

## **TASK 9: ENCOURAGING CARPOOLING, BIKING, AND TRANSIT USE AT THE ABC RAMPS**

This task report identifies steps that Minneapolis’s ABC Ramps can take to help promote carpooling, biking, and transit use among downtown commuters. It draws recommendations from best practices in parking and transportation management from around the world, and suggests application of the most appropriate ideas to the ABC ramps.

While the recommendations vary considerably, many aim to lower the barriers to carpooling, biking, and transit use among people who normally drive alone. The chief problem is that the ABC Ramps’ current pricing structure offers little flexibility: drivers with a monthly single-occupancy vehicle (SOV) parking contract have little incentive to try a different mode of transportation. After they have paid upfront for their parking space, taking the bus, riding a bike, or sharing a ride will not save them money, and it may add inconvenience. Accordingly, the recommendations below explore how the ABC Ramps can give drivers an incentive to reduce SOV driving by leaving the car at home at least part of the time.

The first portion of this report summarizes the ABC Ramps’ current policies and identifies which behaviors they encourage or discourage. It also considers the equity impacts of each policy. A second section—the core of the report—identifies a series of potential improvements that the ramps could make. These can be grouped into four broad recommendations: modifying the price structure, integrating technology, improving the benefits and amenities, and expanding outreach efforts. These recommendations do not form a unified program, but rather a menu of options, many of which are mutually reinforcing (and some of which are mutually exclusive or redundant). A third section identifies improvements that other agencies, such as Metro Transit, could consider. While ABC Ramps cannot take the lead in implementing many of these programs, it could advocate SOV-reduction policies with its peer agencies. Next, a fourth section describes long-term developments that could affect the ABC Ramps in the future. These are not recommendations, but possible scenarios in the broader city and regional context that would require the Ramps to reevaluate their role. Finally, an appendix describes numerous other transportation-management and congestion-reduction solutions from around the country and the world. These form the basis of the recommendations presented in part two.

Professors Jason Cao and Frank Douma, of the Humphrey School of Public Affairs at the University of Minnesota, oversaw the creation of this report, while Allen Young and Kevin Karner compiled many of the specific proposals. The review of solutions from other states and countries comes from the students of Professor Cao’s graduate-level course on transportation and land use, “Networks and Places” (PA 8202), taught in spring 2017. Each student analyzed one program or solution, briefly evaluating it and identifying the behaviors it encouraged and its equity impacts. Their anonymized findings make up the appendix.

## CURRENT PROGRAMS

The ABC Ramps are owned by the Minnesota Department of Transportation, managed by the city of Minneapolis, and run by ABM Parking and Transportation Services. Built in the 1990s, they are intended to reduce congestion downtown by providing convenient and affordable parking, and direct highway access to commuters from I-94 and I-394. Ramp A, the largest of the three, has around 3,500 parking stalls, while Ramps B and C each have around 1,500 stalls each.

In addition to monthly, daily, and hourly parking, the ramps offer a number of programs to encourage drivers to carpool or vanpool, or to incorporate biking or transit into their trips downtown. Easy connections to light rail, buses, and bike share stations make it easy for travelers to leave their car behind for the last leg of their journey. Other services, such as dedicated motorcycle parking and secure bike storage, cater to those who don't travel by car at all.

The following information comes from the website of the ABC Ramps (<http://www.abc-ramps.com>).

### Parking

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Monthly, daily, and hourly rates are competitive with other garages downtown. Parking contracts are \$130 (Ramp A), \$140 (Ramp C), or \$150 (Ramp B) per month. Short-term parking costs \$2 for the first and second half hours, \$2 for each additional hour, and \$12 for five to twelve hours. (Rates are slightly lower in Ramp A.) Early-bird parking, with entry between 6am and 9am on weekdays, costs \$8 for up to twelve hours (\$7 at Ramp A). Weekend parking is \$5, while nighttime and special event parking ranges from \$5.25 to \$15. Charter bus parking for events needs to be purchased in advance. A special long-term "Ramp-Ride-Fly" rate is available to those going to Minneapolis-St. Paul International Airport: for \$10 for the first day and \$3 for each additional day, with a three-day minimum and a 16-day maximum, travelers can park their cars and take the light rail to catch their flight.

### Carpool-to-Work Program

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Unlike other parking garages, the ABC Ramps have programs to discourage commuting to work in single-occupancy vehicles (SOVs). Drivers who travel with one or more passengers can qualify for a discounted carpool rate of \$99 per month, or \$20 per month if they live in the West or Northwest suburbs. (This discount is offered because the ramps were intended to reduce congestion on I-394 and I-94, which commuters from these areas would be likely to use.) Additionally, vanpools with a minimum of five commuters can park for free. This program has undergone only very minor changes since its inception, and in recent years, participation has declined precipitously.

## Transit

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The garages are connected by skyway to the light rail, which goes east to St. Paul and southeast to the airport and Mall of America. Ramp B is a transit hub, serving lines 3, 14, 20, and 94, as well as suburban express lines 353, 355, 365, 375, and 887 (to/from St. Cloud Friday midday only); Ramp A serves lines 4, 5, 9, 19, 22, 39, 61, 134, and 452. Several other lines stop within the surrounding blocks. Additionally, the ramps connect to the North Star commuter rail line, which extends north to the town of Big Lake. In order to encourage drivers to use transit for the last leg of their trip, the ramps offer carpool contract holders free transit within the downtown area through the Ramp-Ride-Rail program. Furthermore, the suburban bus lines that connect to the ABC Ramps let riders park closer to their homes at park-and-ride stations.

## Cycling

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The ABC Ramps also serve cyclists. Secure storage lockers are available for rent on a six-month or yearly basis for \$30 or \$50, respectively. Additionally, the ABC ramps offer showers to bike storage contract holders for a flat rate of \$50 (regardless of the length of the contract). Bike racks are also available. The ramps also sponsor Nice Ride stations near the ramps let drivers and transit riders cycle to their destinations during the months of service (April to November).

## Other programs

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The ABC Ramps offer special rates for motorcycle parking (\$5 for 24 hours), and allow drivers of electric vehicles to power up for \$0.80 per hour (on top of regular parking rates). Move Minneapolis does outreach to commuters and employers regarding the carpool program, and to allay commuters' fears of not being able to return home in an emergency, Metro Transit offers the Guaranteed Ride Home program, which reimburses users for up to four taxi trips home per year (or \$100 maximum). It is available to anyone who commutes by carpool, vanpool, bike, or transit at least three times a week.

## Summary Table

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The table on the following page summarizes these programs, notes which behaviors they encourage and discourage, and identifies their potential equity impacts. Several of the programs, such as preferential rates for carpoolers, encourage people to share their commute with others. Nevertheless, by targeting commuters from the western suburbs, these rates in effect give a subsidy to residents of the wealthiest parts of the metropolitan area.

The Guaranteed Ride Home program offers carpoolers a helpful backup plan in case they need to return home quickly. The Ramp-Ride-Rail program helpfully makes transit more affordable through the central core, discouraging commuters from driving downtown to their final destination.

**Table 1 Current ABC Ramps Programs**

Programs	What behavior is encouraged?	What behavior is discouraged?	What are the equity impacts?
Bike lockers, showers	Biking, walking	Driving, downtown driving, other modes	Promotes low-cost transportation
Bike sharing	First- and last-mile transit use, biking, walking	Downtown driving, other modes	Promotes low-cost transportation; bias against those without credit cards
ABC carpool (\$99)	Carpooling, downtown driving	Solo driving, other modes	Promotes relatively low-cost transportation
ABC I-94, I-394 carpool (\$20)	Carpooling from west metro	Solo driving, downtown driving, other modes	Gives low price to most affluent areas
ABC vanpool	Car-(van)pooling, downtown driving	Solo driving, other modes	Promotes relatively low-cost transportation
ABC monthly SOV contract	Solo driving every day	Other modes	Charges market rates – no advantage to low-income commuters
ABC daily parking	Solo driving on some days	Downtown driving (no in/out privilege), nonessential driving, other modes	Charges market rates – no advantage to low-income commuters
ABC early-bird rate	Solo driving on some days	Downtown driving (no in/out privilege), other modes	Provides cheaper alternative that could benefit low-income commuters
ABC event rate	Driving to events	Other modes	Charges market rates – no advantage to low-income commuters
ABC airport parking	Transit to airport	Airport pick-up and drop-off, parking at airport, taxis and Ubers	Provides low-cost alternative
ABC motorcycle parking	Motorcycle use	Other modes	Charges market rates – no advantage to low-income commuters
On-street parking	Driving, downtown driving (cruising for parking)	Other modes, short-term parking at ABC ramps	Charges market rates – no advantage to low-income commuters
EV charging	Electric vehicle use	Other modes	Gives benefit to owners of expensive electric vehicles
Ramp-ride-rail	Last-mile transit use, walking	Downtown driving	Promotes low-cost transportation (with parking)
Transit hubs / station amenities	Transit use, walking	Driving, downtown driving	Promotes relatively low-cost transportation
Guaranteed Ride Home	Carpooling, biking, transit use	Solo driving	Promotes relatively low-cost transportation

## RECOMMENDED PROGRAMS

While the ABC Ramps already offer several programs to encourage carpooling, transit use, cycling, and walking, these programs could be expanded. As noted above, the following recommendations focus on lowering the barriers to carpooling and on making the connections between driving and other modes of transport as smooth as possible. Many of these proposals are compatible with each other, while others are alternative ways of achieving similar goals.

## RECOMMENATION 1: MODIFY THE PRICING STRUCTURE

### 1a. Flexible Parking Contracts

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Currently the ABC Ramps offer monthly contracts and daily and hourly parking. Users who purchase a monthly contract may be inclined to drive alone even when they could carpool or take transit, because the monthly fee is a sunken cost. More flexible contracts covering a combination of services, or providing reimbursement for unused parking days, would let users alternate between carpooling, biking, riding transit, and driving alone.

### 1b. Contracts for Occasional Carpoolers and Transit Riders

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One new option would be a flexible contract for people who drive most of the time but occasionally carpool, bike, or take transit. This might provide these users with a set number of parking days per week or month (for example, three or four per week, or fifteen per month). Without the sunken cost of a unlimited parking for the month, these occasional drivers would be encouraged to continue to take transit or bike.

### 1c. Occasional Use Parking Passes for Carpoolers and Transit Riders

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People who regularly carpool or take transit to the ABC Ramps could enjoy a number of days of free or discounted parking every month for those times when carpooling is not possible or practical. Such a system exists at the University of Minnesota, which offers an Occasional Use contract for employees who do not typically drive to work: for around \$100 or \$130 (depending on the lot), they can use the parking facilities for 22 days each year. As with the contracts for occasional carpoolers and transit riders, this solution would lower a barrier for potential carpoolers: knowing they could drive occasionally, if necessary, would make them more likely to sign up to carpool.

### 1d. Carpool Bundle

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A more ambitious option would be to provide a bundle of benefits with carpooling contracts, including not only a limited number of days of free SOV parking (through occasional use passes), but also a transit pass, Hourcar credit, a Nice Ride membership, etc. The currently existing Guaranteed Ride Home program would be automatically incorporated into the bundle.

### 1e. Flat Carpool Rate

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The current carpool rates give a significant discount to commuters from the western suburbs (\$20 vs. \$90). In effect, this program subsidizes carpooling to the wealthiest areas in the metropolitan area. Instating a single flat rate for the region would be fairer and could encourage more people to carpool.

## **1f. Daily Carpool Rate**

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Currently carpoolers receive discounts only on monthly contracts. Providing all vehicles that enter with multiple passengers a daily discount could provide an added incentive to commuters who carpool occasionally, as well as to anyone else who shares rides with others.

## **1g. Rate Adjustments to Change Incentives**

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One suggestion put forward by the [Victoria Transport Policy Institute](#) (VTPI) is to reduce the discounts enjoyed by long-term users: monthly contract holders, who pay a single lump sum for unlimited parking, can use the ramps (and hence the highways) even when they do not need them. The VTPI suggests making “daily rates at least 6 times the hourly rates, and monthly rates at least 20 times daily rates.” Replacing monthly contracts with packets of daily or hourly vouchers would reduce incentives to unlimited driving, though it would also push some customers to competing nearby private lots. Likewise, removing early-bird discounts would help correct the incentive to drive, although this option would leave low-income commuters without an economical parking option downtown.

## **1h. Rate Adjustments to Optimize Capacity**

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On many days Ramps B and C are nearly full, while Ramp A is often at close to half capacity. ABC Ramps could continue to adjust their rates to achieve 90% occupancy in all three ramps. The current price difference between the ramps (\$10 per month between A and C, \$20 per month between A and B) could be adjusted every three or six months until the desired occupancies are reached. Adjustments should affect the daily rate as well. A Carpool Study completed in early 2017 by Kimley-Horn also recommends adjusting the parking rates, though only modestly. (They propose raising hourly rate in lot C by \$1.00 and reducing the monthly carpool rates outside the western suburbs.) However, since the ABC Ramps cannot compete with the private sector ramps downtown, there would be a limit on how far down they could be adjusted.

## **1i. Cap on SOV Contracts**

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To have a more dramatic impact on carpooling, the ABC Ramps could limit the number of single-occupancy vehicle contracts it offers. This would be particularly useful in Ramps B and C, which typically fill up. A portion of commuters would be forced to pay daily or hourly rates, and would adjust their behavior accordingly. While some would no doubt go to competitors, others might find they have a financial incentive to move to the A Ramp, or try carpooling or transit use.

**Table 2 Recommendation 1: Modify the Pricing Structure**

Program	What behavior is encouraged?	What behavior is discouraged?	What are the equity impacts?
Ia. Flexible contracts	Use of multiple modes	Driving alone every day	None
Ib. Occasional carpooling contract	Occasional carpooling	Driving alone every day	None
Ic. Free or discounted parking for carpoolers and transit riders	Carpooling, biking, transit use, and occasional driving	Driving alone every day	Makes carpooling, biking, and transit available to people who occasionally need to drive
Id. Carpool bundle	Carpooling, biking, transit use	Driving alone	None
Ie. Flat carpool rate	Carpooling outside the western suburbs	Driving alone	Removes benefit from Western suburbs
If. Daily carpool rate	Carpooling occasionally	Driving alone every day	None
Ig. Rate adjustment to change incentives	Carpooling, biking, transit use	Buying a monthly contract, driving alone every day	Could cause a burden for low-income commuters who rely on early-bird rates
Ih. Rate adjustment to optimize use	Parking in A, carpooling to B or C	Transit use, potentially	Could affect private competitor lots
Ii. Cap on SOV contracts (in all 3 ramps, or in B&C only)	Carpooling, biking, transit use	Driving alone	Could cause a burden for low-income commuters who rely on monthly contracts

## RECOMMENDATION 2: INTEGRATE TECHNOLOGY

### 2a. Total Access App (or Card)

A single access mechanism to pay for parking, transit, and car- and bike-sharing services would encourage users to do more than just drive to and from at the ABC Ramps. Currently the Ramp-Ride-Rail program lets carpool contract holders ride transit downtown for free; expanding this program, and integrating it into other services—preferably through a mobile app, or failing that, through a card—would further lower the barriers to multimodal travel. The key convenience would be a single payment method that users would automatically calculate user’s parking fees and transit discounts. Such an app could also provide anonymized data about travel patterns, which in turn would let the ABC Ramps or Metro Transit tailor their services more effectively. This app could also provide access to other services, such as the ramps’ showers, which are currently available only to bike-contract holders (See discussion of “Expanded Biking Amenities,” below).

Additionally, this app could also link to the ride-matching tool used by Move Minneapolis and Metro Transit, so that people willing to carpool could easily and safely meet matches. Each user could have a

personal profile—perhaps linked to Facebook or other social media platforms—so potential carpoolers would know something about who they were riding with in advance. It could also provide an option for spur-of-the-moment carpooling, by connecting users with other nearby drivers headed in the same direction, in a way similar to Uber’s “Commute” function, which is not yet available in Minneapolis.

Vancouver’s TravelSmart program provides an app that shows travel options within a geographic area, as discussed on page 38. A similar approach was taken by the San Diego Association of Governments: it recently requested proposals for a regionally specific app that local commuters could use to find carpool partners; a pilot initiative that the city launched looked promising. This is discussed in more detail on pages 82-83. Whatever the method, a well-designed app could make carpooling much more convenient.

## **2b. Parking Payment in the Metro Transit Mobile App**

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Metro Transit has an app to pay for transit use. Integrating parking payment options into the app would make it easier for regular transit riders to park (and drive) on occasion. This could also make more people willing to try taking transit more often, since the payment option would be built in to a system they already use.

## **2c. Lyft Line, Uber Pool and Uber Commute**

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Currently, Lyft and Uber do not offer their ridesharing services (Lyft Line, Uber Pool and Uber Commute) in Minneapolis. Since these services make it easier for users to carpool casually and spontaneously for a small fee, the ABC Ramps could work with these companies to offer these programs here and provide carpool parking discounts to their drivers. This would allow more people to carpool without having a fixed riding partner.

## **2d. Parking Prices in Navigation Apps**

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Drivers comparing commute prices may look at transit fares or ride-sharing fares and conclude that SOV driving is cheaper. Once parking is factored into the equation, however, a solo commute may look less attractive. The ABC Ramps could work with Google Maps or other apps to show how much a car trips costs when it includes a certain number of hours of parking. They could also include this information in the Metro Transit app or in the Total Access app described above.

## **2e. Autonomous Vehicle Pilot Program**

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The ABC Ramps could help commuters see how autonomous vehicles can ease their commute in the future. The ABC Ramps could serve as an operations hub for these vehicles, taking transit riders, bicyclists and other paying customers the “last mile” from the Ramps to their workplace. More broadly, a similar program near transit hubs (led by Metro Transit) could make commuting easier for people

whose work or home is not close enough to a transit corridor to make riding the bus or light rail convenient.

**Table 3 Recommendation 2: Integrate Technology**

<b>Recommendation 2: Integrate Technology</b>			
<b>Program</b>	<b>What behavior is encouraged?</b>	<b>What behavior is discouraged?</b>	<b>What are the equity impacts?</b>
2a. Total Access app	Varying commute methods	None	Some commuters may not have a smartphone
2b. Parking payment in Metro Transit app	Transit use, driving	None	Some commuters may not have a smartphone
2c. Uber Pool and Uber Commute	Carpooling	Driving alone	Some commuters may not have a smartphone
2d. Parking prices in navigation apps	Transit, biking, carpooling	Driving alone, parking	Some commuters may not have a smartphone
2e. Autonomous vehicles	Parking in a ramp and taking an automated shuttle the last mile	Driving the last mile	

**RECOMMENDATION 3: IMPROVE BENEFITS AND AMENITIES**

**3a. Expanded Ramp-Ride-Rail Program**

The Ramp-Ride-Rail program currently offers ABC Ramps carpoolers free rides on transit within downtown Minneapolis. This program could be expanded through cooperation with St. Paul Smart Trips, to expand the area to include the Green Line corridor. The area could also include other employment or entertainment hubs along the Blue Line, while the program could be expanded to include all contract holders.

**3b. Expanded Biking Amenities for Occasional Users**

In addition to its current storage lockers and bike racks, the ABC Ramps could expand their services to include even more bike racks, as well a bicycle fix-it shop and information center, with route maps and other materials showing easy ways to get around downtown Minneapolis on two wheels. The Ramps could also be a hub for storing shared bikes (either through Nice Ride or any future programs that may be implemented). Bike storage lockers could also be available on a one-day basis, to encourage people who may wish to bike occasionally but don't want to pay for a six-month locker contract up front. Additionally, a secure bike cage could be offered free of charge, with access restricted to those who register for a key card. This option would create a no-cost storage option for the occasional cyclist that would be deterred by paying any charge for securing their bicycle. Finally, the showers could be made available to all bike commuters, not just locker renters, for a fee and with controlled access (e.g., key cards or the Total Access app). All these measures would make cycling more attractive to occasional

users, who wouldn't have to sign up for a six-month or one-year contract to take advantage of the facilities.

### **3c. Preferential Parking Spaces**

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Carpools and vanpools should have preferential parking spaces in the ABC Ramps, perhaps on the first floor and near the skyway exits. Subtle measures like this can visibly reinforce the ramps' commitment to encouraging carpooling and discouraging solo driving.

### **3d. Reserved Spaces**

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Given the fact that Ramps B and C are frequently at capacity, a daily reservation system could let drivers save a spot in advance. Advance reservations would make it easier to manage demand, particularly for special event parking. Users who reserve a spot might be given additional in-and-out privileges. This could be restricted to, or a discounted reservation rate could be provided to people who normally take the bus or commute in a carpool, which would give them a more convenient parking option on days when transit or carpooling are inconvenient.

### **3e. Relaxed Carpool Verification**

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Annual carpool verifications, rather than semiannual verifications, would be another way to lower the barrier to carpooling. Not only might a more relaxed system attract more users, it could also lower verification costs. A system could also be put in place to perform spot checks on people entering the garage with carpool contracts. One danger is that, while such a program would make it easier for people to sign up for carpooling contracts, it would not necessarily make them more likely to carpool (if they knew no one was checking up on them).

### **3f. Refer-a-Friend Promotions for Carpools and Vanpool**

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Carpool or vanpool users who refer their friends, and thus encourage more people to share rides downtown, should receive a discount on their own fees, or perhaps even parking credit for future months.

### **3g. Free or Discounted Hourcar Membership**

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The Hourcar car-sharing system does not currently have cars at the ABC Ramps. Providing a few convenient parking spots could add a very useful service for the ramps' users. Carpoolers, and specifically those who ride as passengers, may find having access to cars for short trips downtown an added convenience that could incline them to forego solo driving; the ABC Ramps could provide carpool contract holders with a few free hours of car-share program use per month. More significantly, convenient access to shared cars could serve nearby residents in the North Loop, who might choose it

over car ownership. Downtown, businesses, too, could find car-sharing a more economical alternative to maintaining (and paying to store) corporate vehicles (as noted on page 65, HourCar provides this option already). For their part, the ABC Ramps could provide free or discounted parking for Hourcars or Zipcars.

### 3h. Free or Discounted Nice Ride Membership

The Nice Ride bike-sharing system currently have Nice Ride stations at the A and B ramps and several others within a few blocks. Giving ABC Ramp users a free or discounted membership would encourage them to take advantage of this very convenient service for getting around downtown Minneapolis. Currently University of Minnesota staff, for example, pay just \$25 for an annual membership, as opposed to \$75 for the general public. Stronger links between parking and bike-sharing could help more users solve the first-mile / last-mile problem: in the warmer months, in particular, contract holders could use Nice Ride to bike from the ramps to their workplace.

**Table 4 Recommendation 3: Improve Benefits and Amenities**

Program	What behavior is encouraged?	What behavior is discouraged?	What are the equity impacts?
3a. Expanded Ramp-Ride-Rail	Transit use	Biking	None
3b. Expanded biking amenities	Biking	Transit use, driving	None
3c. Preferential parking spaces	Carpooling	Driving alone	None
3d. Reserved parking spaces	Driving, parking	Transit use, biking	Could be a burden for low-income commuters who can't afford reservation premiums
3e. Relaxed carpool verification	Carpooling, cheating on carpooling	Driving alone, carpooling	None
3f. Refer-a-friend	Carpooling	Driving alone	None
3g. Hourcar discount	Shared car use	None	None
3h. Nice Ride discount	Shared bike use	None	None

## RECOMMENDATION 4: EXPAND OUTREACH EFFORTS

### 4a. Advertising

No matter how the ABC Ramps decide to expand their services, they will need to let more people know about their programs. Many newcomers to the area, as well as many longtime residents, may be unaware that the Ramps offer such cheap carpool rates or such convenient airport parking. More

advertising could go a long way toward making the ABC Ramps more successful. Advertising could include increased signage in skyways and billboards on local highways. Fliers and emails aimed at those who work downtown could build on Move Minneapolis's existing outreach efforts to downtown employers. By making more people aware of the ABC programs, advertising would encourage them to consider saving money by carpooling.

#### **4b. Employer Outreach**

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In addition to new employee education and outreach programs, Move Minneapolis can expand its efforts to work with employers to provide technical assistance for the implementation of TDM plans. One possible program expansion could involve managing the parking contracts of employers whose employees use the ABC Ramps. More broadly, the Ramps could work with downtown companies that pay for their employees' off-site parking, encouraging them to consider the ABC Ramps. Employees who, through transit use or carpooling, spent less than their employer-provided parking credit could receive a refund, possibly shared with the employer.

#### **4c. New Employee Program**

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Working to educate new downtown employees about carpooling and transit options when they are first hired could prevent them from settling into solo driving habits. The ABC Ramps could work with larger employers, and could reach out to employees at smaller companies directly through increased advertising. Move Minneapolis would have an important role to play in this effort. One option would be to make an informational video that new downtown employees could watch to learn about commuting options. Microsoft has seen results from such a video, as discussed on page 49.

#### **4d. Targeted Marketing**

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ABC Ramps could use targeted marketing to encourage alternatives to driving among key constituencies, promoting biking to people who live within a few miles of downtown, promoting transit use to people who live near park-and-ride stations or transit corridors, and promoting carpooling to people who live farthest outside the city. Knowing whom to target would entail knowing where people live and work. For this recommendation, the Ramps might start with people whose information they already have, such as current customers.

#### **4e. Engagement with Carpoolers**

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Increased outreach to current carpoolers could help them stay engaged and continue to carpool. Newsletters would make them aware of new programs, and activities could provide them a forum in which to meet new people.

#### 4f. Incentives

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A loyalty program could measure how often people take transit or carpool and reward them, perhaps with Hour Car time, a Nice Ride membership, or SOV parking credits. This could be tracked in a fun, easy-to-use app.

#### 4g. Champions program

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The ramps could work with downtown partners (employers, multi-family residential communities, etc.) to create a “Champions” program that would help develop, implement and coordinate long term strategies for disseminating information about options to driving alone. This program could be modeled after a similar program in Arlington County, Virginia, which is discussed on page 28.

**Table 5 Recommendation 4: Improve Outreach Efforts**

Program	What behavior is encouraged?	What behavior is discouraged?	What are the equity impacts?
4a. Advertising	Using ABC Ramps programs	None	None
4b. Employer outreach	Using ABC Ramps programs	Driving alone	None
4c. New employee program	Transit use, biking, carpooling	Driving alone	None
4d. Targeted marketing	Transit use, biking, carpooling	Driving alone	None
4e. Carpooler engagement	Carpooling	Driving alone	None
4f. Incentives	Transit use, biking, carpooling	Driving alone	None
4g. Champions program	Long-term awareness of and opportunities to use non-SOV options	Driving alone	None

### OTHER INITIATIVES TO SUPPORT

Below are a few initiatives that fall beyond the scope of what ABC Ramps can do, but which could have an impact on reducing single-occupancy vehicle driving. Where possible, the Ramps should support other agencies in moving to implement these or similar policies.

#### Free Transit Passes for All Downtown Workers

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A more ambitious variation on the Ramp-Ride-Rail program would be a free monthly transit passes for everyone who works downtown. The passes could be paid for with a small tax on businesses and/or with grants. Columbus, Ohio, recently rolled out a pilot program with free passes and is considering

extending it to everyone who works downtown. Faced with the choice between paying for parking or riding transit for free, commuters are more likely to leave their car at home.

### **Free Transit Passes for New Users**

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A more limited approach would be for Metro Transit to offer free single-trip transit passes to commuters who typically drive alone, as a way of encouraging them to try out the bus. Metro Transit already sends welcome packs with transit passes to new residents in some areas, and this program could easily be expanded to reach suburban commuters who park at the ABC Ramps. Similar education and encouragement programs have been shown to be effective by St. Paul Smart Trips, whose Neighborhoods program sought to boost ridership by educating people about transit.

### **Health Insurance Discount for Non-drivers**

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Patrons who regularly bike or take transit to work could have their commute “certified” by the Ramps, so that health insurers wishing to encourage a healthy lifestyle could offer discounts. (Transit users would get the benefit, in addition to cyclists, as they typically walk to and from stops.) This could take the form of a monthly incentive: for example, insurers could offer a \$20 monthly discount on premiums for people who bike or take transit a certain number of times per month. In this kind of program, the role of the ABC Ramps would be to certify the commutes.

### **Enforcement and Expansion of Current TDM Plans**

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Existing transportation demand management (TDM) plans should be enforced and expanded. Companies should provide incentives for their employees to carpool, bike, or take transit to work. Additionally, cities in the area could require employers to provide incentives for leaving their cars at home. For example, rather than offering free parking and a modest transit benefit, companies could charge their employees a fee to park and offer them free monthly transit passes. Cities, for their part, could help “nudge” employers to take these steps, perhaps by taxing any free parking spots they provide. Cities could organize promotional events throughout the year (as Arlington, VA, does in its “Champions” program) to promote diverse modes of transportation.

Several cities along the I-494 corridor require a financial guarantee from large employers to ensure they make a good faith effort to reduce solo-driving. The I-494 Corridor Commission also helps employers to write TDM plans, sometimes more stringent than conventional consultants.

## **POSSIBLE FUTURE SCENARIOS**

Any broad changes that occur in downtown Minneapolis will directly affect the ABC Ramps. The scenarios described below are not proposed programs, but rather plausible city changes that the ABC

Ramps may wish to prepare for. To successfully lower congestion in the future, the Ramps should increase efforts to become as a multimodal hub, not just a place to store cars.

### **Car-Free Downtown**

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European cities such as Madrid, London, and Copenhagen strictly limit the number of private passenger vehicles in the central core, either banning them outright or charging drivers who enter the city center a fee (using “cordon pricing”). In the US, New York recently made Times Square a pedestrian area, while San Francisco has limited driving on Market Street. If this trend continues, Minneapolis may one day follow suit, prohibiting or restricting private cars from its downtown. If it does, the ABC Ramps, positioned as they are on the fringe of downtown, could become a very important hub for people to leave their cars before they enter the downtown area.

### **Self-Driving Cars**

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As noted above, some long-term predictions for trends in transportation suggest that autonomous vehicles will not only do away with driving, but will also drastically reduce the need for car ownership. Surrounded by cheap, plentiful self-driving taxis, commuters in the future may no longer need a place to store their car for the day. If this happens, and the demand for parking dramatically drops Ramp A, with its flat floors, could be converted to another use, as either residential or commercial space. Since Ramps B&C have sloped floors, such dramatic re-use may not be possible, but they could provide parking and recharging for autonomous vehicles in off-peak hours (e.g., overnight). Even if self-driving cars are not a majority by the end of the ramps’ useful life, they will likely play a role in the ramps’ future uses.

### **Development Potential**

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The ABC Ramps could also be developed into housing or office space, or made into a transit hub in an expanded rail network if the garages are no longer needed to provide parking capacity, or if rising property values downtown make parking an unwise use of land. (This could involve tearing them down altogether or, in the case of Ramp A, which unlike the other two has flat floors, using the same structure for a non-parking use.) Such an arrangement could theoretically provide a revenue stream for the Minnesota Department of Transportation, which owns the ramps. An example of this approach is found in Hong Kong, whose transit authority, the MTR, collects rent from the residential and commercial properties it owns inside and nearby rail stations. Making such a change would entail overcoming legal barriers, as the ramps are required by law to serve a transportation purpose. Still, bold changes will be needed to meet future needs.

## APPENDIX: LITERATURE REVIEW

This literature review includes 21 essays completed by the students of the course PA 8202 Networks and Places in spring 2017. Many of the recommendations above come from these review documents. It should be noted that these are original, mostly unedited documents produced by different individuals, and they therefore vary in scope, style, emphases, and conclusions.

### 1. TDM PROGRAMS IN THE TWIN CITIES: MOVE MINNEAPOLIS

Move Minneapolis is a Transportation Management Organization (TMO) non-profit in Minneapolis. It was founded in 1991 and is funded through a “Federal Congestion Mitigation and Air Quality (CMAQ) grant in partnership with the United States Department of Transportation, the Metropolitan Council, the City of Minneapolis and the Downtown community” (Move Minneapolis, 2017). The TMO has three full-time employees that work to shift transportation use from single occupancy vehicles (SOV) to alternative transportation options including: carpools, car-sharing, transit, bicycling, and walking. They promote sustainable transit to improve the commute of Minneapolis employees, reduce congestion, improve livability in downtown Minneapolis, and benefit the environment. They accomplish this through partnerships with local employers, outreach to residents, commuters, and visitors, and education programs. They also partner with Meet Minneapolis through the management of a local retail store in downtown Minneapolis to give visibility and the opportunity for people to easily get information in person if they have questions on their commute. There are four local TMO’s that work on transportation management around the metro county. Move Minneapolis serves downtown Minneapolis, while the other three serve St. Paul, the area surrounding I-494, and Anoka County.

To collect data for this research two employees of Move Minneapolis were interviewed and information was gathered from the store in Minneapolis as well as their website. The core mission of the organization is to reduce SOV use in the city. The Move Minneapolis website is populated with information to help direct and educate people to the multiple transportation options available to avoid commuting by themselves to work. The website helps people by being a one-stop shop for any information needed for commuters to investigate alternative options. There are programs created internally like parking maps for carpoolers, bicyclers, and motorcyclists. Also videos to promote transit, the ZAP bicycling program, and carpooling. Finally they include links to external programs including Guaranteed Ride Home by Metro Transit, \$20 carpool options at ABC ramps, and information on road construction. Move Minneapolis utilizes social media to get their voice out by retweeting local news stories and posting alternative transportation options on Facebook. Their programs go beyond their online platforms and consist of in-person workplace and bicycle education. They recently were involved in World Car Free Day on September 22<sup>nd</sup>, which helped inspire commuters through prizes to try transportation other than a SOV to get to work. Move Minneapolis is the go to place for employers, commuters, visitors, and local residents to learn about options in Minneapolis to avoid driving on their own to get around.

Move Minneapolis is effective in using a small amount of resources to create a high level of outreach. The TMO reaches thousands of commuters through partnerships with more than 1,000 local employers, the downtown store, and their online presence. They partner with Metro Transit to get the Metropass commuter program to 349 companies and stored-value transit cards to hundreds of employers that don't allow the Metropass. Part of their responsibility is to show metrics for how they are reducing the number of single occupancy vehicles traveling into Minneapolis. In 2015 they helped add \$2.23 in transit revenue for every \$1 spent in funding for the TMO through the federal CMAQ grant. Their work resulted in more than 7 million less single occupancy riders commuting to Minneapolis.

Move Minneapolis makes indirect impact on social equity through the programs it concentrates on. A core reason they collect funding is to improve air quality in Minneapolis and improve the health of those that live in the city which includes low income residents. The programs Move Minneapolis supports often times have cost savings that is a needed benefit for those without the financial opportunity to own a car. The organization can make more of a forward facing strategy to discuss the social detriments of SOVs and the responsibility local businesses have for their community. Making social equity a pillar of their strategy can make employers more willing to partner with the organization.

Move Minneapolis is the link to commuters that ABC ramps can leverage and utilize to build on their goal to "Make it easy for people to drive alone less often." The best way ABC ramps can utilize a program like Move Minneapolis is through their connection with local employers. Move Minneapolis engages with local employers through commuter summits, fairs, World Car Free Day, and benefits teams within employers. They get into the field through major benefit fairs 2-3 times a year, at a large corporation once a week, and several other table top events in the skyway or with Metro Transit to promote the Orange Line, and Southwest Light Rail and Bottineau Light Rail. ABC ramps has a partnership with Move Minneapolis already but this should be built on as a signature strength going forward. Getting a chance to get into the workplace in front of commuters that don't know what options are available at the ABC ramp is a very effective way to get a message to thousands of engaged commuters. There are many tools available for people to learn about transportation options like new apps or websites, but Move Minneapolis is unique because of the direct and ongoing engagement they have with employers and the opportunity to connect back to their helpful tools.

While at a job fair or event at a local employer, ABC ramps could provide a map of the area available for the \$20 carpool incentive. Employees interested in the program could then put a sticker on the map where they live and write their name down to say they are interested in the carpool program in hopes that another employee in the company is also interested. If commuters are interested but there isn't a match at their employer they could allow ABC ramps to track their interest in case an employee is interested at another employer that can be matched with them. Move Minneapolis currently uses a carpool match program offered by Metro Transit but this would involve an extra step for a commuter. If ABC ramps would be able to match carpoolers on the spot at a commuter event it has the potential to increase its carpool rate more effectively.

Another example of how the ABC Ramps have worked with Move Minneapolis was their promotion of World Car Free day through signage and communication at their ramps. Along with this they could offer prizes to anyone that uses the carpool program that day, bike parking, or walks to work. Some prizes might include transit pass cards, a month of free bike locker use, or a month of a free carpool registration.

Currently downtown Minneapolis (and downtown St. Paul) does not allow vanpool between the rush hour times of the day. Metro Transit doesn't offer this because it wants people to use the transit service that is already available and the city wants to limit congestion (Andre, 2017). This constrains the alternative transportation options of many commuters who don't live near a transit line and either don't have the ability or prefer not to use a park and ride facility. The ABC Ramps currently do provide Vanpool parking, but could also partner with Move Minneapolis to further promote this opportunity. Since the ramp is on the outer ring of downtown the van won't cause congestion in the city and is in a central location for those using the vanpool. It wouldn't need to be a group of people all working at the same location. ABC ramps and Move Minneapolis could coordinate to help organize groups of people to vanpool together.

Move Minneapolis is a valued organization in Minneapolis for many commuters, employers, and residents. It has helped eliminate millions of single commute trips to downtown Minneapolis. ABC ramps can continue to partner with this TMO by creating new initiatives and programs to achieve its mission to "Make it easy for people to drive alone less often" (Move Minneapolis, 2017). By combining efforts the small teams of Move Minneapolis and ABC ramps will create greater economies of scale and reach more commuters to compliment the work of each other.

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## 2. TDM PROGRAMS IN THE TWIN CITIES: ST. PAUL SMART TRIPS

St. Paul Smart Trips (SPST) formed in 2007 as a result of a merger between two St. Paul transportation management organizations (TMOs), one for the downtown area and the other for the Midway area. For the past decade, SPST has offered a number of services aimed at discouraging single-occupancy driving and encouraging walking, taking transit, carpooling and biking, and increasingly has engaged in advocacy to encourage policymakers to implement policies that embrace sustainable modes of transportation. Today, St. Paul Smart Trips is in the midst of another merger, this one with transit advocacy organization

Transit for Livable Communities (TLC). This merger was a logical course of action because the work of the two merging organizations has been converging; TLC, historically an advocacy organization, has recently been engaging in more TDM-like activities, and SPST, the TMO, has ramped up its advocacy work in recent years. As such, instead of competing with one another for funding and other resources, the two organizations decided to merge in late 2016. I spoke with Jessica Treat, current CEO of TLC and former CEO of St. Paul Smart Trips, who is leading the merger between the two organizations. Jessica and I discussed SPST's experiences over the years with travel demand management (TDM).

Early in its history, SPST made the decision to work with neighborhoods, rather than just employers, which are the target constituencies of many TMOs. One of SPST's most innovative approaches to TDM was its Neighborhoods program, which it operated from 2008 to 2010 in the St. Paul neighborhoods of Summit-University, Union Park and Highland Park. The goal of this program was to educate people in these neighborhoods on transportation options such as local bus routes and bike facilities, and to show them how to leverage these options to improve their mobility, health, and economic situations.

The methodology of the Neighborhoods program was designed to measure statistically significant impacts of the program. Before making any interventions, SPST commissioned phone surveys of residents of the test neighborhood and a control neighborhood with similar socioeconomic characteristics. The survey asked residents about their travel behavior and attitudes toward different modes of transportation. After the initial survey, the test neighborhoods would receive a year of interventions from SPST, which included informational mailings, free sustainable transportation kits that included free transit passes (the kits were delivered to people's homes by bicycle), and a series of events such as community bike rides. The goal of the interventions was to educate residents on their transportation options, discourage single-occupancy driving, and to "hold people's hands" by showing them exactly how to use transportation modes like transit and bicycling in their neighborhoods.

After a year of interventions, a follow-up survey was conducted of both the test and control neighborhoods, asking the same questions as the initial survey. The second survey enabled SPST to measure the impact of their interventions in the test neighborhood on people's travel behavior and attitudes toward sustainable modes of transportation. Jessica was pleased that the data collected from these surveys demonstrated that the Neighborhoods program was effective in encouraging residents of the test neighborhoods to use alternatives to driving.

An approach similar to that of the Neighborhoods program could be embraced by the leaders of MnDOT's ABC Ramps. Since the longtime goal of the ramps has been to discourage single-occupancy driving from the West Metro to downtown Minneapolis, MnDOT could identify neighborhoods in the West Metro with high proportions of downtown commuters, and intervene to educate these people about alternatives to driving alone (with particular emphasis on how ABC Ramps can help people change their travel behavior). To measure statistically-significant impacts, MnDOT could replicate SPST's use of phone surveys of a test and control neighborhood before and after their interventions. Based on the

success of SPST, I think this approach to TDM could be effective for ABC Ramps, though I have some equity concerns, as downtown commuters from the West Metro are likely to be white and well-off.

Another example of an innovative SPST program is its partnership with Augsburg College. Prior to entering into a contract with SPST, Augsburg's approach to TDM consisted mainly of tabling at campus events to raise awareness about local transit options. Having learned the value of "hand-holding" from its experience with the Neighborhoods program, SPST helped energize Augsburg's efforts to discourage single-occupancy driving. SPST organized a series of events for Augsburg students and staff, such as excursions on the Green Line and Blue Line, and a biking tour of Nice Ride stations located on and near the Augsburg campus. SPST also trained Augsburg staff members to serve as "Transit Coaches" in charge of encouraging coworkers to ride transit to work. Additionally, SPST worked with Augsburg's administration to raise campus parking rates to make other transportation modes more attractive relative to driving. Jessica stated that SPST's interventions at Augsburg were effective, causing a statistically significant increase in subscriptions at Augsburg to the Metropass unlimited transit pass.

ABC Ramps could benefit from a similar approach of engaging in intensive TDM work tailored to large institutions. Perhaps ABC Ramps could enter into a partnership with one of the largest employers in the vicinity of the ramps, and design a series of interventions to not just encourage employees to use modes of transportation other than single-occupancy driving, but also to show them how to make use of those modes. Many people who have never used transit find transit intimidating and confusing, and can benefit greatly from being shown exactly how to ride transit. Of course, this approach has similar equity implications as a neighborhood approach in the West Metro: as large downtown employers tend to employ white professionals, an intervention focused on these organizations would probably mostly benefit people who enjoy many privileges in society. Perhaps, however, it would be possible to tailor such an intervention to downtown hotel, restaurant, or maintenance workers who earn less than white-collar downtown workers and are more likely to be people of color.

A final theme that Jessica and I discussed that may have implications for ABC Ramps is that of TMO capacity. Jessica has now been involved in two TMO-related mergers: the 2007 merger that created SPST, and the current merger between SPST and TLC. Both mergers were motivated in part by a desire to capture the administrative efficiencies of a larger organization; larger organizations are more able to employ dedicated staff to handle administrative functions like finance and human resources, freeing up other staff members to focus on programmatic work. In Jessica's opinion, TMOs can deliver higher-quality work when their programming staff can focus on implementing programs, and administrative staff handle other aspects of running the organizations. Jessica thinks that having a patchwork of small TMOs through the Twin Cities metropolitan area can hamstring the effectiveness of TDM efforts, as the TMOs carrying out TDM have just a few staff members each, most of which have to perform both administrative and programmatic work. Furthermore, the patchwork of TMOs around the region creates a barrier to implementing coordinating, large scale TDM programs. The implication for MnDOT and ABC Ramps is that perhaps encouraging the creation of larger, better-equipped TMOs is a way to enhance

the effectiveness of TDM metro-wide. If ABC Ramps has more powerful TMOs with which to collaborate, it may be able to more easily achieve the goals it sets for the next 25 years of its existence.

### 3. TDM PROGRAMS IN THE TWIN CITIES: UNIVERSITY OF MINNESOTA AND I-494 COMMISSION

#### University of Minnesota

As one of the largest employers in the state, the University of Minnesota has a robust transportation operation. As manager Ross Allanson outlined in his presentation, the University operates 27 buses and manages over 20,000 spaces in 15 parking ramps and 118 lots. They also manage 13 electric vehicle charging stations, a wide bicycle and pedestrian infrastructure and facilitates, mobility services such as para transit, a ride-pooling program, and a discounted transit pass (Allanson, 2017). Among the parking facilities on campus, there are a variety of pricing schemes:

- A public hourly rate from \$2 to \$3 per hour
- A public daily rate from \$2.50 to \$22 based on location, kind of user and facility
- An early-bird, night owl and weekend rate at \$6
- An event rate from \$6 to \$20, depending on type and location of facility
- Contracts from \$35 to \$150, depending on time of day, type of user and facility

In addition, there are also vehicles available for rental by University staff and faculty. A number of these are electric, hybrid or run on biofuel from as low as \$28 a day. In 2015 the University received a grant from the Minnesota Pollution Control Agency to build six public electric vehicle charging stations on campus. With a total of 26 potential ports, they have the most charging stations among Big Ten universities. These units, which are dispersed between the discount lots and ramps, are free to use along with the rate at that particular facility. The University also has ten HOURCAR vehicles on campus, available for use by members of the program. Up until recently, the University was a participant in Zimride, which was a rideshare matching program hosted through National Car Rental. The parking pricing scheme makes using a daily rate competitive with contracts, which are available on a monthly basis. While individuals may find a benefit in purchasing a contract, they can just as easily not if they're willing to forego in and out privileges and walk slightly farther. The presence of rental vehicles and car-share on campus allow for quick off campus trips if people take transit, walk or carpool to campus.

Perhaps the most progressive transportation options at the U of M are related to bicycle and transit. The University of Minnesota recently received two platinum awards for their bike infrastructure, which includes six miles of lanes, five bike share kiosks, a shower facility for cyclists, two protected bike parking cages and an innovative commuter program run in partnership with Move Minneapolis. In this incentives program, participants clip an RFID tag to their spokes and receive points when they ride past

solar-powered kiosks. Students receive prizes for their involvement while staff and faculty receive points that contribute to the University of Minnesota's health insurance program. In terms of transit, there is the U-Pass and Metropass. The U-Pass is \$100 for about four months while the Metro Pass is about \$80 per month. These passes work with all the major transit providers in the region and are some of the most discounted passes available.

The ubiquity of transit routes that run to the University, the option of a discounted monthly pass or student pass and the well-developed bike infrastructure make biking and walking to the University a very easy prospect. Despite rising prices, I've been told by PTS staff that U-Pass sales remain consistent even as prices have increased. By contrast, the ZAP program has seemed to have hit a bit of rut in the past few years and biking rates seem to have flattened, with declining use in the program most notable among students (Sanders, 2017).

The fairly dynamic pricing on campus mostly impacts the 66% of people who live outside the City of Minneapolis or St. Paul who have to commute more than five miles to campus. With the exception of the express busses that serve suburban park-and-rides, the transit and bike programs programs mostly serve the 34% of commuters that live within five miles of campus. Both of these programs are only eligible to U students, faculty or staff of the University or the Fairview system. By virtue of being an exclusive program that caters to people with decent jobs or are probably coming from a middle class background, there are obvious equity considerations.

The University of Minnesota provides a reasonably good comparison study to the ABC ramps. Despite the obvious differences, both are major employment centers that have a stated goal to reduce SOV trips. The wide array of parking pricing schemes, such as monthly contracts, late night and early morning rates could definitely be applied to the ABC ramps, where parking contracts are currently less flexible. Additionally, the placement of car-share and rental services could serve individuals who work near the ramps and want to take transit. If the organizational infrastructure was put in place, I see no reason why ABC ramps couldn't contract out a ridesharing app, such as Zimride or Ride Amigos, like the University of Minnesota has done in the past. While there are plenty of infrastructural changes that could work near the ramps and downtown at large, there may be an opportunity to integrate multi-modal transportation options with wellness programs run by large employers in the downtown area.

### **I-494 Commuting Services**

The I-494 Corridor Commuting Service is a regional TMO established about three decades ago. As Executive Director Melissa Madison pointed out in her presentation, they are a non-profit that receives membership contributions from the suburban communities they serve Bloomington, Edina, Minnetonka, Richfield and Eden Prairie (Madison, 2017).

The TMO's efforts fall into two camps, employer promotions and promotions aimed at individual commuters. For employers, they offer guidance and implementation of discounted transit carpool and bicycle commuter programs and help run transportation fairs and new-hire commuter trainings. They

also advocate for progressive company policies around telecommuting. In my follow up call with Melissa, she mentioned that their staff is often involved in the negotiation of TDM goals between their constituent cities and employers. For individual commuters, they help facilitate ride matching through their own database. To those looking for assistance, they provide potential multimodal commute itineraries. As giveaways, they provide free provisional transit passes.

While the ultimate goal is to lower the number of single occupancy vehicle trips on the corridor by any means practical—be it through encouraging individual ridesharing, biking or transit use—from my perspective it seems that employer-based incentive programs are the TMO’s most progressive service. While I-494 is technically open to the over 200,000 individual commuters in the corridor, Madison agreed that their biggest impact is made when implementing culture changes among employers. Among those who the I-494 Commuter Services has reached in past surveys, it seems that more willing to experiment with transit or carpools when the idea is endorsed or somehow supported by their employer.

As with the University of Minnesota, these efforts primarily affect middle-to-upper class commuter. The cities that they deal with are some of the more affluent in the entire region, with perhaps the exception of Richfield. Much of this prosperity is directly derived from the kinds of employers based there and the kinds of workers those jobs attract—skilled, white collars positions that often cut among particular demographic lines.

What could be applied to the ABC ramps? MnDOT and the ramp operations staff have clearly demonstrated a willingness to step outside what a normal parking operator might consider. Lisa Austin mentioned how they conduct annual surveys of their carpool users, that they have contracted out marketing firms to understand commuter behavior and are obviously in partnership with the University of Minnesota to study the efficacy of the ramps. Given their commitment to finding innovative avenues to decrease SOV trips to the ramps, they could work with Move Minneapolis to redirect some of that effort into targeted employer outreach and education in the same way that I-494 does.

## References

University of Minnesota Parking and Transportation presentation on January 30<sup>th</sup>, 2017  
I-494 Commuter Services presentation on February 1<sup>st</sup>, 2017  
Phone interview with Melissa Madison on February 21, 2017  
Phone interview with Steve Sanders on February 27, 2017

## 4. TDM PROGRAMS IN WASHINGTON AND OREGON

The following report outlines a number of Transportation Demand Management (TDM) programs in the states of Washington and Oregon. Each state has a variety of programs, many of which overlap, and some of which are unique. At the end of the report, a section discusses some approaches that may be useful for the ABC Ramps project.

## **Seattle Vanpool Permit**

The Seattle Vanpool and Carpool Permit program focuses on encouraging people to use vanpools instead of commuting in SOVs. Now, the vanpool permit program is much cheaper than the carpool permit program, but by 2019, there will be a fee of \$600 per quarter for either a vanpool or carpool permit in the Central Business District (CBD), and a \$300 fee per quarter for a non-CBD permit (<https://www.seattle.gov/transportation/parking/carpool.htm>).

## **Rideshareonline.com – Covers Washington and Oregon**

The Washington State Department of Transportation administers this online platform and offers a variety of options for commuters in both Washington and Oregon. There is no charge for this service and it allows commuters to access carpool, vanpool and bicycle ride-matching services, as well as information about alternatives to commuting in an SOV. According to their website, they also provide services to employers to help them run their employee commuter programs. Another unique feature of the RideshareOnline platform is the SchoolPool feature, which allows parents to match up with each other to find carpools for their kids. (<http://www.rideshareonline.com/>)

## **King County Metro Online Rideshare-Vanpool, Washington**

This is the “largest publicly owned and operated commuter van program in the nation, providing vans and everything else required to operate them” (<http://metro.kingcounty.gov/tops/van-car/van-car.html>). On their website, King County provides a Metro VanPool Starter Kit, which includes information related to starting and maintain a vanpool and useful resources, such as signs for recruiting riders or worksheets to help organize a vanpool. There are also resources outlining emergency procedures for vanpool, winter driving tips and there is a free Vanpooler App to help simplify the process. Aside from just vanpool, the King County Metro website also contains information about water taxis, biking, rail, and transit.

## **NavSeattle**

This pilot program started in 2014 with the aim of providing information to multifamily developers and building managers about the many available transportation options in Seattle. Through this program, building managers and developers are encouraged to give their residents maps for biking and walking around the city, set up screens in their buildings with real-time transit information, create bicycle parking and participate in the ORCA Multifamily Development Passport program (<http://www.seattle.gov/waytogo/navSeattle.htm>). “The ORCA Multifamily Development Passport is an annual transportation pass that property owners can offer to residents” (<http://metro.kingcounty.gov/programs-projects/orca-multifamily-passport/>). With this pass, users can use many transit services offered throughout the region.

## **Seattle Children’s Hospital**

The Seattle Children's Hospital has been working hard on their TDM program for a long time. Their work includes the creation of a Comprehensive Transportation Plan (CTP), which they created with the help of the Seattle Department of Transportation, the Citizens Advisory Committee and the Department of Planning and Development. The CTP also incorporates a Transportation Management Plan (TMP) that aims to reduce SOV use among staff and visitors and increase the amount of people who walk, bike and take transit or shuttles. There are many components included in the TMP, such as the Flexbike bike share program, and Company Bikes, "which offers free bicycles to employees committed to cycling at least two days per week" (<http://masterplan.seattlechildrens.org/transportation.aspx>). The hospital also invests in bike and pedestrian improvements in the surrounding region as well as onsite enhancements.

### **Commuter Trip Reduction Program - Washington**

In the early 1990's the Washington State Legislature enacted legislation that targets the state's nine most populous counties to decrease the number of single-occupancy vehicle (SOV) commute trips made to work. Known as the Commute Trip Reduction Law, this legislation requires public and private employers with more than 100 employees to create plans that promote alternatives to SOV commuting. Furthermore, in 2006, the Commute Trip Reduction Efficiency Act was passed, which forces local, urban municipalities to implement initiatives that reduce SOV trips and vehicle miles traveled per capita (<https://www.wsdot.wa.gov/Research/Reports/400/468.1.htm>).

The Commuter Trip Reduction (CTR) program was created in response to this legislation. Through this program, which only receives about \$6 million in funding for every biennium, over 1,000 worksites and 530,000 commuters take part in this program. Employers are required to submit reports on their programs at regular intervals and local governments have to report on their SOV and VMT reduction targets and the use of state-provided funding (<https://www.wsdot.wa.gov/Research/Reports/400/468.1.htm>).

In 1999, a study was conducted to increase and focus the effectiveness of this program. The study was created to ascertain why certain people, whom they labeled "switchers," chose to bus, bike, walk, or carpool instead of commuting alone in their vehicles. The study found that "[s]witchers tend to value "commute trip reduction" (CTR) incentives, come from organizations where the CTR program is strongly supported, engage in other environment-protective activities, perceive the presence of reasonably convenient alternatives to SOV travel, and be less concerned with the "convenience and flexibility" benefits of SOV commuting than SOV commuters" (<https://www.wsdot.wa.gov/Research/Reports/400/468.1.htm>).

The general purpose of this program was to encourage people to carpool, vanpool, and take transit and other modes of transportation besides SOVs. By discouraging SOV commutes and encouraging alternative transportation modes, this program was able to save \$59 for the average rush hour commuter in 2009 and reduce 154 million vehicle miles traveled since 2007. It also conserved 3 million gallons of gasoline during the 2009-10 biennium and keeps 69,000 metric tons of greenhouse gases out of the atmosphere annually (<http://www.wsdot.wa.gov/Transit/CTR/overview.htm#role>). There may be

many reasons behind the success of this program, but one important element of this program is the sustainable funding from the state. Even though \$3 million a year is not that much, it makes a big difference that this program received funding at a constant level for an extended period.

### **Oregon Transportation Options Plan – Oregon DOT**

The Oregon Transportation Options Plan lays out ways for partners at state and local levels to improve transportation options. This plan focuses on improving five main outcomes: efficiency, reliability, reduced cost, access, and other community goals (economy, environment, community and public health). The plan incorporates a variety of programs and investments, such as individualized marketing campaigns to statewide education campaigns. The plan also discusses in-person and online rideshare resources, investments in bicycle, pedestrian and transit infrastructure, and more.

### **Portland Smart Trips**

This program focuses on individual transportation behaviors. They provide individualized marketing materials to residents in specific neighborhoods to reduce SOV trips. St. Paul Smart Trips is a local organization based on this model. Specifically, this organization focuses on increasing walking, biking, transit and car-sharing trips, especially in relation to commuting. Their online resources include bike share information, biking and walking maps, car-sharing opportunities, bike shop locations and route planning for walking, biking and transit trips, among other things (<https://www.portlandoregon.gov/transportation/43801>).

### **Commute Options – Bend, OR**

The Bend Commute Options Rewards Program incentivizes growth in the number of employees who walk, bike, take transit and share rides to get to work. They do this by targeting employers and helping them to get their employees to switch from SOV commuting. Their online platform includes information about the “value of carpooling, vanpooling, walking, bicycling, teleworking and using public transportation” (<http://www.commuteoptions.org/>). They also advertise the “*Drive less. Connect.*” service, which is an online ride-matching tool. According to the website, the “*Drive less. Connect.*” program has saved a total of \$2,020,782 and 787,702 trips (<http://www.commuteoptions.org/your-options/drive-less-connect/>).

### **Parking Management Toolkit – Portland, OR**

This toolkit includes a variety of TDM activities that can help to reduce SOV trips. These range from improving bike, pedestrian and transit facilities to supporting car-sharing and vanpooling programs. The toolkit also discusses the potential for bike share systems to limit driving. With bike share, people can park once and then extend their trip by bicycle to reach their destinations. Another suggestion from the toolkit is to unbundle parking, which means to make people pay per day for parking instead of renting them a space or giving them monthly, quarterly or yearly rates. This strategy promotes car-free living and can help to reduce parking demand. Yet another strategy listed in to require developers to provide

space for car share services in off-street locations to encourage the growth and availability of car sharing services (<https://www.portlandoregon.gov/transportation/article/567030>).

### **Applying Strategies to the ABC Ramps**

This report has discussed a number of useful and successful strategies for TDM from Washington and Oregon. Many of these strategies focus on increasing options for biking, walking, transit, carpooling, vanpooling and teleworking. The question, however, is how to utilize these strategies at the ABC Ramps in Downtown Minneapolis. None of the programs discussed will work for the ABC Ramps exactly as described, but a number of elements from these programs could prove successful for the ramp project.

For example, there are ways that part of the Commuter Trip Reduction program could work for the ABC ramps. Although it would not be possible to force employers to engage in TDM programs without legislation similar to the Washington CTR legislation, it would be possible to target employers in a similar manner. For example, you could conduct a survey of ABC ramp users to discover where they work. Then it would be possible to work with the employers that have large amounts of employees that park in the ABC Ramps to provide incentives for their employees to switch to carpooling or vanpooling. It may also be beneficial to conduct a study, if allowed, of the employees at those organizations to find out a profile of “switchers,” just like the 1999 study in Washington. With this information, you could target people who are more likely to engage in carpooling or vanpooling and advertise to them more directly.

There are also a few things to learn from the Seattle Children’s Hospital. In their Transportation Management Plan, they discuss expanding bike share service. Along those lines, if the ABC Ramps added Minnesota Nice Ride stations onsite it would make people more likely to use them. Then, it would be possible to offer discounted bike share trips to people who carpool or vanpool to the ABC Ramps. Along this same line of thinking, you could also turn some of the parking spaces in the ABC Ramps into car sharing spaces. Then, you could offer people who carpool or vanpool a cheaper rate for car sharing. This would allow them more flexibility to get around during the day even though they did not drive their own vehicle. They also discuss expanding their shuttle-to-transit service. While a shuttle service may not be terribly efficient in this setting, it might be possible to provide a discount on transit to people who carpool to the ABC Ramps. Offering discounted transit allows people to be more mobile throughout the workday despite not having a car and offers an extra incentive to reduce SOV commutes.

There were a number of strategies discussed earlier related to using online platforms or Apps to engage potential rideshare users. The Vanpooler App from King County Metro Online Rideshare-Vanpool seems to have potential to work in the ABC Ramps. By providing an easy to use app you take out the annoyance of setting up carpools the old fashioned way. It might be interesting to take it even a step further than the Vanpooler app to incorporate social media in some way. People could create either their own profiles or link to a Facebook profile. This might help spread the word about the service and it could alleviate the fears of people who do not want to ride with strangers. If they can see profiles of other people using the service, they might be less tentative. It would also be worth looking into marketing the service as a sort of informal networking.

In conclusion, if there is one thing that I would stress after conducting this research it is that Seattle has been successful because they have focused on employers. Fortunately for them, their state requires employers to engage in TDM efforts, which definitely contributes in large part of their success. However, Oregon has also had success targeting employers, and it seems like there is potential for that to work in this case as well.

## 5. TDM PROGRAMS IN VIRGINIA AND NEW YORK

Too many single occupancy vehicles can exacerbate the road traffic congestion and produce excessive emissions of green-house gases. So reducing the number of single occupancy vehicles is an important target in traffic demand management.

The traffic demand management programs in this report reduce solo driving in three ways. The first way is increasing the convenience and attractiveness of another mode of traffic to induce passengers to use traffic or bicycles. The corresponding programs are TDM for Site Plan Development program, Smart-benefit program, Champion program. The second way is encouraging passengers to use carpool or vanpool. The corresponding programs are non-SOV preferred parking, van-pool accessible parking program and carpool matching platform program. And some of those TDM programs, such as Champions program and Smart-benefit program are employer-based or community-based programs, which will have a good effect on changing people's behaviors. In the following part of the report, all these programs mentioned above will be described with more details.

### **Arlington County, Virginia**

Arlington Transportation Partners (ATP) implemented a long-term TDM program called Champions. This program cooperates with employers, multi-family residential communities, schools, to help improve the benefit to employees and residents in Arlington [1]. This long-term TDM program includes many short-term programs in a 9-month period, such as National Walking Day, Bike to Work Day. But the difference between this long-term program and those short-term program is that ATP will make strategies for employers or communities about how to implement those short-term programs reasonably and efficiently. With the help of the companies and communities, a larger population will be included in a series of short-term programs. And within the companies or communities, an active atmosphere to attend those short-term programs can be created. Most short-term programs, such as National Walking Day and Bike to Work Day, are aimed at increasing people's awareness and encourage them to shift their traffic mode from Single Occupancy Vehicles to transit, carpool, bicycles, and other traffic modes.

According to the statistical data from the website of Mobility Lab, there are 241 residential communities, companies and schools that are included in Champions program. And the percentage of employees participating in those short-term programs rises from 3 percent to 12.2 percent after the Champion program starts for 3 years. And Arlington County has the lowest drive-alone rate in the state of Virginia by 2017 according to the speech of the bureau chief of Arlington County Commuter Services, Larry Filler [2]. The success of this long term TDM program should be attributed to the power of

employers and communities. At first, employees and residents account for a large part of the traveler. So the Champion program is able to cover the population widely. And this program incorporates the regulation of “community-based social marketing” to help traveler change their behavior step by step.

Everyone gets benefits in this program. In the perspective of employees or residents, they can save their time from traffic congestion, and save costs on driving. In the perspective of employers and communities, employers save the cost of the gas subsidies for their employees, the companies create a good work space culture for sustainable traffic, and residential communities increase its attractiveness and enjoys a better atmosphere among their residents. From the perspective of the county, this program will improve the traffic in rush hours and reduce the emission of greenhouse gases.

As the largest parking lot in downtown Minneapolis, most users are employees in the downtown area. So it is a good idea to start cooperation with the companies in downtown Minneapolis and implement a long-term TDM program. The short-term programs can be City Bicycles Day, Van-pool Day.

Another TDM program in Arlington County is Transportation Demand Management for Site Plan Development. It is a part of the Arlington County Commuter Service program. This Site Plan Development program requires a designer to consider transit and commuter facilities, such as bicycle parking facilities and van-accessible garages, when they design the building. So the new-build houses will be convenient for bicycles and vanpool users, which will lead to a decrease of the single occupancy vehicles [3].

### **Fairfax county, Virginia**

Fairfax County in the state of Virginia launches a transit incentive TDM program called SmartBenefits Program. In this program, employers offer tax-free commute benefit to their employees. Employees get a SmartTrip card and this card can only be used in transit systems and pay for the vanpool [4]. Fairfax county also implemented two parking related TDM programs that are in favor of the carpool or vanpool users. One is the Non-SOV Preferred parking and the other one is Van-pool accessible parking and drop-off [5]. In the first program, there will be some parking spaces prepared for registered vehicles used as high-occupancy vehicles. In the second program, there will be some exclusive parking spaces and drop-off lanes in the parking lot prepared for van-pool users. These two programs enhance the convenience by using carpool or vanpool and induce some passengers to use their cars more efficiently. But there is no statistical data about the how much these programs reduce the solo driving behaviors.

It is known that the ABC Ramps has some parking contracts, directing at carpool and vanpool users, although the number of carpool contacts has been declining for years. If ABC Ramps can take this further and design similar exclusive parking spaces or drop-off lanes for carpool and vanpool users, the effect will be better.

### **The state of New York**

There are many carpool matching platforms in the state of New York and they serve the people in different counties in the New York state. For example, the people in Tompkins County use Zimride and the people in Binghamton county use Greenride. 511NY Rideshare is a synthetic platform for the whole state of New York [6]. These carpool matching platforms benefits the carpool users best because it saves money for carpool users and offer you friendships on your commute, For the city with a large number of carpool users, there will be less air pollution and traffic congestion.

It is a good idea for the ABC Ramps to set up a carpool matching platform for its users and integrate it with other carpool services. The platform can be a website or a mobile APP. On this platform, the destination of all the users should be the ABC Ramps.

### **The city of Buffalo**

To reach the goal of building a walkable city, the city of buffalo removes the parking minimum requirement widely used in the US [7]. The parking minimum requires some parking spaces for a new-built building according to its usage. The elimination of the parking minimum in the city of Buffalo will greatly influence its traffic condition in the future. When the parking is not guaranteed for customers, they are pushed to use other traffic modes, so there will be more buses users or car-sharing users. Those parking spaces are used to build bus lanes or bicycles lanes, which will create a city friendly to transit and bicycle users.

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## 6. TDM PROGRAMS IN CALIFORNIA

A review of the transportation demand strategies that are currently employed in The State of California yields interesting findings, some of which relate quite well to the case of the ABC Ramps in downtown Minneapolis. The cases of the Warner Center Transportation Management Organization in Los Angeles, maximum parking requirements in San Francisco, and the use of real-time traffic information by the California Department of Transportation will be examined for the purposes of evaluating the applicability of these TDM strategies to the case of the ABC Ramps.

In a review of the literature regarding transportation demand management in the Los Angeles metropolitan region, the Warner Center Transportation Management Organization (WCTMO) received near ubiquitous mention as a model Transportation Management Organization in the region. Located in the Woodland Hills area of Los Angeles, Warner Center is a business park that is home to hundreds of companies. The WCTMO is a coalition of large employers and local business owners within Warner Center, charged with providing commuters a robust selection of transportation options. It employs a broad range of strategies including transit, bicycling, walking, carpooling, vanpooling and guaranteed ride home. All of these commuting options are encouraged, with the effect of discouraging SOV driving.

The WCMTO's efforts have a highly successful record of accomplishment. Since its inception in 1988, the WCMTO has seen SOV drivership steadily decline from 85% to 68% (Warner Center Transportation Management Organization [WCTMO], 2012). In that same timeframe, carpooling has increased from 10% to 23%, bus riding from 0.4% to 5%, and bicycling and walking from 0.5% to 2%. Fully one third of Warner Center commuters do not arrive to work alone (WCTMO, 2012). Additionally, Warner Center stands out compared to the rest of the Los Angeles metro, with 32% of Warner Center commuters participating in some form of rideshare compared to 22% in the Los Angeles region overall (WCTMO, 2012).

The reason for the WCMTO's success seems to lie in its broad scope, as well as its dedication to quality in each specific case. The WCTMO has dedicated programs in place for every major transportation demand strategy. It has experienced unusual success with its carpooling assistance programs, for which 10,000 employees are currently registered (WCMTO, 2012). Part of the reason for this high degree of participation involves the dedicated maintenance of carpool ridership data for which the TMO is responsible (WCTMO, 2012). Additionally, the WCTMO has been steadfast in its collaboration with the Los Angeles Metro system during planning processes. In particular, the WCTMO was highly influential in its involvement with the planning process surrounding the Orange Line Busway, which is now the fastest way to get to downtown Los Angeles from Warner Center (WCTMO, 2012).

The WCTMO's high degree of influence over transit planning processes does bring up some equity concerns. As a mode share, transit gets much of its ridership from lower-income communities. In this way, the expansion of transit seems to produce equitable outcomes. However, the fact that the WCTMO had so much say in the planning process may suggest that it moved transit service away from communities that are more dependent just to bring it closer to its business park, whose members are significantly composed of higher-earning companies and employees. Despite the TDM advantages of successfully shifting mode share to more sustainable options, this may constitute an equity concern, as populations who vitally depend on transit may end up with less transit accessibility for the sake of providing service to populations who have more choice.

In the case of the ABC Ramps, the example of the Warner Center Transportation Management Organization can serve as a model of the importance of maintain a carpooling database and how TMOs can employ effective strategies to encourage HOV or entirely non-motorized options to its constituents. However, the case of Warner Center differs significantly from that of the ABC Ramps' position in downtown Minneapolis. Warner Center began as a master-planned development which may better lend itself to more centralized planning approaches and strategies (WCTMO, 2012). Similarly, the fact that Warner Center is dominated by the business community gives the WCTMO's members more influence than is possible for the members of the ABC Ramps partner TMOs.

In the case of San Francisco, land use and zoning authorities are bucking the longstanding and widespread trend of requiring new developments to provide a minimum number of parking spaces. To the contrary, *maximum* parking requirements are being enacted with the effect of limiting the number of spaces that a development can provide (Livable City, 2017).

This practice discourages driving in favor of transit, non-motorized transportation, and more balanced, mixed land use developments (Livable City, 2017). Enacted in 2009, this policy's effect on new development will take time to be fully observed and understood. However, San Francisco possesses unique characteristics that likely set the policy up for success. First, San Francisco already has a vibrant public transportation system. Minimum parking requirements categorically ignore such considerations in establishing standards, which means that parking in San Francisco tends to be oversupplied as it is (Livable City, 2017). Secondly, San Francisco's development guidelines contain stipulations that favor transit oriented development in the future, meaning that any problem generated by scarce parking might easily be remedied by patterns of development with built in transit accommodations (City and County of San Francisco Planning Department[CCSFPD], 2013).

From an equity standpoint, maximum parking requirements are quite favorable. Minimum parking requirements are ignorant of the fact that much of the true cost of parking is externalized onto society. That means low-income populations for whom owning and operating a vehicle is prohibitively expensive end up shouldering some of the cost of the providing parking, which is factored into the prices of goods that they might purchase from the business who is obligated to provide parking, regardless of whether or not their customers use it. Relatedly, the enactment of maximum parking requirements in San

San Francisco is concomitant with regulations mandating that residential developments “unbundle” the cost of tenants storing vehicles from the cost of actual housing (CCSFPD, 2013). Across the board, low-income populations are being granted the freedom to choose whether or not they pay for parking, an outcome which serves equity quite well considering many low-income people do not own cars to park in the first place.

As exciting as this policy is for the future of San Francisco, it does not directly translate to the case of the ABC Ramps, as the ramps themselves are providers of parking. However, the TMOs that collaborate with the ABC Ramps stand to learn much from the eventual outcomes of San Francisco’s maximum parking in determining such a policy’s potential to liberate new development from the burdensome standard of minimum parking requirements.

On a statewide level, the California Department of Transportation has been actively implementing real-time motorist and transit information technologies. This network of online systems strategically provides motorists and transit users with real-time updates, enabling informed decision-making about mode choice and travel route. The program can produce a wide range of effects, from motivating a driver to alter their route slightly, to causing a transit rider to catch a different bus, to influencing a person’s decision to switch modes completely (City of Los Angeles, Department of Transport [LADOT], 2011). Most commonly, real-time information services are used by drivers who sign up for traffic alerts that are customized according to their specific commuting needs. These alerts can inform drivers of commuting hassles such as congestion, construction and crashes and suggest alternative routes when significant delays are detected. This is especially important for California’s uniquely congested regional transportation network. In addition to the benefits for individual drivers, real-time information systems can be credited with diverting traffic from locations of traffic accidents, which reduces response times to emergencies (LADOT, 2011).

In the case of transit ridership, real-time transit information provides transit users with useful information about arrival times, delays, and disruptions to service. These factors combine to help transit users make informed decisions before and during trips (LADOT, 2011). It also may reduce some of the anxiety and feelings of lack of control that may sometimes dissuade people from taking transit.

By enabling informed decision making, and enhancing user experience, the availability of real-time information encourages transit more so than would be the case for a transit system without these technologies. Determining whether real-time information encourages or discourages driving, however, is a more complicated question. On one hand, by helping drivers avoid congestion and lowering the total cost of driving, these technologies might be understood to encourage driving. Alternatively, by contributing to a smooth flow of traffic, these technologies achieve two major goals of transportation demand management. They reduce the total amount of time that people spend driving, as drivers can avoid the most congested parts of the transportation system. Additionally, the reduction of time spent in traffic contributes to a reduction in amount of air pollution generated from a set number of vehicle

miles travelled. By reducing traffic congestion and air pollution, it seems that these technologies discourage the wasted time that drivers would otherwise be spending stuck in traffic jams.

The equity implications of real-time motorist and transit information are also mixed. For motorists, the use of these technologies largely depends on the ownership of a smart phone, which is a prohibitively expensive product for some low-income populations. In this regard, the technology contributes to inequitable outcomes, distributing the advantage chiefly to affluent populations. However, low-income populations are more likely to use transit, and the enhancements that real-time information contributes to the user experience of transit riders through publicly accessible station amenities generate an outcome that favors equity. Air pollution also tends to have a disproportionately costly effect on low-income neighborhoods, which are more commonly located in areas with congested transportation infrastructure (Katz, 2012). Wealthier populations, on the other hand, are able to locate in more secluded neighborhoods. By reducing air pollution and enhancing transit ridership experience, real-time information technologies ultimately seem to contribute more to equitable outcomes more than they detract.

In the case of the ABC Ramps, implementing sophisticated systems of real-time motorist and transit information holds significant potential to succeed as a transportation demand management measure. In its most basic form, providing real-time information represents an inexpensive, low-risk possibility. However, the ABC Ramps could also tweak the idea to suit the strengths of its unique condition of storing the greatest concentration of vehicles in downtown Minneapolis. For instance, broadcasting traffic report highlights at the payment window for motorists to see on their way out could be a clever way to disseminate information. Additionally, having estimated roadway congestion times posted alongside transit trip times could be an auspicious way to present commuters with a cost comparison between taking transit and driving. In a region where winter weather commonly disrupts rush hour traffic, advertising an on-time bus schedule or LRT train next to foreboding freeway travel time estimate could offer the greatest possible advertisement for transit imaginable. Whether implemented in its conventional form, or modified in innovative ways to enhance its effect, readily available real-time motorist and transit information represents low-hanging fruit as a strategy for the ABC Ramps to adopt to help reduce traffic congestion.

The unique cases of Los Angeles, San Francisco and the State of California as a whole each offer interesting examples of programs and policies that seek to manage transportation demand. Though these findings vary in their applicability to the case of the ABC Ramps, it seems clear that a nation-wide, and even world-wide review of TDM measures is bound to generate important ideas that may help the Twin Cities region move toward more sustainable options. With pressing issues such as climate change, accelerating urbanization and shifting preferences, it is as important as ever that metropolitan regions pool their intellect to find solutions to these issues.

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## TDM PROGRAMS IN ILLINOIS AND OHIO

Cities and states alike are becoming more aware of the negative impacts of solo driving. Driving is hazardous to the environment, and parking these large vehicles takes up a lot of space. Chicago and Columbus are two examples of cities implementing TDM efforts to reduce solo driving in their respective metropolitan regions. Furthermore, the states of Illinois and Ohio are further trying to implement strategies to reduce solo driving by encouraging alternative modes.

To combat its sprawled city which incentivizes driving, the city of Columbus has recently doubled its frequent bus service. The project will kick off in May of 2017, with goals of not only offering bus service at least every fifteen minutes, but also increasing weekend service for consistency (Warren 2017). On a regional level, the Mid-Ohio Regional Planning Commission initiative includes a Complete Streets Toolkit program. The initiative includes on-street parking for other users. On-street parking for bicyclists would utilize several bicyclists compared to one motor vehicle. The parking should also include motorized two-wheel vehicles, including scooters and motorcycles (Transportation Advisory Committee). Columbus already has many dedicated parking spaces for motorcycles. In order to advocate alternative modes of transportation, cities need to provide adequate places to park bicycles, motorcycles, and scooters.

The Mid-Ohio Regional Planning Commission has other TDM strategies, including their RideSolutions program. The RideSolutions program is effective because it is free for users. This program incentivizes

biking by connecting potential “bike buddies” or people with similar commutes to make the ride safe and enjoyable. RideSolutions further provides free connections for commuters to create a convenient carpool. There is also a program connecting families with school children, giving children “buddies” to walk or bike home with, not just after school, but also after sports practices and after school events (RideSolutions). The access to databases of compatible commuters works because it provides easy connections for individuals with similar commutes and travel behavior.

Other innovative projects RideSolutions has explored includes partnering with businesses to offer additional services, including aiding to relocate employees. This decreases the length of employees’ commutes. The program website also has an interactive feature in which commuters can “Compute their Commute” and calculate the monetary, environment, and time costs of their daily commute. This is a powerful tool because users can visually see the costs of their commuting method. The program recently began a Vanpool Refer-a-Friend promotion, granting individuals who refer friends to their vanpool services a \$25 Amazon gift card, with no limitations on the number of referrals (RideSolutions). Offering fiscal incentives promotes participation and rewards those who are active in the RideSolution program.

Meanwhile, the Chicago Metropolitan Agency for Planning, CMAP has been attempting to reduce parking and congestion in their cities with the GO TO 2040 Plan. In their Parking Strategies to Support Livable Communities, CMAP encourages their municipalities to engage in employer incentives. These incentives include the offering discounted transit passes to employees as well as offering subsidized or preferential parking for those who carpool (2012). CMAP further advocates a parking cash-out program. When employees do not drive and park a vehicle, they get paid for not parking. In this program, there is no penalty for parking or those who chose to continue to solo drive. Similarly, a business in a suburb outside of Chicago pays their employees who bicycle to work per mile for their commute. It seems that paying employees is a strong positive incentive that does not focus on not driving, but rather utilizing alternative modes is effective for the metropolitan TDM efforts.

CMAP is not the only Chicago metropolitan institution strategizing to decrease parking demands. The Regional Transportation Authority, RTA, focuses on reducing parking and congestion by advocating through transit-oriented development projects. Because the RTA serves many suburban communities, there is an understanding that the majority of commuters are automobile dependent. Because of this, RTA is reducing parking costs in commuter parking lots utilized for Park & Ride (2011). Moreover, RTA proposes that partnering businesses offer cash to employees who do not need their subsidized parking spot as well as a travel allowance which would cover the cost of a transit pass (2011). The ongoing trend is not to discourage solo driving, but to incentivize other commuting habits.

The city of Chicago is difficult to quantify its parking because on street parking was privatized in 2009. The city was paid \$1.15 billion by Chicago Parking Meters, CPM, giving the company access to manage the meters as well as collect the profit. Since CPM took over, parking revenues have more than doubled (Dumke and Fusco 2016). Meanwhile, in 2016, garages became privatized as well (Dumke and Fusco

2016), giving the city even less control over their parking management. Parking is expensive in the city and is designed to encourage driving.

Illinois and Ohio have both taken measures to tackle parking in their metropolitan and suburban areas. Cities need to have control of their parking in order to make positive changes to driver behavior. The most positive changes in driving behavior seem to be the result of incentivizing other transportation methods, rather than to diminish solo driving. Solo driving is difficult to discourage, therefore it is most effective to educate and encourage other modes of transportation.

To tackle parking in the ABC Ramps, MNDOT should focus on driving initiatives which focus on advocating alternative modes of transportation. Reprimanding solo commuting is not enough to change the behavior. Instead, governments should focus on creating incentives for alternative modes. It seems as though the most effective programs involved some sort of payment or reward. While this is most likely not a long term solution to parking issues, it could be the agent to change behavior. This means that future commuting policy should reflect the behavior desired from drivers, and decrease the availability of parking as a whole.

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## 8. TDM PROGRAMS IN CANADA

The Cities of Vancouver, Montreal, and Toronto have been developing transportation demand management programs for over a decade. Programs, such as Vancouver’s Travel Smart App and Toronto’s easy and efficient carpool matching system, have been operating and producing significant results since the early 2000s. It is important to mention that these Canadian cities have a strong culture of using alternative forms of transportation: for instance, Vancouver, British Columbia logs 50 percent commuting trips taken by transit, bike, and walking.<sup>1</sup> By contrast, the American Community Survey’s most recent commute mode share data (2011-2015, 5 year estimate) for the City of Minneapolis estimated that 69.6 percent of commuting trips were taken by car, truck, or van.<sup>2</sup> Therefore, one cannot assume that adopting the Canadian programs will produce the same results for Minneapolis.

### **Program 1: Vancouver, British Columbia’s Travel Smart Program**

By collaborating with local governments, Vancouver BC’s TransLink public transit service implemented the TravelSmart program. The program provides interested households with information on how to change their commuting and travel habits to accommodate more sustainable alternatives such as transit, cycling, walking, and car share.<sup>3</sup> Travel Smart also has an online application. Using the online app, one places a pin on either one’s neighborhood or one’s workplace, then selects a travel time of 10 to 100 minutes, and then selects a mode (walking, biking, transit, car share). With that information, the app creates a circle showing all the places one can reach, given the aforementioned conditions.

The program encourages people to reimagine their travel, it increases their awareness of driving alternatives, and by showing possible destinations, it shows people how they could chain trips together. This program has been successful. Studies have shown that the TravelSmart “project increased the number of walking trips by nine percent, transit trips by 12 percent and cycling trips by 33 percent in a variety of neighborhoods”<sup>4</sup> within the first two years of the program (2005-2006).

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The program discourages driving, but it is debatable if the program is applicable to everyone. While there are financial and health benefits in choosing not to drive, this does not mean that it is easier for some to leave the car at home. Those who live too far-flung from the city core and from transit options will likely continue to drive. They might be able to take advantage of the app if/when they get closer to the city.

The TravelSmart app could help to reduce solo driving in Minneapolis. The ABC ramp could relate to the app by making itself a connected destination. Improving bus service around the ramps, adding Nice-Ride bikes, and sidewalk improvements could help make the ramps a hub for alternative forms of transportation in the North Loop and in Downtown. For example, if someone used a Minneapolis version of the TravelSmart app, they would see a plethora of easily accessible destinations.

### **Program 2: Smart Commute Initiative – City of Toronto, Ontario, Canada**

The Smart Commute Initiative is operated through Metrolinx, the public transit authority for the Greater Toronto and Hamilton areas. The initiative aims to reduce traffic congestion and carbon dioxide emissions. Besides education and outreach, the cornerstone of Smart Commute initiative is its innovative carpooling program. Working with employers to identify their employees' commutes, the carpool program "automatically matches commuters who live and work near each other—or along a route – based on their travel habits and preferences."<sup>5</sup> The program's intelligent route matching system separates itself from other carpool programs by also including information on how the same trip could be accomplished using alternative forms of transportation such as public transit and biking. As of September 30<sup>th</sup>, 2016, there were 330 employers and 721,000 employees and post-secondary students participating in the program.<sup>6</sup>

The program discourages solo driving through dividing the cost across the passengers. The system is free to the public; however, this does not mean it is equally accessible to everyone. Individuals unwilling to have their living whereabouts publicly available, despite being within the confines of the program, could not participate in the program.

In terms of the ABC ramp, there is an application opportunity. While Metro Transit already has carpooling and "RideMatch Programs", the ease and efficiency with which such a system could operate outside of just one network of employees is questionable. A key advantage that the Toronto Metro area has over the Twin Cities Metro area is population size. As of 2016, the Toronto Metro area had a

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<sup>5</sup> Transport Canada. "Smart Commute Initiative: Effective Congestion Relief". <http://www.toronto.ca/legdocs/mmis/2008/pg/bgrd/backgroundfile-13043.pdf> (Accessed February 15, 2017).

<sup>6</sup> Metrolinx. "What is Smart Commute?". <http://smartcommute.ca/about-us/what-is-smart-commute/> (Accessed February 15, 2017).

population of 6.4 million<sup>7</sup> compared to the Twin Cities' 3.5 million.<sup>8</sup> On population alone, it simply more likely to find a carpool match in the Toronto Metro area than in the Twin Cities. A joint effort between the ABC Ramps, Metro Transit, and the Minnesota Valley Transit Authority to create a smarter system that not only provides carpool options, but public transit information could be a useful tool for the Twin Cities.

#### **Other Programs:**

Voyagez Futé- Montreal, Quebec, Canada

- The program provides downtown employers with “information, advice and operational support for workplace initiatives” to promote alternative forms of transportation.<sup>9</sup>

Decades of Bicycle Infrastructure Investment – Montreal, Quebec, Canada

- As of 2014, the City of Montreal, often named the best biking city on the North American continent, had 342 kilometers of separated bike lanes.<sup>10</sup> The foundation for this investment comes from the Vélo Quebec cycling and advocacy group, which has been active in lobbying for infrastructure spending since the 1960s.

Nat Bailey Stadium Parking – Vancouver, British Columbia

- While redeveloping the Nat Bailey Baseball Stadium, the baseball team collaborated with the City of Vancouver to integrate some transportation management strategies. A source of the energy behind this process was the City of Vancouver's 2040 strategic plan to make the City the

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<sup>7</sup> Statistics Canada. “Population and Dwelling Count Highlight Tables, 2016 Census”.

<http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=304&SR=46&S=87&O=A&RPP=5&PR=35&CMA=0&CSD=0> (Accessed February 15, 2017).

<sup>8</sup> Twin Cities Pioneer Press. “MINNEAPOLIS, ST. PAUL STILL GROWING, AND TWIN CITIES METRO AT 3.5 MILLION” MAY 19, 2016.

<http://www.twincities.com/2016/05/19/minneapolis-st-paul-population-growing-census-estimates/> (Accessed February 15, 2017).

<sup>9</sup> Travel Management Center: Voyagez Futé. <http://www.voyagezfute.ca/> (Accessed February 15, 2017).

<sup>10</sup> Bruntlett, Chris. “North America's Best Kept (Cycling) Secret”. *Spacing*. <http://spacing.ca/national/2014/06/16/north-americas-best-kept-cycling-secret/> (Accessed February 15, 2017).

greenest in the world by 2020.<sup>11</sup> Some of the strategies implemented at the stadium were: intentionally not constructing enough parking for the facility, increasing the price for parking at peak usage times, increasing the number of bike racks, and offering a discounted sporting event ticket for attendees who did not drive to the event.

### **Conclusion:**

The Cities of Vancouver, Montreal, and Toronto provide the ABC Ramps with a few ideas of how to reduce solo driving. Beyond the specific strategies described, the consistent theme that arose was the need to make it easy for people to access alternatives to driving. While there are many variables that influence an individual's commute mode, creating systems that are accessible, that sync up with people's lifestyles, and that inform people about their options is an excellent way to assist some people to change their commuting habits.

## **9. TDM PROGRAMS IN AUSTRALIA**

As more people migrate to metropolitan areas, the three largest Australian cities—Sydney, Melbourne, and Brisbane—are trying to manage their transportation demands. In many ways, Australian cities are very similar to that of the American Midwestern cities: cities are sprawled throughout the country with large distances between one another. With a good number of people commuting from the suburbs to the commercial business district (CBD), the transportation departments of the three cities have focused on TDM programs in the past few years.

Despite the similarity in terms of the ambiance of the cities, Sydney, Melbourne, and Brisbane's public transportation system is not as advanced as that of the Twin-Cities. Therefore, much of their TDM programs focus on making improvements to existing transit infrastructures. While there are few different aspects to each city's TDM plans, all three cities hope to add more buses, bus lines, and train cars to the existing trams to increase ridership (Infrastructure Australia 20). In addition, all three cities want to build more bike lanes and pedestrian paths to promote themselves as a "walkable" city ("Brisbane City Centre-An Open City"). They have all implemented a bike share system in which people can rent and return a bike at a designated bike station. In many ways, the three Australian cities may have more to learn from the Twin-Cities. However, there are some innovative TDM programs in each of the three Australian cities.

Sydney is one of the most popular tourist destinations in Australia. Therefore, New South Wales (NSW) Transport not only has to address the transportation demands of its citizens but also the influx of visitors who crowd in the CBD every year. One of its ways to manage transportation demand is providing a cheaper and easier access to public transportation system for everyone. Since the electronic ticketing

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<sup>11</sup> City of Vancouver, "Greenest City: 2020 Action Plan," (2012).

system was introduced –the OPAL card— NSW Transport was able to promote public transit as a mode of transportation that is cheap and easy (Transport for NSW 63).

With an OPAL card, visitors and residents are able to take the rail, bus, light rail, or the ferry. NSW Transport also provides various incentives to riders to encourage people to take public transit. First, riders are given one free travel pass if they have used the public transit at least eight times during a time period of seven days. They also introduced a daily, weekly, and Sunday caps. In other words, no matter how many times one takes the public transit, there is a cap in which you will be charged. For example, on Sundays, people can enjoy unlimited access to any public transit at the price of \$2.50 AUD (63).

The adoption of the OPAL has been particularly popular among those who live in the northern coastal areas taking the public ferry. To avoid traffic and congestion, people on the coastal areas frequently use the public ferry to get to the city. Therefore, the caps put on public transit per day, week, or on a particular weekday make public transit much more affordable and convenient. Furthermore, NSW Transport is working to introduce a way for the OPAL card to be multifunctional, for example, transforming it into a simplified version of a debit card in which people can use to purchase things elsewhere.

Along with its developing public transit, Sydney has been working to accommodate public transit users who still drive. In hopes to encourage people to drive less into the CBD, NSW Transport is also working towards improving park and ride parking lots. Sydney also has plans to improve major points of intersection to make transit easier for people who park and ride.

The southern city of Australia, Melbourne, has taken a different approach to transportation demand management. Melbourne has already started its transition into the future modes of transportation: car sharing. With the City of Melbourne already working with five car-sharing companies, Melbourne has started to create car sharing specific parking spaces (City of Melbourne 90). To further support the idea of car sharing, the City of Melbourne has specifically reserved certain on-street parking spots for car sharing vehicles. By allocating on-street parking spaces to car sharing vehicles, car sharing users do not have to be inconvenienced by trying to look for parking. With a recent policy that passed in July 2015 – allowing the rights to reserve on-street parking spaces for car sharing companies— this simple but cost effective change has proven to be pretty successful; members of the car sharing programs are driving their private vehicles less (91).

On-street parking spaces being reserved for car-sharing vehicles bring inconvenience to private vehicle owners. People will either have to park their cars further away from their destinations or drive around to look for non-car sharing on-street parking spaces. And, the inconvenience of looking for parking can be frustrating in a busy CBD and may become a crucial factor in one's decision making process on whether they want to drive to the city or not. Melbourne's attempt to decrease congestion and CO<sub>2</sub> emission is something to look forward to.

Lastly, Brisbane's approach to transportation demand management has focused a lot on improving public transit through the means of advanced technology and improving standing conditions of public transit vehicles. One of the more modern high-tech approach to managing travel demand in Brisbane has been free public Wi-Fi on CityCats (public ferries), parks, and all throughout the Brisbane CBD ("Brisbane City Centre-An Open City" 40). This kind of access to Wi-Fi encourages people to be more efficient during their commute without having to sit in their cars in slow traffic. Along with this initiative is the free City Loop. The City Loop is bus route that loops around the Brisbane CBD. Fare is free for anyone getting on the City Loop buses, allowing people to get around the busy area free of charge and not having to worry about parking.

Just like the other two cities, Brisbane is providing public transit users a park and ride system. Knowing that congestion in the inner city is not just contributed by private owned vehicles, the city of Brisbane is also trying to limit the number of buses in the city. The city claimed that buses alone will not be able to service the number of people in the Brisbane CBD in the near future, especially when some of the bus stations and buses are already overcrowding with people ("Brisbane Metro Subway System October 2016" 2). By implementing Brisbane metro and making it the main mode of transit within the inner city streets, the city of Brisbane hopes to decrease congestion while increasing road safety for bikers and walkers; fewer cars on the streets will lead to less accidents. As a result, Brisbane is trying to reconfigure its bus routes to better compliment the metro.

Although it isn't specific to one particular city, Australia as a country has been trying to come up with a TDM strategy that would help mitigate congestion through tax reforms. By giving tax incentives to business who encourage their employees to take public transit, the Australian government hopes to manage congestion in CBDs better throughout the country –tax exemptions for employers and employees who drive less (Tourism & Transport Forum 5).

While no particular Australian TDM program may be the best fit for the ABC Ramps, a small alteration of Melbourne's TDM program could help benefit the ramps. Borrowing the idea of reserved on-street parking for car sharing vehicles, something similar can be adopted in the Minneapolis downtown area. Although car2go no longer operates in the Twin-Cities, the city of Minneapolis should look into advocating car-sharing programs.

On-street parking is popular among people because it is convenient. However, knowing that on-street parking is an option, that encourages people to drive around to look for an empty or a better parking space. As a result, this creates unnecessary congestion in the already bustling downtown area. By decreasing the number of on-street parking spaces, not only would this create more road space for bikers and buses but it would also encourage people to use the ramps. Furthermore, this could possible discourage people to drive less when coming into the city because of the inconvenience to park further away from their final destination. Or, people may choose to park at a ramp and chose to take another mode of transportation to get their final destination.

By limiting the number of on-street parking spaces, we are restricting people from parking on the street. Because people are being restricted in terms of their parking options, they don't have a choice but to either accept the change or find another way to travel. Since the introducing of car sharing in Melbourne, people who have enrolled into a car sharing program are showing a change in their travel behavior; the number of people who claimed that they drove as their primary mode of transportation dropped almost 25% (City of Melbourne 91). The car-sharing program will be effective because it gives people the option to drive or not based on their situation. However, those who do not have a choice but to park in the ramps are discouraged to drive around downtown since parking is not easily accessible.

This program however only benefits those who are enrolled in the car-sharing program. And, it further benefits those who do not have a car as they are given the option to drive without having to enduring the extra cost of owning a car—insurance or parking. On the other hand, this can appear to be an inconvenience to those who already have cars as they will be required to pay a fee to be part of the program and a mileage usage fee every time they drive a car sharing vehicle while they continue to pay for their own car insurance and gas. Yet, this program could help increase the usage of ABC Ramps; this will encourage people to either get a monthly contract at one of the ramps or drive them to park at one of the ramps due to the lack of parking options. In addition, the ABC Ramps could also be a car sharing station. To help meet its full capacity, car sharing companies can pay a fix rate in which they can reserve spaces for their car sharing vehicles. However, this is all under the assumption that car sharing will be a widely adopted practice in downtown Minneapolis.

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## 10. TDM PROGRAMS IN SCANDINAVIA

The ABC Ramps, located on the edge of downtown Minneapolis, provide convenient parking options for commuters driving in from the western suburbs of the Twin Cities. While parking is the primary function of the three ramps, the Minnesota Department of Transportation (MnDOT) built the ramps as multimodal transportation facilities aimed to connect commuters to transit, skyways, and bike infrastructure, reduce traffic congestion within the downtown core, and support clean air and other environmental initiatives (ABC-ramps). Almost halfway through their life cycle, MnDOT is beginning to evaluate the existing transportation demand management (TDM) programs of the ABC ramps to better meet their mission and goal of reducing solo driving trips for the next 25 years. It is critical to look at parking policy and infrastructure, like the ABC ramps, when evaluating TDM programs because every car trip begins and ends at a parking space.

Over the last few decades, TDM programs and initiatives have become more broadly adopted by cities all over the United States and the world, leading to more innovative and effective solutions to traffic congestion, air quality, and reductions in car trips. TDM programs in northern European cities are important to study because of their shared climate with Minnesota. Oslo (Norway), Stockholm (Sweden), and Copenhagen (Denmark) all experience cold, snowy winters, much like Minneapolis. Learning what programs Oslo, Stockholm, and Copenhagen utilize, how they implement them, and the results of the programs can be helpful in determining what TDM initiatives the ABC ramps should pursue in the coming years.

Oslo, Norway (population 618,683 in 2012) is a relatively new member of TDM programs compared to the other two northern European cities in this analysis. Oslo has focused its efforts on three main programs: congestion pricing to reduce congestion in the city, removing cars from the city center to reduce greenhouse gases, and an electric bike voucher program to reduce overall car trips.

In 1990, under the program called 'Oslo Package 1', the city of Oslo created an urban toll cordon consisting of 19 toll stations located five to eight kilometers from the city center (Rye 27). People entering the city center are tolled 24 hours a day, seven days a week (Lian 175). The toll ring system was designed to, "primarily...finance future urban road construction schemes and, secondly, to reduce car/vehicle traffic in the city centre" (Rye 27). When first introduced, traffic in Oslo decreased by three to five percent – a relatively small effect (Lian 175). However, "The decrease affected all modes, travel purposes and combinations of origin and destinations. There was no shift to other modes of transport" (Rye 28). While transportation demand management was an aspect of Oslo's tolling system, it is important to note that it was not designed as a congestion pricing program, but instead as a revenue for infrastructure projects. In 2016, 'Oslo Package 3' was adopted. This package aims to reduce car traffic and improve air quality through the introduction of congestion pricing (Fosli). Two new toll cordons will

be added to the network and 85% of the revenue generated from the tolls will go towards public transportation and cycling infrastructure and only 15% will go towards building new roads (Fosli). In an effort to promote “clean” driving in Oslo, electric vehicles are exempt from having to pay the congestion toll.

In 2015, Oslo city officials proposed a plan to remove private cars from the city center by 2019. In 2016, the city council approved that plan, which is part of a larger goal to lower emissions of greenhouse gases by 50% by 2020 and to reduce traffic by 20% by 2019 and 30% by 2030 (Schmitt). Liv Jorun Andenes from Oslo’s agency for the environment reports, “the city is planning to remove 1,300 spots over the next three years. In their place, eight bicycle routes will be added. In addition, 500 spaces will be eliminated to make room for pedestrians and transit” (Schmitt). Capitalizing upon the new infrastructure for bicyclists, pedestrians, and transit, earlier this year Oslo began offering residents vouchers to help buy electric cargo bikes. This program is an effort to reduce the number of car trips and lower greenhouse gas emissions by making these types of bikes affordable. Electric cargo bikes are being offered because of Oslo’s hilly topography and harsh winters. Feargus O’Sullivan from CityLab writes, “For that reason electric cargo bikes are a potentially greater part of the solution here. Not only do they give riders a push up hills, they also make bikes a feasible option for new purposes like weekly grocery shopping. They can even be used for the school commute”. The ABC ramps in partnership with the City of Minneapolis and other agencies could implement a few of these TDM strategies from Oslo. However, political and resident pushback would be the greatest hurdle, especially with any congestion tax pricing solution or removal of cars from downtown. Strategic, phased removal of parking or cars from downtown could create greater opportunities for pedestrian, bicycle, and transit facilities and increased access to those modes.

Stockholm, Sweden (population 814,418 in 2012) established parking regulations in the 1970s and has continued to update policies to better manage congestion and traffic to reflect the current and future city’s needs. Stockholm has focused its TDM efforts on two main programs: low mandated minimum parking requirements to utilize existing parking facilities and pay-and- display (P&D) parking zones to increase the cost of on-street parking closer to the city center.

Donald Shoup, in his book *The High Cost of Parking*, argues that, “minimum parking requirements subsidize cars, increase traffic congestion and carbon emissions, pollute the air and water...degrade urban design, reduce walkability and damage the economy” (Shoup). While minimum parking requirements are the antithesis of TDM programs, Stockholm has modified its minimum parking requirement to reduce the need for developers to provide additional parking. Of the major European cities (Paris, London, Barcelona, etc.), Stockholm has the lowest mandated minimum parking requirement – 0.14 spots per room (Kodransky and Hermann 17). The City of Stockholm can provide such a low minimum because developers “can fulfill parking requirements by finding available spaces in nearby parking facilities with the assistance of Stockholm Parkering, the local parking authority” (Kodransky and Hermann 17). The city not only encourages, but requires developers to identify available spaces and facilities nearby that can support their building’s parking needs before they comply with the

official zoning code (Kodransky and Hermann 17). This is a TDM strategy that the ABC ramps could pursue, especially with the recent housing boom in the North Loop. Already some residents of the area use ramp C either as additional or primary parking for their car. MnDOT and the City of Minneapolis could leverage this already existing pattern and create an official parking program within the ABC ramps for developers/residents to utilize. This would benefit the developers in not needing to provide parking in their development, it would help residents not front the cost of parking they may not use, it would benefit the city in helping to reduce traffic congestion and increase walkability, and it would benefit MnDOT in creating additional revenue for the ABC ramps.

Stockholm is also one of many European cities to adopt a P&D parking structure for on-street pricing. The P&D area in Stockholm is divided into three zones: blue, red, and green. The blue zone is located on the edge of the central city and costs 15 SEK/hour during the day and is free at night. The red zone is the intermediate zone and costs 25 SEK/hour during the day and 15 SEK/hour at night. The green zone is located at the heart of the central city and is “a small time-limited parking area near the city’s central rail station” (Kodransky and Hermann 57). The price in this zone is 40 SEK/hour always. By pricing parking in this manner, the city discourages people from driving into the city center, and instead encourages parking on the outskirts and having people walk, bike, or take transit to their destination in the city. Increasing the cost to park forces drivers to either “find an alternative parking location, start their journey at another time, shift to another mode of transport, change their destination, or avoid making the trip altogether” (Kodransky and Hermann 13). A UK study found that “doubling parking fees reduced car usage by 20%” (Kodransky and Hermann 13). In addition, this reduces pollution and creates expanded opportunities for pedestrian, bicycle, and transit facilities. Exempt from this P&D parking structure are eco-friendly vehicles and motorcycles. By exempting eco-friendly vehicles and allowing them to park for free, Stockholm is encouraging its residents to swap out their older, high emission vehicle for a new, low emission one (Kodransky and Hermann 14). It is important to note that this is not a long-term TDM solution and could still be problematic for Stockholm with regards to land use. The ABC ramps could adopt a similar pricing strategy as Stockholm with zones of prices. Being located at the edge of downtown, the ABC ramps could be priced significantly lower than the ramps located in the downtown core encouraging people to park at the edge and walk or bike into the core. One problem with this implementation would be the ownership of the ramps. In Stockholm one agency, Stockholm Parkering, owns the majority of parking facilities. This makes it possible for the city to create pricing zones. In Minneapolis, it would become problematic trying to control the price of a privately-owned parking facility and affecting their profit.

Copenhagen, Denmark (population 551,900 in 2012) has become the leading city in the world for alternative modes of transportation (i.e. bikes) and public space reclamation. Copenhagen has focused its TDM efforts on removing parking from the streets in the city center and has used that reclaimed space for “daylighting” and the expansion of world-class pedestrian and bicycle facilities. In the 1960s, city officials from Copenhagen realized that by offering a limitless supply of parking they were creating their own traffic congestion problems (Kodransky and Hermann 11). Thus, began their reclamation of street space for people, not cars. “From 2002 to 2008, 219 parking spaces in Copenhagen were replaced

by cycle tracks. The investment in new bicycle infrastructure has led to an increase in biking from 30% in 1998 to 37% in 2008” (Kodransky and Hermann 13). Copenhagen has not only removed on-street parking from its city center, but has closed off entire streets to traffic. Strøget and Nørrebro, both districts in the city, are completely pedestrianized. The harsh winters have little affect on how people get around and use the city, with people walking and biking even on cold, snowy days. Businesses on streets with no on-street parking and even businesses in pedestrianized areas have not lost business, but instead have seen a boon (Kodransky and Hermann 6). The lesson from Copenhagen is that by, “reducing the number of on-street car parking can be a way to encourage the use of other transportation modes by transforming former spaces to bicycle paths or wider walkways” (Kodransky and Hermann 6). While Copenhagen has reduced its on-street parking, it has invested in off-street facilities. The removal of 1,000 on-street spaces resulted in the creation of 3,000 off-street spaces (Kodransky and Hermann 16). Even though the cost of off-street facilities is more expensive, the opportunity to use the on-street space for another mode of transportation outweighs the cost of construction (Kodransky and Hermann 40). In Minneapolis, reducing on-street parking near the ABC ramps could force people to use the ramps, thus reducing the amount of traffic in downtown and getting people out of their cars at the edge of downtown and walking into the core.

Northern European cities have a lot to offer for TDM programs and solutions. The greatest challenge for the ABC ramps will be to modify and adjust their existing policies within the framework of the City of Minneapolis and its residents. One thing that should be taken away from these case studies is to not be afraid to experiment or test out solutions and to always be bold.

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## 11. EMPLOYER-BASED TDM PROGRAMS: MICROSOFT, MITRE, GENENTECH

Three large employer campuses were assessed for their unique take on transportation demand management (TDM) strategies. The Bill and Melinda Gates Foundation in Seattle, Washington, the MITRE Corporation in Tysons, Virginia, and Genentech in South San Francisco, California are included in this literature synthesis. These employers were selected due to their noteworthy TDM initiatives. Each of these campuses employ thousands of people from the surrounding community, meaning much traffic can be generated along the routes to these campuses. The following pages will dive into the most successful TDM schemes currently in action.

### **The Bill and Melinda Gates Foundation**

In 2009 the City of Seattle asked the Bill and Melinda Gates foundation to write a TDM plan. After moving the headquarters to its current location and implementing the TDM plan, the use of single occupancy vehicles (SOV) for commuting dropped from 88% to 42% [1]. The most important pieces of the TDM plan include the endorsement of all mode options, a \$3/day incentive for commuting by an alternative mode, disincentivized parking, and daily parking rates that do not exceed monthly contracts. Parking a SOV is \$12 a day while carpools get a \$3 incentive and vanpools park for free [2].

Employees are not locked into a monthly parking plan. Instead, a daily market rate is applied to the ticketing gates. The daily rate is set to never exceed the monthly rate because many employees have very flexible schedules due to travel and generous family leave policies. The parking flexibility made a huge difference in the anxiety the employees felt over deciding if they should buy a monthly contract. Thus, the number of monthly contracts dropped significantly. Parking charges are auto applied to employee accounts and a phone app allows employees to form carpools, split the cost, and get credited their \$3/day incentive. These features are enabled by the transportation demand management software that The Foundation switched to in 2011. The software is made by luum<sup>®</sup>, a mobility as a service platform for enterprises.

The Bill and Melinda Gates Foundation has a dedicated transportation management team. This group of people have transformed the organization into a workplace that offers a well-rounded package of commuter benefits. Many employees take advantage of the ride match capabilities within the luum transportation management software [3]. Through this software, employees can purchase subsidized transit passes that include bus, light rail, monorail, and ferry services. The Foundation has a dedicated intranet page for commute resources, including a daily report of traffic disruptions in the region which is highlighted on the intranet homepage. The software can be adapted to other Bill and Melinda Gates Foundation offices around the world. An informational video is shown to new staff which introduces them to the plethora of commute tools available to them. The web interface even allows employees to

track their carbon emissions savings and expenditures depending on the distance traveled and mode taken. Additionally, employees can calculate how much they spend on parking per month and log their daily commute mode in a “gamified” interface that awards points, new levels, and badges to employees. The TDM system logs when an employee arrives to work by SOV through a card reader at all employee parking lots. Employees are required to swipe their card for payment and the system deducts the charge from their account while recording the mode used. The software lets the transportation administrative board view extensive data reports that ultimately drive program decisions. Additionally, the software can quantify the environmental impact of their employee’s commute decisions on a daily or annual basis. Employees have individual accounts where they can purchase a variety of transit passes and store their transit user credentials within the system. This eliminates the need for complex Excel spreadsheets previously used by the transportation staff. Over 50% of employees at the Bill and Melinda Gates Foundation regularly took alternative modes of transportation to work in 2015.

The TDM strategies used by the Bill and Melinda Gates Foundation appear to encourage the use of alternative modes of transportation for the daily commute. The wide variety of transit options available to employees along with the interactive commuter software have drastically decreased the SOV mode-split. This program explicitly disincentivizes parking by charging employees around \$12.00/day to park in a lot on campus. The effect is compounded by the additional \$3.00 that is awarded for taking alternative modes of transportation to work. The strong encouragement to take alternative modes to the Bill and Melinda Gates Foundation campuses may allow people from lower economic backgrounds to apply for jobs and effectively work at The Foundation. The most applicable strategy to implement at ABC Ramps is a daily parking rate that does not exceed the monthly rate. This would give commuters the freedom to drive or take alternative modes of transportation with the knowledge that on any given day, either mode is viable and affordable.

### **The MITRE Corporation**

The MITRE Corporation is located just outside of Washington D.C. in Tysons, Virginia. The non-for-profit corporation employs around 3,500 people from the region. The recently completed Silver Line subway has a station near the MITRE Corporation. After the rail line opened in 2014, MITRE saw a 450% increase in employees enrolled in pre-taxed commuter benefits, and the mode split for transit went from 3.5% to 7% [1]. Despite the proximity to the Silver Line, 77% of employees continue to drive alone. This is mainly due to the large and free parking lots available for MITRE employees.

MITRE uses a variety of technologies for employee commute options. The tech services include an internal website dedicated to commuters, MITRE shuttles that are hailed and tracked with an app, a variety of communication channels (electronic signage, MITRE Monday Email, Facebook, Twitter, etc.) a SharePoint transit incentive signup and other services [4]. The internal commuter website is a one-stop-shop for all the commute services offered at MITRE Corporation. Links to trip planners, bike routes, shuttle schedules, parking information, and employee to employee ride share are all featured sections within the website. Ridesystems.net is used as the backend for tracking the shuttle services, some of

which are free while others are paid for by the employees. Electronic message boards inform MITRE employees about special transit events and monthly commuter challenges [5]. Employees can track and make changes to commute orders through the WageWorks online platform. Transit subsidies, monthly, weekly transit passes, parking passes and paycheck withholding are all processed through this medium.

The MITRE Corporation has many small-scale efforts underway to give employees better information about their commute. Ultimately, these efforts are undermined by the free parking lots available to all employees. The convenience of these lots favors more wealthy employees that have vehicles, thereby allowing them to work late, drive to meetings, and work on their own timetable. These benefits may influence their success at work and further widen the gap between people from higher and lower economic status.

One project the transportation staff at MITRE Corporation have implemented are robust carpool forums. ABC Ramps may be able to collect information on driver's origins to establish a heatmap of zip codes from which ramp users drive from in the morning peak hours. The map may spark conversation on a message board or online forum about carpooling to the ABC ramps.

### **GenenTech**

Genentech has a 180-acre campus and serves 12,000 employees. The TDM strategies are administered by a dedicated transportation department (gRide Team) which oversees commuter buses, vanpools/ carpools, public transit connectivity, the Genentech bike share program, campus shuttles, and a fleet vehicle program. Genentech understands that "top talent" is retained and attracted by making the commute easy and efficient [6]. Some employees have reported that they have never needed to drive to work because there are so many other options. Over the last 8 years, the participation in "gRide" services has increased by 20%. The mode with the biggest increase was the GenenBus service which collects regional transit riders from nearby stations and brings them to campus (1.2 million passenger boardings in 2015). The Bay Area has thorny traffic conditions which makes GenenBus routes unpredictable. With these problems, gRide team recently optimized its routes by reconfiguring empty buses and double decker buses, increasing efficiency by 18%. A commute reporting calendar allows employees to log their daily mode choice and badge readers auto record which buses are being used by specific employees. A smart phone app offers route scheduling and transit countdown for when the next bus/train will leave from the Genentech campus (developed in house). Demand for buses is so high that four additional double decker buses will be purchased in 2017. A seat counter will show employees how many seats are left on the next departing bus which will help them determine if they should take BART instead.

The Genentech transportation staff have been working to reduce SOV share for over a decade. The services they provide to employees are reinforced by the appalling traffic conditions around the San Francisco area. For this reason, much of the demand for transit is out of necessity which makes the gRide program highly successful. The program is mature and has many sophisticated features, some of which were developed in house. These resources and service conditions are not applicable to ABC

Ramps, however, the Genentech example bolsters the argument for implementing a robust card reader/user account system at ABC Ramps. The wide range of data that is generate by these systems would allow ABC Ramps to quickly adapt to demand fluctuations in the next 50 years. With the cost of smart phones on the decline, more people in lower income brackets will be able to take advantage of these services and make educated decisions about their commute.

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## 12. EMPLOYER-BASED TDM PROGRAMS: GOOGLE, APPLE, AND CLIF BAR

Through policy, planning, and promotion, Google, Apple, and Clif Bar and Company are innovators in reducing single occupancy travel for their employees. Located in the northern California region, these employers have the challenge of increasing sustainable modes, such as walking and biking, in more suburban settings. As part of their Transportation Demand Management (TDM) strategies, they have engaged in bike planning and promotion, electric vehicle incentives and accommodations, shuttle bus systems, and carpooling incentives to ease employee travel and congestion in the Bay Area. Google, Apple, and Clif Bar's transportation practices serve as models for employer based TDM for other companies and cities, including the ABC Ramps in Minneapolis.

As large, well-resourced, and well-financed companies, Apple and Google have a top standard of TDM programming and policy. Clif Bar, a smaller company, has a strong commitment to employee satisfaction, creating policies that make them an innovator in TDM by providing many employee benefits and having sustainability at the core of their work. Google employs over 11,000 workers on its Mountain View campus as of 2013, whereas Apple is estimated to have over 23,000 employees as their new campus in Cupertino is completed (Hollister, 2014; Burrows, 2013). A 2011 study found that Apple has a 72% SOV commute rate for peak trips (“Apple Campus 2 EIR,” 2013). Clif Bar, a medium sized company which was rated as one of Fortune Magazines “25 Best Medium Sized Companies to Work for,” has just under 400 employees and a central office in Emeryville, CA (Mangalindan, 2014). Although these companies vary slightly in locations and significantly in employees, their transportation programming and policy has similar tenets.

Shuttle bus transportation is a TDM innovation that has been popular for Google and Apple employees. Google’s shuttle bus program, GBus, plays a significant role in helping the company achieve their goal of reducing SOV travel to 45% (“Google Environmental Report,” 2016, p. 11). Both Apple and Google’s buses run on biodiesel and are free for employees. Google claims that the buses pick up 9,000 riders each way on peak days. In 2014, the LA Times quoted Apple’s ridership significantly lower at 1,600 employees per day on average, although this is notably a non-peak time estimate (O’Brien & Guynn, 2014). These shuttles have helped the companies attract younger employees who live farther from their campuses, many in San Francisco, to join their companies. The buses are designed to attract employees through amenities such as complimentary Wi-Fi, and frequent pick up times as early as 5am and as late 10pm for Google, allowing employees to have travel flexibility (“Transportation to Work,” 2012).

Although shuttle buses have helped large companies like Apple and Google shuttle employees from less expensive or central city locations, the programs have been criticized on equity grounds. GBuses in particular gained negative attention for contributing to gentrification in the Bay Area by making it easier for employees with the ability to pay high rents to dominate the San Francisco housing market (Brown, 2014). They have been the center of protests and controversy leading the San Francisco Chronicle to call them “nondescript, double-deck behemoths that have become so synonymous with class tensions in San Francisco” (Brown, 2014). Despite shuttle bus program’s controversy related to equity, their ability to take the equivalent of 2000 cars off the road in Google’s case is an impressive achievement in TDM.

Although the buses may not have obvious implications for the ABC Ramps in Minneapolis, shuttle bus accommodations could be considered in the planning for the next 25 years of the Ramps. The ABC Ramp planning could accommodate shuttle bus parking and drop off, allowing for commuters to travel in larger capacity vehicles, further reducing congestion. The ABC Ramps are centrally located with connections to thousands of jobs, similar to the large Google and Apple campuses. Undoubtedly adaptations would be necessary to accommodate suburban to urban travel and identify financial resources if companies were not interested in creating and independently financing the shuttle programs.

Google, Apple, and Clif Bar are also engaging in TDM policies that seek to engage employees in biking and increase biking and walking mode shares. This goal is approached from different angles at each of the companies. Clif Bar and Company provides bike storage and showers for employees, as do Google and Apple (J. Hantman, personal communication, February 8, 2017). Clif Bar also reimburses employees who bike, walk, or take public transport to work with \$1,500 (Mangalindan, 2014). Apple, in addition to providing necessary facilities like Clif Bar, reimburses employees who bike to work with \$20/ month (Donato-Weinstein, 2013). In addition to this reimbursement, Clif Bar manages a unique point system in which employees can exchange points for money on their pay checks or wellness benefits, such as acupuncture, provided at Clif Bar (J. Hantman, personal communication, February 8, 2017). Jeff Hantman of Clif Bar and Company indicated that after SOV travel, biking and carpooling are their most popular modes, implying that their incentives and programming have been effective (2017).

Google and Apple, with larger employee bases and campuses, are able to support more robust bike commute programming and policy. Google has smaller scale efforts like Clif Bar to provide support for bicyclists through access to showers, lockers, and changing rooms (Kidd et al, 2015). They have even gone a step further by providing helmets at building entrances and exits and “FIXIT” stations along popular routes that have bike tools (Kidd et al, 2015). Other programs include their notorious GBikes for free on campus rides, e-bikes, bike racks on shuttles, substantial bike parking, and even seven-person conference bikes that can be used for meetings (Bernstein, 2012; Kidd et al, 2015). The conference bikes in particular shows a commitment to creating biking culture and innovation in transportation. Furthermore, the company instead of paying employees for biking to work, donates to charity (Bernstein, 2012). Combined with other TDM programming, these offerings work to reduce SOV travel by leading to 10% of Google employees biking to work (Kidd et al, 2015, p. 6). This compares to a 6% bicycle and walk trip percentage at Apple (“Apple Campus 2 EIR,” 2013).

Beyond these important efforts, notable biking innovations stand out in the areas of promotion and planning. Google worked with their county, local bicycle coalition, and a design firm, Alta Planning and Design Inc., to create a bike vision plan not simply for their campus, but for the North Santa Clara County area (Kidd et al, 2015). This report states a goal of increasing Google employee bike commuting to 20%, a 10% increase (Kidd et al, 2015, p. 6). The plan stands out because it was a unique collaboration of advocacy, private, and corporate entities. It’s also unique because of its intentional planning to increase bike commuting for not only Google, but for the entire region.

One of the steps to help reach this goal was a Bike to Work Month, rather than a Bike to Work Day that engaged many Google employees in logging their bike trips. The company was successful by holding pre-event activities, encouraging bicycle buddies, creating targeted communications, such as a banner on their website, providing free bike servicing, renting out bikes for the month, giving prizes, and holding celebrations (Tice, 2016). Apple also has a comprehensive bicycle route matching program to connect employees for bike commute trips (“Apple Campus 2 EIR,” 2013). In this one month, Google had 870 participants and 400 new users for their trip logging platform (Tice, 2016). Google used the RideAmigo

platform for trip logging and has continued to offer prizes through this platform, allowing employees to stay engaged in biking beyond the month (Tice, 2016).

Some of these bike innovations have implications for TDM solutions at the ABC Ramps. The intercampus biking on Google and Apple's campus show the value of easily accessible bikes for trips during the day. All three companies have bike parking, showers, and changing rooms, which could be maintained and made accessible at the ABC Ramps. Installation of a "FIXIT" station in the ramp could be considered to further incentivize safe biking. Involving employers in transportation planning, such as the Google collaboration with their county and bike coalition should be considered around the ABC Ramps to allow for better long term planning and corporate buy-in.

Although alternative fuel vehicles are not necessarily a more efficient mode of travel, it is notable that these companies have significant transportation incentives and subsidies for electric vehicles. Electric vehicles are connected to TDM's sustainability goals, and demonstrate how these companies provide incentives for SOV modes. Because sustainability is central to these company's missions, most of them provide an electric vehicle subsidy even though this would encourage SOV travel. Clif Bar gives employees \$6,500 when they purchase an electric vehicle or a vehicle that gets 45 miles per gallon or better (J. Hantman, personal communication, February 8, 2017). Google has the "largest corporate electrical vehicle charging infrastructure" which can be used for personal vehicles, but is also key to the company's car sharing program, GFleet (Anonymous, 2011). GFleet vehicles are available at the Google campus were created as a special incentive for employees who use alternative transportation, mostly for short trips (Schreiber, n.d). Investment in electric vehicle infrastructure makes having electric vehicles for intercampus travel more affordable, and allows non SOV commuters more options for travel while at work.

The ABC Ramp could further incorporate electric vehicle infrastructure and car sharing innovations in future planning. The Ramps could partner with companies that offer electric vehicle incentives, similar to the incentive for free travel with Gfleet. The ABC Ramps may also consider offering more incentive to bike and carpool commuters, such as Uber and Lyft vouchers that make it easier for them to use alternative modes. Car sharing for alternate transportation users should also be considered as an incentive to commuters who are avoiding SOV travel. Lower or no rates for bike commuters and carpoolers could be considered, as is done at Google.

Google, Apple and Clif Bar provide solid examples of companies of varying sizes that approach transportation challenges through innovation and investment in TDM efforts. Through long term planning, policy at a local and corporate level, and promotion of various transportation alternatives, these companies are working to increase biking, walking, and public and private transit mode shares. These companies show strong models of employer based TDM that could be adopted through ABC Ramp planning with steps to accommodate shuttles, biking, and electric vehicle infrastructure.

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### 13. EMPLOYER-BASED TDM PROGRAMS: AMAZON, YA, AND MICHAUD COOLEY ERICKSON

MnDOT is seeking to improve their parking programs in downtown Minneapolis' ABC Ramps, with specific goals to increase the share of high occupancy vehicle trips and reduce single occupancy vehicle trips. With increased congestion in many urban areas, many private companies are developing similar goals for their employee commute shares. Some are finding travel demand management strategies to be a requirement for their urban offices, whether by municipal requirement or employee demand. To investigate best practices of corporate travel demand management, information has been requested and obtained from Amazon, YA, and Michaud Cooley Erickson.

Amazon headquarters are located in Seattle, Washington. Despite rapid growth and need for extra space, Amazon has chosen to keep their headquarters in the urban Seattle environment, in part due to requests by employees. As a leader in the technology industry, Amazon faces a good deal of competition for top talent. Unsurprising, then, are their incentives that ease employees' commutes.

Simply choosing to remain in a dense, urban environment allows 20% of Amazon's Seattle employees to walk to work. Their efforts to encourage active transportation forms do not stop at location. Amazon's "urban campus," as they call it, incorporates public spaces including "a dedicated two-way cycle track to separate bikes from traffic, a shared use street that's designed to be great for pedestrians as well as cars, ...[and] covered public walkways" (Amazon.com, Inc., 2017). The walking mode share for commutes shows that these strategies have been effective in terms of demand management, though how much can be attributed to features beyond location and context is uncertain.

Assuming that Amazon pays its employees enough to afford living in the urban core of Seattle, the ability to walk to work has the potential to benefit a good number of them. For those who cannot walk, Amazon also sponsors transit passes called ORCA cards that are valid on all types of transit, ferries, bus, rail, and train, throughout the greater metropolitan region. Based on information obtained directly from an Amazon employee, those who use the transit program do not pay anything for it (Kennedy, 2017).

The last strategy Amazon has implemented to ease employee commutes is modeled after other tech giants, like Microsoft, and is called Amazon Ride. Amazon Ride is basically a direct shuttle service from six suburban locations to various Amazon buildings in urban Seattle. The use of the service does not appear to be publicly available, though it is still functioning after five months. Employees can reserve

space on a shuttle up to two weeks in advance, and in the event that they need to stay late there is an additional guaranteed ride home program that employees can use five times per year (Levy, 2016).

Amazon's strategies are all sensible ideas for private companies, however, applying them to a public parking facility like the ABC Ramps is not as straightforward. The ABC Ramps exist to enable people to drive at least most of the way to work, while Amazon's strategies seem geared toward ensuring people do not have to drive. Moreover, this investigation did not produce any information relating to employee organized carpooling, one of the goals for the ABC Ramps moving forward. One possible way of using Amazon's example in improving carpooling numbers in the ABC ramps would be for MnDOT to establish relationships with companies whose employees can use the ramps. Working directly with companies on their travel demand management strategies could help the ABC ramps to improve carpool numbers.

The ability of the ABC ramps to work with companies with downtown Minneapolis offices can be aided by current practices of these companies. Companies interviewed with locations in downtown Minneapolis are Michaud Cooley Erickson (MCE), an engineering firm and YA, an engagement marketing and promotions company. Both companies have their own ways of addressing commuter challenges.

YA has a unique history that shapes its employee commute patterns. Until 2015, the company's primary offices were in suburbs west of the Twin Cities including Young America, MN which gives the company its name. Though the company has moved its headquarters from suburban verging on rural locations to a very much urban location, all YA employees have not done the same and face a significant commute distance (YA, 2015).

Despite this spatial disconnect between office and employees, YA has not opted to make the ability to drive to their headquarters their priority by offering extensive free parking. Rather, YA gives employees the option of expensing up to \$110 per month for parking, or providing them with a Metro Pass free of charge. The Metro Pass provides employees with unlimited transit rides (of cost up to \$3) for the month. Many employees use their passes to catch express buses from park and rides in the suburbs into the city center. Some employees living far from park and ride locations carpool to park and rides, though YA does not formally organize the practice. A human resources representative from YA described a sort of comradery that occurs amongst employees who take transit from the outer suburbs. For example, employees will organize themselves to take the same express bus to and from work (Senna, 2017).

In addition to the Metro Pass, employees opting for that option can have parking for work purposes validated up to four times per month. This allows employees some flexibility for when they might want to stay late at work or perform other activities requiring a car throughout their days (Senna, 2017).

Such a parking and transit scheme could be effective for companies looking to utilize the ABC Ramps. Specifically, consumers could benefit from having a certain amount of flexibility in their commute choices. While this wouldn't necessarily increase high occupancy vehicle trips into the ABC ramps, it could reduce some of the regular demand for single occupancy vehicles while maintaining a steady flow

of income to the ramps with employers arranging contracts in lieu of employees operating independently on a day to day basis.

MCE takes a different strategy when it comes to giving employees flexibility in mobility. Like Amazon and YA, MCE sponsors Metro Passes for its employees. Employees have the choice of accepting a Metro Pass free of charge or to take \$75 per month to spend on parking. The company further supports a transit culture by encouraging its employees to take transit together to meetings outside of the office but during the work day when possible. When transit isn't an option, or is simply infeasible, MCE has a fleet of company cars available to employees. The MCE employee consulted with over email stated that MCE tries to, "have everyone going to the meeting take one of their provided cars before all driving in ourselves." This promotes a reduction in single occupancy vehicle trips beyond just the commute trip. The employee couldn't speak to the effectiveness of the programs as he had just started working for MCE, but these policies are clearly some of the first things he has been made aware of in the workplace, indicating their significance (Nault-Maurer, 2017).

The idea of car sharing is hardly new; however, ABC Ramps could make an ideal place to host a round trip car sharing service into which employers could buy, particularly those without their own facilities to store company cars like MCE. Cars could be checked out for days when employees have to attend meetings far from the office, have appointments during the day, or simply want to go somewhere for lunch.

MnDOT has a myriad of options available for revamping their policies surrounding the ABC ramps. Working directly with area employers only increases the options for programs they can pursue. Employer-based contracts that give employees a few days per month of parking or hosting a ride share company are just two options. MnDOT has a unique opportunity to reshape the parking industry in Minneapolis, and it will be interesting to see what they decide.

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## 14. SHARED-USE VEHICLE PROGRAMS: BIKE SHARING

### Free-Roaming BikeShare

Mobike is a Chinese bike-sharing service that began operation in 2016. Unlike conventional bike-sharing services, such as Nice Ride, Mobike has no stations. Instead, users find bicycles on the street and ride them directly to wherever they are going. A smartphone app lets them locate a bicycle and unlock it by scanning a QR code, while a novel self-locking mechanism makes it easy to secure the bike to itself at the end of the ride. Users can reserve a bike up to 15 minutes in advance.<sup>12</sup>

In its general concept, Mobike is very similar to Car2Go: it offers users a high degree of flexibility by letting them park the bike anywhere. The downside to this system is that users can never be sure whether there will be bikes near them when they need it. This makes the smartphone app—which displays nearby apps—necessary for riding.

Mobike's pricing structure also differs from conventional bike-sharing programs. Rather than paying for a yearly, monthly, or daily subscription to take an unlimited number of half-hour trips, Mobike users are charged for the time they actually use the bike. Currently in China, rates are extremely low, around 1 RMB (\$0.17) per hour. Additionally, users pay a 300 RMB (around \$44) deposit that is returned to them if they cancel their subscription. This makes it an extremely cheap transportation option—cheaper than public transit for short trips.

The bikes themselves are very simple: they consist of what appears to be an aluminum frame, a plastic GPS device with a QR code printed on top, and a securing mechanism that is locked manually and unlocked when the QR code is scanned. The battery needed to power the lock and the GPS device is recharged each ride by pedaling. One feature the bikes lack is an adjustable seat: as a result, they are extremely uncomfortable for all but the shortest riders.<sup>13</sup>

Mobike encourages cycling for short trips. Perhaps more importantly, it makes it easy to combine occasional cycling with other forms of transportation: users can commute to work by subway and return

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<sup>12</sup> Michael Moritz, "The Internet of Bicycles' Is China's Latest Export," *Financial Times*, January 19, 2017. <https://www.ft.com/content/9d91c86a-de36-11e6-86ac-f253db7791c6>

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home by bike, or they can use a bike for a spontaneous trip in the middle of the day. With Mobike, people do not have to commit to using one mode of transportation for the entire two-way commute.

Mobike also provides an effective solution to the first-mile / last-mile problem, as users can ride a bike from their home to a subway station or bus stop, and from the destination station to the final destination. Because of how easily it can be combined with public transit, the program does not at all discourage bus or subway use—just the opposite. What it discourages is driving, either in a private vehicle or in a taxi. Indeed, in situations where traffic can be slow, Mobike offers an attractive alternative to travel by car.

### **Effectiveness**

Mobike has so far been effective in filling a niche in the bike-sharing market. Since the bicycles do not need to be based at any fixed spot, the system can be quickly and cheaply rolled out in new cities, obviating the need to plan for and locate new stations. (It already operates in several cities within China, and has recently expanded to Singapore.) Mobike is particularly effective in solving the “last-mile” portion of the first-mile / last-mile problem, because it lets users drive directly to their destination, without having to walk from the nearest bike station, which in conventional bike-sharing programs may not be very near.

The chief drawback to the program—and the chief limit on its effectiveness—is that bikes are often hard to find, and are not reliably clustered in known places. A user of a conventional bike-sharing program can usually count on finding bikes available in high-traffic stations; the station forces users within a certain radius to park the bikes there, which in turn makes it easier for the next users to locate them. With Mobike, bikes are spread out across the city, and even if there are several in a given area, they won’t all be conveniently located in the same spot.

### **Equity Impacts**

Given Mobike’s minimal cost—a six-hour ride costs only about \$1—it can particularly benefit low-income users who need a convenient alternative to taxis when public transit is not available. (This problem is especially acute in cities such as Shanghai, where subway service stops well before midnight.) However, this service requires users to have a smartphone: not only is the app the most convenient way to locate bicycles, it is also needed to scan the QR code and unlock the bike. Payment is currently made through the payment apps AliPay and WeChat (commonly used in China), which in turn are linked to the user’s bank account or credit card. People without a smartphone or bank account would not be able to benefit from this service.

### **Applicability to the ABC Ramps**

So far there is no similar stationless bike-sharing system in the United States. Were such a program to exist in Minneapolis, it could no doubt be used with ABC Ramps: commuters could park at the ramps and take a Mobike-style bike to their final destination. However, it would not be possible to locate bikes

near the garages, as their availability would depend on whether people had previously parked them there.

### **Nice Ride**

Nice Ride is the Twin Cities' bike-sharing program. It began operation in 2010, and over the last six years has become a key part of the cities' transit landscape. Nice Ride is a conventional bike-sharing system, in the sense that bicycles are docked at stations spread across the metropolitan area. Users locate a station, use a key or "fob" to unlock a bicycle, ride it, and return it to another station near their destination. Currently Nice Ride has nearly 1700 bicycles and 200 stations throughout the Twin Cities metro area.<sup>14</sup>

The Nice Ride system is very similar to programs in other North American cities, like CitiBike in New York, Divvy in Chicago, or Bike Town in Portland. As bikes do not have to be returned to the station of origin, the system makes it easy to take one-way trips—say, taking the bus to work and biking home, or biking to a bar and taking a cab back. Stations are often located near transit stations or popular destinations (such as college campuses, commercial nodes, etc.), which makes them easy to combine with other transit modes.

Users pay in advance for a yearly (\$75), monthly (\$18), or three-day membership (\$10), which lets them can take unlimited hour-long trips (or half-hour trips, in the case of three-day passes). Trips lasting longer than the allotted time are charged \$4 per half-hour. Alternatively, users can pay for single trip, which costs \$4 per half-hour.<sup>15</sup>

Nice Rides are available only from mid-April to mid-November. During the winter stations are removed. Its seasonal. Similar bike-sharing programs in other U.S. cities are available year-round—even in places like Chicago, where winters are snowy and long.

Nice Rides encourages cycling. In particular, by making it possible to take one-way trips, the program removes some of the logistical barriers to biking: users can bike to work, for example, and take a bus home. In fact, because it makes one-way travel easy, the program promotes biking without discouraging other modes of transportation, such as walking, transit, cabs, or ride-sharing services. Nice Ride discourages driving, since it provides a convenient alternative to short- or medium-distance trips.

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<sup>14</sup> Nice Ride Minnesota. <http://www.niceridemn.org>

<sup>15</sup> Nice Ride Minnesota. <http://www.niceridemn.org>

## **Effectiveness**

Nice Ride has been a so far success, with 1,750,000 rides taken since between 2010 and 2015, according to the website. The fact that stations cover much of the Twin Cities area makes Nice Rides a plausible mode of transportation for many trips: anyone riding downtown, for example, has only to walk a few blocks to their final destination. Still at least three limitations stand out. First is the seasonal nature of the service, which makes the bikes unavailable even in the warmer, snow-free portions of March or November. Second is the fact that stations are concentrated in the denser parts of the cities: riders cannot dock bikes in large parts of south Minneapolis, or St. Paul. Third is the size and weight of the bikes, which make them very unwieldy. These limitations aside, however, Nice Ride effectively complements other Twin Cities transportation options.

## **Equity Impacts**

Nice Ride makes it easy for people who do not own a bicycle, or who are not in the habit of riding, to try it out. In particular, it lets people ride without making a large upfront in a bicycle. (Personally, I disliked urban biking I tried using Chicago's Divvy bicycles.) In theory, at least, Nice Ride would make it easier for low-income residents to get around the city without a car. In practice, however, low-income residents may be less likely to benefit from the service, because billing requires a bank or credit card, and checking on station status (i.e., whether or not there are empty docks) requires a smartphone or computer. Nice Ride has sought to increase its impact in lower-income neighborhoods with the Neighborhood Program, which lets residents of North Minneapolis and Frogtown, St. Paul, learn about bike riding and safety, and borrow bikes free of charge for an entire season. While this program is very different from the bike-sharing service itself, it supports the same goal of promoting cycling.<sup>16</sup>

## **Applicability to the ABC Ramps**

The Nice Ride program already works with the ABC Ramps, insofar as there are stations located near the ramps, including one under the skyway between Ramps B and C. Those who use the ABC Ramps can easily park their car and take a bike to their final destination (or at least to a nearby station). However, at present the ABC Ramps do not have an agreement with Nice Ride to give parking pass holders free or discounted membership.<sup>17</sup>

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<sup>16</sup> Nice Ride Minnesota. <http://www.niceridemn.org>

<sup>17</sup> ABC Ramps. <http://www.abc-ramps.com>

## 15. SHARED-USE VEHICLE PROGRAMS: HOURCAR

As interest in car ownership declines, car share programs are becoming more and more popular as a means of reducing car dependency. Car share programs allow people to rent cars on a short-term, as-needed basis. Members pay for the time spent using the car and the mileage they drive, and the program operators cover the costs of maintenance and insurance. These programs allow users to gain the benefits of having a car without being responsible for the full cost and responsibility of ownership, making it an attractive choice for those who have little need for a car in their day-to-day life and those with lower incomes who would struggle with the upkeep associated with car ownership. Although it seems counterintuitive, ABC Ramps could actually work with car share programs to boost ramp utilization by allocating spaces to local car shares, thus filling more spots in each parking garage and making carpool a more feasible option.

HOURCAR is a nonprofit car sharing program based in Saint Paul, Minnesota that serves the Twin Cities metro area. It offers short-term car rentals ranging from 30 minutes to 3 days. The program claims to be more accessible than conventional car rentals because it is available 24 hours a day, seven days a week, and rather than finding their way to a central car rental location, members pick up and drop off their rented car at a designated parking spot in their neighborhood. The program also advertises greater convenience than carpooling because members don't have to accommodate other riders and their schedules.

HOURCAR encourages people to drive less and lead a less car-dependent lifestyle by providing an alternative to owning a car for trips that are either inconvenient or impossible to achieve using only public transit. Some benefits of car sharing in general include more careful thought about the necessity and length of trips, which could decrease car ownership; cost and energy savings; better air quality resulting from fewer cars on the road; and greater focus on alternative modes, leading to increased transit ridership, bicycling, and walking (1).

Because of its pricing system, HOURCAR may not limit vehicle miles as much as other car share programs with strictly mileage-based pricing. HOURCAR offers two plans, both of which have the same application fee (\$25) and annual membership cost (\$6 monthly or \$55 annually). The Voyager Plan, which is advertised as the more popular of the two, has a flat hourly rate of \$8.50 with 100 miles included and a charge of 35 cents for each mile driven past the first 100 in a trip (2). The Neighborhood Plan, which HOURCAR advertises as "great for shorter trips", has a slightly lower hourly rate of \$6.75 but has no miles included for free and charges the 35-cent rate for every mile driven. The latter plan discourages extraneous driving because drivers want to minimize the cost of each trip taken, and both plans encourage members to keep their trips as short time-wise as possible in order to keep the expense low.

One of the stated goals of HOURCAR is to make it possible for their members "drive less overall", and in this goal they (as well as car share programs across the country) are proven to be quite successful. In a

study of 6,281 North American households participating in neighborhood car share programs, Elliot Martin and Susan Shaheen found that members owned an average of 0.47 vehicles per household prior to car sharing, and that number decreased to 0.24 vehicles per household after joining a car share program (3). They note that most of this shift occurred because one-car households became no-car households. In addition to households reducing their car ownership, a large proportion of respondents who had been carless prior to car sharing decided to stay that way in part because of their car share program. Martin and Shaheen note that approximately 25 percent of the respondents expressed that they “‘maybe’, ‘probably’, or ‘definitely’ would buy a car in the absence of a car share program. In a separate study from 2005 (4), Shaheen stated that there is data that shows vehicle miles traveled (VMT) can be reduced by as little as 7.6% to as much as 80%, though estimates differ significantly between users who sold vehicles after joining car share programs and those who gained access to vehicles via the programs.

While these programs do, on the whole, reduce reliance on vehicle ownership and increase vehicle access (particularly young, physically able people with a good income and a bank account), there are segments of the community that are not effectively served by car sharing including lower-income people, senior citizens, and people with disabilities. Car- and bike-share operators are united in concern about ensuring access for low-income people, who may not have a debit or credit card which is required for program registration, and may not be able to afford membership costs (5). A few car share programs throughout the country are also beginning to recognize the need to serve the aging and disabled populations.

In Washington, DC, Capital Bikeshare implemented a program to help overcome the barrier of obtaining a debit or credit card (5). The organization partnered with financial institutions in order to help users open bank accounts, acquire debit cards, and even receive gift cards to help offset the cost of membership. Although bikeshare programs are less costly than car shares, HOURCAR may still be able to look to Capital Bikeshare for a model of greater equity.

City CarShare in the San Francisco Bay Area is one remedy for the problem of affordability. City CarShare is a low-income car share program that requires prospective members to be referred by one of six partners who serve lower-income residents in the area (5). The program also provides subsidies for usage and membership fees in order to make it more affordable for their low- and moderate-income users. Unfortunately, HOURCAR makes no mention of a similar program on their website, and there is not another program in the Twin Cities geared towards serving lower-income users.

NextVillage is a San Francisco nonprofit aiming to increase mobility for older adults, and it has partnered with City CarShare in order to work towards this goal. NextVillage pays for one year of CarShare membership for volunteers who donate twelve hours each quarter to drive senior citizens to their appointments, errands, and other outings (5). Some nonprofits in the Twin Cities provide transportation for seniors, but the transportation options are limited in scope. HOURCAR could also look to City CarShare as an example if they choose to expand their accessibility for senior citizens.

People with disabilities remain underserved by car share programs. While HOURCAR addresses concerns about using its cars to transport bikes (6), it makes no mention of wheelchair accessibility or transportation. City CarShare again leads the nation in equitable shared transportation: in 2008, it introduced AccessMobile, a fleet of the country's first wheelchair-accessible vehicles which now includes vans (5). As HOURCAR grows, City CarShare serves as an excellent model of providing more choices for those who have the fewest.

As car share programs continue to grow in popularity, the government and its entities are able to help facilitate a shift away from individual car ownership. Car2go, a nationwide car share program, withdrew from the Twin Cities at the end of 2016 in part because of the high motor vehicle rental tax (7). In response to this loss of business, D. Scott Dibble, Minnesota Senator, just introduced a bill in the state congress to exempt car sharing programs from the 5% rental/lease fee and the 9.2% vehicle rental/lease tax (8). If Dibble's bill becomes law, the Twin Cities will become a more attractive place for programs such as car2go, potentially bringing more car share services into the metro area. This would be beneficial for local businesses because, as mentioned above, car share programs promote alternative transportation methods, and a study conducted in Portland, Oregon (9) found that non-drivers spend more on recreation and at local stores than drivers. Reducing barriers to car sharing will likely benefit private citizens and business owners alike.

ABC Ramps and HOURCAR are united in their goal to reduce traffic congestion, and they can work together to achieve it. By allocating spots in the ramps to HOURCAR, ABC Ramps would make carpooling more attractive to employees who need to take trips during the workday. A potential carpool member may decide not to join because of meetings or other obligations outside of the urban core which are not well-connected via transit, citing the need to drive in order to not waste working hours waiting on the bus. If car share becomes easily accessible to such a person – who would park in the ABC Ramps whether driving alone or carpooling – that person may opt in to the carpooling program, knowing that they could still easily access a car if necessary for a meeting or appointment. In fact, HOURCAR already has a membership option for businesses (10), so if a potential carpooler's employer is already a participant, this user would not even have to worry about the cost of joining.

While HOURCAR has work to do to expand the equity of its services, it is quite effective in reducing car ownership and dependency, and its goals are compatible with those of ABC Ramps to an extent. With a thoughtful partnership, ABC Ramps could work with HOURCAR to promote carpooling and increase the utilization of its facilities.

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10. <https://hourcar.org/business/about>

## 16. SHARED-USE VEHICLE PROGRAMS: CARPOOLING PROGRAMS

Various innovative approaches to carpooling have emerged in the past decade, augmenting the basic ride sharing agreement with web applications, cost sharing, parking-based incentives, real-time GPS data, and employer incentives. One of the most popular carpool programs currently available is BlaBlaCar. This web-based company started in France in 2006, and now serves over 30 million members in 22 countries including most of Europe as well as India, Brazil, and Mexico.<sup>18</sup> The service is designed for occasional inter-city trips, making it well-suited for tourists, students, and anyone who travels long distances to visit friends or family. Before starting their trip, users create a profile on BlaBlaCar's website including their name, photo, verification of their government-issued ID, and travel preferences. Drivers create posts showing their departure date and location, destination, and number of available seats in their car. Riders then search through these posts to find their desired match, and contact and pay the driver. BlaBlaCar sets maximum payment rates according to fuel costs, ensuring that drivers do not make a profit and thus avoiding any insurance or tax complications.

Each of the programs discussed in this report encourage ride-sharing and discourage driving alone. In the case of BlaBlaCar, that encouragement is generally limited to occasional long-distance travel. The payment system incentivizes car owners who would otherwise drive alone to bring other travelers along for the ride. Since the fee for passengers is a fraction of the total fuel cost for a trip, the program also incentivizes travelers who own a car to join a carpool. To some extent, this system encourages car owners to drive and continue owning a car, rather than making the same trips by bus, train, or airplane.

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<sup>18</sup> BlaBlaCar. <https://www.blablacar.in>

However, the greater availability of affordable rides ultimately lowers the opportunity cost of not owning a car, and may make living without a car a viable option for some people.

In the United States, a number of carpooling programs have emerged in recent years with a focus on the daily commute. Metro Transit's Ridematch tool provides a very similar carpool matching service to BlaBlaCar, but leaves any questions of payment up to the individual users. Instead, carpools registered through this service are eligible to receive a discounted parking rate through a Carpool Parking Permit.<sup>19</sup>

In another example of parking-related incentives for commuters, BART in San Francisco provides a guaranteed park-and-ride spot for carpools registered using the Scoop mobile application. The app matches riders to carpool drivers the night before their commute, sends the driver a printable placard to display on their dashboard when picking up riders, and sends BART parking enforcement a list of license plate numbers eligible for guaranteed spots.<sup>20</sup>

Both of these parking-based programs encourage commuters to carpool and discourage driving alone. The BART program encourages carpoolers to park at transit stations and take the train to work, while Metro Transit's program encourages driving directly to the destination. I would expect the BART program to be more effective in reducing the number of lone drivers than the Metro Transit program because a free guaranteed parking spot is significantly more valuable than a discounted non-guaranteed spot. Parking at a BART station also provides access to a wide range of destinations by train, while any given parking spot in downtown Minneapolis has a lower level of accessibility by light rail and non-dedicated bus lanes.

Commuter-focused parking-based programs primarily benefit full-time permanent employees with regular schedules, with little benefit provided for part-time workers and anyone with an irregular schedule. They also primarily benefit car owners because they don't provide a robust enough network to guarantee a ride every day for a commuter without their own car. However, another pilot program in San Francisco may have the potential to provide reliable ride access at a wide range of times, given a great enough adoption rate.

Waze Rider is a mobile app introduced by Google that taps into the existing network of Waze users as potential carpool drivers. When a user selects their desired departure and arrival locations, the app identifies nearby drivers traveling to the desired area, and allows the user to request a ride. The program is currently limited to the silicon valley area and to certain participating employers, but the model could potentially be expanded to the large scale seen in ridesharing services such as Uber.

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<sup>19</sup> Metro Transit. <https://www.metrotransit.org/ridematch>

<sup>20</sup> "Pilot Parking Program Promots Carpooling." *Insights*. <http://insights.wsp-pb.com/articles/advisory-services/pilot-parking-program-promotes-carpooling>

Furthermore, because the payment system is capped in proportion to fuel costs (similarly to BlaBlaCar), Waze Rider would be able to avoid Uber's insurance and licensing controversy.<sup>21</sup>

Because app-based carpooling programs such as Waze Rider and BlaBlaCar give users a great deal of flexibility in choosing their departure and arrival points, they have the potential to benefit elderly and disabled populations more so than commuter and transit based incentives. While some elderly or disabled residents choose to avoid the added hassle of waiting at transit stops and boarding buses, carpool drivers can pick up riders at their home and provide assistance in a more private, low-pressure environment. Depending on the situation, this type of carpool may also provide the rider with a one-seat ride from their home to their destination.

Finally, employer-based incentives remain a traditional but highly effective method to encourage carpooling. In 1995, engineering services company CH2M Hill began charging a \$49 monthly parking fee to employees who drive alone, while providing free parking and a \$40 monthly travel allowance to employees who commuted in carpools. As a result, the rate of employees driving to work alone fell from 89% to 64%. At the same time, telecom company Pacific Northwest Bell charged a \$60 monthly parking fee to solo drivers, while offering a discounted rate for carpools. Following the program's implementation, 25% of the company's employees drove alone, compared to an average rate of 80% for other employers in the local area.<sup>22</sup>

While the date and various local factors limit the transferability of these results, they demonstrate that sizeable changes in the price of parking implemented at the employer level can discourage commuting alone and encourage carpooling for a sizeable portion of employees. In the case of CH2M Hill, an \$89 net monthly benefit to carpools (in 1995 dollars) correlated with a 35% drop in the solo driving rate. These employer-based incentives are particularly effective in changing behavior because they impose a visible added monetary cost on driving alone (in the form of a parking fee) and provide a monetary incentive to carpool (either by reducing the parking fee alone or by providing an additional travel allowance). Employer-based carpool incentives benefit only car owners employed by the participating companies, but this group includes part-time employees as well as those on a full-time schedule.

Out of all the program examples discussed, the BART park-and-ride incentive and employer-based incentives appear to be the most applicable to ABC Ramps in Minneapolis, while all the other examples would have a smaller indirect effect simply by reducing the number of cars that need to park downtown.

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<sup>21</sup> Yu, Howard. "Google's Carpool Pilot with Waze Offers Lessons for Innovative Executives." *Forbes*. <http://www.forbes.com/sites/howardhyu/2016/09/04/googles-carpool-pilot-with-waze-offers-lessons-for-innovative-executives/#7966dcac652e>

<sup>22</sup> K.T. Analytics (1995), *Parking Management Strategies: A Handbook For Implementation*, Regional Transportation Authority (Chicago), 1995. [www.fta.dot.gov/library/planning/tadmstatus/tdm.htm](http://www.fta.dot.gov/library/planning/tadmstatus/tdm.htm)

If ABC ramps provided reserved parking spaces to carpoolers, they could reduce the number of cars competing for spots in the ramp, and ensure a steady flow of income if they provided those reserved spots at a discounted but cost-effective rate. Employer-based incentives would be most effective as a partnership between employers located nearest to the ABC ramps and the owners of the ramp itself.

## 17. PARKING PROGRAMS AND POLICIES: SF PARK AND PARKCHICAGO

Congestion in cities have increasingly become a problem. It has become clear that continually building road capacity alone will never eliminate congestion. Expanding highway capacity causes induced demand eliminating any benefit provided by the increased capacity. Instead planners have turned to transportation demand management (TDM) programs to encourage different behavior to relieve congestion.

On-street parking can encourage or discourage driving in cities. When on-street parking is provided for free it provides an incentive for drivers to circle the block looking for a free space. When on-street parking is metered it is almost always cheaper than other parking options. Studies have shown that up to 30% of traffic in downtowns are the result of drivers looking for free or cheap on-street parking<sup>23</sup>. Different cities have addressed on-street parking in different ways. SF Park is a program in San Francisco aimed at creating better prices based on demand for metered on-street parking and municipal ramp parking. ParkChicago is an app that allows for easier payment for metered on-street parking. These programs have different effects on demand for parking.

San Francisco started the SF Park program in 2010 with the intent of increasing availability of on-street parking and reducing traffic. The goal of the program is to have an occupancy rate at parking meters of 60-80% on each block. This occupancy rate was selected because it provides about one space per block. In order to achieve this goal the San Francisco Municipal Transportation Authority (SFMTA) set out to apply a market based approach to parking by basing price on demand for parking.

The SF Park program had a simple premise; every six weeks the cost of a meter would go up or down based on the normal occupancy rate of parking on that block until the occupancy rate reached the goal of 60-80%.<sup>24</sup> They would never increase the price more than 25¢ or decrease it by more than 50¢. The occupancy of each block was determined using sensors during the initial test period from 2010 and

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<sup>23</sup> Shoup, D., & American Planning Association. (2005). *The high cost of free parking*. Chicago: Planners Press, American Planning Association.

<sup>24</sup> SFMTA. (n.d.). SF Park Pilot Project Evaluation. (June 2014), from [http://direct.sfpark.org/wp-content/uploads/eval/SFpark\\_Pilot\\_Project\\_Evaluation.pdf](http://direct.sfpark.org/wp-content/uploads/eval/SFpark_Pilot_Project_Evaluation.pdf)

2013. This also helped determine how many cars were parked without paying. After that period SFMTA has adjusted costs based on number of vehicles paying for parking.

Changing the cost of metered parking was coupled with adjustments to the cost of parking at municipal parking ramps. The price for ramp parking remained higher than metered parking, but as the costs were adjusted they became more comparable. This was done to encourage drivers to park in a ramp instead of looking for an on-street parking space. The cost changes were accompanied by a new website and phone app that would display cost of meters and availability at parking ramps.<sup>25</sup>

The SF Park program did result in progress toward their goals. By using a market based approach, SFMTA was able to increase the availability of on-street parking by 16% during their study period between 2010 and 2013. During this time, there was also an 11% increase in use of parking ramps.<sup>26</sup> Another goal, to decrease the number of vehicles that circle blocks looking for on-street parking was also achieved with a 50% reduction of this behavior by 2013.<sup>27</sup> By changing the pricing of meters and ramps SFMTA had successful metrics as a result. These changes also saw an increase in turn over at parking meters coupled with availability during most of the day.

Setting the price of on-street parking based on demand benefits some groups of people over other groups. One of the main goals of this program was to decrease the number of vehicles that would circle looking for parking and eliminate any double parking that would occasionally occur. It also has the benefit of decreasing the distraction for drivers who are searching for a parking spot. These benefits create a better flow of traffic and more attentive drivers resulting in a safer environment, especially for pedestrians and bicyclists. With an increased cost of parking other modes of transportation become more attractive. This results in some motorists switching modes to transit, biking, walking, or finding another way to get to their destination without driving. For people who continue to drive it encourages them to park in a ramp instead of at a meter because the cost will be more similar and availability at a ramp is more predictable. Ultimately, dynamically pricing on-street parking discourages people from parking on the street.

Increased turnover and availability directly benefit the businesses and some drivers. By increasing turnover, businesses benefit from always having parking available on the street and increased visibility

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<sup>25</sup> SFMTA. (n.d.). SF Park. Retrieved February 12, 2017, from <http://sfpark.org/>

<sup>26</sup> SFMTA. (n.d.). SF Park Pilot Project Evaluation. (June 2014), from [http://direct.sfpark.org/wp-content/uploads/eval/SFpark\\_Pilot\\_Project\\_Evaluation.pdf](http://direct.sfpark.org/wp-content/uploads/eval/SFpark_Pilot_Project_Evaluation.pdf)

<sup>27</sup> Millard-Ball, A., Weinberger, R., & Hampshire, R. C. (2017). Cruising for Parking: Lessons from San Francisco. ACCESS, 8-15. Retrieved February 5, 2017, from <http://www.accessmagazine.org/wp-content/uploads/sites/7/2016/11/access49-web-cruising-for-parking.pdf>

from additional people parking their cars in front of their businesses. People who are willing to pay more have also been advantaged with this system. The increased availability makes it easier to park if cost isn't an issue. People with limited incomes, but extra time, are disadvantaged by SF Park. However, handicap drivers have been unaffected because California state law allows any vehicle with a handicap placard to park at a meter without paying.<sup>28</sup> Most areas with meter parking in San Francisco are surrounded by residential streets that do not have meters. The increased cost of SF Park has pushed some drivers to park on these residential streets instead of at a meter. The program has provided some concrete advantages to the neighborhood businesses but gives some disadvantages to surrounding areas.

Chicago has taken a different approach to on-street parking. With approximately 36,000 metered parking spaces in Chicago the city has rolled out a new system to make it easier and more convenient to pay for a parking meter. ParkChicago is a phone app that can be used to pay for any parking meter in the city of Chicago. It eliminates the need to place a receipt on the dashboard of a parked car and instead requires a license plate number and payment with a phone. It has the added convenience of alerting a user if their time is close to running out and allows time to be added immediately without returning to the car.<sup>29</sup> This new system makes it convenient and easy to use parking meters in Chicago.

Making it easy to park at a meter in Chicago encourages behavior that San Francisco was trying to decrease. By making it easier to pay for parking it makes it easier to drive. These drivers will spend more time looking for on-street parking that will result in more cars in the road and more congestion. The distraction of looking for parking will also decrease the safety for other people on the street; including bicyclists and pedestrians crossing the street. The program also requires a minimum of \$10 pre-paid at all times. This sunk cost encourages people to choose driving over other modes of transportation because they already have an investment in parking expenses. It ultimately will do little to reduce congestion and automobile use and by making it convenient will likely increase congestion.

This system is exactly what people want. It takes paying for parking, something that many people do, and makes it easier. Eliminating the need to place a receipt on the dashboard, paying by phone instead of station, and easy ability to add time to the meter all lead to the effectiveness of this program. Just

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<sup>28</sup> SFMTA. (n.d.). Accessible Parking Policy. Retrieved February 12, 2017, from <http://sfpark.org/how-it-works/accessible-parking-policy/>

<sup>29</sup> Chicago Parking Meters, LLC. (n.d.). Welcome to ParkChicago. Retrieved February 8, 2017, from <https://parkchicago.com/>

after a month of launching the program 15,000 people had signed up for it.<sup>30</sup> This program just encourages more use of parking meters by making their use more convenient.

This program benefits people who were already driving in Chicago. It doesn't make it easier to use another mode of transportation or make those modes safer. It just continues to enforce existing behavior that is already occurring in Chicago. People who are forced to use other modes of transportation will likely suffer from more people on the streets looking for available meters to park at.

These programs can offer lessons when trying to implement TDM strategies. They offer limited advice for the ABC Ramps in Minneapolis, but some lessons can be learned. Altering prices have already been implemented to shift parking from ramp C to ramp A. The experience of SF Park would suggest that price adjustments could be effective to some extent. But it is important to know what the goal is. On a limited scale changing the price can continue to be used to shift which structure people park in. On a larger scale the price of the ABC Ramps could be part of a downtown wide pricing program that included municipal ramps and on-street parking.

The lessons from ParkChicago are less obvious. This program is about convenience, it enforces behavior that is already engaged in. This process could be applied to aspects of parking in the ABC Ramps. If the goal is to make money, then streamlining the payment process would be best. If the goal is to encourage carpooling, then discounts on daily parking for carpooler could encourage this. By creating a system to enforce desired behavior it will perpetuate.

These two program provide examples of how to deal with on-street parking. They demonstrate two approaches that support two different outcomes. By increasing cost, San Francisco could increase parking turnover and decrease cruising. Chicago encourages on-street parking by making it easier to pay. Both program offer limited lessons that can be applied to the ABC Ramps in Minneapolis but they do show different ways to manage parking.

## **18. PARKING PROGRAMS AND POLICIES: APPROACHES TO RAMP PRICING**

The ABC Ramps in Minneapolis have been heralded as innovative structures to the city's Transportation Demand Management program. However, as the Twin Cities Metropolitan area continues to grow in population, the ability of ramp pricing to reduce vehicle miles traveled and automobile dependency must be called into question. Parking structures have important effects on driving behavior, urban form, affordable housing, and new development. The ABC Ramps, with their skyway connections, may even compound some problems the city faces with regard to its struggling downtown retail market. Indeed,

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<sup>30</sup> Chicago Parking Meters, LLC. (2015, October 6). More than 15,000 Drivers Have Signed up for ParkChicago. Retrieved February 8, 2017, from <http://chicagometers.com/2015/10/06/more-than-15000-drivers-have-signed-up-for-parkchicago/>

it is difficult to envision how ramp parking pricing will contribute to reduced driving demand, lower vehicle miles traveled, or contribute to a more equitable built environment.

The most costly forms of parking lots to build are parking structures. Parking structures are multi-storied buildings--either above or below ground--and hold a massive number of cars during peak demand. According to the Transportation Demand Encyclopedia, there are a number of factors that contribute to parking pricing generally, and more specific instruments that may be used to set prices and pricing policy in parking structures. These instruments include installation of individual meters, automated or attendant-based control systems, contract passes, prepay boxes, and pay-and-display meters, among a variety of others. The size of the structure, along with these aforementioned instruments are the essential ingredients for determining the rates and occupancy levels that cover construction, operations, and maintenance costs, factors which serve as the basis for creating a financially-viable ramp.

In *The High Cost of Free Parking*, Donald Shoup estimates that the cost of debt service, maintenance, and operations for parking ramps on the fifteen ramps built on the UCLA campus from 1961-present cost *at least* \$127 per space per month, for a *minimum* total of \$22,500 per space per year (Shoup, 192). That means that the university must bring in a minimum of \$127 per space per month to cover operating costs and debt service, a number that serves as the foundation for setting prices.

However, a financially-viable ramp with prices set too low may induce greater shares of driving, which contributes to congestion, environmental degradation, and air pollution. To bring the social cost of parking in line with private costs of these externalities, municipalities may seek to privilege certain behaviors over others by creating variable parking rates depending on certain contexts. Cities may encourage individuals change the peak demand for commuting by charging lower rates early in the morning, and by charging higher rates during major events like sporting events and concerts. They can encourage carpooling by offering significant discounts to cars carrying multiple people and who park for the whole day. Once again, the TDM recommends the following strategies to ensure turnover: pricing the most convenient stalls at minute or hourly rates, using higher prices during peak times, pricing less convenient spaces at weekly or monthly rates for residents and employees, and using parking pricing to encourage mode-shifting (Victoria Transportation Policy Institution, 2017).

The effects of increasing pricing, particularly when done by large ramps in a given area, has behavioral and environmental effects. By “shifting from free to cost-recovery parking (prices that reflect the full cost of providing parking facilities) typically [reduce] automobile commuting by 10-30%, particularly if implemented with improved Transportation Choices and other complementary TDM strategies” (Hess, 2001). Furthermore, the consulting firm ICF found that “a \$1.37 to \$2.73 increase in parking fees reduces auto commuting 12-39%, and if matched with transit and rideshare subsidies, reduces total auto trips by 19-31%” (Victoria Transportation Policy Institution, 2017). Parking pricing is critical because prices have demonstrable effects on commute trips and travel decisions, although the degree

of these effects depends largely on contextual features and socioeconomic conditions of parking structure users.

However, no matter what the price, the existence of ramps and on-street parking stalls induces demand for driving and requires that cities build infrastructure for parking. The space reserved for off-street lots, on-street stalls, and parking structures may be valuable urban land that could be put to alternative uses like affordable housing, commerce, and office space. Moreover, external costs like emissions and congestion are seldom factored into induced demand models.

Donald Shoup's exhaustive study of the matter notes that minimum parking requirements, free parking, and underpriced parking contribute to the low-density forms typical of American cities. Unfortunately, "because parking is usually free to drivers almost everywhere" planners and "transportation analysts neglect the price of parking in estimating the demand for vehicle travel" (Shoup, 2011, p. 194). From an environmental review of a new, 1,500-stall parking structure on the UCLA campus, Shoup notes that the increase in parking volume (vehicle-storage capacity) accounts for roughly 727 vehicle miles traveled per space per month. In addition, the new parking stalls increase congestion costs by \$72.70 per space per month, \$44.16 in emission costs per month. Together, the new parking structure added \$116.86 in external costs per parking space per month. When put into more readily-accessible terms, the additional stalls contribute to an increase of more than 13 *million* vehicle miles traveled, the external costs of which are conservatively estimated to surpass \$2.1million, a cost that is passed on to faculty, students, staff, administration, neighbors, and alumni (Shoup, p. 195). By comparison, the ABC ramps contain 6,755 parking stalls while the Hawthorne Transportation Center, across the street from the A Ramp, has another 975 stalls.

Apart from the high cost and induced demand, parking structures contribute greatly to the urban form of American cities. According to Shoup, "the first concern in the design of many buildings has become parking, not architecture" and "parking spaces in the city are like dark matter in the universe: we tend not to see them, but somehow they add up to an enormous area that deadens the urban environment" (Shoup, pp. 137-139). The ABC Ramps in Downtown Minneapolis serve a great example for the effects of parking on urban form. The area around the ramps includes Target Field, Target Center, First Avenue, and are within walking distance from both Blue and Green Lines as well as a MetroTransit, Greyhound, and Megabus bus lines. To the City's credit, these ramps are built above the Interstate-394 trench, an area that may not be financially viable for housing, commerce, and office developers because of massive engineering and construction costs. But for the sake of argumentation, let's suppose that developers can make this financing work: the sites then become highly-valuable areas for life rather than highly-valuable areas where people can store personal property. Recently, the city reduced parking requirements in areas served by high-frequency public transportation, so developers could have greatly increased floor-area-ratios for new construction on these sites. They could charge rents without passing the hidden costs of parking along to tenants and qualify for Transportation Improvement Area grants. Office spaces, residences, and retail, moreover, contribute substantially more tax revenue to cities than do parking structures, *especially* municipal parking structures like the ABC ramps.

In addition, these ramps would not be nearly as attractive to consumers were it not for skyway connections. Renowned urban designers Gil Penalosa and Jan Gehl note important effects that skyways produce. Penalosa said that they “suck the public life out of cities.” Gehl described the effects of the skyways across the world as follows: “On weekdays, skyways bustle and shops flourish for a few hours a day. But at night and on weekends, people are thrown out onto barren and neglected public sidewalks. A social hierarchy develops: the wealthier classes in private spaces on weekdays; poorer people out in public spaces at all hours. That's not a winning formula... It's bad for retail business, bad for culture, bad for civic life” (Berg, 2007). Shoup recommends that cities look to boost the attractiveness of parking structures by encouraging ground-floor retail uses to activate the built environment (Shoup, p. 108). But the skyway system would drive down retail demand at the ABC Ramps. Although it is not within the scope of this analysis to delve further into the effects of skyways on urban form, it is critical to note that, when given access to skyways, people seldom use streets-level sidewalks to get from point A to point B when going to work, making short lunch-time trips, and going home. This has direct effects on the viability of ground-floor retail, which remains a multi-layered and ongoing crisis at the city (Norfleet, 2017).

Put together, these data point to the negative effects of structured parking on development in America's cities. Minimum parking requirements limit the availability of housing construction at all price points by artificially constraining the floor-area-ratio on which developers may build (Shoup, p. 95). These requirements mean that condo and apartment developers must either devote a substantial portion of land (surface area) to parking or build incredibly expensive underground parking structures. In the former situation, if one considers that parking spaces in the United States average roughly 150 square feet (about 8.5' wide x 18' deep) a 50-unit apartment complex in a city with a one-stall per unit minimum requirement must dedicate 7,500 square feet to parking, with additional space set aside for driveways, entrances, and exits. If one uses a conservative estimate to bring the total parking and driving space to 8,000 square feet (0.184 acres), parking for a 50-unit complex requires just under one and a half average Minneapolis residential parcels (0.125 acres). Moreover, these costs are passed along to residents, who must bear the brunt of parking construction whether or not they own a car. Minimum parking requirements are therefore the single-greatest barrier to adding density in cash-strapped-yet-unaffordable American cities.

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## 19. INTEGRATED MULTIMODAL SYSTEMS: RAMP-RIDE AND RIDE SHARING

A ramp-ride system would operate in a similar fashion to a traditional park and ride lot or ramp. The goal of the program would be to encourage SOV commuters to shift to multi-modal routes to get to work. The ABC ramps have excellent transit connectivity due nearby light rail, commuter rail and bus stops. Bike facilities, street-level pedestrian access and skyway access allow for non-motorized travel to the rest of downtown Minneapolis. A ramp-ride program could use incentives to encourage commuters to park their cars at the ramp and finish their trip via other modes. ABC Ramps already offer two ramp-ride programs: Ramp-Ride-Rail and Ramp-Ride-Fly. The Ramp-Ride-Rail provides a free transit pass for downtown bus and LRT service for commuters who have purchased an ABC ramp parking contract (ABC Ramps website). The Ramp-Ride-Fly program allows travelers to reserve a parking spot and take the light rail to the airport. While travelers have to pay full price for the light rail ticket, parking at the ABC ramps is much cheaper than parking at the airport (ABC Ramps website).

Transportation Demand Management (TDM) programs tend not to focus on ramp-ride activities specifically. However, park and ride programs both within the Twin Cities and throughout the United States offer many examples of additional ramp-ride incentives beyond what is already offered through Metro Transit. Denver offers “subsidized transit passes, fare free transit zones, and other fare discount programs” (City of Denver, 34). Metro Transit could consider expanding the Ramp-Ride-Rail program and offer discounted transit passes to commuters who work in St. Paul. San Francisco Bay Area Rapid

Transit District (BART) is developing a program with funding from the FTA to offer reserved, prime parking spaces at BART stations to carpoolers (San Francisco BART, 1-2). These spaces, located nearest to transit stations, are reserved for carpoolers until 10 am, giving commuters more flexibility in when they travel to work. This reservation system could be appealing to ramp ride users, because it offsets the inconvenience of leaving one's car behind with more flexibility on when they can travel to work. This could also dilute the peak morning commute time period in downtown Minneapolis. The Boulder, CO Transportation Master Plan outlines strategies for the development and operation of "Mobility Hubs" to encourage multi-modal travel including "congregation of multiple shared mobility services" and "integrated technology...mobility kiosks, reader boards" (City of Boulder, 5-14). These programs make it easier for commuters to use the parking facilities and finish their journeys without taking automobiles for the whole trip. As part of their "Employer Toolkit," Seattle offers "Park Free Days," which are reserved parking spots for commuters who usually ride transit, but occasionally need to take their cars to work (Seattle, 8). A similar program could be offered in the ABC ramps, so that commuters would never have to drive the entire trip to work. Many other communities offer similar multi-modal incentives: preferential parking for carpoolers, vanpoolers, and HOV users; rebates for commuters who don't use parking; higher parking fees for SOV users; and subsidized transit tickets (Cheney, Yuba County, Durham, Snohomish County, Spokane County, Alameda County). All of these programs could be offered to ABC ramp users who take transit or non-motorized modes to finish their trips.

A ramp-ride program encourages commuters to park at the edge of downtown Minneapolis and finish their journey through non-SOV modes. This program could target two groups of commuters, both of whom would have origins north and west of downtown Minneapolis: commuters whose destination is somewhere in downtown Minneapolis, and commuters whose destination is to the east, most likely in Saint Paul. These two groups of commuters might require different incentives to use ramp-ride facilities. Downtown Minneapolis commuters might be inclined to finish their trips through bike share or pedestrian access like the skyway system, while commuters going to St. Paul would be interested in LRT or express bus service in order to travel between the two downtowns in a relatively short amount of time. Both groups could benefit from preferential parking spaces or modern reservation and ticketing technology.

### **Evaluation of Ramp-Ride Program in the ABC Ramps**

A ramp-ride program in the ABC ramps encourages non-SOV travel and could decrease congestion along I-94 and I-35W. It would not lessen congestion from commuters coming from the west or north to Minneapolis. In addition, changing the travel patterns of commuters going from west metro to St. Paul would be difficult. For many commuters, it is much more convenient to drive for the entire trip rather than drive, then transfer one or more times to transit. One possibility is for Metro Transit to partner with large employers in St. Paul that have employees who live in Minneapolis. These employers could offer commuter benefits to their employees and shift their mode choice to multi-modal trips.

Lisa Austin's presentation on the ABC Ramps program outlined several MNDOT goals for the ABC Ramps (Austin, 12-13). Overall, the ABC Ramps are designed to "make it easy for people to drive alone less often." An expanded ramp-ride program would meet this goal for a small segment of the Twin Cities commuter population. Other goals a ramp-ride program would help fulfill include incentivizing non-SOV travel, better air quality, and reduced congestion in downtown Minneapolis. Again, these benefits would not extend to the entire Twin Cities metro area, or even all of Minneapolis. This program would only target commuters whose trips originate from north and west of downtown Minneapolis, and end in locations already well-served by transit. The benefits for commuters with destinations in downtown Minneapolis would be minimal; they would not save much travel time in exchange for an increase in inconvenience due to mode switching. Commuters going to St. Paul might be best suited for the ramp-ride program. Removing these commuters from the I-94 and I-35W corridors could significantly reduce congestion and air pollution.

Another benefit to the ramp-ride program are the minimal additional costs to Metro Transit. This program does not require additional transit service or construction of parking structures. Most of the cost of the program would go to subsidized transit passes, marketing the program to the right commuters, and possible upgrades to ticket payment and enforcement systems to make use of the program easy for both commuters and ramp staff.

Finally, a ramp-ride program could have some positive equity impacts for the City of Minneapolis. This program would not help transit-dependent commuters. Census data reveals that minority households and households below the poverty line are more likely to not possess a car (FTA, 9). A ramp-ride program in the ABC ramps is thus not the ideal solution to address transit dependency and limited transportation options for the poorest residents of the metro area. This program could help low or moderate-income car-owning commuters access more jobs, by decreasing the cost of commuting from Minneapolis to Saint Paul. The ramp-ride program could also increase transit accessibility for commuters with limited mobility, if the reserved ramp-ride parking spots are located conveniently adjacent to transit stations in the ramps.

Ultimately, a ramp-ride program could be a small piece to a larger TDM program in the ABC ramps. The ramp-ride program can only serve a limited number of commuters going to select destinations. The program would likely have to offer many types of incentives and much greater flexibility for commuters to significantly alter mode choice. Some evidence exists that intercity bus service is on the rise after years of decline. A DePaul University study has found that city-to-city bus service has increased in the last decade, and young adults make up a significant percentage of this ridership (Marshall). The Twin Cities area is uniquely situated to take advantage of these trends, since this area is one of the few regions in the country to possess two metropolitan areas so close to each other. A ramp-ride program targeting commuters traveling from Minneapolis to St. Paul could capitalize on this trend, and in doing so help meet some of the TDM goals of the region.

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## FUTURE OF THE ABC RAMPS

The ABC Ramps remain a substantial portion of the publicly managed off-street parking in downtown Minneapolis and remain a core start or ending point for infrastructure supporting a variety of modes: MnPASS, Metro Transit local routes, light rail transit, commuter rail, inter-city bus travel, bike trails and

the Minneapolis skyway system. As the ABC Ramps move past their 25th anniversary, questions remain on what can be done to fulfill the initial purpose of the ABC Ramps while innovating to meet present and future transportation demands.

## 20. INTEGRATED MULTIMODAL SYSTEMS: BUNDLED PARKING, TRANSIT, AND BIKE SHARE

One morning, you park your car in the B Ramp. You got going early this morning and could take advantage of the *early-bird* rate so you'll pay about \$8. Not too shabby. But as you walk toward the skyway, you notice a sign that says "Parking for \$3 per day." You're on your way to work and don't have time to read into the sign but decide to Google this concept later. Of course, you forget.

The next day as part of your routine you walk by the sign again. "Parking for \$3 per day with ABC Total Access." This time you take special note. You sit at your computer that day, remember the task at hand, and find ABC Total Access at the top of your Google results.

A simple site pops-up with a clear leading question: "Do you live in the western suburbs?" - Yes you do.

- "With the ABC Total Access card, pay just \$3 per day to park when driving with another passenger - that's \$1.50 per person.
- "No carpool today? Pull into a Park & Ride on your way and access the bus using the very same Access card.
- "Once downtown, use the Total Access card to grab lunch on a Nice Ride or run an errand using an Hourcar."

The ABC Total Access card opens the door to a variety of multi-modal options with little to no commitment from the user, and includes enticing daily rates. With this, the driver knows that they can access cheaper transportation and have flexible options on their daily commute. The card combines technology to access the carpool parking gate, Metro Transit vehicles, Nice Ride bikes, Hourcars, and even a locker-room to store boots during winter workdays.

Getting the Access card is free and easy. Vending machines around the skyways, like those on Metro Transit platforms could make acquiring an Access card simple. Users could have two ways to attain their Access card, like a current Nice Ride system. One option is to fill out one's name, address, and credit card information on the vending machine screen. A Total Access card is then dispensed. A second, and perhaps more popular option, is to enter one's information using a personal computer. Later, by swiping the credit card on-file at a skyway vending machine, the Access card is dispensed.

Finding fellow carpoolers is easy and -most important to a variety of users- possible in a variety of ways. Because their address is on file, users could have the option to find carpoolers using Metro Transit's Ridematch program. The beauty of the Total Access card, however, is the variety of options that users can exhaust. They may find a neighbor that commutes to downtown, find assistance from their

employer, or use a smartphone application such as Swoop. The user does not need to commit to a carpool partner but is free to ride with whomever they'd like. The important thing is that multiple people ride in the car.

Passengers would likely buy their own Access card if the carpool was to become routine. This way they can contribute to the payment of parking in the carpool ramp, and access Metro Transit vehicles should they want to head home at a different time than the driver. They may, of course, drive their own vehicle to carpool as well, utilizing their own Access card.

Users can pick up ABC Total Access card nearly as easily as picking up a single-ride card from a Metro Transit vending machine. The process seems straightforward and does not require any significant commitment - perhaps the time to fill out a form and cost of an RFID card. It is marketed much like a pay-as-you go transit card.

Eventually, the Access technology can be integrated into a smartphone application. Metro Transit, Nice Ride and carsharing programs elsewhere have begun to consider integrating their payment technology into smartphone applications.<sup>31</sup> ABC Ramp Access could work with these other transportation companies so that carpooling could be treated as one of the growing number of multi-modal transportation options. For the time being, however, access card technology is easy to understand and can work as a physical reminder to the user. *(With access to \$3 parking and \$2.25 bus fare, why pay \$7+ for parking?)* Access cards are also more intuitive for aging users and those unable or unwilling to download smartphone applications. Smartphone technology is promising for the future but Access card technology can do the trick for the time being.



Ultimately, the ABC Total Access card discourages driving alone. Because card holders have available access to multiple modes of affordable transportation options, driving alone should be seen as the least attractive option. Driving is a convenient option for those coming from an auto-oriented neighborhood, and carpooling is an easy way to retrofit driving as an affordable option. If a user does not find someone

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<sup>31</sup> U.S. Department of Transportation. Shared Mobility: Current Practices and Guiding Principles. Washington DC, April 2016.

to ride along, they are reminded by the design of the Access card and roadside Park & Rides that there is another option in route. It isn't until these options are exhausted that a user considers driving alone, sitting in traffic and knowing that they will be paying a higher price for parking.

The Access card is a large benefit to drivers of the western suburbs. Carpooling is presented as simple, flexible and interconnected with transit and alternative modes of transportation. Less often would users think "I don't have cash for the bus," "I don't understand the payment for Nice Ride" but "What option should I use to avoid driving downtown alone." Drivers from the western suburbs will benefit from the perception that carpooling, transit and bikeshare are a simple and integrated system.

Downtown businesses could also see benefit to getting suburbanites out of a daily routine of coming-and-going in single occupancy vehicles. A Total Access card would give downtown workers a versatile range of transportation options allowing users to be more adventurous in their downtown daily life. Rather than visiting the same skyway level restaurants, users may find the Nice Ride bikes an attractive vehicle to find lunch. Putting multi-modal access in the hands of suburbanites could increase patronage to a wider variety of downtown businesses.

The ABC Ramps could see an increase in carpools. Creating a non-committal way to take advantage of the carpool rate on a day-to-day basis could make carpooling less of a miserable task and more of a common ride. As carpooling increases, more passengers can utilize the ABC Ramps in the same number of vehicles. The increased people traffic could mean more eyes on program advertising and a further increase in utilization of programs such as the ABC Total Access card.

To increase the number of carpools and decrease the number of single occupancy vehicles, bundling carpool parking with a variety of multi-modal options may be the best option. While no single transportation alternative can compete with the convenience of driving one's own car downtown from the suburbs, a truly *multi*-modal solution may be the ticket. A simple, non-committal approach could put carpooling in the hands of more users and even transition drivers to transit riders.

## 21. MOBILE TECHNOLOGIES: CARPOOLING INCENTIVES IN SAN DIEGO

Carpool Incentive Pilot Program, or CIP, was an experimental program carried out by a local public agency called San Diego Association of Governments (SANDAG) in San Diego, California. As a subproject of iCommute, which is the Travel Demand Management (TDM) division of SANDAG whose goals are to mitigate congestion, greenhouse gas emissions and other environmental pollutants resulting from solo driving<sup>32</sup>, CIP tried to achieve these goals by encouraging carpooling and vanpooling. Moreover, CIP was

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<sup>32</sup> Request For Partnership Document (2016), San Diego Association of Governments: 401B St, Suite 800, San Diego, CA.

a pilot program SANDAG brought up to develop a mobile App-based carpooling software in collaboration with a qualified rideshare company.

### Components

In general, CIP consisted of three parts: app development, policy making, and participation process. App development further can be divided into two branches: identifying a rideshare company and designing functions in this app. Policy making also had two different aspects: contracts with the private technology company and subsidy given to participants. Lastly, CIP also needed to limit the scope of participants since it was only a preliminary project of mobile app-based carpooling.

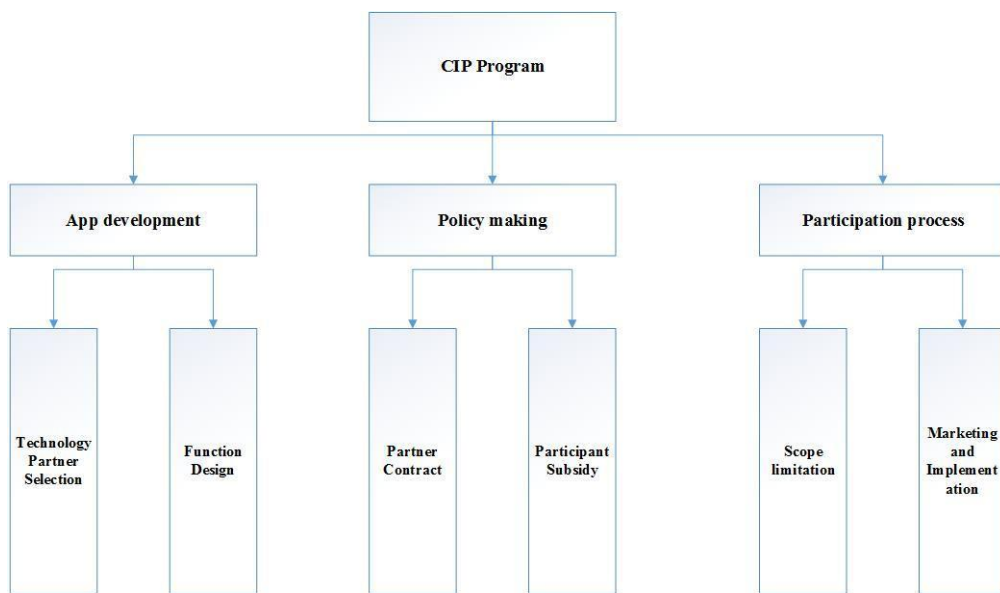


Figure 1 Carpool Incentive Pilot Program

### App development

In order to select an exclusive CIP technology partner to develop a carpool app, SANDAG published an official document called Request for Partnership (RFP) to public that describes the project, required scope of service, partner selection process and minimum information must be included in the proposal.

In this document, SANDAG listed several requirements of carpool application on mobile phones, including compatibility and free of charge, flexible platform, GPS-friendly technology and on-going communication. Apart from basic function such as automated payment and vehicle occupancy confirmation, this app should also have a capability of planning real-time or advanced trips for users. Moreover, although SANDAG had a cash subsidy for participants to stimulates their incentives to

carpool, it also requires the app have a function called TripTracker to display user's savings of their carpool commute not only to themselves but to the planet they are living in<sup>33</sup>.

To potential partners, SANDAG listed plenty of roles and responsibilities for selected partner in RFP, including maintaining functionality and providing certain data of carpooling while protecting privacy information at the same time. SANDAG will select, vet and enroll participating employers and new carpoolers to take part in the CIP and market and promote both CIP and the App. In order to stimulate incentives for carpooling, SANDAG subsidized participants up to \$30 per month for up to three months depending on user reports and payment receipts.

Given that this was only a pilot program, SANDAG chose up to 20 employers located in the largest employment center in San Diego who had active participation in SANDAG projects. However, carpool incentive program was also designed for future expansion which was a requirement written down explicitly for app development.

### **Goals**

Basically, CIP aimed to discourage driving-alone and high automobile-dependent behavior and reduce congestion, greenhouse gas emission and other environmental pollutants along with these behaviors. On the other hand, CIP also encouraged commuters to use transportation alternatives such as walking, carpool, vanpool and public transit.

### **Effectiveness**

In general, CIP program's effectiveness was limited but promising as well. Due to the fact that CIP was a primary idea, its scope was restricted to a small scale and only served a certain group of people. However, it has a potential to expand which mentioned explicitly in RFP document. Moreover, some functions in this app could be quite beneficial to users. For one, TripTracker can be an innovative design in this app because it showed the benefit of using it directly to users which may generate positive impressions and further be introduced to potential participants. For another, TripPlanner is a function which helped users to plan their commute by carpooling. This function was actually an interdisciplinary which involved not only computer science and Geographical Information System but also planning theories. Most importantly, in SANDAG's website, they advertised that "carpool reduces commuting cost by 50 percent or more instantly"<sup>34</sup>. Increase usage of HOV Express lanes and Park and Ride facilities for TDM. In that case, mobile app-based carpooling software is a cost-effective alternative for

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<sup>33</sup> Request For Partnership Document (2016), San Diego Association of Governments: 401B St, Suite 800, San Diego, CA.

<sup>34</sup> Source: <http://www.icommutesd.com/carpool/carpool>.

encouraging more rideshare activities and thus reducing negative externalities producing by driving alone.

First of all, smartphones and network are getting more popular. Mobile phones become a necessity for us which makes a mobile phone app is more user-friendly than an online website service. It's portable, low cost, and convenient. Second of all, in this app abundant functions can satisfy multiple needs such as monitoring savings and budget or even planning trips. Thirdly, apart from app itself, SANDAG adopted outsourcing business strategy and selected technology firms from the open market and cooperated with it. In this way, CIP made the business a triple win case: SANDAG saved their human resources and budget to develop an app, the technology company received a contract and was advertised by this project, and users benefited from a better designed app elected from many proposals.

### **Equity**

No matter how promising this app will be, it also raised some equity issues that should draw our attention. For example, CIP benefited people with smartphones and have network in their smartphones which excluded people without them. Moreover, employees in the employment center generally a small group of people who have decent jobs and good salaries. However, carpooling can achieve more than mitigating environmental deterioration derived from driving alone. It has a potential to serve low income people or people who don't have an automobile. CIP would have been more equitable if it had considered including people in different income levels.

### **Implications for the ABC ramps**

First of all, outsourcing business strategy is feasible in Minneapolis where plenty of software corporations located. Also, ABC ramps can cooperate with University of Minnesota where I believe have enough innovative and skillful students and scholars in both planning and computer science area. Secondly, the market is potentially large because there isn't any carpooling smartphone app in Minneapolis and St Paul area for the time being. However, about two thirds of people in America own a smartphone<sup>35</sup>. Moreover, ABC ramps locate in the business center surrounded by light rail and bus stations and numerous employers. In addition, interstate highways like I-94 and I-35W go through this area which means there are many HOV and Express lanes available for carpooling. More also, carpool often goes hand in hand with public transit and park-and-ride activities. ABC ramps have all geographical, commercial advantage and political resource to promote a carpooling project like CIP. In summary, a mobile app-based software for carpooling worth considering and has a good future for both managing and expanding ABC ramps' business in the Twin Cities.

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<sup>35</sup> source: <http://www.pewinternet.org/2015/04/01/chapter-one-a-portrait-of-smartphone-ownership/>.

### **Other mobile apps: UberPool and UberCommute**

In 2014, Uber company launched a new platform in their mobile phone application called UberPool. UberPool is a rideshare application in which drivers can register and post their route on the platform. Passengers on the same route will send a carpooling request to the driver through online platform about their location and destination. Driver then will pick up the passenger and drop him/her off at his/her destination without much change of his original route. After two years, in 2016 Uber company helped Philippine to launch a platform called UberCommute which has similar functions. Although one driver can only bring one passenger, mobile apps like UberPool and UberCommute encourage carpool and discourages driving alone by providing a platform for commuters to share their commute plans. By utilizing position tracking and exhibiting devices like GPS and GIS in smartphones, these apps satisfy the commuters' real time need and give an opportunity for drivers to earn extra money by sharing their rides. In the meantime, Uber will charge registration fee to keep it functioning. Moreover, they also contribute to mitigate congestion and air pollution created by driving alone. These apps are quite effective and have been introduced to many place outside the United States.

However, these rideshare apps have a common equity issue. As we all know, there has been a work-residential mismatch in different income level groups: high income people live in suburb neighborhoods but work in CBDs; low income people, on the other hand, low income groups live in inner urban area while work in manufacture sectors or service industries on the periphery. In this case, those who don't have a car and need carpool to get to work have opposite direction to those who usually drive their own cars to workplace. Therefore, regardless of the fact smartphone ownership is lower in low income groups than in affluent people, only this mismatch situation will make these apps exclude customers who may potentially benefit more from them.

Although equity issues exist, mobile apps like UberPool and UberCommute can be a good choice for ABCramps to expand its carpool business. On one hand, ABCramps locates in the central area of City of Minneapolis surrounded by shopping sectors and a sport stadium which means on holidays or sport event nights a lot of traffic will flow into this area. Carpooling apps will be a good choice for people to share a ride to there either shopping or watching a basketball game.

### **Other mobile apps: Moovel Transit App**

Unlike carpool apps introduced above, Moovel Transit App focuses its business in providing better service of public transit by plugging an online platform in mobile devices for commuters to choose, pay, and plan their trips. It has two major functions. First of all, after installing Moovel Transit App and registering, users can buy mobile transit tickets which replaces conventional paper tickets and cash transaction. Besides buying tickets, users of course can manage and add value to their online accounts. Second function of Moovel Transit App, which is called RideTap, helps solve commuters' first-mile and last-mile challenge. RideTap will present all possible alternative ride options such as rideshare, carshare, bikeshare and so on for users to reach the station or go to their destination after they get off.

Moovel Transit App encourages public transit and other non-automobile travel modes while discourages driving. Although its goal doesn't align with carpooling apps, it works as effectively as those carpooling apps in reducing driving behaviors. For one, commuters will enjoy more convenient and instant service on mobile devices. To some extent, it increases the accessibility to transit stations. For another, first mile and last mile solutions provided by it help users to plan their trip smart which will attract more people to enjoy a more delightful trip using public transit.

Moovel Transit App excludes the issue of direction mismatch but still seems to some extent inequitable for those who don't own a smartphone. However, the implication for ABCramps is that it can launch a similar platform for registered users in ABCramps and guide them to only drive their cars to the nearest Park & Ride facility or share a ride to get to the transit station and take public transportation to the ABCramps for work, shopping or sports event. Therefore, instead parking at ABCramps, drivers will park at the nearest P&R facility and drive less mileage. As for parking fee, ABCramps can cooperate to other P&R companies to reach an agreement. Users still pay ABCramps but other P&Rs will get subsidy from ABCramps in exchange for their parking service.