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CalPoly 2015 Transportation Survey Report

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CalPoly 2015 Transportation & Parking Survey Report

William Riggs, PhD, AICP, LEED AP

Winter 2016
Available at: http://digitalcommons.calpoly.edu/crp_wpp/38
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INTRODUCTION
During the 2015-2016 academic year City & Regional Planning faculty conducted a campus-wide transportation and parking survey as part of work on the campus Climate Action Plan. The survey which occurred in the spring of 2015 and represented spring 2015 commutes, and was issued to a sample of full and part-time Cal Poly faculty, staff, students and auxiliaries with assistance from Facilities Management and Development and the Vice President for Administration and Finance. The parking analysis conducted primarily during early 2016 validated those survey results.

The survey received a total of 3,961 responses, 17% of the entire campus population of roughly 23,000. Unsurprisingly, the majority of respondents were students, totaling 68.6%, while the rest were made up of faculty, staff, and visitors. Results are significant at the 99% Confidence Interval with a margin of error of ± 1.68%.

![CalPoly Transportation Modes 2015](image)

Figure 1: Modal Split for Entire Campus

On average survey respondents traveled roughly 17 vehicle miles traveled (VMT) to campus of those reporting to drive alone or in a carpool to campus. The average VMT was calculated based on the distance of stated residential address data to campus from the CalPoly Travel Survey. The distances representing the closest intersection to each respondent’s residence. This was geo-coded and the network distance calculated using the ArcGIS network distance from a campus centroid; in this case Kennedy Library. The distances were then averaged.
Figure 2: Geocoded Responses by Closest Intersection
Figure 3: Network Distance Calculations
I: SURVEY SUMMARY

KEY POINTS & HIGHLIGHTS

General
- Most common ‘Other Modes’ were skateboard and motorcycle.
- Most did not use more than one mode of travel in a week (e.g. not multi-modal).
- Most arrive between 7:30am and 8:30am and depart between 4:30pm and 5:30pm, Monday through Thursday; 18% do not come to campus on Fridays due to compressed work weeks and over 70% do not come to campus on the weekends.
- 36% use telework options at least once a week.
- 71% of respondents are interested in telework opportunities.
- Most respondents walk or bicycle around campus once they have arrived.
- Many of those who walk, bike, or take transit to work also exercise moderately or vigorously at least 45 minutes per day.
- While most respondents do not fly within California for CalPoly-related purposes, those who do average less than 10 times per year.
- Most respondents do not fly domestically or internationally for CalPoly-related purposes each year, while those who do average less than 10 times per year.
- The male to female ratio of respondents was 45:55.
- 71% have never been married and 25% currently married, making up the majority of respondents.
- Over three quarters of respondents identify as White, followed by 10% Asian, 10% other (often interracial).
- Only 14% of respondents are of Hispanic or Latino origin.
- All colleges of the University were represented in the survey, with the most respondents from the College of Engineering (24.5%).
- Other respondents that are not affiliated with a college include those working in the library, administration, facilities, and ITS.
- Over one third of those who responded have been studying at CalPoly for 3-4 years.
- Of those respondents employed by CalPoly, 19% have been employed for one year or less.
- The mode of the estimated household income of respondents was between $50,000 and $74,999.
- Over half of the respondents live in households two people or less.
- About 85% of respondents do not travel with children < the age of 18 at least 50% of the time.
- About 16% of respondents live in university-owned housing.
- Half of the respondents spend $500 to $999 per month on housing costs (excluding utilities, taxes, and insurance).

Driver and Vehicle Characteristics
- The predominant type of vehicle coming to campus is a 4-door sedan.
- 66% have a model newer than 2005.
- Roughly 10% drive a hybrid or electric vehicle.
- 90% of drivers use campus structures (garages) or surface lots for parking, while others use off-campus street and lot parking.
- Most common “Other” parking space was designated vanpool parking.
• About 87% of all respondents have a campus parking permit.
• Campus parking structures (garages) were all utilized at ~99% occupancy, with the Grand Avenue parking structure being the most common.
• Respondents were equally split on whether they frequently have to drive around looking for spaces. Of those who frequently look, most spend less than 20 minutes looking.

Table 1. Mode Split by Cohort Relative to Population Size

<table>
<thead>
<tr>
<th></th>
<th>Student</th>
<th>Faculty</th>
<th>Staff / Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>18%</td>
<td>16%</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>24%</td>
<td>68%</td>
<td>68%</td>
<td>38%</td>
</tr>
<tr>
<td>Carpool / Vanpool</td>
<td>5%</td>
<td>8%</td>
<td>19%</td>
<td>8%</td>
</tr>
<tr>
<td>Public Transit (Bus)</td>
<td>10%</td>
<td>5%</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>Walk</td>
<td>41%</td>
<td>3%</td>
<td>1%</td>
<td>29%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Alternative Mode Characteristics

Of those who bike to campus, 14% do so at least five days per week (Table 2). Those who bicycle, drive alone, and walk, most use these respective modes at least five days per week. This is unlike those who vanpool or use public transit, with the majority of these commuters using these transportation modes only one day per week or less.

Table 2. Travel mode by days of the week

<table>
<thead>
<tr>
<th></th>
<th>Never Use this mode</th>
<th>Less than once per week</th>
<th>1-2 days per week</th>
<th>3-4 days per week</th>
<th>5+ days per week</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>63.4% (2,099)</td>
<td>10.1% (334)</td>
<td>6.2% (204)</td>
<td>6.4% (213)</td>
<td>14.0% (463)</td>
<td>3313</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>31.2% (1,132)</td>
<td>16.5% (597)</td>
<td>11.4% (414)</td>
<td>13.1% (475)</td>
<td>27.7% (1,005)</td>
<td>3623</td>
</tr>
<tr>
<td>Carpool / Vanpool</td>
<td>56.7% (1,838)</td>
<td>21.2% (688)</td>
<td>12.6% (409)</td>
<td>4.9% (159)</td>
<td>4.5% (145)</td>
<td>3239</td>
</tr>
<tr>
<td>Public Transit</td>
<td>64.9% (2,066)</td>
<td>15.6% (496)</td>
<td>7.3% (231)</td>
<td>6.4% (204)</td>
<td>5.8% (186)</td>
<td>3183</td>
</tr>
<tr>
<td>Walk</td>
<td>41.1% (1,333)</td>
<td>12.5% (405)</td>
<td>7.0% (227)</td>
<td>5.9% (193)</td>
<td>33.5% (1,088)</td>
<td>3246</td>
</tr>
<tr>
<td>Other</td>
<td>91.6% (2,500)</td>
<td>4.4% (119)</td>
<td>1.5% (40)</td>
<td>0.7% (20)</td>
<td>1.8% (50)</td>
<td>2729</td>
</tr>
</tbody>
</table>

While only 8% of the campus population (approximately 2,196 individuals) actively uses transit as their primary mode of travel, 35% of campus constituents use it as a secondary form of travel or almost 8,100 of the total campus population of 22,997. We estimate that another 30% take occasional rides; a number that more closely relates to the figure of 20% from Parking Services (based on card swipes). This estimate of roughly 15,000 users is fairly consistent with FY 15/16 ridership data provided from SLO Transit indicating the system had:

- 14,919 Total Unique Riders
- 754,946 Total Rides Given

For a large number of students particularly, modal choice is largely dictated by how far one lives from campus. Tables 3 and 4 illustrate how, on average, students and staff live further from campus than faculty staff. While some may find this trend for students counterintuitive since many do in-fact live close to campus, in actuality the second largest share of both students and staff live greater than 10 miles from campus, as illustrated by Table 4 which chose the average distance each cohorts goes in order to get to the campus. This combines travel by all modes—meaning that those who travel from longer distances are offset by the proportion of those who live close by, and travel shorter distances.

For students particularly, this provides an interesting discussion point in that a larger share of them commute from far away than other cohorts. This offsets the high number that live on or near campus and creates a larger than average commute distance than both faculty and staff. This skewed relationship over geography (whereby a large number of students live close-by and far-away drawing the mean towards a number that is higher than one would expect) is worth consideration in campus housing transportation policies.
Furthermore, although a small subset of the overall population, more carpool and vanpool data might useful in future surveys particularly given the emergence of Transportaiton Network Companies (TNCs) like Uber and Lyft. This could be revealing as we hypothesize many vanpoolers engage in different behavior than carpoolers, yet this has capacity to change as ridesharing capacity becomes more readily available through tools like UberPool and LyftLine.

Table 3. Average Distance to Campus

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>2426</td>
<td>17.36145146</td>
</tr>
<tr>
<td>Student</td>
<td>1632</td>
<td>18.62698192</td>
</tr>
<tr>
<td>Faculty - Staff</td>
<td>665</td>
<td>16.09775848</td>
</tr>
<tr>
<td>Faculty</td>
<td>229</td>
<td>12.10932211</td>
</tr>
<tr>
<td>Staff</td>
<td>436</td>
<td>18.19260235</td>
</tr>
</tbody>
</table>

Table 4. Distance to Campus by Cohort

<table>
<thead>
<tr>
<th></th>
<th>Less than 1.5 Mile</th>
<th>1.5 to 5 Mile</th>
<th>5 to 10 Mile</th>
<th>Great than 10 Mile*</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>357</td>
<td>805</td>
<td>17</td>
<td>453</td>
<td>1632</td>
</tr>
<tr>
<td>% within User Type</td>
<td>21.9%</td>
<td>49.3%</td>
<td>1.0%</td>
<td>27.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Distance Cohorts</td>
<td>69.5%</td>
<td>71.9%</td>
<td>68.0%</td>
<td>70.9%</td>
<td>71.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>15.5%</td>
<td>35.0%</td>
<td>0.7%</td>
<td>19.7%</td>
<td>71.0%</td>
</tr>
<tr>
<td>Faculty</td>
<td>63</td>
<td>105</td>
<td>2</td>
<td>59</td>
<td>229</td>
</tr>
<tr>
<td>% within User Type</td>
<td>27.5%</td>
<td>45.9%</td>
<td>0.9%</td>
<td>25.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Distance Cohorts</td>
<td>12.3%</td>
<td>9.4%</td>
<td>8.0%</td>
<td>9.2%</td>
<td>10.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>2.7%</td>
<td>4.6%</td>
<td>0.1%</td>
<td>2.6%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Staff / Other</td>
<td>94</td>
<td>209</td>
<td>6</td>
<td>127</td>
<td>436</td>
</tr>
<tr>
<td>% within User Type</td>
<td>21.6%</td>
<td>47.9%</td>
<td>1.4%</td>
<td>29.1%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Distance Cohorts</td>
<td>18.3%</td>
<td>18.7%</td>
<td>24.0%</td>
<td>19.9%</td>
<td>19.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>4.1%</td>
<td>9.1%</td>
<td>0.3%</td>
<td>5.5%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Total</td>
<td>514</td>
<td>1119</td>
<td>25</td>
<td>639</td>
<td>2297</td>
</tr>
<tr>
<td>% within User Type</td>
<td>22.4%</td>
<td>48.7%</td>
<td>1.1%</td>
<td>27.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Distance Cohorts</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>22.4%</td>
<td>48.7%</td>
<td>1.1%</td>
<td>27.8%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

*It is worth noting that there are survey anomalies in how individuals responded to questions about primary mode due to access to transit at more distant location. The reason for these varied responses is based on behavioral psychology and the perception of a trip, and discussed more in classic literature from Tversky & Kahneman (1985, 1986) and recent work by Riggs (2017). Put simply, the length of a walk to transit would frame whether a trip was classified as a walking trip as opposed to a transit trip. Comments indicated that individuals experienced long walks to transit for locations beyond 10 miles from campus, and, even though transit occupied the bulk of the distance of the trip, they classified their trip as a “walking trip” prima based on their individual experience. This is a phenomenon that warrants more detailed evaluation in the future, particularly as methods of gathering revealed information become more available, shedding new light on stated preference data.
Telework

Approximately 36% of the campus population teleworks (or telecommutes) at least once per week. This equates to roughly 8,000 individuals, who likely do not commute to campus. Parking and daily use surveys indicate that telecommuting usually occurs on Mondays or Fridays.

Travel Around Campus
Once people complete their commute, over 95% of respondents walk or bike to get around campus. Those who selected “Other” included a combination of modes, and using designated staff vehicles such as golf carts and electric trucks.
Parking Location
When asked where individuals parked, 90% of those who drive to campus indicated that they park in campus structures and lots, and only 1.6% pay for parking through meters or off-street parking. It is unclear whether those using residential parking permits are purchasing them to support their commute activities, however these individuals have self-reported that they “drive to campus”. Those who responded with “Other” often referred to parking in vanpool-designated spaces, or being dropped off.

Table 5

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>On street (city), meter</td>
<td>0.8%</td>
<td>14</td>
</tr>
<tr>
<td>On street (city), in residential parking zone, with residential permit</td>
<td>0.8%</td>
<td>14</td>
</tr>
<tr>
<td>On street (city), in residential parking zone, without residential</td>
<td>1.3%</td>
<td>23</td>
</tr>
<tr>
<td>On street (city), not in residential parking zone</td>
<td>1.6%</td>
<td>28</td>
</tr>
<tr>
<td>Campus structure or lot</td>
<td>90.0%</td>
<td>1,547</td>
</tr>
<tr>
<td>Off street (city or private), free</td>
<td>1.9%</td>
<td>33</td>
</tr>
<tr>
<td>Off street (city or private), paid</td>
<td>0.6%</td>
<td>10</td>
</tr>
<tr>
<td>Designated disabled parking spot (on or off campus)</td>
<td>0.6%</td>
<td>11</td>
</tr>
<tr>
<td>Other</td>
<td>2.3%</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,719</td>
</tr>
</tbody>
</table>

Only 10% of those who responded to the survey did not have a parking permit. Faculty and staff parking permits accounted for over half of all permits. Those who responded “Other” included those purchasing daily, weekly, or monthly permits, or vanpool permits.
Parking Lot Information from Survey

All of the lots on campus are used, with the most popular choices being (GS) Grand Avenue Parking Structure and (H4) Facilities. Respondents who chose “Other” referred to motorcycle and vanpool parking, or gave general directions without citing a specific lot.

Table 6

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA, I don't have a campus permit</td>
<td>5.2%</td>
<td>89</td>
</tr>
<tr>
<td>A1-Administration</td>
<td>1.2%</td>
<td>20</td>
</tr>
<tr>
<td>C1-Children’s Center</td>
<td>1.6%</td>
<td>27</td>
</tr>
<tr>
<td>C2-Children’s Center</td>
<td>4.7%</td>
<td>81</td>
</tr>
<tr>
<td>C3-Stadium</td>
<td>2.3%</td>
<td>40</td>
</tr>
<tr>
<td>C4-Business</td>
<td>2.6%</td>
<td>44</td>
</tr>
<tr>
<td>C6-Dining Complex</td>
<td>0.1%</td>
<td>2</td>
</tr>
<tr>
<td>C7-Engineering</td>
<td>6.0%</td>
<td>103</td>
</tr>
<tr>
<td>G1-Grand Avenue</td>
<td>6.7%</td>
<td>114</td>
</tr>
<tr>
<td>GS-Grand Avenue Parking Structure</td>
<td>21.6%</td>
<td>370</td>
</tr>
<tr>
<td>H01-Warehouse</td>
<td>1.0%</td>
<td>17</td>
</tr>
<tr>
<td>H01-Crops Unit</td>
<td>1.0%</td>
<td>17</td>
</tr>
<tr>
<td>H02-Campus Market</td>
<td>6.8%</td>
<td>116</td>
</tr>
<tr>
<td>H04-Facilities</td>
<td>10.0%</td>
<td>172</td>
</tr>
<tr>
<td>H10-Library</td>
<td>2.5%</td>
<td>42</td>
</tr>
<tr>
<td>H11-Agriculture Building</td>
<td>2.3%</td>
<td>40</td>
</tr>
<tr>
<td>H12-Via Carta</td>
<td>7.0%</td>
<td>119</td>
</tr>
<tr>
<td>H13-Research Development</td>
<td>0.4%</td>
<td>6</td>
</tr>
<tr>
<td>H14-Via Carta</td>
<td>2.0%</td>
<td>34</td>
</tr>
<tr>
<td>H15-Sports Complex</td>
<td>1.5%</td>
<td>26</td>
</tr>
<tr>
<td>H16-Beef Unit</td>
<td>4.7%</td>
<td>80</td>
</tr>
<tr>
<td>R1-University Housing</td>
<td>1.7%</td>
<td>29</td>
</tr>
<tr>
<td>R2-Grand Avenue</td>
<td>1.5%</td>
<td>25</td>
</tr>
<tr>
<td>R3-Village Drive Parking Structure</td>
<td>0.5%</td>
<td>8</td>
</tr>
<tr>
<td>R4-Canyon Circle Parking Structure</td>
<td>1.1%</td>
<td>19</td>
</tr>
<tr>
<td>Other</td>
<td>4.3%</td>
<td>73</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,713</td>
</tr>
</tbody>
</table>
**Type of Car**
Over half of those who drive a car, the majority drive 4-door sedans, with SUVs being the second most popular choice.

![Pie chart showing car types](image)

**Figure 5**

About 8% of respondents drive hybrid cars, with only 1.1% driving hybrid electric, plug-in electric, or electric vehicles. Given the population of daily drivers on campus (6,738 considering both those who drive alone and carpool) this equates to approximately 75 unique electric vehicle drivers every day. This does not include any occasional drivers or campus visitors.

**Table 7**

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>90.3%</td>
<td>1,546</td>
</tr>
<tr>
<td>Yes, hybrid</td>
<td>8.1%</td>
<td>138</td>
</tr>
<tr>
<td>Yes, hybrid electric / plug-in hybrid</td>
<td>0.5%</td>
<td>8</td>
</tr>
<tr>
<td>Yes, electric</td>
<td>0.6%</td>
<td>11</td>
</tr>
<tr>
<td>Other, please specify</td>
<td>0.6%</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,713</td>
</tr>
</tbody>
</table>
II: PARKING SURVEY

2015 Parking Counts and Bike, Ped, Auto Volumes

During fall (October) of 2015 parking counts and traffic volumes were collected over a 3-day period to better understand travel patterns, space occupancy across the campus. Data was collected Tue/Wed/Thurs during the AM (7-9am), Midday (11-1pm) and PM (5-7pm) hours. Of particular interest is the share of travel at each intersection, and the tendency to engage in circling behavior.

![Figure 6](https://docs.google.com/spreadsheets/d/14Xtj1MGkuG3sAMeAX-fh9-U0NQSNtzIwPp8gg9Odkys/edit?usp=sharing)

The geocoded raw data by time-of-day is available via the document link below. The summary data on the proceeding pages aggregated the data to uncover generalizable trends.

https://docs.google.com/spreadsheets/d/14Xtj1MGkuG3sAMeAX-fh9-U0NQSNtzIwPp8gg9Odkys/edit?usp=sharing.
Bicycle and Pedestrian Data

**Foothill and California Avenue**

The intersection of Foothill Boulevard and California Avenue observed the highest number of pedestrians, vehicles, and buses in the evening. Both the number of vehicles and buses increased throughout the day. Bicyclists used the intersection most frequently in the morning, but did not fluctuate much throughout the day, staying around 300 bicyclists per time. There is a significant jump in number of vehicles between morning and evening by about 2,000.
The intersection of Highland Drive and University Drive witnessed a similar number of all modes for both midday and evening.
Highland and California

The intersection Highland Drive and California Avenue witnessed the largest number of pedestrians at midday (around 225 for the two-hour period), and the largest number of bicyclists in the morning. Both vehicle and bus averages were highest in the evening, up slightly from the morning for both modes.
Highland and Slack had the most volume in the PM, averaging 200 pedestrian trips per hour (400 total) and 60 bike trips from the neighborhoods to the South of campus. This represented 67% of total traffic volume compared to the auto traffic.
The intersection of Village Drive and South Perimeter Road saw the highest numbers of pedestrians, vehicles, and buses in the morning. Bicyclists most frequently used the intersection midday. All of the modes did not vary drastically throughout the day. Especially during the morning and midday, pedestrian trips matched the number of auto-trips.
The intersection of Slack Street and Grand Avenue had the largest number of pedestrians and buses in the evening. Vehicles consistently used the intersection throughout the day, averaging about 1,500 vehicles for each time period. Bicyclists passed through the intersection most frequently during the morning and evening.

Parking Services Data

Cal Poly has a number of parking lots on campus for various users. Students, visitors and faculty all frequent campus for various durations of time. For planning purposes it is useful to determine which lots reach capacity by time and day. Parking data provided and recorded by the University Police Department allows planners to make decisions about the future by analyzing current conditions.

Currently, data is collected by recording parking space occupancy at 10:00 am and 2:00 pm during the second week of every quarter. Counts were not recorded at all lots on campus, instead, parking enforcement records data for only lots estimated to be the most frequently used. While this data provides some level of information, it does not provide a full snapshot of space occupancy by location and time. Given this, it is difficult to base planning projections on the data and apply the findings from the specific lots to the entire campus.
Despite this limitation, this analysis attempts to interpret and assess the parking data available. That said, it should be noted that there are opportunities to improve methods and gather better data. (For example in some cases the number of cars occupying lots exceeded the amount of parking spaces in lots in some instances.) This would improve the validity of any reports that might reference this dataset. To that effect, after review the data, we provide conceptual guidance on how to improve counting methodology on the campus.

In sum, trends in the data did show that the average space vacancy by day / time is highest on Fridays when compared to all other weekdays—a day when many with more flexible schedules likely do not come (or use other means of coming) to campus. Around 2pm both the North Quadrant parking area and the Grand Structure (garage) began to increase the number of vacant spaces and the rate goes up. On Fridays, this yielded an average occupancy of roughly 48% and 20% respectively at 2pm.

**Visitor Parking Data (Daily Users)**

Visitor parking data on the campus of Cal Poly San Luis Obispo was collected from the years 2011 to 2015, with only half of final year calculated due to time constraints. Three categories were analyzed when reviewing the data: Total Revenue; Total Number of Daily Use Permits Purchased; and Total Number of Daily Use Permits Purchased during Peak Hours. Data for all three categories exhibited a significant increase from 2011-2012, while all other yearly totals experienced moderate increases.

As far as type of permits purchased by visitors of the campus, All Day General Passes (daily use permits) are most common. It should be noted that only limited hourly permits are available for purchase; an area for potential future user and revenue growth. Between 2011 and 2014, the number of daily use parking permits purchased on the campus experienced an increase of 248% from 30,731 to
106,797 daily use permits purchased, although comparisons are limited based on the quality of information prior to 2012 and changes / increases in the pay stations available for permit purchase.

Over the four-year period, revenue increased by 279% from $30,672 to $106,797. Additionally, revenue was highest via parking daily use permits purchased during the hour of 1:00, pm four out of five years.

The hour that proved to be the peak hour turned out to be between 7:00 pm and 8:00 pm. From 2011 to 2014 the yearly total of daily use permits purchased by visitors of the campus during peak hour rose 194% from 4,431 to 13,021 permits.
Figures 9 and 10 particularly provide a window into the increased revenue possibilities of more sophisticated pricing strategies—something that could provide additional support for transportation demand management programs. This would help better manage supply / inventory in situations like what is illustrated in Figure 11—when General Passes actually declined between 2013-2014 despite a revenue increase.
Summary

In sum some key trends can be derived from the parking survey and from general pass data.

1. Permit parking on campus tends to fill up by 9am (at latest) and then experience very little turnover.
2. At the same time there is ample general permit demand, as the bulk of purchases tend to occur during the peak hours and events.

These two factors seem to indicate policy opportunities to reframe parking services for both permit holders and those who purchase daily / hourly use permits. Specifically this might include a combination of policies such as:

- Considering time of day or location based peak pricing and invest in related technology (gps, sensor, RFID or mobile) particularly for daily permit users;
- Unbundling monthly permits to allow for daily or hourly payment vs. monthly permits (gps, sensor, RFID or mobile) not to exceed maximum allowable;
- Using a climate impact charge on top of permit to account for the full cost of providing parking spaces (Tudela-Rivadeneyra, Shirgaokar, Deakin, & Riggs, 2015).

At the same time, consistent with literature (Benson, Cooper, & Knott, 2008; Hamilton, 2008; Riggs, 2015, 2016; Riggs & Kuo, 2015) exploring rough social and financial TDM strategies would behoove the campus in parallel—developing a comprehensive program to incentivize active commuting via walking and biking. Strategies might include:

- Social Market Norms
  - A social application that allows for group connections
  - A commute club where campus travelers are entitled to a free cup of coffee or juice when they travel via walking or biking
  - A free monthly gym membership to allow for shower before work and support a holistic healthy lifestyle / workplace.
  - Bike Voucher Programs

- Financial Market Norms
  - Money back or “cash-out” for taking an alternative mode of transportation to work, as an offset to the fact that they did not use the campus parking resource.
  - Hybridized cash-out program where commuters are entered in to a daily raffle for a prize of cash or goods. Literature shows that this can have an equal effect as cash-outs since, as long as individual are engaged, they believe they have a chance at winning (Ariely, 2008; Heyman & Ariely, 2004).
  - A points-based or competition (number of steps or miles traveled) based system where you can earn small rewards or wager points for larger rewards. A variation of this approach has been very successful as a part of the Stanford CAPRI program (Green, 2007) which used gamification to encourage off-peak commuting.
III: PARKING SURVEY METHOD SUGGESTIONS

Analysis of parking data revealed that certain practices might improve survey methods and the data collected in the future. For example, daily permit data might be more useful if it were cataloged by month, possibly displaying months with the most purchases by location. Furthermore, data consistency over time should be paramount to allow for accurate comparing and adjustment when looking at inventory usage and price setting, along with a regularly scheduled mode survey. This modal survey should be conducted every 2-3 years to provide longitudinal comparisons and benchmarking. The questions/instrument used as a part of this survey is provided in part IV of this document for future use.

While daily permit data can be gathered automatically and survey information gathered online, better lot usage information as whole is critical in the future. The points below outline a methodology for recommended monthly or quarterly surveying and data gathering in parking lots. First it provides instructions on what should be recorded and instructions on how to deal with certain situations (valet; no plates). This is followed by a diagrammatic floor plan and some baseline information for each lot. In the future, we suggest exploring virtual/mobile or license plate recognition (LPR) technology to streamline and eliminate human judgment error from these surveys.

Data Recording

On the form that follows collect the following information

- **State:** For Efficiency, only record if NOT California
- **License Plate Number:**
  - Mark both with large X if there is no license (new car, etc.)
- **Permit Number:**
  - Permit should be displayed visibly on dash
  - Permit number includes data indicating the year, permit type and number (if possible) so make sure you get the whole string
  - If no permit mark with large X and indicate in notes (Yes or No) if there is a citation
  - If there are two placards (required for carpool) record one permit number in the box provided and another in the notes; indicate if the other number is not visible
  - Include permits/plates for motorcycles
  - Include any irregularities in notes/comments box; this includes things like departmental reserved, university vehicles and oddities such as a pile of lumber or coned off spaces in addition to things such as potential carpool violations (e.g. one person getting out of car with carpool tags)

Survey Protocols

- Surveyors should show up at least 15 minutes early so that you can get a sense of the context/garage
- Surveyors should start promptly at the indicated start times, and to end within an hour. If you happen to begin a little later or end a little later, please indicate it on the data collection form so that we have good research documentation of when the surveys are conducted
- Be consistent and to record the numbers according to a pattern that allows you to easily keep track of where you have been in a garage and communicate with your partners so there is no overlap.
- If there is anything unique that occurs (people ask for direction or if they can pay for public parking during the day) write it down in the notes
- If people inquire what you are doing, let them know that you are assisting with robust occupancy/parking utilization surveys
# Parking Data Collection Form

<table>
<thead>
<tr>
<th>Surveyor Name</th>
<th>Garage Name</th>
<th>Garage Level</th>
<th>Weather</th>
<th>Additional Notes:</th>
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<th>Valet</th>
<th>State</th>
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<th>Permit #</th>
<th>Notes</th>
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Riggs 2016 26
IV: CALPOLY TRAVEL SURVEY QUESTIONS

CAMPUS AFFILIATION

INFORMATION POSSIBLY PROVIDED WITH SEED / AUTHENTIFICATION DATA
1. What is your campus affiliation? If you have more than one, choose the one you most strongly identify with.

   Student
   - Undergraduate
   - Graduate

   Nonstudent
   - Professor/Associate Professor
   - Assistant Professor
   - Adjunct / Lecturer
   - Other Faculty/Academic (includes Emeriti)
   - Executive / Staff
   - Staff
   - Corporation Employee
   - Visiting Scholar
   - Other, please specify

TRAVEL TO CAMPUS

2. Thinking about your commute as a whole, how did you usually travel during the spring of 2015. Just so you know, we call this your ‘primary mode.’

   - Bicycle
   - Drive Alone
   - Drive or Ride with Others (Carpool / Vanpool)
   - Public Transit (Bus)
   - Walk
   - Other: please specify
3. Some people get to campus the same way each day, others travel in different ways by day. Please tell us more specifically how you got to campus on average during the spring of 2015. Choose all that apply.

<table>
<thead>
<tr>
<th></th>
<th>Bike</th>
<th>Drive Alone</th>
<th>Drive or Ride with Others (Carpool / Vanpool)</th>
<th>Public Transit</th>
<th>Walk</th>
<th>Other: Specify</th>
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<tbody>
<tr>
<td>Never Use this mode</td>
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<td>3-4 days per week</td>
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<td>5+ days per week</td>
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4. Some people use a different mode to return home from campus than they use to get to campus. Please tell us how you usually returned home from campus during the spring of 2015?

- Bike
- Drive Alone
- Drive or Ride with Others (Carpool / Vanpool)
- Public Transit (Bus)
- Walk
- Other: Specify

5. What time do you usually first ARRIVE on campus? Select one option for each day of the week.

<table>
<thead>
<tr>
<th>Day</th>
<th>Do not usually come to work</th>
<th>Before 7:30 am</th>
<th>7:30 - 8:29 am</th>
<th>8:30 - 9:29 am</th>
<th>9:30 - 10:29 am</th>
<th>10:30 am - 12:59 pm</th>
<th>1:00 - 3:29 pm</th>
<th>3:30 - 4:29 pm</th>
<th>4:30 - 5:29 pm</th>
<th>5:30 pm or later</th>
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6. What time do you usually first DEPART on campus? Select one option for each day of the week.

<table>
<thead>
<tr>
<th>Day</th>
<th>Do not usually come to work</th>
<th>Before 7:30 am</th>
<th>7:30 - 8:29 am</th>
<th>8:30 - 9:29 am</th>
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<th>10:30 am - 12:59 pm</th>
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7. On the days when you do not come to campus, do you telework?
   - Yes / No
   - Other, please specify

8. If the campus were to more formally consider a telework opportunities would you be interested?
   - Yes / No

**DRIVING & CARPOOLING**

9. You indicated that you drive at some times to campus. Where do you typically park?
   - On street, meter
   - On street, in residential parking zone, with residential parking permit
   - On street, in residential parking zone, without residential parking permit
   - On street, not in residential parking zone
   - Campus structure or lot
   - Off street, free
   - Designated disabled parking spot (on or off campus)
   - Other, please specify

10. Do you have a campus parking permit?
    - Yes, Faculty/Staff permit
    - Yes, Student permit
    - No permit
    - Yes, Other type of permit, please specify

*ONLY TO THOSE WITH CAMPUS PARKING PERMIT*

11. On average, in which Cal poly lot do you usually park? Check all that apply. (Parking Map Available Here: [LINK](#))

12. Do you frequently have to drive around looking for parking or go to more than one parking lot to find parking?
    - No
    - Yes
      - How long does this search typically take (in minutes)?

13. What type of car do you drive?
    - 4-door sedan
    - 2-door coupe
    - Van/wagon
    - Sports car
    - Sports utility
    - Pickup truck

14. What is the Model year?
    - Year dropdown

15. Is your car a hybrid or electric vehicle?
    - No
    - Yes, hybrid
    - Yes, hybrid electric / plug-in hybrid
    - Yes, electric
    - Other, please specify
RANDOMLY SELECTED DRIVERS UP TO N=100
16. Will you agree to turn in your parking pass and not drive for a week some time in the next year? In exchange we will give you a $5 Amazon gift card.
   • Agree
   • Do not agree

RANDOMLY SELECTED DRIVERS UP TO N=100
17. Will you agree to turn in your parking pass and not drive for a week some time in the next year? If you agree, we will give you a free cup of coffee.
   • Agree
   • Do not agree

RANDOMLY SELECTED DRIVERS UP TO N=100
18. Will you agree to turn in your parking pass and not drive for a week some time in the next year? If you agree, we will give you a free cup of coffee (~value $2).
   • Agree
   • Do not agree

RANDOMLY SELECTED DRIVERS UP TO N=100
19. Will you agree to help us make the campus a more green environment and reduce campus commute emissions by turning in your parking pass and not driving for a week some time in the next year?
   • Agree
   • Do not agree

MULTIMODAL

20. Once you have completed your commute, how do you get around on-campus for class, meetings, study, work, etc.? 
   • Bicycle
   • Drive Alone
   • Drive or Ride with Others (Carpool / Vanpool)
   • Public Transit (Bus)
   • Walk
   • Other, please specify

21. On the days that you walk, bike or take transit to work how many minutes per day do you engage in other forms of moderate or vigorous exercise (estimate in whole numbers)? Examples of moderate exercise are walking briskly, playing tennis or bicycling. Examples of vigorous exercise are race walking or running, lap swimming or strenuous hiking.
   • Minutes
   • Not applicable, I don’t walk or bike to work

22. How many minutes do you do vigorous exercise on an average day?
   • Minutes
   • Not applicable, I do not engage in vigorous exercise
AIR TRAVEL

23. How often do you fly for CalPoly-related purposes?
   - # In-state
   - # Domestic
   - # International

ABOUT YOU / BACKGROUND

24. Please provide us with your local address so we understand how far you live from campus. Enter the closest cross street / closest intersection, the city and zip code. Keep in mind that if your permanent address is not the same as your local address, that you should provide your local address.

25. What is your sex?
   - Male
   - Female

26. In what year were you born?
   - Year

27. What is your marital status?
   - Never married
   - Married
   - Divorced
   - Widowed

28. Ethnicity
   - Hispanic or Latino
   - Not Hispanic or Latino

29. Race: Please specify your race
   - American Indian or Alaska Native
   - Asian
   - Black or African American
   - Native Hawaiian or Other Pacific Islander
   - White

30. What is your height in feet and inches?

31. What is your weight in pounds?
STUDENT BACKGROUND

32. What is your year of study?
   • 1 year or less
   • 1-2 years
   • 3-4 years
   • 4-5 years
   • 5 or more years

33. What is your primary college or school (choose only one)?
   • College of Agriculture, Food and Environmental Sciences
   • College of Architecture and Environmental Design
   • Orfalea College of Business
   • College of Engineering
   • College of Liberal Arts
   • College of Science and Mathematics

34. What type of housing do you live in?
   • Own a house or condominium by you or someone in this household with a mortgage or loan?
   • Own a house or condominium by you or someone in this household free and clear (without a mortgage or loan)?
   • Rent a private (non-campus affiliated) apartment or condominium
   • Rent a private (non-campus affiliated) house or duplex
   • Rent a room in a shared household / private home
   • University-owned residence hall
   • University-owned apartment
   • Fraternity or sorority
   • Live rent free with parents or relatives
   • Live rent free in a unit owned by parents or relatives
   • Other, please specify:

FACULTY / STAFF BACKGROUND

35. What is your primary college or school (choose only one)?
   • College of Agriculture, Food and Environmental Sciences
   • College of Architecture and Environmental Design
   • Orfalea College of Business
   • College of Engineering
   • College of Liberal Arts
   • College of Science and Mathematics

36. How many years have you been employed at Cal Poly? Please include full-time and part-time appointments, but do not count student positions.
   • 1 or less
   • 2
   • 3
   • 4
   • 5
   • 6
   • 7
   • 8
   • 9
37. What is your estimated annual household income, from all sources?
   - Less than $25,000
   - $25,000 - $49,999
   - $50,000 - $74,999
   - $75,000 - $99,999
   - $100,000 - $124,999
   - $125,000 - $149,999
   - $150,000 - $199,999
   - $200,000 or more
   - Prefer not to answer

38. How many people (including yourself) make up your household?
   - 1
   - 2
   - 3
   - 4
   - 5 or more
39. What type of housing do you live in?
   • Own a house or condominium by you or someone in this household with a mortgage or loan
   • Own a house or condominium by you or someone in this household free and clear (without a mortgage or loan)
   • Rent a private (non-campus affiliated) apartment or condominium
   • Rent a private (non-campus affiliated) house or duplex
   • Rent a room in a shared household / private home
   • Other, please specify:

40. How many children under the age of 18 live with you at least 50% of the time?
   • 0
   • 1
   • 2
   • 3
   • 4 or more

41. Not including utilities, taxes or insurance, how much is your monthly housing cost (mortgage payment or rent)?
   • Less than $500
   • $500 to $999
   • $1000 to $1499
   • $1500 to $1999
   • $2000 to $2499
   • $2500 to $2999
   • $3000 to $3499
   • $3500 to $3999
   • $4000 to $4499
   • $4500 to $4999
   • More than $5000

COMMENTS / FEEDBACK

42. Do we have your permission to follow up with you if we have any questions about your responses?
   Yes / No

43. Is there anything else you would like to say about transportation or housing at Cal Poly or are there suggestions you have to help us improve our surveys in the future
REFERENCES


