Carnegie Mellon Parking Proposal to City Council

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0.1 Introduction

We are proposing that Carnegie Mellon University develop, implement and manage, in cooperation with the Pittsburgh Parking Authority and approval of City Council, a new and better method for managing the on-street parking at the Southeast end of the Carnegie Mellon campus. This would include Tech and Frew streets as well as the small adjacent portion of Schenley Park (segments of Schenley Park Drive and Frank Curto Drive) that primarily serves Carnegie Mellon. The purpose of the improved methods would be to improve access to parking resources throughout the week. Right now, a census of parking the week of March 19, 2012 showed that the current on street parking is grossly underutilized. A parking census showed a 35% paid parking utilization rate through the day. This has put increased demands on Carnegie Mellon parking resources while underutilizing the on street parking that could be made available. Our goal would be to bring utilization to a stable rate of closer to 80%. This would provide adequate spaces so people do not have to drive around searching for parking while making much better use of the on street parking resources. We would accomplish this by dynamically pricing the parking to adjust to fluctuating demand for parking through the day and week.

This proposal has been approved by Dean of Campus Affairs Michael Murphy. The proposal has been reviewed and is supported by Traffic21, a research center on traffic and parking at the Heinz School of Public Policy and Management at Carnegie Mellon University.

0.2 The current use of on street parking in the Southeast portion of the Carnegie Mellon Campus near Schenley Park and the Tepper School of Business.

Carnegie Mellon University (CMU) is situated in Oakland. The campus is adjacent to Schenley Park, as can be seen in the map in Figures 1 and 2. There are off street parking resources throughout the CMU campus. The primary metered on street parking available to visitors, students, faculty and staff on campus is found at the Southeast end of campus. This is on Tech Street, Frew Street, a few spots on Margaret Morrison Street as well

as in Schenley Park on Schenley Drive and the Frank Curto Drive portion of Schenley Drive opposite to Phipps Conservatory. There is additional parking inside Schenley Park on West Circuit Road which is unmetered. In addition the adjacent streets in Squirrel Hill have permit parking restrictions. Our focus here is on the on street metered parking on Frew Street, Tech Street and on Schenley Drive between the Tech Street entrance and the Frew Street entrance. There are currently 286 metered parking spots in these locations. This metered parking is highlighted in blue in Figure 1. Prior to the repricing of on street parking at the end of 2011, this on street parking was to all intents and purposes, full. Though no census has been done of which we are aware, casual observation consistently showed essentially no parking spaces in these areas. After the repricing utilization went from what appeared to be 90 % to approximately 48 % (of whom only 35% paid the meter charge), based on a census of parking done the week of March 19, 2012[1]. The week of March 19 was a very representative week, with school in session and no snow emergencies or other weather related restrictions on parking.

While the on street parking is underused, CMU's off street parking resources are strained. There are currently 230 people on the waiting list for parking who can not get parking. On one occasion, when the annual Tech Fair was held on campus and in parts of the Morewood parking lot on Forbes near Craig, users of parking had to be offered $50 payments to not park in the lot for one week. This has not happened in the past. At least some part of this excess demand is due to the higher cost of on street parking. We have also directly observed that people are parking much farther away on West Circuit Road in Schenley Park in order to find parking that is affordable. Some staffers are fearful of parking in the park and have chosen to buy parking permits at CMU. While people are parking farther off campus and stressing CMU parking, there are, on average, about 186 empty spaces with 4 and 10 hour parking limits on them sitting idly. If utilization could be moved to 80 % as we will propose trying to accomplish, this would provide in excess of 130 additional parking spaces with no loss of flexibility to visitors, staffers and others. This situation may become more of a problem if there is reduced availability of mass transit due to cuts in services and/or price hikes. These could put greater strains on current scarce parking resources.

[1]This census was done by a five Carnegie Mellon students, Nancy Geronian, JungMoon Jang, Jeff Lee, Kaylee Makel and Victor Wilczynski, working under the supervision of Professor of Statistics Brian Junker. We appreciate their help and cooperation in sharing their data and report with us.

0.3 Proposed Solution: Institute CMU Managed Dynamic Pricing for these 286 metered parking spaces.

After consultation with the various interested parties at CMU, Walker Parking Consulting, experts on traffic and parking at the Heinz School of Public Policy and Management at CMU, operations faculty at the Tepper School of Business, the Pittsburgh Parking Authority and staff members in the offices of City Council members William Peduto and Natalia Rudiak (member, Pittsburgh Parking Authority Board), and local experts, we have developed a proposal that we believe would make better and more efficient use of on street parking, reduced enforcement costs, and a better response to the continuing and varying needs of the CMU community.

In addition to consulting with the interested and knowledgeable constituencies, we also benefited from our own observations of parking behavior and a very good census of parking done by a student group at CMU under the guidance and supervision of CMU statistics Professor Brian Junker.

The proposed solution is based on recent experience around the country in trying to improve the management of on and off street parking. The most salient example from which we draw is SFPark, an ambitious attempt to manage parking in San Francisco. We start with certain assumptions and goals that are customized to CMU, but are more generally used in managing scarce parking resources.

- The primary objective in managing public and private parking at CMU is to make the highest and best use of parking resources. This means, in particular, that the potential beneficiaries of parking can *all*, to the extent possible, derive those benefits in a way that is best suited to their needs. The various schools and service providers (e.g., libraries, bookstore, research centers, education provision in classrooms and academic departments and so on) have a steady stream of users (users here are students, visitors, staffers, and others who are coming and going as they interact with CMU). This means that when the campus is open (which is essentially always), CMU wants users to be able to park relatively nearby so they can readily visit without spending time looking for parking or being unable to park and having to forego coming to CMU. For users, in a similar way, they want to be able to easily access

CMU. We want to avoid congestion, double parking and other driving behaviors which increase congestion, ambient pollution and make it more difficult for those who need access to be able to obtain access to CMU. Those who need short term parking and turnover in parking (visitors, staffers who are coming and going, students coming in for one class) should have ready access to parking quickly and easily. Those who are parking for a longer term (faculty, staff and students who are staying for longer periods) would be expected to park farther away at a somewhat lower cost to them.

- The cost of managing such a system should be kept as low as possible to all the relevant parties, including the city, which enforces parking regulations that place restrictions on parking such as time limits and meters to ensure that the highest and best use of these resources is in fact obtained.

- Where fees and meters are used to regulate parking, we want to be sure that as much of the revenues that can be derived from metering are realized.

- Where feasible, we want to obtain the efficient use of parking resources. For example, where there is parallel parking, we would like to be able to let more smaller cars park using multispace parking meters rather than have one car per meter, which happens when there is one meter per parking spot.

- The system should be flexible enough to support anticipated and unanticipated variation in demand for parking. This suggests pricing will be dynamic, changing as demand changes.

Working with the Pittsburgh Parking Authority, we would like to see multispace meters used to manage the spaces that are currently metered with 286 meters. To be precise, we would want the metering for

- Frew Street, which currently has 168 meters from the entrance to Schenley Drive/Frank Curto Drive

- Tech Street, which currently has 29 meters

- Schenley Drive between the Tech Street entrance to Schenley Drive to the 3 way intersection where Schenley Drive becomes Frank Curto Drive. There are 59 meters with varying rates and time limits.

- Schenley Drive/Frank Curto Drive from the 3 way intersection of Schenley, Frank Curto and Panther Hollow Road to the Frew Street entrance to Schenley Drive. Only the Northwest side of the street abutting Flagstaff Hill would be covered under this plan. There are 15 meters on this part of the street.

- Margaret Morrison Street, in the area currently covered by 5 meters between the entrance towards Donner House on the North side of the to where the street turns approximately 30 degrees at Donner House.

We would adapt the methodology used in SFPark, which is a demonstration project for the use of dynamic pricing to manage parking. We would set rates which we estimate would bring the usage rate up to 75-80%. This would increase use while providing adequate open parking to accommodate those coming to the campus for varying amounts of time. The old rates which led to nearly 100% usage with no capacity to accommodate visitors was priced at $.50 per hour with varied limits of between 4 and 10 hours, which recognized variation in required turnover of parking. 4 hour limits were and are set in parts of Frew, Schenley Drive and all of Tech Street. When rates were raised to $1.50 on parts of Schenley Drive and $2.00 on the remaining meters we are discussing, parking occupancy plunged to the 35% paid range we have found in the March 2012 parking census.

We estimated the price elasticity of demand for parking based on estimates of parking occupancy before and after the recent price increases. Price elasticity of demand is defined as the percent change in demand for parking given one percent increase in the cost of parking. The industry standard elasticity is about -.30[2], while the elasticity in the southeast section of the CMU campus is -.75. For every 1 % increase in price, we are seeing a .75 % decrease in demand. This is estimated from seeing demand go from 90 % to 35-40% after prices were quadrupled. This suggest that lowering prices from $2.00 per hour to rates in the neighborhood of $1.00 per hour might lead to a 35-40% increase in demand, which would get the parking usage closer to

[2]This estimate is taken from the *Analysis of Pittsburgh's Parking Assets* prepared for the Pittsburgh City Council and the Parking Study Taskforce, Sept. 24, 2010, by Professor Chester Spatt., p. 17

where we think it can and should be. Once a new rate or set of rates is fixed, we expect to see several benefits.

1. Higher overall utilization of parking. This will result from several effects. We rely on the report of Desman Associates to City Council for some of our estimates[3]

   (a) More people will park due to lower rates. This may or may not provide revenue benefits.

   (b) With multispace meters, there will be more cars parked per linear foot of street since cars can park more compactly, rather than aligning to a meter. This **geometry** effect will provide revenue benefits and more capacity. Desman estimates this gain to be 9% in high usage areas.

2. There should still be adequate parking available so one can quickly get a parking space without circling around or doubleparking. This provides benefits to those who want to come to CMU easily and conveniently.

3. With multispace meters, there will be no **piggybacking**, where someone parks in a space that was previously occupied with time remaining on the meter. This should increase revenue, according the Desman Associates report to City Council[4]

Desman estimated the revenue benefits of multispace meters to be 43%, holding rates neutral, with some variability depending on the situation. We would expect the revenue enhancements be more modest given we are proposing reducing rates to increase usage. However, the revenue benefits of greater efficiency and greater utilization with multispace meters plus higher usage due to lower rates should be revenue positive. We reach this conclusion for the following reasons, following the Desman analysis given to City Council.

For 136 spaces, the parking is head in parking. This will provide piggybacking benefits, since each new user pays. However, no benefits of better space utilization can be realized, since cars parking head in will not park more efficiently given variation in car width is far less than variation in car length. Desman maintains gains due to reduced piggybacking are about 10%.

[3] *Financial Analysis of Parking Assets of the Public Parking Authority of Pittsburgh* Prepared by Desman Associates, Chicago, Illinois, April 2010.

[4] em Financial Analysis of Parking Assets of the Public Parking Authority of Pittsburgh.

For the remaining 150 parallel parking spaces, we expect gains due to reduced piggybacking (10%) plus gains due to geometry of 9%. This geometry gain is equivalent to about 14 additional parked cars ($.09 \times 156 \approx 14$).

Replacing the current meters with multispace meters increases violation capture or ticketing, because fewer free broken meters are available. As we noted earlier, the on campus parking census found that about 3.3 % of the meters were broken. Eliminating these would increase revenue benefits as well. This is a minor effect given few meters were broken.

We recommend rates be higher in what are currently 4 hour limit parking areas. We assume that these are 4 hour limits because adjacent buildings required them, such as the Tepper School of Business on Tech Street and the parking spots near the Tepper School of Business and the Hunt library on Frew Street. There are both 4 and 10 hour limit parking spots on Schenley Drive, though we are not quite sure why some are 4 hour limit spots. If rates are sufficiently high, there is no reason to maintain limiits. *We think parking should be governed by dynamic pricing rather than hour limits. If rates in 4 hour limit areas are raised sufficiently, there should be no reason to maintain the 4 hour limit.* If the 4 hour limit is eliminated, the cost of monitoring of such violations is eliminated, reducing the Parking Authority cost to monitor.

0.4 Proposed New Rate Policy

We would propose the following set of rates and rate policies. Rates would be set at $.75 per hour in 10 hour limit zones and $1.00 per hour in 4 hour limit zones after the introduction of new multispace meters. Every 2 months, the utilization would be reviewed using visual inspection and a statistical estimation procedure derived at SFPark[5] which they find does a good job of estimating total usage (paid and unpaid parking) from revenues alone. We used the formula on the parking census data and it came within 1 % of accurately estimating the number of people who parked without paying the meter.

At these three month intervals, we would apply a formulation similar to SFPark[6].

[5]This is described in *SFpark: Putting Theory into Practice* August 2011, p. 29, `http://sfpark.org/wp-content/uploads/2011/09/sfpark_aug2011projsummary_web-2.pdf`

[6]*SFpark: Putting Theory into Practice* August 2011, p. 29, `http://sfpark.org/`

- If occupancy is 80-100%, hourly rates are increased by $.25
- If occupancy is 60-79%, hourly rates are not changed.
- If occupancy is 30-59%, hourly rates are lowered by $.25
- If occupancy is less than 30%, hourly rates are lowered by $.50

Our expectation is that we will see a change in parking and adjustment process such that within one year, parking will settle into the 75-80% utilization rate. We may find the need to vary prices a bit more as a function of distance. Right now, we assume the 4 and 10 hour limits reflect past beliefs about where more and less parking availability was needed. Once the dynamic pricing finds an equilibrium, this should also reduce the cost of monitoring parking since prices replace time limits. This should reduce CMU's uncertainty about parking demand and increase their ability to control parking demand. This will both provide better parking service to the current users of parking and allow CMU to better plan for future parking needs.

We would propose that Council give CMU the discretion to set parking rates, with appropriate consultation with the Pittsburgh Parking Authority. While CMU, as the primary or almost exclusive beneficiary of these parking resources, should manage rates to suit their needs, this should be done in consultation with the Pittsburgh Parking Authority, who are managing the parking assets themselves. All parking revenues, as before, would go to the City.

We hope that this can be the beginning of more effective use and management of these resources. As we gain experience running this dynamic pricing system, we may learn more and want to further adapt and improve the system, applying the skills and ingenuity of CMU faculty, staff and students. We hope the City will welcome such ideas and proposals, building on this one.

Respectfully submitted,

wp-content/uploads/2011/09/sfpark_aug2011projsummary_web-2.pdf

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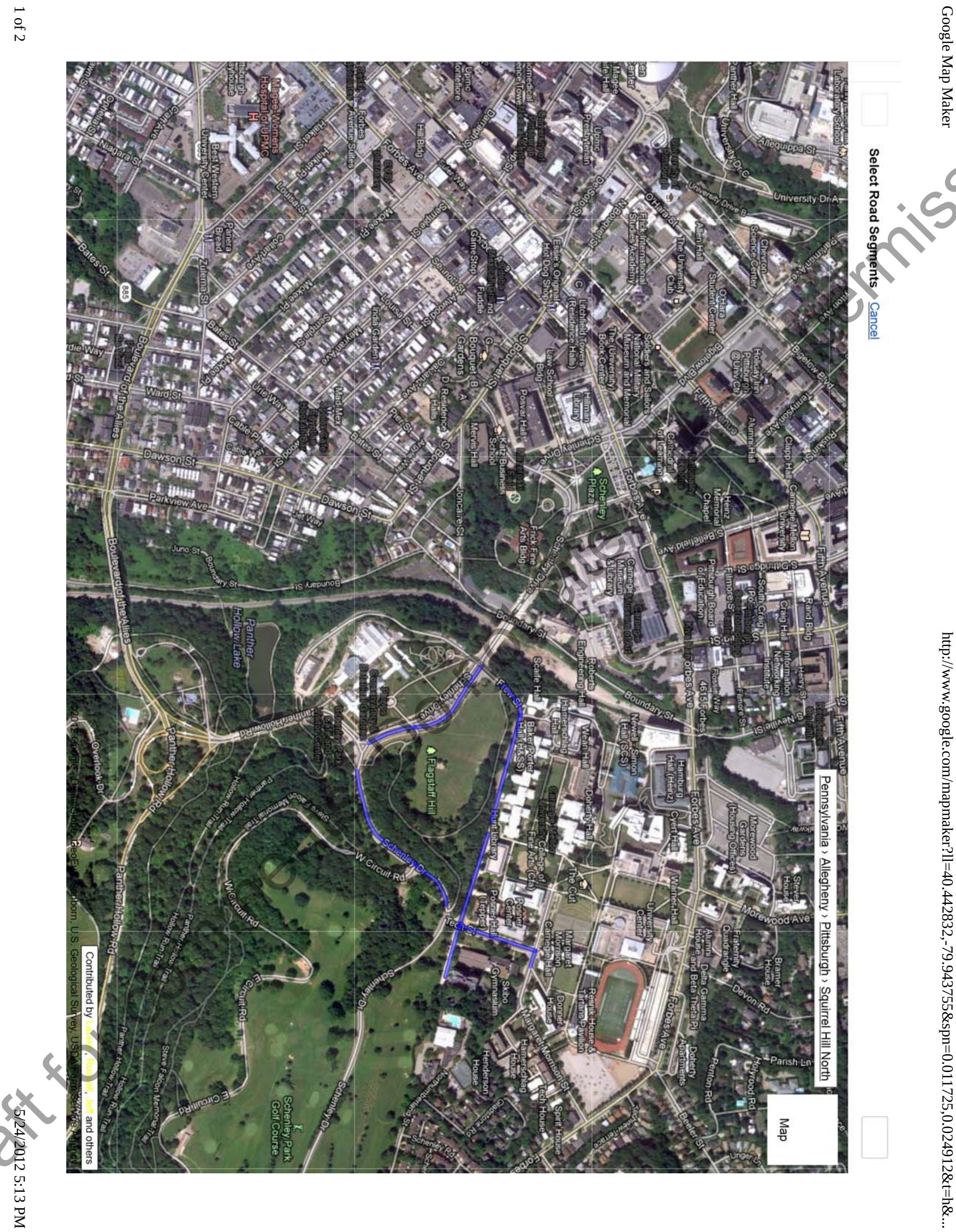

Figure 1: Map of Carnegie Mellon campus and Schenley Park with relevant on street parking in blue

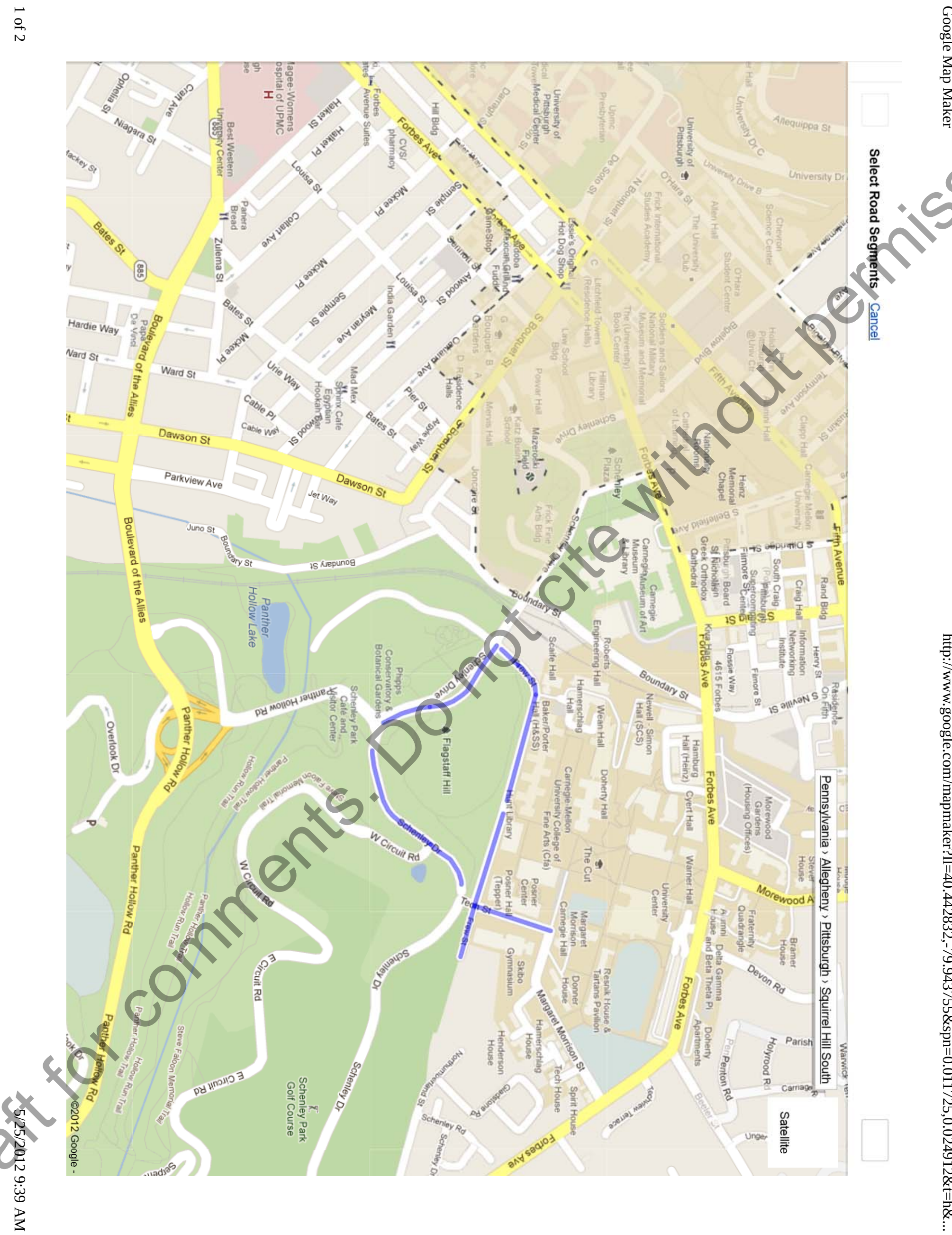

Figure 2: Map of Carnegie Mellon campus and Schenley Park with relevant on street parking in blue