Connectivity and Community: A Study of Transit in Pflugerville

URB 315 Prof. Lowell

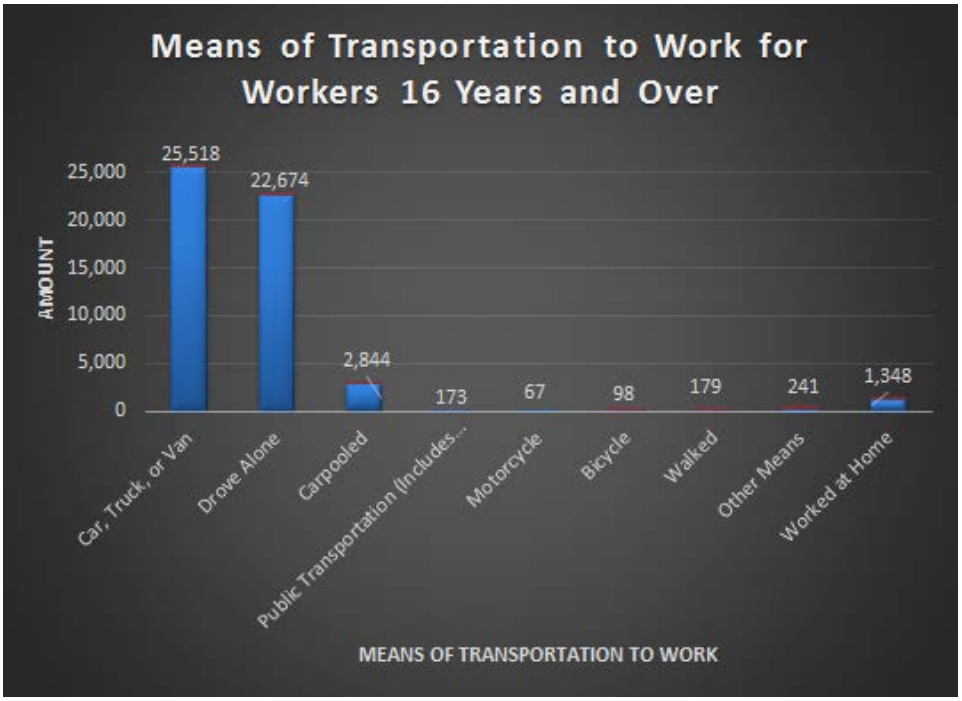
Sylvia Feghali

May 8, 2017

Background

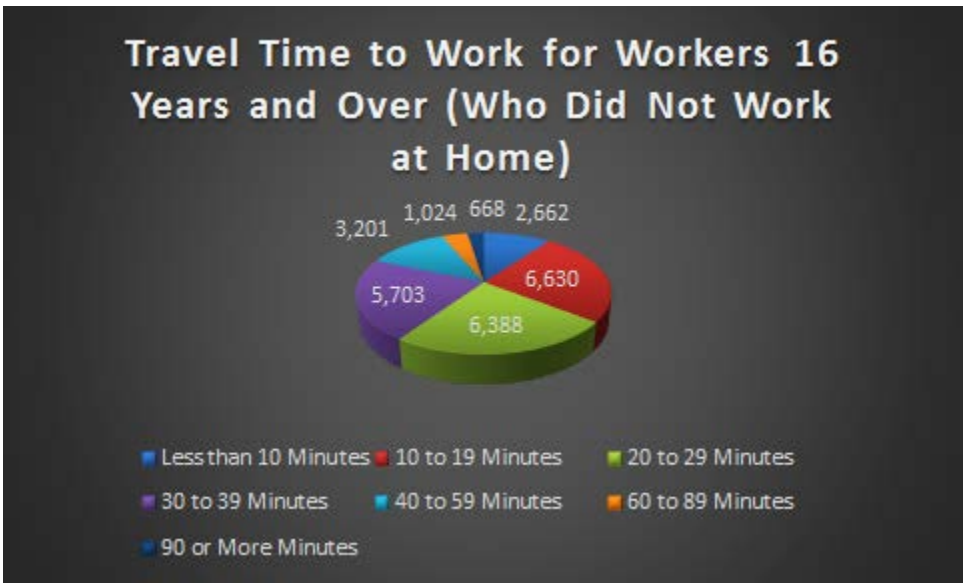
In 2014, Pflugerville hosted an estimated population of 52,128 residents, and is projected to grow to about 165,000 by 2035 (Social Explorer, 2014, City of Pflugerville, 2015, p. ES-3). Growth of this magnitude will undoubtedly be accompanied by developmental strains as the infrastructure and character of the city is expected to keep up with a rapidly growing population. In its current state, Pflugerville remains a city characterized as “suburban”. It had a density of 2,335.8 people per square mile in 2014, and transportation statistics within Pflugerville depict an extraordinarily high percentage of the population, 91.9%, use a personal vehicle such as a car, truck, or van, to commute to work (Figure 1). Of those who commute with a personal vehicle, 81% commute alone, and most of these drivers have a commute time between 15 and 44 minutes (Figure 2)(Social Explorer, 2014). What this shows is great automobile dependency, and a commuting pattern in which most residents of Pflugerville are driving out of the city to work. With the projected growth Pflugerville is expecting, this transit pattern will lead to greater traffic congestion and strengthen the characterization of Pflugerville as a commuter town. It is for these reasons that investigations into more efficient and multimodal transit and infrastructure design are crucial to future of Pflugerville.

Figure 1.



Note: Adapted from Social Explorer data

Figure 2.



Note: Adapted from Social Explorer data

To understand Pflugerville's transit patterns, it is important to look to transportation developments in cities that have similar demographic situations, densities, and intercity relationships. One of these methods is transit-ready-development successfully implemented in

Rancho Cucamonga, California, a city of density 4,147 people per square mile, not so different from Pflugerville. Transit-ready-development is the implementation of practices that would normally be seen around a transit hub, but without the transit (Social Explorer, 2014.; Haya, n.d.). What this looks like are wide sidewalks, mixed use buildings with developments, densification of housing, street lighting, well-kept landscapes, and available space for biking and bike parking. This transit-ready-development model also encompasses infrastructural elements of 'complete streets' that encourage utilization of public space while serving as hubs for transit stations in the future, incentivizing the planning of public transportation.

Complete streets are another model for transit infrastructure that emphasize greater equality among modes of transportation. The idea of complete streets is that everyone is can use them, they are not built exclusively for the automobile, as is the norm for most transit development. They incorporate bike lanes, public transportation, safe sidewalks, and vehicular traffic in a unified manner that supports the use of space by pedestrians and cyclists rather than discouraging it. One way to encourage a development of complete streets, especially within the frameworks of transit-ready-development previously discussed, is to increase foot traffic and bike traffic by implementing traffic calming techniques. This includes an increase in speed bumps near high volume pedestrian regions, more frequent cross-walks, trees and landscaping, and traffic signals (Drennen, 2003). The goal of traffic calming is to reduce automobile speed in certain areas to make streets safer thus attracting people to them for multi-use. Some of these practices were put in place on Valencia Street in San Francisco, California, and were reviewed positively by residents of the area. One success was found in the planning of the street itself; they input bike lanes going both directions, one lane for car traffic in each direction, and a turn lane down the center. Businesses in the area reported a perceived increase in patrons and foot traffic

into their buildings after the bike lanes were added (Drennen, 2003). This demonstrates the potential that traffic calming can have on economic investment in a growing place, which has a domino effect on the popularity of a street, the sociability of the space, upkeep, success of local businesses, and in turn more development.

A similar city, Dublin, California, is a great example for what Pflugerville might aim toward achieving in the future. Dublin has a very integrated system of bike trails both on street, with buffers, and totally isolated from vehicular traffic (Dill & Carr, 2003). This allows cyclists to access main roads that feed into central places within the city in a way that does not put them in direct contact with cars, but also to maintain safe routes away from high speed traffic. Dublin also includes under-crossings for bikes to have safe access across freeways, a type of connectivity that does not exist in Pflugerville and isolates cyclists' ability to commute (Dill & Carr, 2003). With these types of additions to the bike paths in Pflugerville, residents would have alternative routes into the city where bike lanes already exist to be connected to. Additionally, these paths would serve a recreational purpose as well, strengthening the character that residents seek to preserve.

Methods

To begin our investigation, my team collected qualitative data in three types of observational settings. The first was through unstructured observation. We split up and visited Pflugerville on different days and at different times, as our schedules permitted. This allowed us to make note of patterns at different days and times. We initially observed indicators related to walkability, biking, condition of infrastructure, location and number of crosswalks, condition of signage, and lighting to uncover trends related to trail and sidewalk usage.

Table 1: Observation Schedule					
	Wednesday March 8th	Thursday March 9th	Wednesday March 22nd	Friday March 24th	Saturday April 29th
9:00 am-10:00 am					Structured
10:00 am-11:00 am					Structured
11:00 am-12:00 pm					
12:00 pm-1:00 pm					
1:00 pm-2:00 pm					
2:00 pm-3:00 pm	Unstructured				
3:00 pm-4:00 pm	Unstructured				
4:00 pm-5:00 pm	Unstructured	Unstructured			
5:00 pm-6:00 pm		Unstructured		Structured	
6:00 pm-7:00 pm		Unstructured		Structured	
7:00 pm-8:00 pm			Structured		

Based on these trends that were noted through unstructured observation, we decided to go back to Pflugerville to specifically make note of the number of bike racks, bicycles, and

cars parked in lots. We chose to focus on locations that had a lot of public traffic—HEB on Pecan/Dessau, Pflugerville High School, Pflugerville Public library, Timmerman Elementary School, and the First Baptist Church. Focusing on these locations allowed us to follow patterns across consistent destinations. It was important to maintain some constants throughout our observations to capture overall trends over different time periods. For this round of observations, we went out on a Wednesday night, a Friday evening, and a Saturday morning.

The third method was through surveying residents. Here, my group focused our curiosities on biking and walking trends as they compare to driving. To obtain our results, some of our group members walked around Pflugerville and interviewed people they met, but we obtained most of our data through an online survey portal that we posted in a Pflugerville community forum. To this we received over 236 responses, an overwhelming amount of feedback. Thus, our sample came largely from those residents of Pflugerville who are a part of the community Facebook group, frequent the page enough to have seen the survey, and thought it worth their time to fill out the questionnaire without any of us approaching them in person. We found that this survey method was extremely efficient in the collecting, data input, and analysis portions of our testing. We were weary, however, of potential volunteer sampling bias that tends to represent the extremes of a population, rather than the entire population's general trends (Montello & Sutton, n.d., p. 146). Despite this, it was a very successful method of data collection overall.

Findings

To begin our unstructured observations, one group went in the afternoon on a Wednesday and observed no one using the sidewalks along Pecan Street, but many people

using the paths on Pfluger Street, leaving Pflugerville High school. There were also many bicycles parked on the racks at the high school Wednesday afternoon (Figure 3). We noted other trends like disconnected sidewalks and trails along Pecan Street and there were no noted crosswalks along the commercial strip of Pecan for 10 blocks between 10th Street and Railroad Avenue.

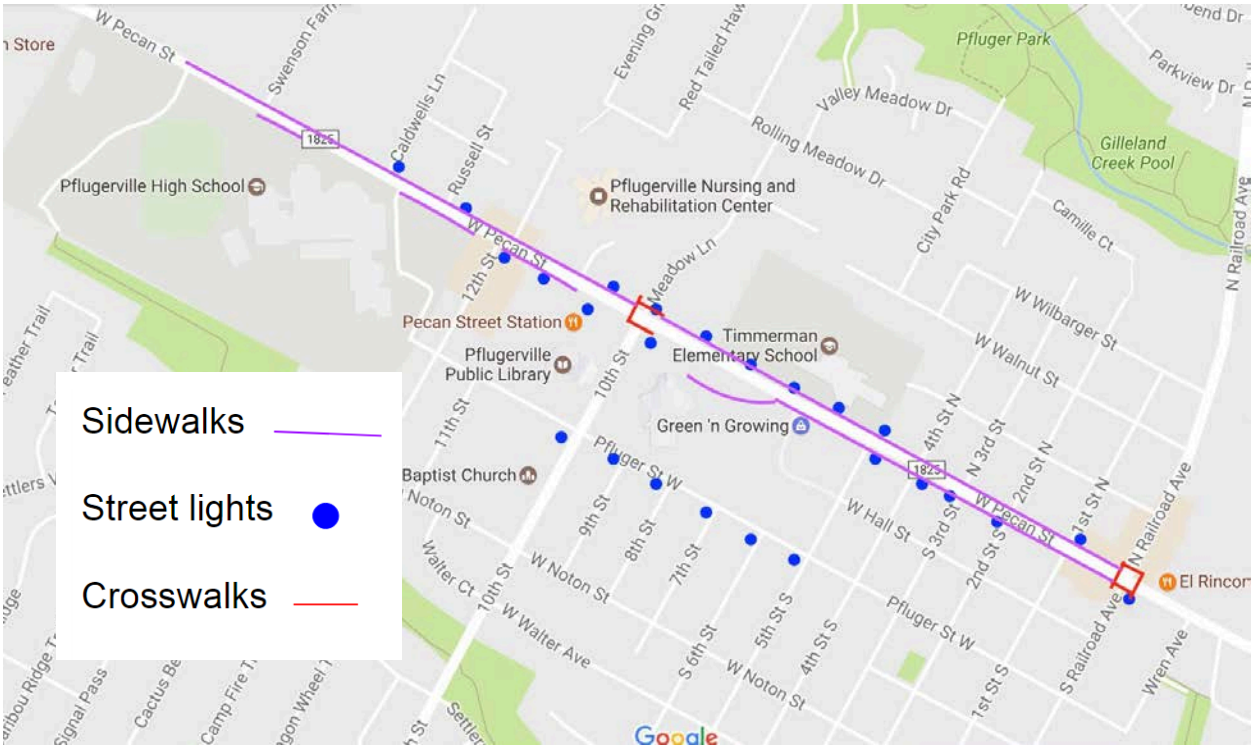
Figure 3. Parked Bicycles outside Pflugerville High School

Another group visited Pflugerville on a Thursday evening at 5pm. We observed a lot of traffic into Pflugerville, and very little out. We drove through Old Town and the

surrounding neighborhoods, and by doing this we noticed the quickly changing speed limit along Pecan Street. It begins at 45 mph on a 4-lane road in front of Pflugerville High School and within two blocks drops to 30 mph on a 3-lane road with traffic going both directions separated by a turn lane. Driving further down Pecan St. we observed sidewalks that dead-end and restart without warning, no cross walks between 10th street and Railroad avenue, and very few pedestrians on the sidewalks (Figure 4). We took note of the lighting along Pecan St between Pflugerville High School and Railroad Avenue, and found a pattern that leaves only one side of the street lit at one time, alternating so as one walks down Pecan, they will always encounter a stretch of darkness and no way to cross to the lit side (Figure 5). The lights did not come on until well after the sun had set, with several of them out completely.

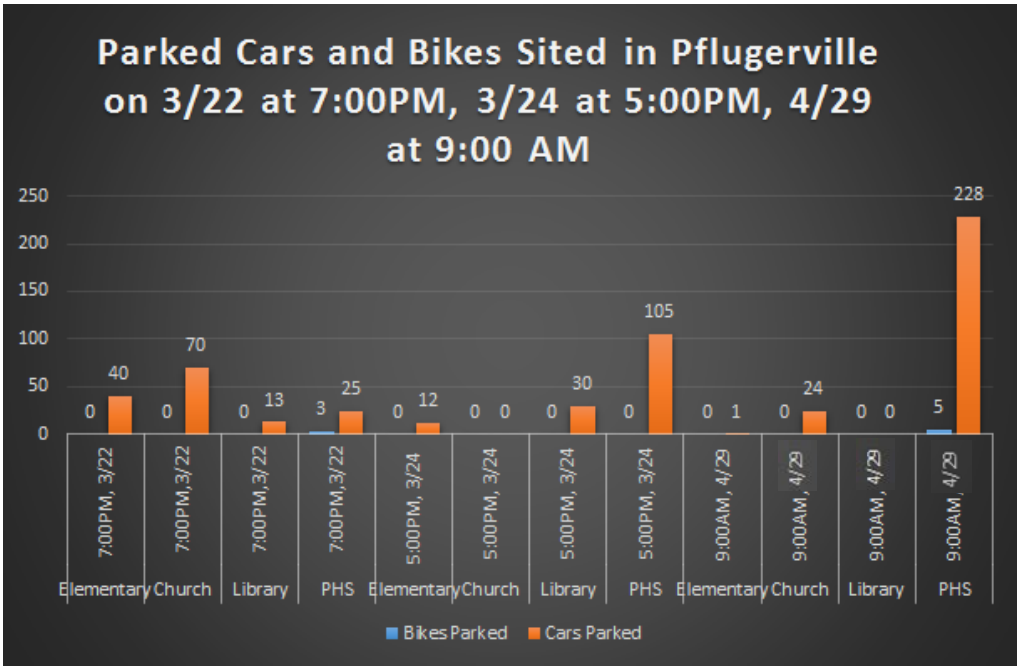
Figure 4. Intersection with dead-ending sidewalk on Pecan St. and 10th St.

Figure 5. Map of Infrastructure along Pecan Street



During our structured observation, we recorded two bike racks at Pflugerville Library, two at Pflugerville High School, and one small rack at HEB, but none at the rest of the locations. In addition, we only saw two bikes at the High School and none at any other location. Parking lots, on the other hand, were plentiful and we counted many cars occupying them at each observational period (Figure 6).

Figure 6. Observed Counts of Cars and Bikes



We also observed trail usage at Bohls park, noting usage of the trail at 5-minute intervals for a period of 25 minutes. What we found was when starting at 6:05 on a Friday, there was little trail activity. However, as it approached 6:30, the number of people observed on the trail began to increase (Figure 7). In addition to people on the trail we also noted activities of users. We found that of the 6 people we observed using the trail, 3 were pedestrians and three were bicyclists. When observing trail use on a Saturday morning, we noted a steady use of the trail with 8 pedestrians and 5 cyclists passing by our observation point between 9:40 am and 10:10 am (Figure 8).

Figure 7. Observed Trail use Friday Evening 3/24

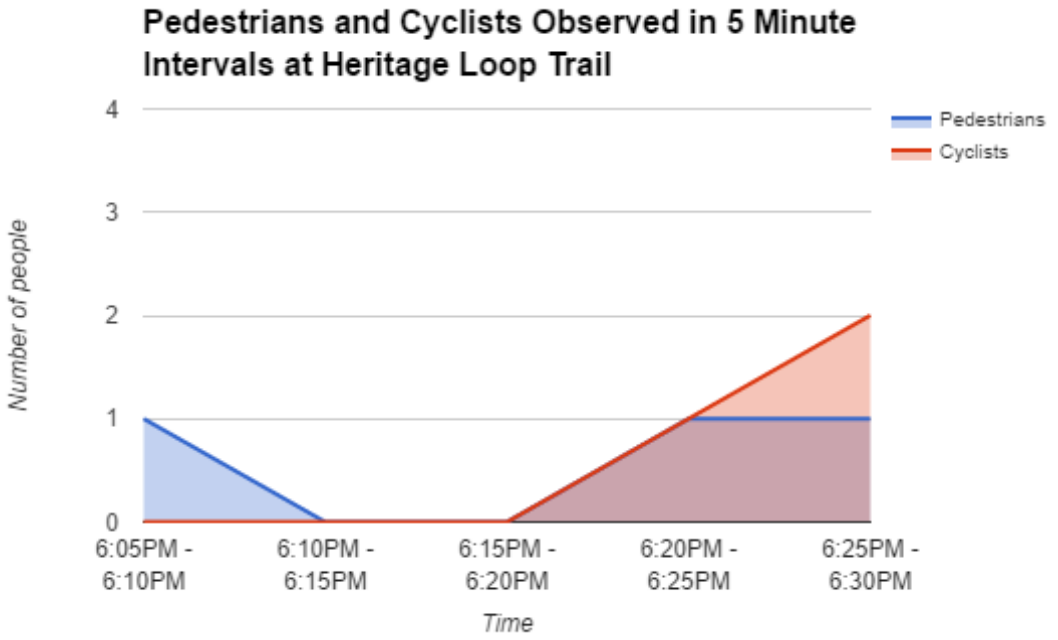
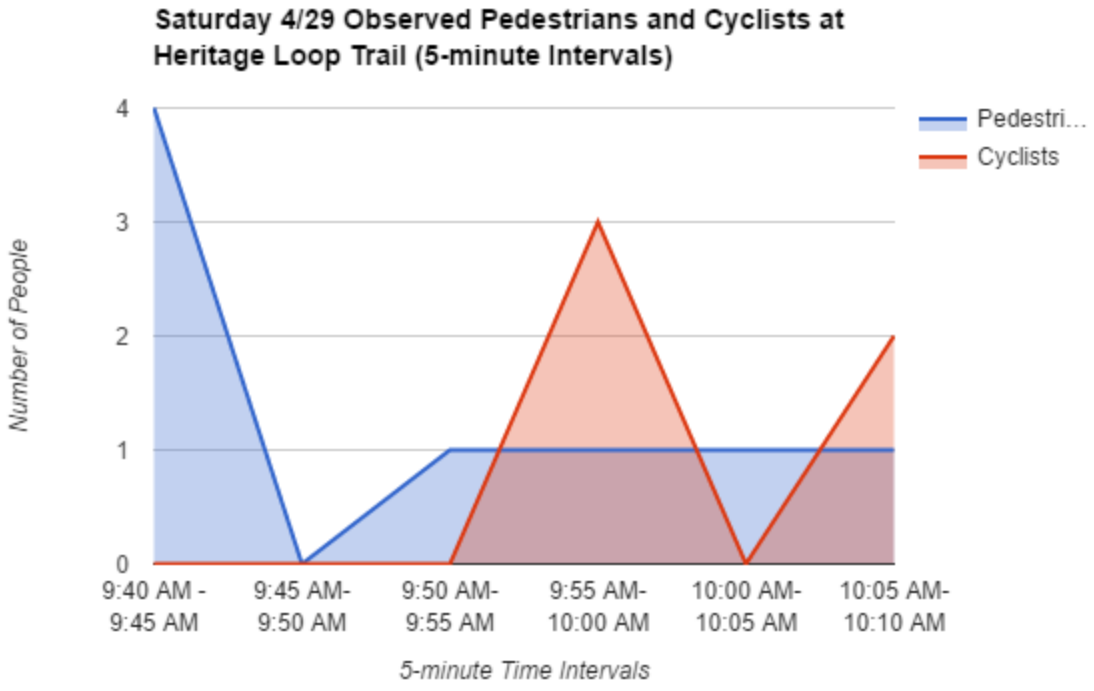


Figure 8. Observed Trail Use Saturday Morning 4/29



The results gathered through both online and in person surveys produced 352 responses. From this, observing specifically close-ended, transit-related questions, we found driving was the only transit mode that had a majority of responses as “daily”, while both biking and walking responses had “never” as the most popular response, with “never” at 75% of responses to the question “how frequently do you bike” (Fig. 9,10 & 11). Looking at the places that people frequent by way of alternative transportation, namely biking and walking, a majority of both groups indicates ‘parks’ as the main destination by bike and foot (Fig. 12 & 13).

Figure 9. Driving Frequency

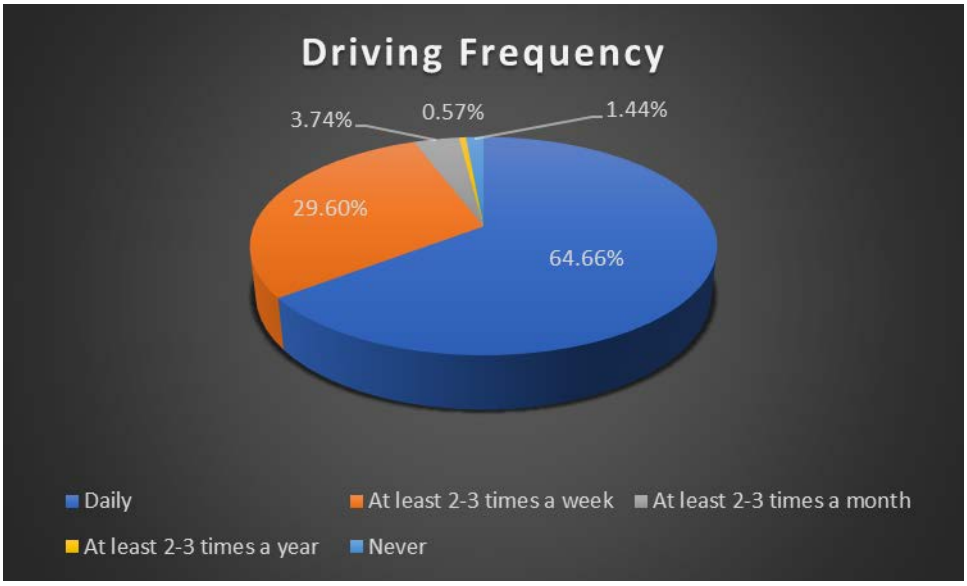


Figure 10. Biking Frequency

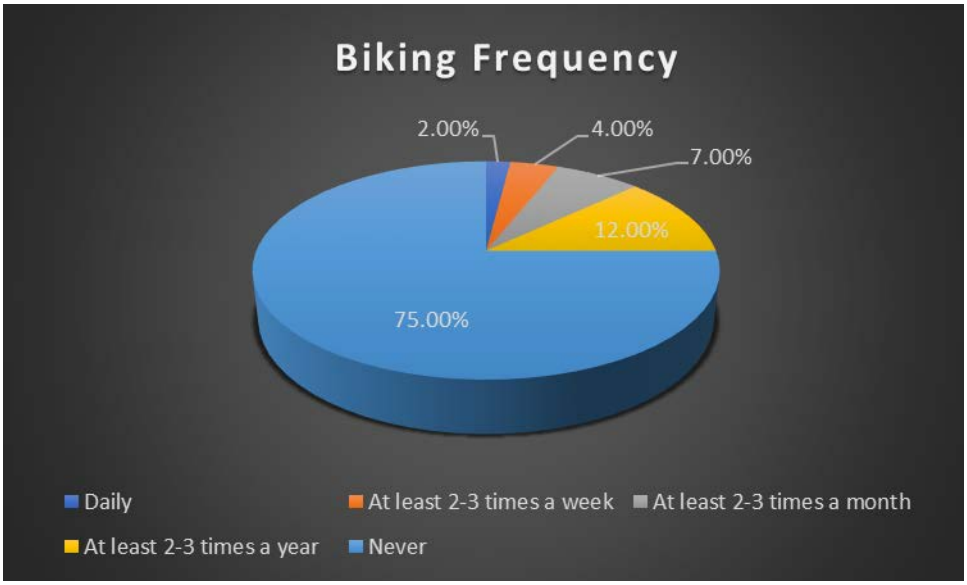


Figure 11. Walking Frequency

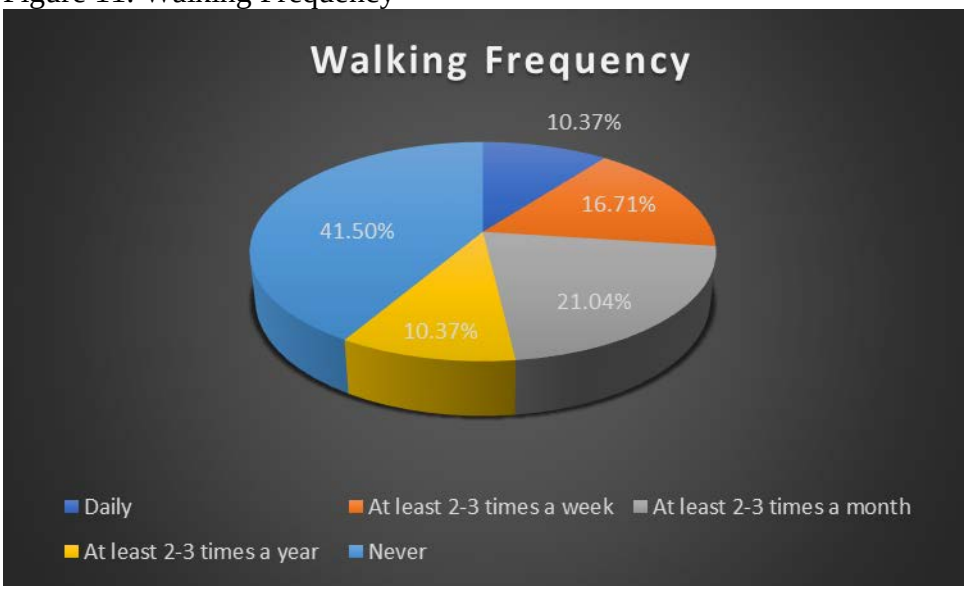


Figure 12. Pie Chart of Walking Destinations in Pflugerville

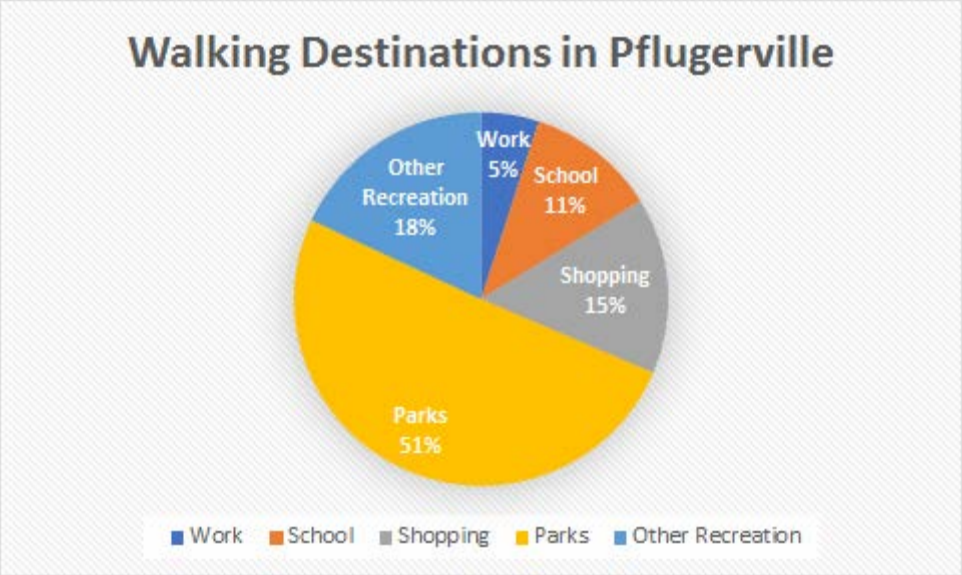
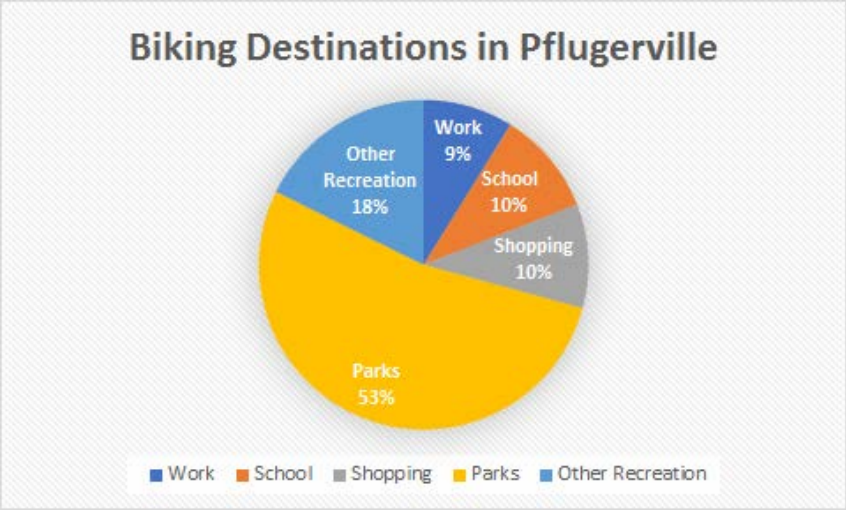


Figure 13. Pie Chart of Biking Destinations in Pflugerville



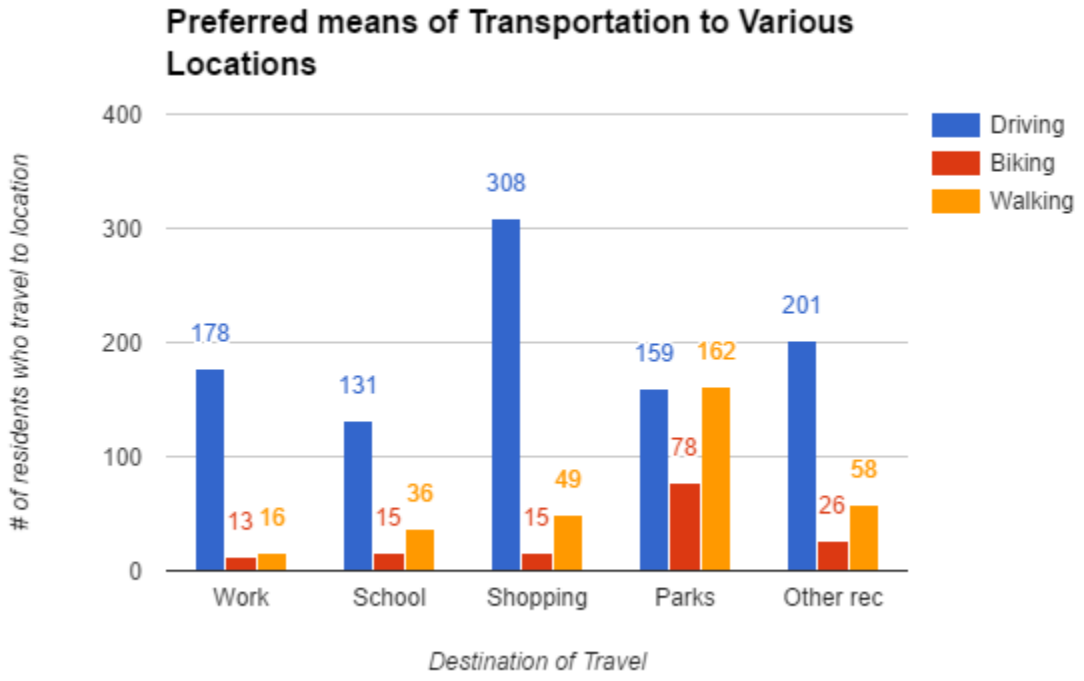
The open-ended question at the end of the survey provided us with insight into the desires of the community members. We asked two questions, the first was, “If Pflugerville should implement or improve any transportation infrastructure, what do you think it should be and why?” We received 47 responses that specifically noted desire and request for infrastructure related to, “Public transit to downtown Austin” as well as “bus or rail service” within Pflugerville. To the second question, “If you had the option to bike to most of your destinations within Pflugerville instead of driving, what kind of improvements would you like to see to the

city's infrastructure? Where?", we received more varied responses. 74 of these expressed interests in bicycle-related infrastructural improvements such as expanded connectivity to restaurants, parks, and retail, better lighting, and safer relationships with roadways. 15 responses expressed no inclination to cycle at all or desire for bicycle infrastructure. Several responses mentioned a current use of drainage ditches as trails when sidewalks abruptly end or do not exist in high-foot traffic areas.

Discussion

The trends we observed did not surprise us. The data previously acquired stated that Pflugerville is a heavily automobile dependent city and the comparison between the number of cars we observed parked at each observed site and the number of bicycles we counted confirmed this. Looking at destinations reached in Pflugerville, 'parks' is the dominant location to be reached by bike and foot, with options of parks, shopping, work, school, and other recreation. However, when automobiles are added into the mix, it is clear that biking and walking do not dominate the ways in which people travel to parks overall. This shows that even the highest frequented destinations by bike and foot are more frequently reached by car (Fig. 14).

Figure 14. Bar Graph of Preferred Mode of Transportation vs Destination



The most influential reason that alternative transportation is not popular, is that infrastructure is designed specifically for vehicular traffic. High traffic volume and speeds adjacent to Pflugerville High School is an example of this prioritization of automobiles over foot traffic, as 45 mph is an uncomfortable traffic speed to be walking alongside. This was supported by the fact that students did not walk down Pecan Street when leaving school, but rather were seen using the trails and sidewalks behind the campus. Spotty lighting and an inability to cross the street along Pecan St. also shows priority to vehicular traffic, with no consideration for the convenience or safety of pedestrian traffic along the street. It is unsafe to walk down a poorly lit sidewalk at night, especially without knowing if the sidewalk will end abruptly, or if the path will suddenly go dark. In these cases, there are no other ways for pedestrians to find lighting or better sidewalks, as there is no way of crossing the street for 10-blocks without sprinting across three lanes of traffic, in the dark. If Pflugerville would like to see Pecan St develop as a

recreational hub, walkability will need to be improved to make people feel safe and comfortable both using the sidewalks and navigating the street. A sentiment of fear from the lack of safety for pedestrians and cyclists was also expressed in many interview responses. One response cited, "…I'd like to travel on the widened sidewalks, but it's not permitted…I wouldn't find biking along 685 or Pecan or Town Center safe at all". Another response expressed, "I would never bike here as I truly believe I would be hit by a car." Of the interview responses, safety was a dominant concern keeping people in their cars. Thus, there is demand for infrastructural development that supports more than just automobile traffic, but the inconsistent and inconvenient nature of connectivity dis-incentivizes regular use of the trails and sidewalks. Both trails and sidewalks have potential to provide useful alternatives to automobile transportation, but cannot be used for much other than recreation as they currently exist.

When referring to the Pflugerville Comprehensive plan, the city cites an interest in creating a "walkable, mixed-use district centered on Pecan/FM 1825" (Pflugerville 2030, 2010, p 10). Reflecting on this and community responses, I investigated how residents observe and use this road segment, analyzing data from the survey that exposed frequency of and reason for visitation to Old Town. I was curious to see if residents who frequent Old Town do in fact tend to walk more than others, as this is an area in which the city wants to improve walkability. To investigate this, a Chi-square test of independence was conducted to determine whether the relationship between frequency of visiting Old Town and frequency of walking is independent or dependent. In this Chi-squared test of independence, frequency of visiting Old Town was grouped into "Daily", "2-3 times a week", "2-3 times a month", "2-3 times a year", and "never", as well as frequency of walking in Pflugerville grouped into the same categories (Tables 2,3, & 4). What I found after going through the test, was a p-value of 0.0000093, small enough even to

be compared to an alpha value of 0.01 and conclusively say that I can reject the null hypothesis that the variables are independent. What this means is that there is a dependent relationship between frequency of visiting Old Town and frequency of walking, and this can be said even with 99% confidence. In the context of planning in Pflugerville, this is important because it shows that if the city does focus development on improving walkability along Pecan St., the population that tends to walk more is also interested in visiting Old Town more frequently. So, if this trend continues, improving the walkability along Pecan could bring in more people to Old Town which would be great for local businesses and developing the character of Pflugerville, while also encouraging and increasing frequency of walking by residents.

Limitations

There were some situational differences between our observational periods that affected the data we gathered, and limited our study. First, we were unable to observe every day of the week or time of the day to see how trends differed relative to time and weekday. The times we were able to visit Pflugerville tended to be in the evenings due to other scheduling conflicts. This restricted the data we gathered prevented us from realizing larger patterns that may have developed over more varied and longer periods of observation. For example, the day in which we observed the most bicycles parked at any location was a Friday afternoon, when we were conducting unstructured observations, without recording counts, so this pattern is missing from our dataset. This suggests a potential need for more observation in the afternoons rather than the evenings to determine whether this is a trend based on time, and to increase variability in results. Second, of the days and times we observed, it was raining during one of the evenings, which deterred people from going outside and using the sidewalks and trails to bike. Another evening we happened to count cars at the church during a weekly

bible study. The rain is a random situational event that influences our data collection, and Wednesday bible study is a regular influence, but both contexts are important in analyzing the data. If we had a chance to observe at longer intervals, different times, and more days we would be able to gather more robust and fuller data to analyze. However, from the data we do have it is very clear that Pflugerville residents are primarily car users.

In reflection of the survey results, all data we collected confirmed our hypothesis that people are primarily using automobiles to get anywhere in Pflugerville, with biking and walking serving almost exclusively as recreational modes of transportation. Improving connectivity for walking and biking was noted as requests in the free-response section, but I was surprised at how many people specifically noted that they have no interest in bicycle infrastructure. A concern I have related to this, is that perhaps the population that is most frequently biking and walking, especially to school which we received very few responses for, exists below our youngest age category. As previously noted, the most bicycles we saw at any given point in Pflugerville, were parked at Pflugerville High School. Additionally, the most people that were seen using the sidewalks were students walking away from the high school. Because we did not have approval from the Institutional Review Board, we were unable to survey those under 18 years of age, and so missed out on an entire demographic of trends. Younger residents are the ones who obtain the most freedom and independence from using transportation alternative to automotive, so it would be an interesting set of data to analyze if we were able to survey this younger sample. Without this option, however, it might be useful to include questions that allude to the same answers, for example asking whether a respondent has children that walk or bike to school. Overall, however, our data collection was successful in representing the larger trends of the population of Pflugerville. The predictions we made were visible in trends we analyzed through survey data,

and the recommendations and analyses we will make in the future will be based on the community's requests, responses, and interests as represented in the analyzed data set.

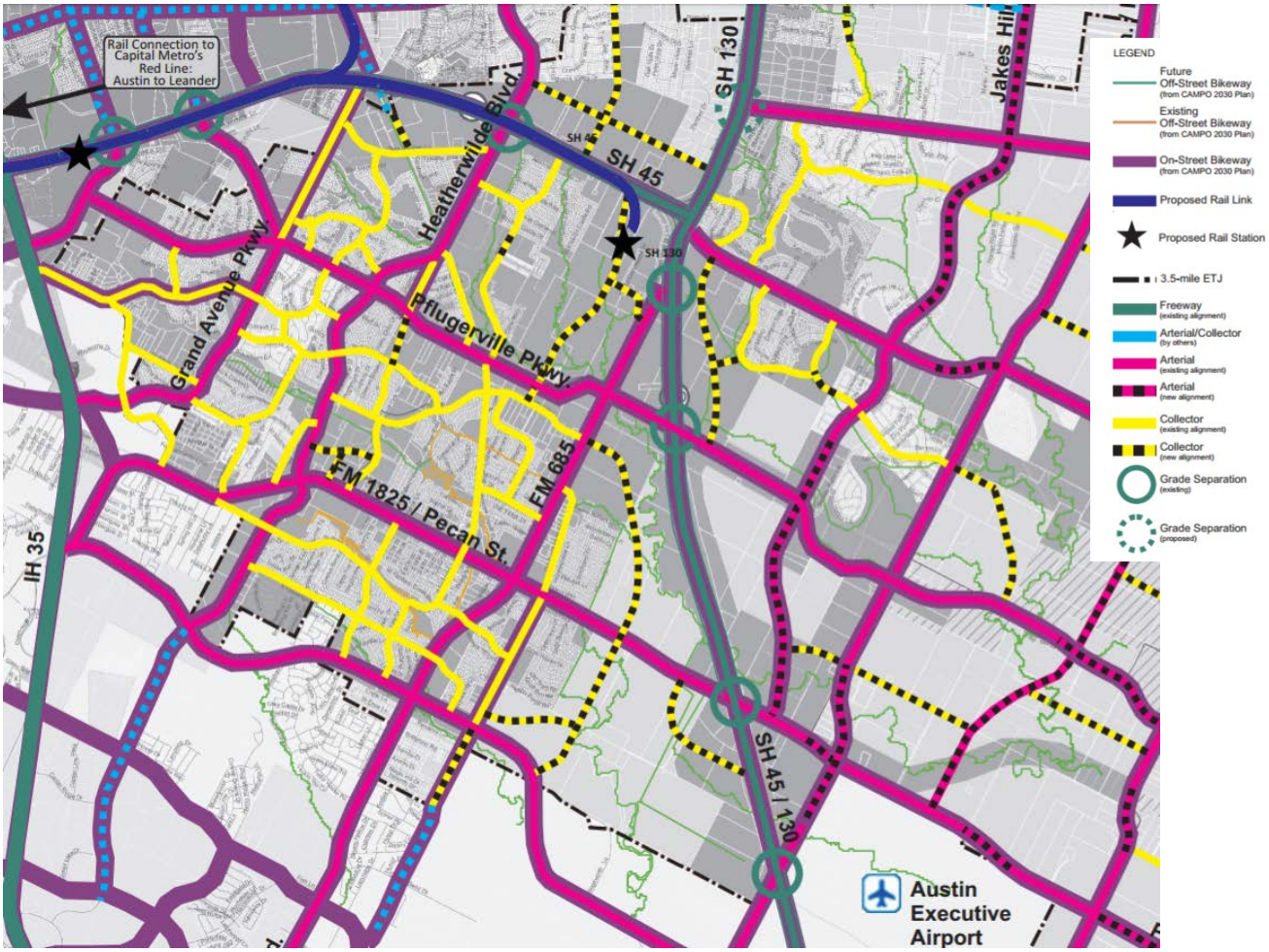
Conclusions

Suggested development in Pflugerville should ultimately focus on the creation of complete streets and transit ready development, as these are the most successful, sustainable, long-term development models. The first steps toward this, should focus on walkability through increasing frequency of cross-walks, landscaping to create more comfortable walking environment, and traffic calming. This will make the space more oriented toward people, and thus more comfortable for personal use.

The system of trails currently in place is a good foundation, and feedback from residents has proven they are used and valued, however remain insufficient due to their lack of connectivity between residential, commercial, and business districts. This current trail system can be seen in brown lines that are only evident downtown (figure 4). What the city of Pflugerville has recommended in their comprehensive transit plan are extensions of the trails seen in a teal color along the edge of the freeways. This is a great first step, because it demonstrates an interest in trail expansion, but is not sufficient for connectivity. As seen by evidence of increased bike transit through traffic calming methods, improved access through the city by bicycle is crucial to developing an alternative to automobile dependency in Pflugerville. A model that would work well for Pflugerville, is implementing a fully connected system of trails that allows bicyclists and pedestrians to access all major junctions and public destinations. This would provide a path dedicated for non-automobile traffic that could be used for transportation rather than solely recreation. It would also decrease the conflict between vehicles and bicycles who, as infrastructure currently permits, must share busy and often very high speed

roads. Those who are opposed to using bicycles as transportation would not encounter cyclists as they drive, and cyclists would have the safety of separate pathways that avoid traffic and connect to the same destinations. To make this work, however, it is crucial that these paths, currently part of the hike and bike trail, be connected to streets and sidewalks. Connectivity to FM685 was specifically requested 21 times within our survey, so this should be investigated for expanding trails. Additional suggested locations for connectivity are between neighborhoods and schools, Old Town, Stonehill shopping center, HEB

Figure 3. 2030 Circulation plan



Note: retrieved from Pflugerville 2030 Plan (Pflugerville 2030, 2010, p. 85)

Another commonly requested infrastructural development is the establishment of a train or rail or bus system that would connect Pflugerville to Austin. We did not pursue this in our research due to its extremely complicated status, economically, politically, and socially. However, with 47 mentions, it was the most requested infrastructural improvement of responses to the interview question, “If Pflugerville should implement or improve any transportation infrastructure, what do you think it should be and why?”. Transit-ready-development is a viable solution to this at present.

At present, the City Pflugerville is in need of a comprehensive development plan that places transportation as a top priority. This will spur economic growth, and encourage diversity that will make Pflugerville and even more attractive, dynamic city. To do this, development of complete streets should be considered along particular streets that can be densified for use by both residents and businesses. Walkability should be improved within the densest parts of Pflugerville, most notably Old Town, and, if development builds this street up, Pecan Street. This could incorporate all or several aspects of traffic calming that would encourage comfortable pedestrian access to the entire street. Finally, a connection between bicycle paths and development of bicycle lanes that can connect to these off-road paths would incentivize the use of bikes as alternative transit. These ideas have the potential of improving economic activity and sociability within Pflugerville, helping the city to develop a distinct character that the citizens have expressed is important to them, but also make growth within Pflugerville a much more sustainable concept, by reducing automobile dependency.

Appendix

Table 2. Actual values Chi-Square Analysis Old Town Frequency vs Walking Frequency

		Old town					
	Frequency of visit	Daily	2-3 times a week	2-3 times a month	2-3 times a year	Never	Total
Walking	Daily	5	4	10	6	11	36
	2-3 times a week	6	10	16	22	4	58
	2-3 times a month	5	5	23	26	14	73
	2-3 times a year	2	5	15	11	3	36
	Never	0	9	45	29	51	134
	Total	18	33	109	94	83	337

Table 3. Expected Values Chi-Square analysis Old Town Frequency vs Walking Frequency

		Old town					
	Frequency of visit	Daily	2-3 times a week	2-3 times a month	2-3 times a year	Never	Total
Walking	Daily	1.92	3.53	11.64	10.04	8.87	36
	2-3 times a week	3.10	5.68	18.76	16.18	14.28	58
	2-3 times a month	3.90	7.15	23.61	20.36	17.98	73
	2-3 times a year	1.92	3.53	11.64	10.04	8.87	36
	Never	7.16	13.12	43.34	37.38	33.00	134
	Total	18	33	109	94	83	337

Table 4. Chi Squared distribution Old Town Frequency vs Walking Frequency

		Old town					
	Frequency of visit	Daily	2-3 times a week	2-3 times a month	2-3 times a year	Never	Total
Walking	Daily	4.92	0.06	0.23	1.63	0.51	7.36
	2-3 times a week	2.72	3.29	0.41	2.10	7.40	15.91
	2-3 times a month	0.31	0.65	0.02	1.56	0.88	3.41
	2-3 times a year	0.00	0.62	0.97	0.09	3.88	5.56
	Never	7.16	1.29	0.06	1.88	9.81	20.21
	Total	15.11	5.91	1.68	7.25	22.49	52.45
	Degrees of Freedom	16.00					
	Chi square test stat =	52.45					
	p value =	0.0000093					

Survey Responses accessible at:

https://docs.google.com/spreadsheets/d/1dmkCU1SLevlFifDekTuhow7EuDhQXPrFHkZtaYarNE0/edit#gid=65993884

Works Cited

Traffic Calming (APA Citing: Drennen, E. (2003). Economic effects of traffic calming on urban small businesses. *Department of Public Administration, San Francisco State University*.)

Dill, J., & Carr, T. (2003). Bicycle commuting and facilities in major US cities: if you build them, commuters will use them. *Transportation Research Record: Journal of the Transportation Research Board*, (1828), 116-123.

Ragovin, H. (2011). Getting AROUND Gets EASIER. Planning, 77(1), 16-19.

Renne, J. L. (2009). From transit-adjacent to transit-oriented development. Local Environment, 14(1), 1-15. doi:10.1080/13549830802522376

Pflugerville City Council meeting 8-9-16 [Video file]. (2016, August 9). Retrieved from http://pflugerville.granicus.com/MediaPlayer.php?view_id=1&clip_id=94&meta_id=9493

Pflugerville 2030 Plan: A comprehensive plan. (2010, October). Pflugerville, TX: Design Workshop.

Haya El, N. (n.d). Builders create suburbs with downtown appeal. USA Today.

Social Explorer Tables: ACS 2014 (5-Year Estimates)(SE), ACS 2014 (5-Year Estimates), Social Explorer; U.S. Census Bureau [Fact sheet]. (2014). Retrieved from Social Explorer database.

Conflicts on multiple-use trails: Synthesis of literature and state of the practice. (n.d.). Retrieved from US Forest Service website: https://www.fs.fed.us/cdt/carrying_capacity/conflicts_trails_synthesis_1994.pdf

City of Pflugerville master transportation plan. (2015, May). Retrieved from Brown & Gay Engineers website: file:///C:/Users/sfeghali19/Downloads/Pflugerville%20Master%20Transportation%20Plan%202015.pdf

Montello, & Sutton. (n.d.). Explicit reports: Surveys, interviews, and tests. In *An introduction to scientific methods in geography* [PDF].

Works Referenced

City of Pflugerville master transportation plan. (2015, May). Retrieved from Brown & Gay Engineers website: file:///C:/Users/sfeghali19/Downloads/Pflugerville%20Master%20Transportation%20Plan%202015.pdf

Pflugerville 2030 Plan: A comprehensive plan. (2010, October). Pflugerville, TX: Design Workshop.