Trip Generation and Parking Study
Oxford Plaza, Berkeley

Institute of Transportation Engineers
University of California, Berkeley
Student Chapter

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Background

The ITE Student Chapter at UC Berkeley (Cal ITE) has completed a trip generation and parking study at Oxford Plaza, a mid-rise apartment building located in Berkeley, CA. (See Figure 1.) Completed in early 2009, Oxford Plaza provides housing for low-income families. Its non-profit developer, Berkeley-based Resources for Community Development (RCDev), specializes in constructing affordable and environmentally sustainable residential buildings.

Figure 1: Exterior Photo of Oxford Plaza

The six-story building contains 97 units of housing, of which 95% are currently occupied by 217 residents. A garage exclusively for residents has a capacity for 40 vehicles in addition to 1 car-share space, while a bicycle room provides parking to accommodate 54 bicycles. The ground floor has 8500 square feet of available retail space; however, as this space is still unoccupied to date, Oxford Plaza has been categorized as a residential land use for this study. (See Figure 2.)

General	
Stories	6
Retail Space (sf)	8500
Housing	
Residents	219
Dwelling Units	97
Occupancy Rate	0.95
Average Household Size	2.4

Parking	
Total Spaces for Rental	40
Vehicles Registered	42
Standard Spaces	38
Handicap Spaces	2
Motorcycle Spaces	2
Car Share Spaces	1
Bicycle Spaces	54

Figure 2: Table of Oxford Plaza Statistics

Oxford Plaza is located on 2175 Kittredge Street just to the west of the UC Berkeley campus in Downtown Berkeley. (See Figure 3.) Its proximity to dense commercial activity as well as a dozen transit lines (including AC Transit and Bay Area Rapid Transit) obviate the need for residents to travel by automobile on many of their trips.

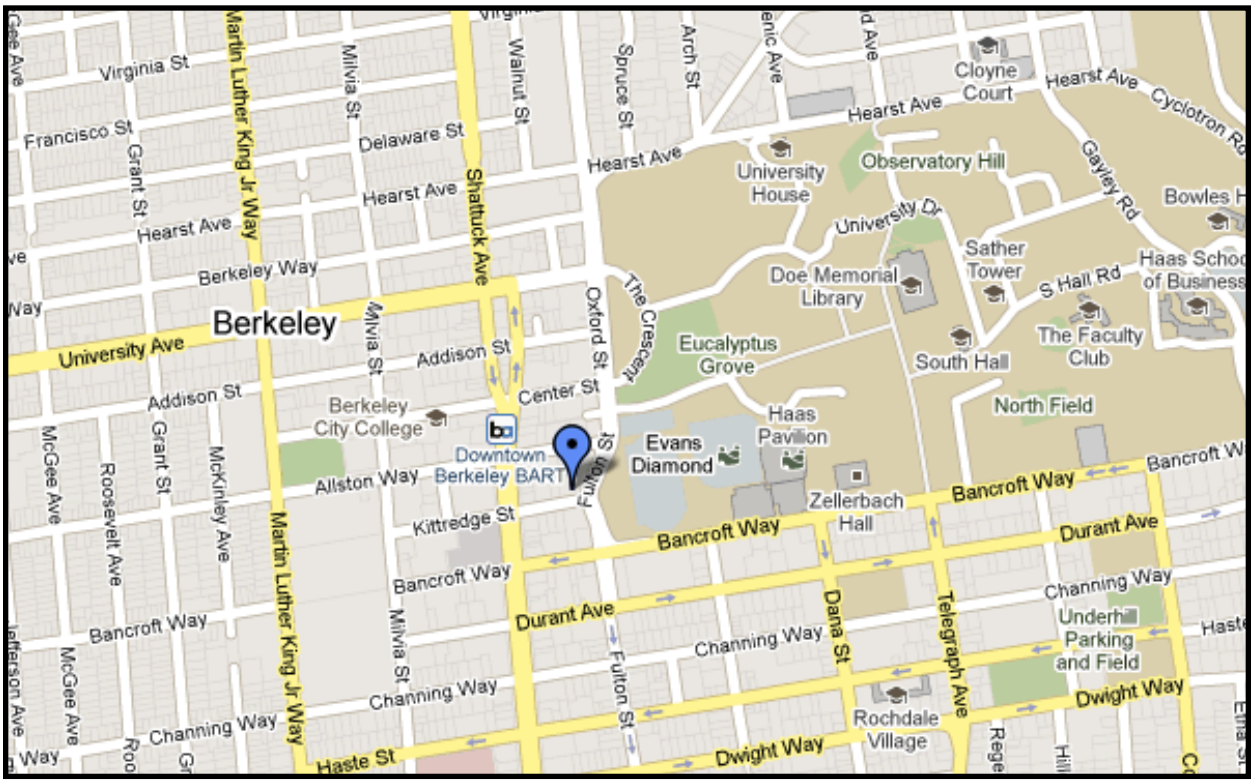

Figure 3: Area Map (Source: Google Maps 2010)

Data Collected

Data collection took place continuously from 7:00am to 6:00pm on three weekdays in March 2010: Thursday the 4th, Wednesday the 10th, and Tuesday the 16th. Through the participation of 21 Chapter members, Cal ITE recorded all person trip ends and vehicle trip ends at Oxford Plaza. Volunteers administered personal surveys to identify trip modes and made visual counts to monitor parking demand.

Person-trips are characterized by mode choice, which comprise of automobile, car pool, walk, bike, and transit trips. To note, both the drivers and passengers of automobiles or carpools are counted as auto or carpool trips, respectively.

Vehicle-trips were identified by occupancy and further differentiated by “on-site” trips and “off-site” trips. Vehicles using the Oxford Plaza garage were counted as on-site vehicle trips, whereas vehicles parking on the street were counted as off-site vehicle trips. (Only on-site trips are reported in the ITE Trip Generation Data Forms attached.)

Results: Trip Generation

The total hourly trips over the observation period are shown in Figure 4. All three days of observation yield the same hour for the AM peak period and indicate a predictable travel pattern in the mornings. As observed during the data collection, the purpose of most morning trips was work or school related, thereby accounting for the uniform time of peak travel across the three week days. However, the time of the PM peak exhibits less consistency, as each day experiences a different hour of peak afternoon travel. Trip purpose in the afternoons demonstrated greater variety, ranging from work and school trips to recreational trips to nearby retail, parks, and civic buildings. On average, the total number of trips made from 1:00pm-6:00pm was 17% higher compared to the period of 7:00am-12:00pm. The spontaneous recreational trips of the afternoon likely account for the disparity between AM and PM travel patterns and intensity.

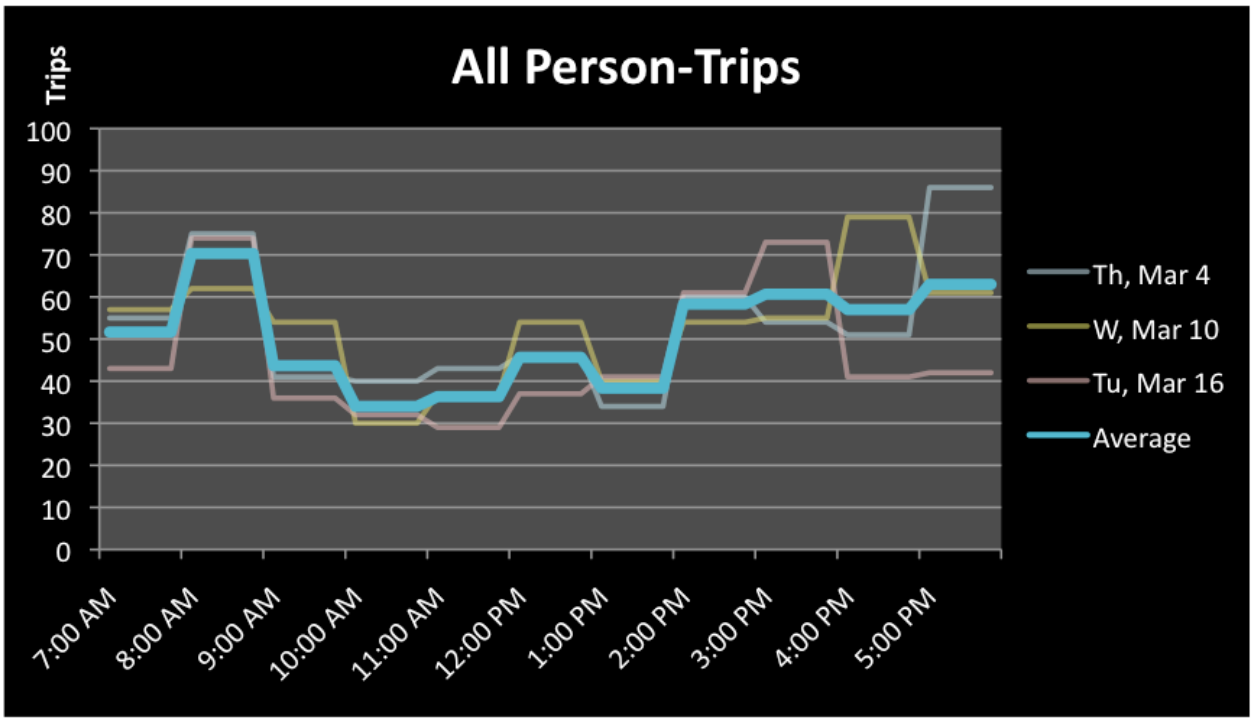

Figure 4: Total Trips Observed per Hour

As summarized in Figure 5, the weather conditions varied appreciably over the three observation days. In particular, Tuesday March 16 saw warmer temperatures and one additional hour of daylight due to the start of daylight savings time on March 14. Notably, travel patterns deviated on March 16th with 10% fewer trips compared to March 4th and 10th.

	Hi Lo	Sunset	Sky
Th 3/4	56° 40°	6:06p	
Wed 3/10	56° 43°	6:12p	
Tu 3/16	69° 47°	7:17p	

Figure 5: Daily Weather Conditions for Observation Days

The most popular modes of transportation are driving, walking, and transit with 35%, 44%, and 15% mode shares respectively. (See Figure 6.) Given the proximity to the highly developed urban core of Berkeley as well as high access to nearby transit alternatives, residents walk or take public transit almost twice as much as they drive.

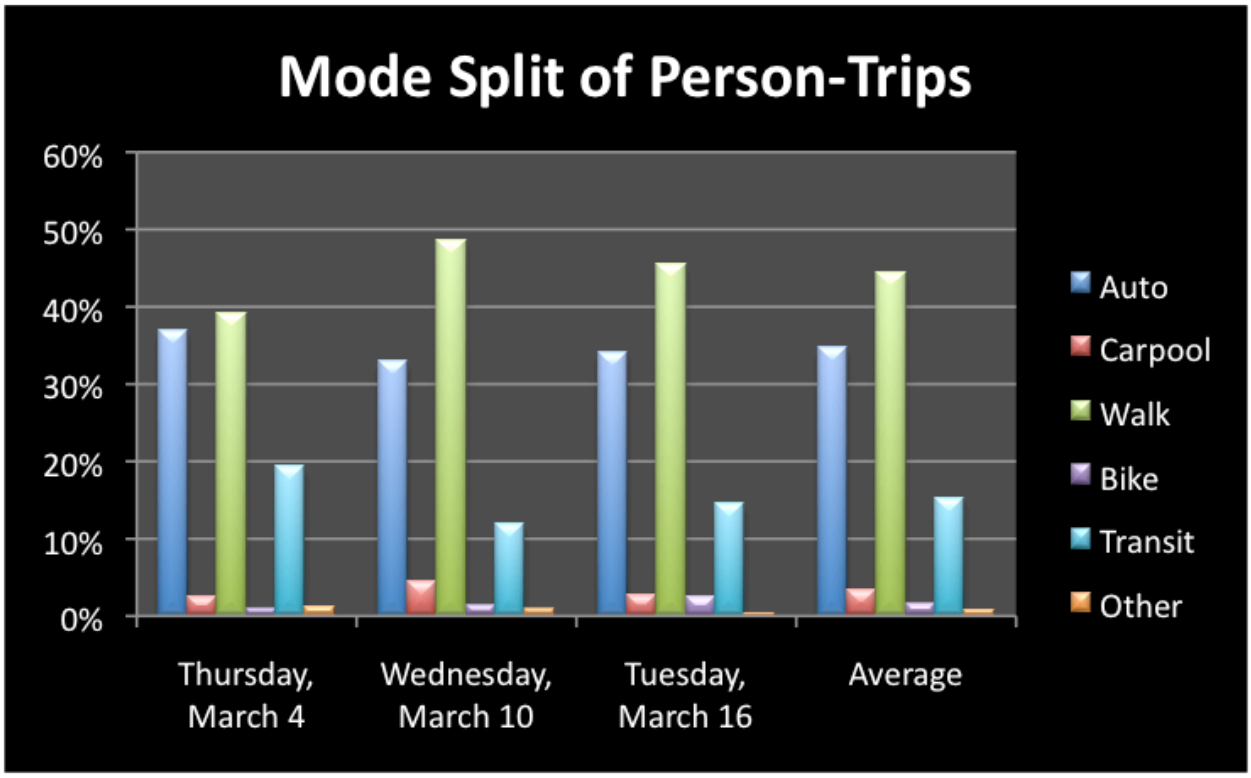

Figure 6: Cumulative Mode Split

Figure 7 shows the three-day average of the number of hourly trips made during the observation period according to mode choice. Automobile trips have highly distinctive peaks in both the morning as well as evening. (The true PM peak of automobile trips may occur after 5:00pm-6:00pm; however, the observation period did not extend past 6:00pm.) The most dominant mode of transport, walking, also shares the same morning peak period as autos but exhibits an earlier afternoon peak period from 3:00pm-4:00pm. These afternoon trips were often made to and from nearby commercial activity, as discussed above.

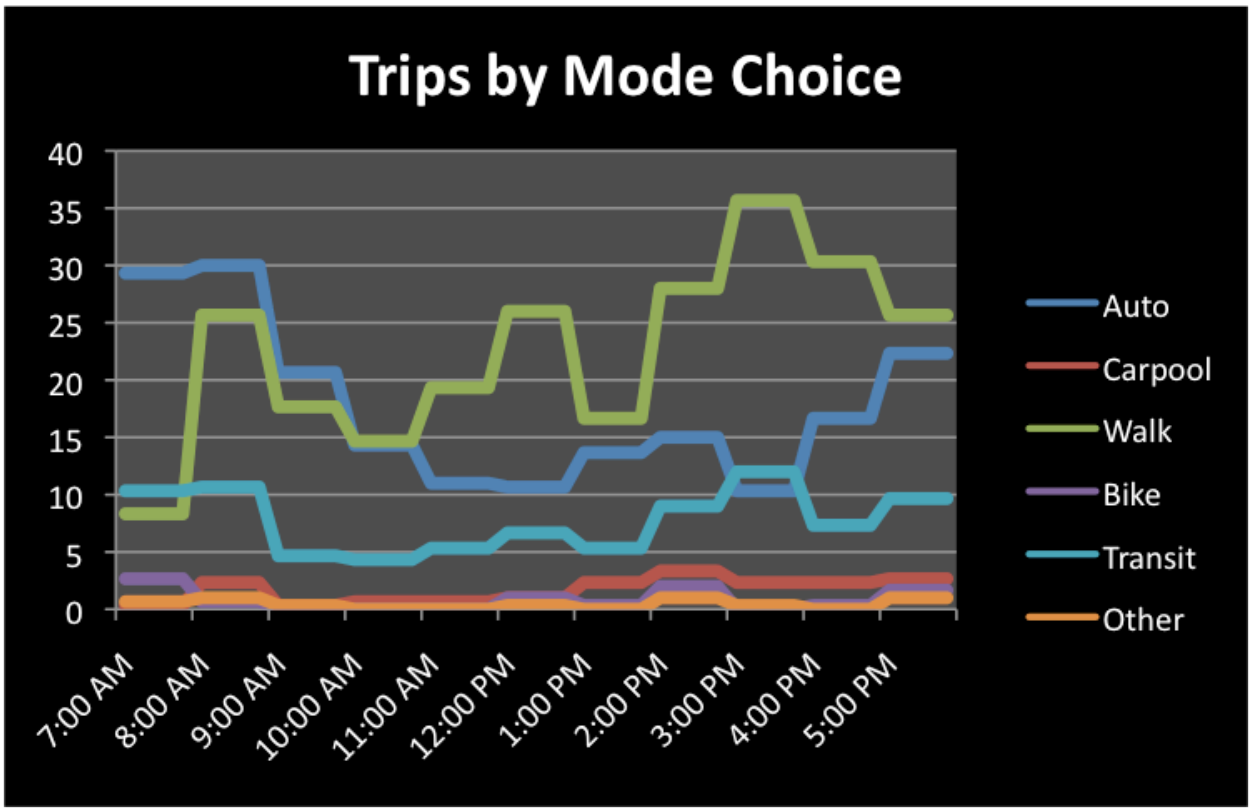

Figure 7: Hourly Person-Trips by Mode Choice, Three-Day Average

The high rates of walking and transit contribute to the low vehicle trip generation rates of Oxford Plaza. Figure 8 compares the trip rate of the weekday peak of generator (by dwelling unit) of Oxford Plaza with the rates of a typical apartment and mid-rise apartment provided by the ITE Trip Generation Manual, 8th Edition. Provided are rates for vehicle-trips made in and out of the residential garage as well as rates for all vehicle trips which include automobiles parked on the street. Reductions in vehicle trip rates range from 29% to 74%. Figures 9 and 10 provide additional trip data for the AM and PM peak hours of the generator.

Vehicle-Trips per Dwelling Unit (Weekday Peak of Generator)	Vehicle Trips to On-Site Garage		All Vehicle Trips	
	AM	PM	AM	PM
3-Day Average	0.14	0.09	0.25	0.16
ITE Apartment (220)	N/A	N/A	0.50	0.61
ITE Mid-Rise (223)	N/A	N/A	0.35	0.44

Figure 8: Trip Generation Rates

Variable	Thursday March 4	Wednesday March 10	Tuesday March 16	3-Day Average
AM Peak Hour	8:00am - 9:00am	8:30am - 9:30am	8:00am - 9:00am	N/A
Vehicles	15	33	20	23
Vehicle Occupants	30	45	34	36
Average Occupancy	2.0	1.4	1.7	1.6
Pedestrians	31	13	26	23
Bicycles	0	0	0	0
Transit Users	13	5	12	10
Total Trips	75	63	74	70
% Entering	15%	22%	14%	17%
% Exiting	85%	78%	86%	83%

Figure 9: Trip Data for AM Peak Hour of Generator

Variable	Thursday March 4	Wednesday March 10	Tuesday March 16	3-Day Average
PM Peak Hour	4:30pm - 5:30pm	4:00pm - 5:00pm	5:00pm - 6:00pm	N/A
Vehicles	17	13	13	14
Vehicle Occupants	32	17	14	21
Average Occupancy	1.9	1.3	1.1	1
Pedestrians	27	49	14	30
Bicycles	1	0	4	2
Transit Users	13	8	7	9
Total Trips	78	79	42	62
% Entering	67%	63%	57%	63%
% Exiting	33%	37%	43%	37%

Figure 10: Trip Data for PM Peak Hour of Generator

Results: Parking

The small number of available parking spaces within the residential garage promotes the low vehicle usage by Oxford Plaza residents. With only 40 leasable spaces in the garage, Oxford Plaza supplies 0.4 spaces per dwelling unit. Several residents commented on the unaffordable monthly parking rate of $75, yet the management reports that 42 vehicles are officially registered for spaces in the garage. Despite the fact that the number of registered vehicles exceeds garage capacity, the maximum occupancy recorded on all three days of data collection was 28 vehicles at 7:00am, the start of the observation period.

Many residents reported that they use on-street parking in residential permit parking zones designated by the City of Berkeley. The street parking permit costs $30 annually, providing a financially attractive alternative to parking on-site. The closest non-metered, permit parking area is located over two blocks (800 feet) south of Oxford Plaza, yet 53% of vehicle trips were made with vehicles parked on the street (this percentage includes other types of off-site parking as well, such as metered parking, illegal double parking, etc).

Although Oxford Plaza provides a relatively small garage in order to maximize affordability or perhaps to encourage the use of non-motorized transport, the effects of limited on-site parking are unclear. This study finds, however, that the garage alone does not adequately serve the parking demand by Oxford Plaza residents, as evidenced by the high rates of off-site parking.