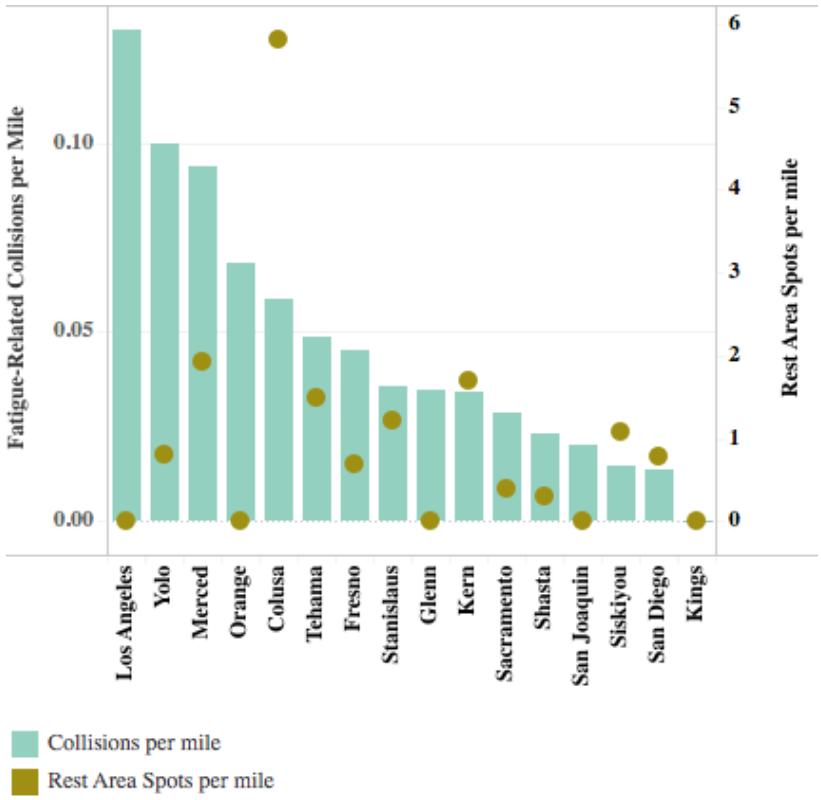


Figure 5. Truck Operator Fatigue-Related Collisions & Rest Area Parking Spots per Mile



Source: CHP SWITRS Data, 2015-2018. Accessed using UC Berkeley SafeTREC TIMS. Caltrans data, 2019.

When testing for correlations between number of fatigue-related collisions and parking supply on a county-level, there were weak negative correlations between parking supply (rest area parking and total parking) and the number of reported fatigue-related collisions generally; however, given the size of the dataset these figures were not significant. Despite this, Figure 5 helps illustrate the relationship between fatigue-related collisions and the number of rest area parking spots on a per mile basis. From this visualization, Los Angeles and Orange counties have some of the highest fatigue-related collisions per mile, but do not have any rest areas (and also have very few truck stop parking options). San Joaquin county has a lower number of fatigue-related collisions and no rest areas, however, it contains far more truck stops which could be a critical factor in reducing collision rates.

Further analysis and data gathering on I-5 is required to fully determine the relationship between operator fatigue and parking availability for a more comprehensive and nuanced picture. It is well-documented that fatigue-related collisions are underreported, but tend to be more severe (Banerjee et al. 2009). One study estimated that fatigue may actually play a role in about ten percent of all collisions (Owens et al. 2018). Thus, these findings may not be fully representative of the impact of poor parking availability and operator fatigue. Moving forward, it is important to mention that Caltrans's criteria for rest area expansion utilizes these following factors: illegal parking, rest area spacing, truck stop location, site remoteness, parking deficiencies and traffic volume. However, Caltrans does not utilize traffic safety data on fatigue related collisions which could be an essential component in helping determine parking need.

Challenges & Solutions

Proposed Solutions towards Addressing the Lack of Truck Parking

Due to financial and budgetary constraints, the state of California cannot build more rest areas. Yet, there are legal barriers towards allowing commercial activity in public rest areas; in other words, the state of California cannot allow commercial activities at rest areas (Caltrans 2011). Vending machines are the only commercial operations allowed under the Randolph-Sheppard Act (Caltrans 2011). This federal legislation was partly intended to eliminate possible financial

barriers for drivers needing rest (Kress and Dornbusch 1991). However, with the limited federal funding sources for rest areas, state agencies have limited options for maintaining rest areas, improving services and developing further infrastructure. Efforts made towards dismantling this constraint have largely been unsuccessful due to lobbying efforts from the private sector fearing additional competition. For example, in 2012, California bill AB 2485 proposed allowing commercial activities at rest areas but was soundly defeated in the initial committee hearing phase (NATSO 2012). Such setbacks have pushed transportation agencies towards public-private partnerships.

Given the need for more truck parking nationally and state-wide, the United States Department of Transportation (USDOT) and Caltrans explored opportunities for private-public partnerships through the Federal Interstate Oasis Program under 2005 SAFETEA-LU legislation (Caltrans 2019; FHWA 2006). By entering into a private-public partnership through the Oasis program, Caltrans and other state agencies can leverage private dollars and management expertise to build out further rest stop infrastructure without violating federal laws against commercial activity at public rest areas. Allowing commercial activity at public rest areas could help alleviate funding problems for maintaining, improving and expanding parking access. However, in the past, Caltrans has had difficulty in building truck parking facilities due to contractor and financial difficulties (Dornbusch et al. 2009). Additionally, of the eleven rest areas on I-5 that require expansion to meet 2030 parking demand, five of them cannot build more parking due to physical land constraints or legal issues.

Outside of expanding facilities, there has been significant research and investment in providing truck operators forecasted and dynamic parking availability data. Crowd-sourced online sites, apps and databases like “Truck Path” and “American Truck Parking,” provide truck operators novel ways in which to access parking information which can alleviate the search for parking (American Truck Parking 2019). Technological innovations like these may play an important role in reducing fatigue-related collisions; however, these systems cannot actively manage parking demand nor improve the odds of finding parking unless the operator pays to reserve. Operators also must rely on a capable phone or device in order to access these data, which may

pose a burden to those who, for example, do not have time to pull over and search or who have poor cell service in more remote areas. Furthermore, these databases cannot provide agencies the funds to further improve or expand truck parking in public rest areas. Fundamentally, these innovations are an exciting step forward and showcase the potential of technology in addressing transportation issues.

Lessons from the Private Sector on Pricing Parking

State agencies like Caltrans are not alone in facing difficulties in further developing parking- truck stops also face hurdles in expanding, especially in urban areas with greater demand (Giulano et al. 2018). Given these constraints, major truck stop chains like Pilot Flying J, TravelCenters of America Petro and Love's have begun implementing paid truck parking reservations in recent years (Overdrive 2015). These reservation systems have largely been implemented in places with high demand, essentially where it would be financially feasible (Boris and Johnson 2015). For instance, several truck stops along I-5 have reserved parking due to the expected high volumes of large trucks. Overall, the introduction of priced reservation systems is a huge shift from the traditional paradigm of free parking for vehicles.

However, the introduction of priced reservation systems has not been without controversy. Many have raised important concerns and questions regarding additional cost burdens for truck operators. As stated by one truck driver in a blog, "We are either drivers or owner-operators and none of us want to lose money as we drive down the road"(TruckerNews 2018). The trucking industry, due to deregulation in the 1980s, has gotten more competitive and difficult in the past few decades for operators. Consequently, lower wages and longer hours have become the norm (Belzer 2000). The national average wage, per one online source, is approximately $65,000- and this figure fails to capture that many of these drivers likely work seventy hours a week (the federal limit) (ZipRecruiter 2019; FMCSA 2019) . Keeping these broader equity concerns in mind, when drivers were surveyed in 2015, nearly fifty percent stated they would not be willing to pay for reserved parking, followed by twenty percent willing to pay up to five dollars and another twenty percent willing to pay up to ten dollars (Boris and Johnson 2015). This study also found that approximately fifty percent of drivers surveyed believed the motor carrier should

cover the costs of parking fees.[7] Charging for something that has historically been free poses numerous transportation equity challenges about who ultimately pays and how. Yet, according to a news report from Transport Topics, it was estimated by an industry expert that drivers lose $4,600 per year and fifty-six minutes a day just looking for parking (Transport Topics 2019). Despite the unpopularity of paying for truck parking, there seems to be some recognition that having access to parking is more important than free parking, even if it means paying sometimes, "Pay to parking equals peace of mind"(TruckerNews 2018). Particularly in areas with limited truck parking and high demand, paying to have guaranteed parking is one way of assuring spots to operators who need them most. Moving forward, pay-to-reserve truck parking systems are likely to become the widespread norm, particularly where supply is extremely difficult and costly to build.

Recommendations

Why Pricing Parking at Public Rest Areas Should be Explored

The previous section briefly described some of the proposed and current solutions towards improving parking supply and how the private sector has begun pricing parking. Given the high costs to operators to search for parking and the safety risks of not finding parking before fatigue sets in, not having access to available parking on high volume corridors, like I-5, is a public health hazard. Caltrans has already extensively explored private-public partnerships in order to allow for commercial activities at rest areas, thus, studying the impacts and benefits of priced parking should be a priority (given the precedents set by the private sector). Notably, under the Federal Interstate Oasis Program, it explicitly states that, "Parking space should be free of charge"(FHWA 2006). This is presumably to ensure that truck operators have access to parking; however, it does not take into account access to parking when supply is limited and demand is high (like in Los Angeles county). Despite the costs of implementation and possible political and legal barriers, exploration of paid parking is worthwhile.

[7] Motor carrier refers to the operator's company/employer. Additionally, it is important to note that many drivers are owner-operators and, thus, own small trucking operations. Paid parking can disproportionately burden small business owners if motor carriers are solely mandated to pay parking fees.

Moreover, program design and management is key for pricing truck parking at public rest areas. For example, the City of San Francisco implements a successful program called "SFpark" which adjusts on-street parking meters on the basis of demand (SFMTA 2019). From a truck parking perspective, it may be valuable to emulate San Francisco's demand-responsive pricing along with private truck stops' reservation models. However, there is a key difference between these two approaches: the first aims to improve occupancy more broadly, while the second aims to guarantee parking. Each has its pros and cons. For example, if aiming for occupancy, all truck parking at a rest area should be priced in order to deter a sufficient amount of operators from parking so there is always some availability. Conversely, reservation systems allow those who have planned ahead of time to find parking, while those who do not reserve ahead of time may not be able to find parking (even if willing to pay for a reserved spot). In sum, future studies will need to carefully assess and design programs so as to ensure greater parking availability for fatigued operators.

Overall, Caltrans has faced numerous financial challenges in building new rest area facilities, and so pricing parking at current rest areas with high enough demand could assist with future development of parking and maintenance of existing areas. Given total freight volumes, parking supply and fatigue-related collisions, rest areas in or near Los Angeles, Orange, Fresno and Sacramento counties along I-5 could be good candidates for a pilot study on priced parking. Generally, areas near and in major urban centers that experience the highest parking deficiencies are where operators will be the most willing to pay for parking. Caltrans should invest in and further study the feasibility of pricing truck parking in high-demand rest areas while also conducting a more in-depth equity analysis to determine potential impacts and benefits to operators.

Conclusion

This paper has discussed truck parking supply and fatigue-related collisions along one of the busiest freight corridors in the state, while also addressing the feasibility of implementing paid parking at California's rest areas. Priced parking can be used as a regulatory tool to help reduce collisions and improve safety outcomes along highway systems. Given the legal, program

design, technological and equity challenges, further study and discussion is required. As parking supply around the I-5 remains static while demand increases, the current and future safety implications are tremendous. These findings have hopefully provided useful context for the consideration of paid parking as part of a multi-pronged strategy to help manage limited parking supply—to ultimately help inform decision-makers in reducing operator fatigue-related collisions and enhancing road safety systems.

Appendix

Appendix Item A. Table of Current Supply of Rest Area Parking for Trucks along Interstate 5

County	Rest Area	Current Truck Parking	2030 Parking Demand Projections	Able to Add More Parking at Current Site*	Urban or Rural Area	Expected Deficit
Shasta	O'Brien NB	9	14	N	Rural	Deficit
Shasta	Lakehead SB	18	24	Y	Rural	Deficit
Siskiyou	Weed Airport NB	18	26	N	Rural	Deficit
Siskiyou	Weed Airport SB	18	27	Y	Rural	Deficit
Siskiyou	R.E. Collier NB & SB	38	16	-	Rural	No Deficit
Tehama	Lt. John Helmick NB	11	16	Y	Rural	Deficit
Tehama	Lt. John Helmick SB	13	13	-	Rural	No Deficit
Tehama	Herbert S. Miles NB	14	24	Y	Rural	Deficit
Tehama	Herbert S. Miles SB	23	20	-	Rural	No Deficit
Colusa	Maxwell NB	44	11	Y	Rural	No Deficit
Colusa	Maxwell SB	44	10	-	Rural	No Deficit
Colusa	Willows NB	55	12	-	Rural	No Deficit
Colusa	Willows SB	55	24	-	Rural	No Deficit
Sacramento	Elkhorn SB	14	12	-	Urban	No Deficit

Yolo	Dunnigan NB	12	16	N	Rural	Deficit
Yolo	Dunnigan SB	12	20	N	Rural	Deficit
Fresno	Coalinga-Avenal NB	23	45	N	Rural	Deficit
Fresno	Coalinga-Avenal SB	23	38	N	Rural	Deficit
Kern	Tejon Pass NB	44	57	Y	Rural	Deficit
Kern	Tejon Pass SB	40	37	-	Rural	No Deficit
Kern	Buttonwillow NB	33	31	-	Rural	No Deficit
Kern	Buttonwillow SB	33	33	Y	Rural	No Deficit
Merced	John Chuck Erreca NB	31	25	-	Rural	No Deficit
Merced	John Chuck Erreca SB	31	23	-	Rural	No Deficit
Stanislaus	Westley NB	18	28	Y	Rural	Deficit
Stanislaus	Westley SB	16	37	Y	Rural	Deficit
San Diego	Aliso Creek NB	27	23	-	Urban	No Deficit
San Diego	Aliso Creek SB	29	20	-	Urban	No Deficit

Source: Caltrans Rest Area Master Plan, 2011. *Value of "Y" equals "yes," "N" equals "no" and "-" equals "not applicable."

Appendix Item B. Table of Total Parking Supply along I-5

County	Rest Area Truck Parking Spots	Truck Stop Parking Spots	Total	Total Parking Spots per Mile
Siskiyou	74	100	174	2.52
Shasta	27	221	248	2.88
Tehama	61	406	467	11.39
Glenn	0	100	100	3.45
Colusa	198	103	301	8.85
Yolo	24	130	154	5.13
Sacramento	14	257	271	7.74

San Joaquin	0	663	663	13.26
Stanislaus	34	175	209	7.46
Merced	62	249	311	9.72
Fresno	46	95	141	2.14
Kings	0	157	157	5.81
Kern	150	1115	1265	14.375
Los Angeles	0	112	112	1.45
Orange	0	0	0	0
San Diego	56	0	56	0.78
Total	**746**	**3883**	**4629**	**-**

Source: Caltrans rest area parking data, 2019 & Caltrans truck stop data, 2019. Caltrans truck stop data was cross-verified using data from Truck Master Fuel Finder 2011, Allstays 2019 and Google Maps 2019. Rest areas numbers reflect rest areas that may be temporarily closed. Actual truck stop parking numbers may be higher or lower as parking counts are difficult to report for unpaved lots. Parking counted if within 1 roadway mile of I-5.

Appendix Item C. Table of Fatigue-Related Collisions along I-5

County	Total Number of Truck-Involved Collisions	Total Number of Fatigue-Related Collisions (Percent of Total)	Number of Fatigue-Related Collisions per Mile	Number of Injuries from Fatigue-Related Collisions
Siskiyou	31	1 (0.03%)	0.014	1
Shasta	58	2 (0.03%)	0.023	3
Tehama	30	2 (0.07%)	0.049	3
Glenn	20	1 (0.05%)	0.034	1
Colusa	27	2 (0.07%)	0.059	3
Yolo	27	2 (0.7%)	0.067	2
Sacramento	110	1 (0.01%)	0.029	1
San Joaquin	189	1 (0.01%)	0.020	1
Stanislaus	58	1 (0.02%)	0.036	1
Merced	47	3 (0.06%)	0.094	2

Fresno	79	3 (0.04%)	0.045	4
Kings	24	0 (0%)	0.000	0
Kern	181	3 (0.02%)	0.034	1
Los Angeles	700	10 (0.01%)	0.130	19 (6 fatalities)
Orange	244	3 (0.01%)	0.068	5
San Diego	153	1 (0.01%)	0.014	2
Total	**1,978**	**36**	**-**	**49 injuries & 6 fatalities**

Source: CHP SWITRS Data, 2015-2018. Accessed using UC Berkeley SafeTREC TIMS. No fatalities reported with the exception of Los Angeles County.

Appendix Item D. Table of Average AADT (Traffic Counts) for Trucks in 2015 & 2018

County	2015	2018	Percent Change
Siskiyou	4,216	4,682	11.1%
Shasta	5,198	5,714	9.9%
Tehama	6,104	5,701	-6.6%
Glenn	5,410	5,811	7.4%
Colusa	5,661	5,402	-4.6%
Yolo	5,747	5,806	1.0%
Sacramento	8,836	9,497	7.5%
San Joaquin	14,900	15,308	2.7%
Merced	7,130	7,538	5.7%
Fresno	7,298	8,331	14.2%
Kings	6,834	7,489	9.6%
Kern	7,686	7,208	-6.2%
Los Angeles	9,573	9,446	-1.3%
Orange	5,172	5,497	6.3%

Source: Caltrans Traffic Census, 2018 and 2015. Counts are calculated for vehicles with 5+ axles and averaged by county. Data not available for Stanislaus county.

Acknowledgements

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