TO: University of Colorado Board of Regents
FROM: Kristee McKee
Students For Transportation Solutions.
Re: Comments on transportation section of CU Master Plan[1]
Date: 2/10 /00

Dear members of the board:

I am submitting the enclosed document as analysis of the transportation section of the public review draft of the CU master plan. I am submitting this report on behalf of Students For Transportation Solutions, a student group dedicated to improving transportation alternatives for the Boulder campus. The intent is to review some of the impacts associated with the proposed construction of 2 new parking garages, and to suggest some possible alternative strategies for providing access to campus.

Some of the key points are:

- What people need is not parking per se; it is access to campus.

- There are many innovative alternatives that can be integrated creatively with parking to attain efficient and effective access.

- The high costs of increasing the parking supply would require large increases in parking rates. It may well be less expensive to the campus and even to those people who drive to campus to raise rates and use the funds generated for alternative access programs.

- Expansion of campus parking is likely to increase congestion at many important intersections, effectively reducing access and safety for everybody. The Euclid Avenue parking garage demonstrates daily the negative impacts of generated congestion and the dangers to the area around the UMC.

- Many innovative alternatives have been implemented at schools around the country. Some schools which have put comprehensive alternative transportation programs in place have actually realized success at reducing automobile demand while expanding the campus.

- The weighted data on travel to campus by students, faculty, and staff shows that only 30% of this population drives to campus. This gives a strong foundation to build upon when trying to increase the use of transportation alternatives.

[1] A number of students, staff and faculty members contributed to this report, including Ernesto G. Arias, Professor of Architecture and Planning; Brian Mueller, Professor of Architecture and Planning; Will Toor, Director of the Environmental Center; John Renne; Masters student in City and Regional Planning; Eric Scharff, Ph.D. student in Computer Science; and Te-I Albert Tsai and Robert Wonnett, Ph.D. students in Planning and Design.

The Proposed Campus Master Plan: Transportation Impacts and Costs

Introduction
This report is the result of a study focusing on campus access alternatives and parking impacts on movement, as well as other 'hard to measure' costs of movement to, from and on campus. Its focus stems from aspects of the proposed Transportation Plan section (pp. 126-149, Final Review Draft 11/99). The spirit is one of constructive criticism in the hope of making the proposed master plan a better plan for the Boulder Campus.

Our aim here is to provide suggestions to the Board of Regents and the administration to address the point that:

- *what people need is access to campus;*
- *there are many creative alternatives that can be integrated creatively with parking to attain efficient and effective access*;
- *the costs of increasing the parking supply are very high and would require a large increase in parking rates. It may well less expensive to raise rates and use the funds generated for alternative access programs;*
- *expansion of campus parking is likely to increase congestion at many important intersections, effectively reducing access for everybody;*
- *parking structures may have value as replacement parking that aims at protecting and enhancing our open space;*

These suggestions are based on a study of the proposed master plan carried out by various students, staff and faculty of the University of Colorado-Boulder and Denver. Their backgrounds and interests ranged from city and regional planning, transportation planning and urban design, to environmental management, conservation and sustainability. Our motivation to take time to research and share this study is based on concerns raised from previous campus planning actions. For example, at our campus we are all very cognizant every day we leave campus of the great impact of the Euclid Parking facility on all our modes, whether as pedestrians or bikers trying to make it safely across Broadway or Euclid or trying to catch a bus, or in automobiles navigating along a congested Euclid while trying to get out of campus.

The university should do better. It should be a leader in utilizing its campus to come up with innovative solutions to improve access and movement. It must recognize that it is a major entity within the context of the city and region. As such, the University should make decisions that improve the regional quality of life since by doing so it improves its own quality of life for the students, faculty and staff. Regionally there are concerns with transportation impacts such as rair quality, the levels of congestion and safety on the local streets. Projections about these conditions are telling us clearly that we need to take new and innovative approaches to the way we plan for institutional growth in the future. Our proposed campus plan is one very important opportunity to do so.

Status Quo and Suggestions

In some ways the situation CU faces is analogous to that faced by Stanford and the University of Washington a decade ago - a growing campus, increasing parking demand, and a location well served by transit and bicycle facilities. Stanford and UW chose innovative approaches to minimize the private vehicle share of campus arrivals , instead pursuing creative alternative modes and policies. The selected approaches by these comparable institutions paid off handsomely. What route will CU choose?

Figure 1 shows that the majority of trips to campus by the campus community do not take place in private automobiles. Campus plans should build on this foundation. We believe that the correct direction is to guide the proposed master plan NOT TO place the emphasis on more surface and structured parking, instead pursuing creative non-parking. The goal would be use demand management and alternative modes to meet the increased transportation needs ofour growing campus. Experiences around the country have demonstrated tremendous fiscal, environmental and social benefits to their campuses when pursuing such innovative thinking.

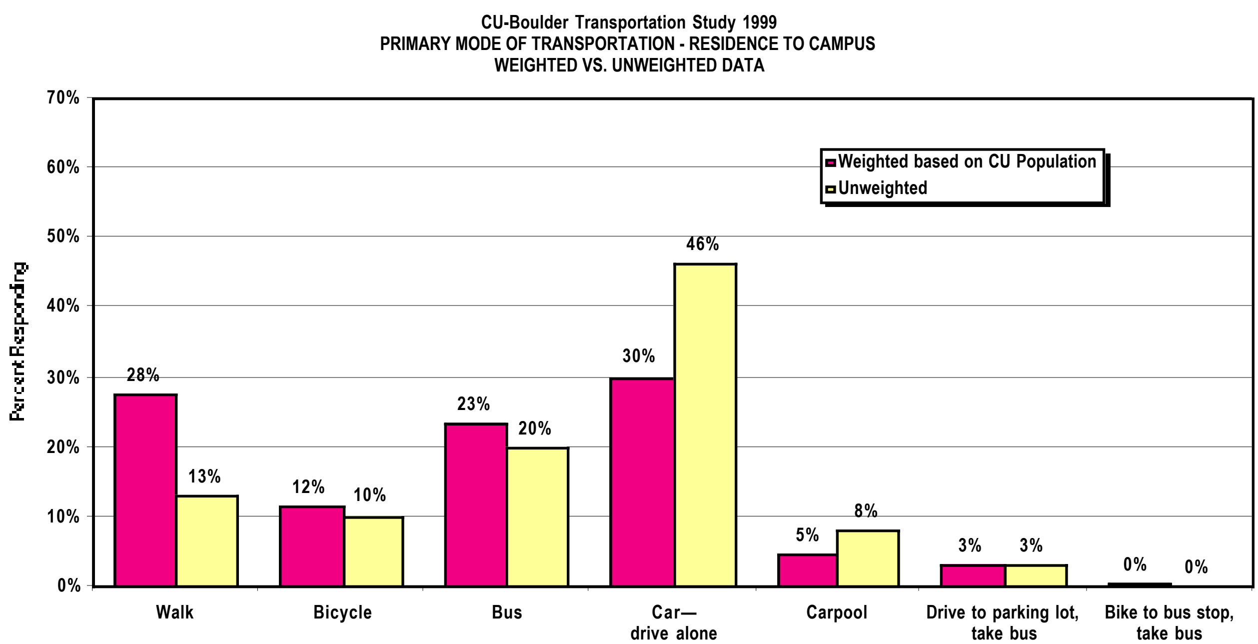

Figure 1 (Source: RRC Associates)

The proposed master plan can be seen as an opportunity to address current trends. Lewis Mumford observed that with the proliferation of parking facilities "instead of buildings set in a park, we now have buildings set in a parking lot" (Mumford, 1961). In our campus, just as is in our cities, the proliferation of parking facilities are creating greater negative impacts on our quality of urban life than at the times that lead Mumford to share that observation.

Costs of Current Plan

The proposed transportation actions regarding the short and long term parking facilities construction need to be evaluated in terms of the direct and hidden costs to the university.

Real Costs to the University

The desire to accommodate access by automobile can be an expensive proposition for a university administration. Parking spaces are auxiliary areas that serve as automobile storage facilities and do not provide direct service to the educational experience. Typically building and maintaining parking spaces increase the cost of education for college students and for accessing the campus by faculty, staff, vendors and visitors. Even thoough parking is an auxiliary, the university as a whole pays for the land used for parking

How much does it cost to bring a person to campus

- By bicycle an estimated figure is around $1,000 per bicycle for parking space and supporting infrastructure. This is a difficult figure to estimate since the costs are distributed over different infrastructure (costs of streets, sidewalks, etc). For the purpose of the study Stanford's experience was used as a source. Its recent $4 million capital outlay was utilized to provide over 3,000 bicycle parking spaces and the corresponding infrastructure improvements on campus. Today, over 21% of its employees bike to work and nearly all its 7,000 undergraduates walk or bike to class (F. Markowitz and A. Estrella, 1998).

- By bus the cost are estimated to be slightly under $1 per trip for the faculty-staff free bus pass. The annual cost of the program is $500,000 (Financial Feasibility Report for Proposed Free Faculty-Staff Bus Pass, 1997). It was estimated that the program would free 320 parking spaces. Using the figures below which include estimated value of land, this would translate in a savings of $6.96 million.

- By private car the parking costs are:

Structure	$18,000 per space
Land @ $1.1million	
Land costs Folsom	$ 1,800 per space
Land costs Grandview	$ 2,400 per space
Total (one time cost without maintenance)	$19,800-$20,400 per car

Therefore the Folsom facility cost is around $11.9 million for 600 cars and the Grandview $9.2 million for 450 cars.

Since the State owns the land, it is difficult to estimate the costs of land for parking. While these costs are never included since the land is owned by the State, real estate brokers estimate that multi-use zoned land such as on the Grandview or Folsom sites may be comparable to the land value around the Pearl Street Mall. Those values range between $25 and $30 per sq. foot. Using $25 per sq. foot figure, the value of an acre is estimated to be 25x 43,560 sq. feet = $1,089,000. Therefore for the purpose of introducing the price of land, $750,000 to $1,250,000 per acre or a range of $18-$23 per sq. foot is reasonable. If the area for a structure such as the ones proposed at Folsom or Grandview is around 55,000 sq. ft., then the cost of the land for these structures would be around $1.1 million.

Another point associated with mitigating the costs above is the type of occupancy level of the vehicles to be served by a parking structure. For example, if fiscal policies can be incorporated to move travel behavior from single occupant vehicles (SOV) to car pooling, then the efficiency of each space will increase accordingly. Presently the unweighted data percentages in the split of SOV vs. carpooling at CU are 46% to 9%, and 30% to 5% weighted (Figure 1).

The relationships between the costs behind the figures for car, carpooling or bus to bring a person to the campus are a tremendous avenue for creative fiscal planning. These figures point to the potential we have to add more academic building space on campus without having to increase parking if creative policies are developed to shift the present modal split. Use of strategic fiscal parking and transportation control is key to mitigating traffic and parking demand in attaining our campus accessibility and environmental quality goals. This may also cost the university less as has been the case in other comparable universities (see Stanford Parking Plan, UC Berkley Parking Policy & Planning Options Study, 1999).

Additional concerns involve adding to the debt burden of the University. Many alternative approaches to transportation will not require the large capital investments by the university that are needed to construct parking structures.

Costs from a more global perspective

We include in Appendix A the overall costs of mobility from a comprehensive national study. This information tells us at a more global sense the higher personal, government and societal overall cost of mobility by private car over public bus modes. The study finds that person-mile-traveled costs by auto are $0.52 cents/person-mile-traveled, with an 85% government subsidy in the form of external costs (pollution, parking, accidents). On the other hand, the cost of mobility by bus is $0.34 cents/pmt, where the subsidy is a direct government expenditure. These findings are another reason for thinking how shift from the prevailing single occupancy vehicle behavior to other forms of access to our campus.

Movement System Impacts

It is important to have some historical perspective. When the Euclid parking structure was approved, planners argued that it would not have significant negative impacts on the level of service at surrounding intersections, and would not have unacceptable impacts on pedestrian and bicycle comfort and safety. Since then, we have seen major congestion develop at the intersection of Euclid and Broadway, and many conflicts between pedestrian and bicycle movements and auto movements in the vicinity of the parking structure. It is important to avoid the same mistakes in the future.

Positive aspects of structures

General - In addition to the view that more parking affords accessibility and convenience to university functions, parking structures may be able to concentrate automobiles on campus so that access can be planned and managed better than if distributed. Structures can also be used to reduce the amount of land dedicated to surface parking, to protect the open space on the campus. This could stop the trend over the past ten years of taking open spaces with social, recreational and environmental benefits to students and turning them into temporary unpaved parking, and then to permanent surface paved parking. So, structure parking proposed can have positive impacts if it is strategically used to replace existing surface parking.

Specific –

The proposed Folsom Parking may be partially subsidized for campus users through charging for football parking. It may also relieve parking impacts on adjacent neighborhood streets and commercial parking areas during football games.

Negative aspects of structures

Intersections

The impacts on major intersections by the Folsom and Grandview proposed facilities will add to the existing "poor" and "critically poor" Levels Of Service (LOS evaluations) at those intersections. around the campus and beyond. The Folsom facility (400-600 spaces) will directly impact intersections with already critical LOS levels at:

Colorado-28th (LOS=F)
Folsom-Arapahoe (LOS=D)

The Folsom facility will indirectly impact intersections at:

28th and Arapahoe (LOS=F)
Colorado-30th (LOS=C)

The Grandview facility (450 spaces) will directly impact intersections with already critical LOS levels. There will be significant impacts which will worsen the already existing poor and critically poor levels of service of intersections at:

Broadway-University (LOS=D)
Arapahoe-17th (LOS=D)

The Grandview facility will also indirectly impact intersections which are already at their thresholds of capacity or beyond, such as those at:

Arapahoe- Broadway (LOS=D)
Arapahoe-Folsom (LOS=D)

Arapahoe-28^{th} (LOS=F)

Congestion and safety

In addition impacts can be expected to deteriorate movement on campus such as LOS at the Colorado-Folsom and Colorado-Regent Dr. intersections. The Grandview facility will create congestion within the Grandview streets, in particular Grandview Avenue. This impact is very much related to safety on campus for pedestrians and bikes, as well as in neighboring streets and intersections. The incompatibility of cars with pedestrian and bicycle movement in the Grandview Area due to the proposed parking facility may be of a similar nature as the present undesirable levels of congestion conflicts between modes we experience with the Euclid facility. In addition to costs such as added environmental stress and loss of time, our concern here is that such conditions also lead to decrease safety for pedestrians and bikers, as well as for vehicular traffic.

Other impacts

In addition to the impacts associated with circulation by the two proposed parking facilities, there will be environmental concerns as well at the campus, city and region levels. Some of these impacts are not measurable as the LOS, or cost of building a structure parking space, but they are of increasing concern. They are of enough concern that we are seeing more of the literature and practices taking them very seriously into account. This is true as we look at campus planning by other leading universities (UC-Berkeley, Stanford, U of Washington, etc.). Some impacts to consider:

- the persistent poor air quality the whole region and Boulder experiences. Such impacts contradict the goal of the environmental management section of the proposed master plan which states that “CU-Boulder will continue to be a community leader in helping assure outdoor air quality” (pg. 120, Final Draft 11/99);
- the impacts on water quality and the Boulder Creek watershed need are of concern given the proximity of the Folsom and Grandview facilities;
- the noise pollution, congestion, and safety conditions in surrounding neighborhoods, particularly along Folsom, but also within the campus as mentioned above;
- the aesthetic impacts such as those on Flatirons views from within and without our campus ;
- the impacts on surrounding neighborhoods

These and other ‘hard-to-measure’ costs such as contribution to urban “sprawl” are already leading concerns in campus planning at other leading institutions comparable to us as well as in the recent transportation research and literature at the national and international levels (e.g., see study “The Price of Mobility: Uncovering the Hidden Costs of Transportation,” by Peter Miller of Natural Resources Defense Council and John Moffet of Resource Futures International).

Cost Savings of Alternatives

The dilemma that we have with the master plan is that of mutually exclusive goals, i.e, increase accessibility through more parking spaces on campus is in direct competition with higher use of alternative modes of transportation to campus. Again, many of the other universities comparable to UCB (exhibit 1B1, pg. 6 (Final Review Draft, 11/99) are carrying out innovative approaches to address the dilemma through strategic actions such as our BUFFONE pass, the HOP routes on campus or our restricted access along the 18th-Colorado Corridor. Other innovative ideas which can be implemented with minimum or no capital outlay include:

- Rental car book as parents/students alternative to buying a car → reduce student parking demand (Stanford)

- Parking cashout programs for employees and higher parking fees → reduce employee parking demand (Stanford)

- Higher parking fees → reduce employee and/or student parking demand (U. of Washington)

Note that the financial feasibility analysis performed for Parking and Transit services in 1997 showed that there is significant elasticity of demand for parking at CU. In fact, the study indicated that there are a range of fee increases which could reduce demand while at the same time generating additional revenue that can be used for investments in bicycle or transit programs to provide alternative access to campus. The following table from that study demonstrates this:

Fee Increase Percent	Estimated Total Revenue	Estimated Increase in Total Revenue	Declining Number Of Faculty – Staff Buying Permits
0%	$875,000	$0	0
5%	$917,875	$42,057	-6
10%	$959,875	$84,875	-16
15%	$1,001,000	$126,000	-31
20%	$1,041,250	$166,250	-49
25%	$1,071,875	$196,875	-118
30%	$1,098,125	$223,125	-205
35%	$1,120,000	$245,000	-307
40%	$1,137,500	$262,500	-423

Source: Financial Feasibility : Proposed Free Faculty/Staff Buss Pass, UCB, David Bamberger & Associates, 1997
Note: Assumes no increase in faculty and staff in 1997-98 over 1997-96
File: F/S Bus Pass Financials - Fee Impact Summary

- Discounted carpooling parking programs and flexible parking permits→ reduce student and employee parking demand (UC Berkley, Cornell University)
- Class schedule changes to reduce peaks, e.g. evening classes → reduce costs and congestion (South Florida, Ohio State)
- Off-campus instruction and distance learning → reduce travel, congestion and parking costs (complementing programs in which CU is a member such as the Western Governors University's proposed credited on-line courses leading to undergraduate and graduate degrees and workplace certificates)

Finally some alternatives may even bring research dollars such as experimentation with alternative vehicle technologies in the context of exploratory research and →reduced air pollution, energy, congestion costs (research and development of people mover at University of West Virginia, UC Davis).

Conclusions: Can CU grow without adding cars to the roads?

We believe that it can if we create alternatives that minimize the private vehicle share of the modal split of campus arrivals by private automobile by pursuing creative alternative modes and policies (see figures on primary mode of transportation).

Examples of such creative alternatives have been already implemented at other comparable major research institutions around the country. Stanford University has grown by 2 million square feet of new building space since 1991, a 20% increase, without increasing peak period auto trips to campus. The population of the University of Washington has increased by 7% since 1991, while vehicle trips to and from campus have decreased by 5%. Could CU follow the same path?

The current draft of the master plan assumes that the current modal split – that is, the percentage of trips that occur on buses vs. cars vs. bikes or walking – will not change. This means that, as campus grows, the number of car trips will also grow. In order to deal with this growth, the plan calls for the construction of two new parking structures in the vicinity of the main campus- one next to the Stadium and one in Grandview Terrace.

How did Stanford do it?

Jeffrey Tumlin, Stanford's transportation programs manager from 1991-1997, visited CU during the fall of 1999 and described the techniques they used to grow without increasing traffic. Interestingly, the driving force was not environmental concerns – it was bottom line economics. His office was faced with a situation very similar to CU today – the campus was growing, new buildings were being built over surface parking lots, and the only way to increase the parking supply was building parking structures. The problem – parking structures are expensive. Each net new parking space can cost over $30,000 – translating into long-term costs of $150 per month per space every month for the lifetime of the structure. This was ten times what people were used to paying for parking – and the campus population was unlikely to accept such an increase. CU faced a similar issue in the late 1980's, and responded by building 2 parking structures – which caused parking rates all over campus to triple.

Paying People Not To Drive:

The key insight Tumlin had: it was cheaper to pay people not to drive to campus than to build new parking structures. Stanford began a program of paying any employee who did not purchase a parking permit during the year $90 – which has since grown to $140. This modest financial incentive convinced many employees to look for other ways to get to campus. They also slowly raised parking rates, increasing them by about 15% annually, but still holding them well below the actual cost of providing new parking spaces.

At the same they dramatically expanded the alternative ways to get to campus. They invested $4 million in improving bicycle facilities, and got 900 more people to shift from cars to bikes – a cost of $4400 per person. Compared to the $18 million or more they would have had to spend on parking structures for the same number of people, they considered this a good deal. They also turned a main road through campus into a bike/transit mall, and dramatically increased transit service to campus.

Keeping students mobile – without having cars

In Tumlin's words "Most students use their cars only sporadically, once or twice a week at most. At Stanford, we calculated that if we charged the full cost of parking to students, it would be cheaper for students to rent a car for three quarters of the weekends of the entire academic year than to store a car on campus. Unfortunately, most rental car agencies do not rent to people under 21. To overcome these problems, we contracted with a local rental car agency and leased them low-cost campus space in exchange for renting to all students and maintaining student-appropriate hours. They also agreed to provide bulk rental car discount books that could be sold to students or their parents in lieu of purchasing a vehicle"

Housing was Key

The other key investment – building lots of housing to allow faculty, staff and students to live on campus. This was driven by the very high housing costs in the area, but has the side benefit of reducing transportation demand. Again in Tumlin's words "By far the most cost effective way to reduce transportation demand is to house people where they work or go to school. Stanford has built thousands of student and faculty housing units over the last ten years. An additional 1,200 units aimed at staff are currently under construction."

The result of all this**: Stanford has been able to add 2 million square feet of buildings while holding peak period traffic to campus constant!**

How it worked at the University of Washington

The University of Washington in Seattle shows that you don't have to be an elite private university to make this approach work - the same general approach can also succeed at a large public university. The UW master plan is focused on allowing the university to grow – without increasing traffic or parking demand in surrounding neighborhoods. Planners estimated that UW's expansion plans would bring 10,000 more cars a day if no creative actions were taken. In response, UW created the U-PASS program, which has many similar elements: improving transit, providing more bicycle facilities –and changing the financial incentives around parking. Parking costs were increased from $24/month to $46.50/month, with much of the additional revenue going to support the alternatives. This may seem like a big hit – but is probably cheaper than parking would be if additional structures were built. It has also made it much easier to find parking – there are more parking lot spaces left for thos people who do continue to purchase parking permits. The net effect: while the population grew 7%, parking demand fell 22% and car trips fell by 17% during the am peak, and 5% averaged over the day.

How about CU?

The Boulder campus has put in place many of the same elements that we see at Stanford and the University of Washington. On the transit front, every CU student and permanent employee now has free access to local and regional transit by showing her university ID. Cooperative efforts between CU, RTD, and the city have led to major improvements in transit service throughout the entire community. Next summer the JUMP, BOUND, and LEAP will come on line (see accompanying article on page 3), giving yet another major improvements in service. Planning efforts are underway today to develop the STAMPEDE shuttle linking main campus to east campus, and the DASH, which will provide high frequency transit between Boulder and Louisville along South Boulder road.

UCB also has some of the bicycle-system elements in place. The Boulder Creek bike path and Broadway bike path, the underpass under College, and the thousands of bicycle parking spaces on campus provide the basic infrastructure needed for biking to campus. However, the number of people riding to campus at CU is much lower than at Stanford. Counts at Stanford have shown that up to 75% of the people arriving at academic buildings arrive by bicycle. At CU, approximately 12% of trips to campus are by bike (See figure on Primary Mode of Transportation). The draft CU master plan does identify one high priority improvement – creating a legal, well-marked East-West route across campus, tying Pleasant Street to Colorado Avenue.

One area which CU has not been explored fully is the use of financial incentives – whether the Stanford approach of offering cash to folks who do not drive to campus, or the University of Washington's approach of raising parking rates to more closely reflect all of the true costs. Also, unlike Washington, CU is still considering large scale construction of parking structures, and even surface parking lots.

In some ways the situation CU faces is analogous to that faced by Stanford and Washington a decade ago - a growing campus, increasing parking demand, and a location well served by transit and bicycle facilities. Stanford and UW chose innovative approaches which paid off handsomely. What route will CU choose?

References and Data

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Appendix A – The General Costs of Mobility – the Car vs the Bus

The Soltice study at the national level mentions various costs, besides the personal costs, associated with mobility (private vehicle vs. public transit) which are good to at least keep in mind when thinking about the overall issue of accessibility to and within our campus. These costs are have been estimated in terms of direct personal, government subsidies and societal costs measured on cents per person-mile-traveled (cents/pmt). We include them here to provide a relative yardstick when thinking about costs of mobility between the private and public modes (Solstice 1999 <http://solstice.crest.org/nrdc/mobility/index.html>):

1. personal	$0.300	vs.	$0.12 /pmt
2. capital and operating	$0.020	vs	$0.20 /pmt
3. local services	$0.0026	vs.	$0.0013 /pmt
4. energy .	$0.05	vs.	$0.013 /pmt
5. congestion	$0.0035	vs.	$0.000 not demonstrable
6. parking	$0.032	vs	$0.000 (part of 2)
7. accidents	$0.033	vs	$0.007 /pmt
8. noise	$0.002	vs	$0.001 /pmt
9. air pollution	$0.070	vs	$0.016 /pmt
10. water pollution	$0.0013	vs	$0.000

The following are too difficult to quantify since they are very qualitative or hidden/societal costs (equity, quality of life), yet as explained here they are very real relative to the proposed parking facilities of the master plan:

1. wetlands -
2. land loss -
3. historic buildings -
4. property values
5. transportation equity
6. urban sprawl

Taken together, the overall cost of mobility by private car vs. public bus modes in this comprehensive study are that the person-mile-traveled costs by auto is $0.52 cents/pmt, with an 85% government subsidy in the form of external costs (pollution, parking, accidents). On the other hand, the cost of mobility by bus is $0.34 cents/pmt, where the subsidy is a direct government expenditure. This last point leads to the incorrect perception that public transit is more heavily subsidized since direct government expenditures are more easily scrutinized.