Potential Carsharing Scenarios in the Sacramento Region

Prepared for:

North Natomas Transportation Management Association

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1. Introduction

Sacramento presents numerous future possibilities for implementing a variety of carsharing models for the purpose of increasing mobility options while reducing emissions and traffic congestion. Carsharing does this by giving employees and/or residents access to a fleet of shared vehicles. There are numerous models in the United States and around the world, but generally the user pays per mile and per hour, often with a monthly administrative fee. This allows the user to reserve and access an available vehicle, treating it similar to a short-term car rental. The carsharing operator provides maintenance, fuel, insurance, and the cost of the vehicle itself.

The user benefits by reducing his or her reliance on personal vehicles. By paying for a vehicle only when it is needed, the costs of owning a vehicle are spread over many people, potentially reducing an individual's monthly costs greatly. At the same time, they have much of the convenience and flexibility of a personal vehicle. Used in conjunction with transit or carpooling, commuters are able to avoid sitting in congested traffic, while still having workday mobility. Companies that subscribe to carsharing services potentially benefit by reducing parking demand, increasing employees' morale (by treating the program as a benefit), and by providing them with a flexible business fleet.

Society benefits because as individuals shift to paying for their car trips on a per-use basis, they tend to make less trips, thus reducing congestion and emissions. This is especially true under certain circumstances. For instance, when a carsharing program allows a household to sell a personal vehicle or avoid the purchase of one, they are much more likely to shift to other modes. Commuters who are able to take transit to work because of carsharing programs contribute less to congestion and pollution than they did before. Finally, when programs utilize low or zero emission vehicles, such as electric vehicles, in their fleet, then even shifting modes from personal to shared vehicles will see emission gains. Fundamentally, since membership in a car-sharing activity changes the cost structure for personal mobility from "ownership of the vehicle asset" to "pay as you drive", individuals have more incentive to drive less since it costs less.

2. Carsharing in the United States

Shared vehicle programs began to take off in Europe (especially Switzerland) in the 1980's, with North American programs beginning in the mid 1990's. Canada led the way with CommunAuto starting in Montreal in 1995, before being joined by carsharing organizations (CSOs) in Toronto, Vancouver, Victoria, and other towns. In the United States, the Bay Area Rapid Transit (BART) had a station car program, utilizing several dozen electric vehicles in the mid-nineties, based out of BART stations. The first large-scale commercial CSO was Carsharing Portland, which began in 1998, with funding assistance from the Environmental Protection Agency and the Oregon Department of Environmental Quality. In California, two university-run CSOs began at about this time: Intellishare at UC Irvine and CarLink I, based out of the Dublin/Pleasanton BART Station.

In 2000, three major CSOs got off the ground. Flexcar began in Seattle and has since expanded to Washington D.C. and Long Beach, and has taken over Carsharing Portland's operations. Zipcar is another commercial enterprise, launching its first cars in Boston, before entering markets in Washington D.C., New York, and Denver. San Francisco City CarShare is a non-profit group with locations around San Francisco, Oakland, and Berkeley. In the summer of 2001, CarLink II was launched in Palo Alto as a partnership between the University of California, Caltrans, and American Honda; during its first year it is being run as a pilot program, with plans to transition to a third-party provider.

3. Different Carsharing Models

There are several different models of carsharing in operation in North America, and many of the above mentioned CSOs utilize different variations of them, depending upon local circumstances. The chief varieties are:

- **Neighborhood:** This is the basic model of the majority of CSOs currently in operation in the United States. Generally one or two vehicles, sometimes more, are located at convenient spots throughout a city. Users reserve the vehicles and take them mostly for occasional trips. These trips are generally no more than a few hours, although programs may allow longer trips, even full days or weekends. Most programs require that the vehicles be returned to the same location, for ease of management, although some programs may allow travel between locations. In addition to any up front or monthly administration fees, the users pay for the time the vehicle is away from its location and the mileage they travel.

- **Transit/Based and Station Car:** These are programs where at least some vehicles are based at transit stations, generally light- or heavy-rail, although many locations may also be positioned near bus lines. The program may be still follow the neighborhood model (i.e., a parking located at a transit station to increase access), or it may be tied directly to the rail line. For instance, the users may be commuters who take transit every work day, and then drive the vehicles for the final leg of their commute to work. There may also be homebased commuter members, who drive the cars to the station each morning, either from their homes or a neighborhood lot; these members could then have access to the vehicles during evenings and weekends. Commuters might pay a standard monthly fee, while occasional users would pay for mileage and time.

- **Business Subscriber:** In this model, a company would subscribe to a carsharing program. They might use the vehicles as a company fleet or allow their employees to use the vehicles for personal and work errands (possibly charging them individually). The business might only have access to the fleet during the workday (allowing the vehicles to be used by other groups at nights and on weekends) or the vehicles might be assigned to the business location on a permanent basis (perhaps allowing workers to drive them home).

4. Possible Scenarios in the Sacramento Area

This section is intended to provide a snapshot of what carsharing could look like in the different Sacramento TMAs. Any actual project would, of course, have many differences from these scenarios and would probably have to continually change to meet the changing needs of the community. This document provides a variety of models in the different TMAs, although many would be transferable between areas; for instance, the model for North Natomas could be adopted in Power Inn. Appendix A presents a table of possible sites for different types of shared-use vehicle programs, by TMA in the Sacramento region.

Sacramento TMA

Carsharing Business Model

The downtown area is one of the strongest candidate locations for placing a carsharing facility in the Sacramento region, especially focusing on a business model. Downtown Sacramento has a high density of businesses and employees, with limited parking. Furthermore, it is accessible through Amtrak, light rail, and numerous bus lines, allowing commuters to leave their cars at home, while having access to a vehicle during the day.

Initially, downtown Sacramento would start out with a basic business model. A few companies in the area would subscribe to the carsharing program, agreeing to "lease" two to ten vehicles during the first year, for example. Possible locations could include the Cal EPA building, 555 Capitol Mall buildings, and the new East End project (please see Appendix for a preliminary inventory of possible locations). Companies here would use the vehicles as their work fleets and allow their workers to reserve the vehicles for personal business, as appropriate. Workplaces with existing fleets, such as the state government fleet, could also use the program's vehicles to augment its own fleet.

This is a very simple model, having only one user group (i.e., employees of subscribed businesses or buildings). It is therefore relatively simple for the operator to manage, since the vehicles are kept in-house and should not require shuttling from location to location. All of the vehicles are in and out from the same location, and advanced technology including vehicle location capability is not initially required.

Ideally, the users of this program are people who sometimes need their car at work, but are able to take transit, carpools, bike or walk, because they can use a shared vehicle during the day. Alternatively, they may be employees on work trips who would prefer not to use their own vehicle. Generally, the employer might or could pay the program for this service, similar to a monthly lease for daytime use including the commutes. The companies could then offer it to their employees as a benefit, or possibly charge them a set fee per mile or per hour.

The type of vehicles would depend upon the needs of the individual companies or buildings. If most of the trips are local then electric vehicles might be able to serve all their needs. If longer trips are the norm or the cars will be used all day, then conventional

vehicles may be the better choice. Ideally, a mixed fleet would be used (e.g., vans, trucks, etc.) and the program operator could shift vehicles around if requested.

This basic model could be adapted in many ways. First of all, if the primary location has excess capacity during the day (i.e., the vehicles are being underutilized during work hours), then nearby business might be able to negotiate to take advantage of them. In each particular location, the operator would try to increase the number of clients per vehicle, in order to maximize utilization per vehicle. Another option would be to allow employees to take these vehicles home; this option would create an additional revenue source and help alleviate any parking shortages. An extension of this would be to allow local residents access to the vehicles after the close of business, making the program a mixture of the neighborhood carsharing and business models. A final option would be to make a hybrid transit based-business model, where employees would pick up the vehicles at a transit station in the morning (e.g., Amtrak or light rail) and then drive it to the worksite; these vehicles could then be used by homebased users in the evenings.

A separate model that could be implemented in downtown Sacramento would be to ferry commuters from the Amtrak depot to the Medical Center. Employees of the Medical Center would take Amtrak downtown (e.g., from Auburn, Davis, etc.). Once there, they would access vehicles parked at the depot and drive or carpool to the Medical Center. Once there, they and other approved employees could use the vehicles for trips throughout the day, before returning them home at night. Once there, it would also be possible to allow them to be used by returning train riders who are interested in becoming homebased users. Furthermore, the Amtrak depot is intended to become an intermodal transportation complex, with light rail connecting it to the rest of Sacramento.

Costs

While this and other early documents may provide a general blueprint for designing a series of shared vehicle pilot projects, much additional work will need to be done prior to launch. Contacts and agreements have to be made with transit agencies, businesses, vendors (vehicles, technology, etc.), local governments, and developers. Input and feedback from the various stakeholders will alter any early plans considerably. For this reason feasibility studies still need to be done. Furthermore, before the pilot projects themselves launch, the project team must be in place with everything ready to go. The following table estimates the costs that will be incurred prior to launch.

Pre-Launch Costs	
Start-up, consultant selection and project management	$75,000
Regional feasibility study	$60,000
Individual TMA baseline surveys	$75,000
Conduct technical studies	$50000
Develop pilot program plans with evaluation methodologies and survey tools	$95,000
Design & produce marketing materials	$20,000
TOTAL	**$375,000**

Although there will be distinct pilot projects spread out over the greater Sacramento region, there should be one single program management. There are several benefits to this strategy. There will substantial cost savings as redundant staff are not hired and it takes advantage of volume discounts for advertising, rent, vehicles, insurance, etc. By having a single management team, staff will be able to deal with all queries from interested parties, no matter what their geographical location is or their needs are. Furthermore, a centralized system will facilitate growth in the system and interchanges between different pilot projects (e.g., allowing users of one project occasional access to the vehicles of another project when the situation demands).

The following table estimates the program wide costs of this program. These are costs that will not radically change, even if the number of pilot projects varies.

Program Wide Costs		
	Up to 40 Vehicles	Over 40 Vehicles
Staff	$95,000	$130,000
Advertising	$15,000	$15,000
Office	$30,000	$30,000
Travel	$1,250	$1,500
Technology-Advanced	$19,520	$21,520
or -Simple	$8,000	$10,000
TOTAL	**$168,770**	**$208,020**

For each distinct pilot project there will be some additional costs, regardless of the total number of vehicles. For instance, there may need to be fine tuning of the recruitment materials and more staff time devoted to dealing with new agencies and partners. The actual costs will depend upon the specific circumstances, but will likely add approximately $15,000 to each pilot project's cost.

For Sacramento, in addition to the above mentioned $15,000, the projects costs are estimated to be in the range of the following table:

Vehicle Associated Costs						
	RAV4's			Th!nk Cities		
	10	15	20	5	10	15
Vehicle Down Payment and Lease	$52,000	$78,000	$104,000	$14,000	$28,000	$42,000
Vehicle Registration	$2,500	$3,750	$5,000	$1,250	$2,500	$3,750
Vehicle Maintenance	$3,300	$4,950	$6,600	$1,650	$3,300	$4,950
Vehicle Cleaning	$4,500	$6,750	$9,000	$2,250	$4,500	$6,750
Vehicle Insurance	$20,000	$30,000	$40,000	$10,000	$20,000	$30,000
Electricity*	$3,600	$5,400	$7,200	$900	$1,800	$2,700
Emergency Roadside Service	$600	$900	$1,200	$300	$600	$900
Ride Home Service	$150	$225	$300	$75	$150	$225
Technology-Advanced	$5,000	$7,500	$10,000	$2,500	$5,000	$7,500
or -Simple	$4,000	$6,000	$8,000	$2,000	$4,000	$6,000
TOTALS (including electricity and advanced technology)	**$91,650**	**$137,475**	**$183,300**	**$32,925**	**$65,850**	**$98,775**
Costs per Vehicle per Month (not including program-wide costs	$888.75	$847.08	$826.25	$798.75	$673.75	$632.08

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

North Natomas TMA
Residential-Based Neighborhood Carsharing

Although the Downtown Natomas Airport (hereinafter: "DNA") Line light rail extension is planned to pass through North Natomas, connecting the airport with the Amtrak depot and downtown Sacramento, residential-based neighborhood carsharing is a more appropriate choice for the community now. The existing bus lines (#s 13 and 14) are not strong enough to support a traditional station car project. Furthermore, North Natomas is strongly residential, reducing the possibility of having a workbased or business component.

Instead, North Natomas is a good location to provide neighborhood carsharing. Vehicles would be based out of lots located in higher density housing communities, such as apartment buildings or townhouses. Residents of these communities, or other authorized personnel could reserve these vehicles and use them, paying either choosing a monthly package (similar to Flexcar, as discussed below) or a fee based on their time and mileage (similar to San Francisco City CarShare). Additionally, vehicles would be made available in mixed-use or commercial areas, providing mobility to workers during the business day, in order to maximize the amount each vehicle is used. If the situation allows, some North Natomas residents could become homebased users if their commute patterns take them to an affiliated transit station (e.g., Amtrak depot) or to an affiliated business (perhaps South Natomas Business Park).

Looking to the future, once light rail stations are established in North Natomas, this carsharing project should be able to expand with it. Since more workers will probably be commuting from their homes in North Natomas, rather than going to it, the work component may be small (although it may only take a few employers to implement it). (A minimum jobs/housing ratio of 66 percent has been established for the City portion of the community) Instead, homebased users would ideally take vehicles to a light rail station that was located near businesses and/or residences. In this way, during the day people could access the vehicles from the light rail station itself, before a homebased person drove the car home in the evening.

The majority of vehicles for this program could be GEMs, with a few RAV4Evs or other longer range vehicles, for extended trips. Electric-assist bicycles could also be used to augment the vehicles.

Prime areas to consider:

- *Housing Developments*: Any carsharing project here would involve the existing or growing housing developments, probably focusing on the higher density areas. Ideally, there would be a minimum of two or three cars per area/parking lot. With a few different lots, there could also be a pick-up truck or minivan available at one of the locations.
- *Natomas Marketplace:* Because most people at the Marketplace probably already arrived by their own vehicle, this location would probably only make sense as a recharging site. However, the marketplace must have a sizeable employee base (approximately 1,700 employees are employed at the Marketplace)many of whom currently, or could in the future, take RT to work. They could then use shared vehicles as needed during the day, thus encouraging them to commute with transit. However, they probably make few trips during the day (e.g., they probably just walk across the mall for lunch). Once light rail exists, it might make sense as the workbased end of a transit-based commuter carsharing system, as might the Raley's Distribution Center or the Pepsi Bottling Company.
- *Destinations:* Sites, such as the Natomas Marketplace, can be encouraged as carsharing destinations. These are sites that local residents would be likely to go to by driving NEV's from their homes or lots near their homes. A carsharing operator could encourage shared-NEV use by offering key incentives such as reserved parking spaces, making recharging conveniently available, and facilitating access through expanding the low speed roads network. By serving both ends of a trip, an operator could increase the ease of the system, especially if a user was guaranteed parking and knew he or she could get in and quickly. Other possibilities could include activity centers (e.g., within housing developments), gyms, supermarkets, or town center areas.

Overall, one possibility would be to start with five to ten vehicles at two or three residential lots, along with a larger number of electric-assist bicycles. Users would pay a registration fee, possibly a monthly administration fee, and be charged per hour and per mile (although a wide variety of packages could be made available).

Costs

The project in North Natomas will have residential parking lots at three to five different apartment/housing complexes, such as the "The Heritage" Lennar Communities. Each lot will have four GEM vehicles and at least one longer-range vehicle; this might be a RAV4EV, but might be an internal combustion vehicle. Additionally, there will be at least one lot in a commercial or, preferably, mixed use location; one possibility would be the Natomas Marketplace. If participants can be found who would drive a vehicle to the Amtrak depot or another affiliated station every morning, then this program can accommodate them as well.

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The specific costs for the North Natomas project, besides the aforementioned $15,000, are outlined in the table below.

Vehicle Associated Costs						
	GEMs*			RAV4 Evs		
	12	16	20	3	6	9
Vehicle Down Payment and Lease	$42,000	$56,000	$70,000	$15,600	$31,200	$46,800
Vehicle Registration	$2,400	$3,200	$4,000	$750	$1,500	$2,250
Vehicle Maintenance	$3,960	$5,280	$6,600	$990	$1,980	$2,970
Vehicle Cleaning	$5,400	$7,200	$9,000	$1,350	$2,700	$4,050
Vehicle Insurance	$18,000	$24,000	$30,000	$4,500	$9,000	$13,500
Electricity*	$3,600	$5,400	$7,200	$1,080	$2,160	$3,240
Emergency Roadside Service	$720	$960	$1,200	$180	$360	$540
Ride Home Service	$180	$240	$300	$45	$90	$135
Technology-Advanced	$6,000	$8,000	$10,000	$1,500	$3,000	$4,500
or -Simple	$4,800	$6,400	$8,000	$1,200	$2,400	$3,600
TOTALS (including electricity and advanced technology)	**$82,260**	**$110,280**	**$138,300**	**$27,195**	**$54,390**	**$81,585**
Costs per Vehicle per Month (not including program-wide costs)	$675.42	$652.50	$638.75	$1,172.08	$963.75	$894.31

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

Power Inn BTA

Transit-Based, Commuter Carsharing Model

The carsharing model identified in this TMA is a transit-based commuter carsharing model, linked to the light rail station(s) at Power Inn, and possibly at University/65th Street.

There would be three main groups of people:

- *Homebased Users*: These would be people living in the area (e.g., west of Power Inn Road or north of Folsom) who take a vehicle to the Power Inn light rail station every workday morning, before taking light rail downtown or their other work destinations. On their return in the evening, they would take a car home and use it

like their personal vehicle at night and on weekends. They would pay a set monthly fee).

- *Workbased Commuters*: These would be people working in Granite Park or Army Depot Business Parks (or other businesses), who take light rail to the Power Inn station, and then take a vehicle to their worksite, ideally in carpools. Nearby workers might use electric-assist bicycles. Employers would pay a monthly fee to "lease" the vehicles and then allow their employees to use them as a benefit to them. Alternatively, the program could charge the individual members.
- *Workbased Day Users*: These would be people who work in the business parks and who have access to the vehicles during the day, including the Workbased Commuters. They are able to reserve the vehicles for personal or business errands during normal business hours. Ideally, they are people who sometimes need their car at work, but are able to take transit, carpools, bike or walk, because they can use a shared vehicle during the day. Granite Park members who work on the side closest to the station might just access them from that parking lot. The employers could also pay for Day Use, or the individuals could be charged on a per mile and/or per hour basis.

In addition to this model, we could also develop something connected to the university. This might take a similar form as the above model, substituting the University/65th St. station for the Power Inn station and CSUS for the business parks. It could also work as a neighborhood carsharing model at CSUS, allowing students, staff, and faculty to rent vehicles by the hour and the mile. There may, however, be insurance issues with letting students in the program. The focus could be on instituting electric-assist bicycles on the campus, with a key and reservation system, to reduce theft. If homebased use is lower than the supply of vehicles at one or more of the stations, weekend rentals could also be implemented. The question could be moot, if the campus demand turns out to be too seasonal. In any event, any carsharing operator may have to dynamically alter the location of vehicles and number of clients in order to maximize vehicle usage per vehicle.

<u>Costs</u>

This model involves multiple users groups (homebased, workbased commuters, and day users) at the start of the program. Therefore, the project-specific costs are calculated to be closer to $20,000, in addition to the following vehicle costs:

Vehicle Associated Costs			
	RAV4's		
	10	15	20
Vehicle Down Payment and Lease	$52,000	$78,000	$104,000
Vehicle Registration	$2,500	$3,750	$5,000
Vehicle Maintenance	$3,300	$4,950	$6,600
Vehicle Cleaning	$4,500	$6,750	$9,000
Vehicle Insurance	$20,000	$30,000	$40,000
Electricity*	$3,600	$5,400	$7,200
Emergency Roadside Service	$600	$900	$1,200
Ride Home Service	$150	$225	$300
Technology-Advanced	$5,000	$7,500	$10,000
or -Simple	$4,000	$6,000	$8,000
TOTALS (including electricity and advanced technology)	**$91,650**	**$137,475**	**$183,300**
Costs per Vehicle per Month (not including program-wide costs)	$930.42	$874.86	$847.08

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

Folsom/El Dorado/Cordova TMA
Transit-Based, Business Model

This model is a midpoint between the Sacramento and Power Inn models. Here, businesses based out of Mather Field or along Highway 50 subscribe to the program. Their employees take light rail to the Mather Field/Mills station, and then carpool in shared-vehicles to work. During the day they, and other approved employees, use the car for business and personal errands. On the return commute they take the cars back to the station. Because there is no homebased component, at least initially, the fleet will be made up a variety of vehicles, including shorter range electric vehicles.

Costs
This program would likely incorporate a dozen or so vehicles, depending upon local enthusiasm. In addition to the program-specific $15,000, the vehicle associated costs would approximate the following:

Vehicle Associated Costs				
	RAV4's		Th!nk Cities	
	10	15	5	10
Vehicle Down Payment and Lease	$52,000	$78,000	$14,000	$28,000
Vehicle Registration	$2,500	$3,750	$1,250	$2,500
Vehicle Maintenance	$3,300	$4,950	$1,650	$3,300
Vehicle Cleaning	$4,500	$6,750	$2,250	$4,500
Vehicle Insurance	$20,000	$30,000	$10,000	$20,000
Electricity*	$3,600	$5,400	$900	$1,800
Emergency Roadside Service	$600	$900	$300	$600
Ride Home Service	$150	$225	$75	$150
Technology-Advanced	$5,000	$7,500	$2,500	$5,000
or -Simple	$4,000	$6,000	$2,000	$4,000
TOTALS (including electricity and advanced technology)	**$91,650**	**$137,475**	**$32,925**	**$65,850**
Costs per Vehicle per Month (not including program-wide costs)	$888.75	$847.08	$798.75	$ 673.75

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

Point West Area TMA
Transit-Based, Business Model

This program would use the same model as described above for the Folsom/El Dorado/Cordova TMA. Members would be commuters traveling between the Watt/I-80 Transit Center and the McClellan Business Park; it could thus benefit transit passengers both from light rail and a variety of bus lines. Members (including other commuters) could then utilize the vehicles during the day for intra- and extra-business park trips.

Costs
As with the above project, this program would likely incorporate a dozen or so vehicles, depending upon local enthusiasm. In addition to the program-specific $15,000, the vehicle associated costs would approximate the following:

Vehicle Associated Costs				
	RAV4's		Th!nk Cities	
	10	15	5	10
Vehicle Down Payment and Lease	$52,000	$78,000	$14,000	$28,000
Vehicle Registration	$2,500	$3,750	$1,250	$2,500
Vehicle Maintenance	$3,300	$4,950	$1,650	$3,300
Vehicle Cleaning	$4,500	$6,750	$2,250	$4,500
Vehicle Insurance	$20,000	$30,000	$10,000	$20,000
Electricity*	$3,600	$5,400	$900	$1,800
Emergency Roadside Service	$600	$900	$300	$600
Ride Home Service	$150	$225	$75	$150
Technology-Advanced	$5,000	$7,500	$2,500	$5,000
or -Simple	$4,000	$6,000	$2,000	$4,000
TOTALS (including electricity and advanced technology)	**$91,650**	**$137,475**	**$32,925**	**$65,850**
Costs per Vehicle per Month (not including program-wide costs)	$888.75	$847.08	$798.75	$ 673.75

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

South Natomas TMA

Carsharing Business Model

This is similar to the downtown Sacramento basic business model. A few companies in a South Natomas business park (or the park itself) would subscribe to the carsharing program, agreeing to "lease" two to ten vehicles during the first year, for example. Companies would use the vehicles as their work fleets, allowing employees to reserve vehicles for personal business, when available.

Ideally, the users of this program are people who sometimes need their car at work, but are able to take transit, carpools, bike or walk, if they are able to drive a shared vehicle during the day. Alternatively, they may be employees performing work trips who would prefer not to use their own vehicle. The companies could then offer it to their employees as a benefit, or possibly charge them a set fee per mile or per hour.

The types of trips taken by employees of these businesses would have to be analyzed to determine the proper type of vehicle. If most trips are local then the fleet should lean towards electric vehicles and if they are longer, then conventional vehicles should be more common.

Costs

The costs for this program again incorporate $15,000 and the following vehicle specific costs:

Vehicle Associated Costs				
	RAV4's		Th!nk Cities	
	10	15	5	10
Vehicle Down Payment and Lease	$52,000	$78,000	$14,000	$28,000
Vehicle Registration	$2,500	$3,750	$1,250	$2,500
Vehicle Maintenance	$3,300	$4,950	$1,650	$3,300
Vehicle Cleaning	$4,500	$6,750	$2,250	$4,500
Vehicle Insurance	$20,000	$30,000	$10,000	$20,000
Electricity*	$3,600	$5,400	$900	$1,800
Emergency Roadside Service	$600	$900	$300	$600
Ride Home Service	$150	$225	$75	$150
Technology-Advanced	$5,000	$7,500	$2,500	$5,000
or -Simple	$4,000	$6,000	$2,000	$4,000
TOTALS (including electricity and advanced technology)	**$91,650**	**$137,475**	**$32,925**	**$65,850**
Costs per Vehicle per Month (not including program-wide costs)	$888.75	$847.08	$798.75	$ 673.75

* Not necessarily attributable to pilot project, as businesses, residents, and transit agencies may pay electricity.

5. Carsharing Technology

Different CSOs in the United States use a wide variety of technologies to keep track of the their vehicle usage, ranging from very simple and manually driven to very advanced and automatically collected. The level of technology chosen by each CSO is based on the program's specific needs, relative costs of the technology, and size of the program. Small programs having users fill out trip logs may find data entry costly and vehicle tracking difficult if they grow into a larger organization. In brief, the types of technology used by CSOs are:

- **Reservation System:** Although individual programs may allow instantaneous, walk-up reservations, all CSOs need some type of reservation system. If all the vehicles are located at one place, near where the users live or work, then this can be as simple as a clipboard. However, with multiple lots and off-site administration, such solutions are bound to fail. The next level up would be an on-line "clipboard," where users log on the web and type in when they want a car, or a telephone "clipboard," where users leave messages and listen to their fellow members' message. The most advanced technology would be a combined Internet/telephone system that identifies the user's accessible parking lots, allows individual vehicles to be chosen if desired, reminds the user in an e-mail, and locks-out other users from using the vehicle during the reserved time.
- **Vehicle Access:** The simplest vehicle access is to give everyone the same door/ignition key. One step above would be to have key kiosks located at the parking lots where users are able to use codes or smart cards to obtain keys, perhaps being told specific cars in the process. The most advanced system would give each user their own key, which would open the doors and allow

only someone with the proper PIN to start the vehicle (i.e., PIN matches key and the car is reserved for that user).

- **Vehicle Tracking:** If real-time vehicle tracking is desired (as would probably be the case with large programs), then a GPS or similar system would be necessary.
- **Trip Tracking:** The most basic solution is to have in-vehicle trip diaries, where at users fill out forms detailing items such as their ID number, odometer readings at the start and end of the trips, trip start time, trip end time, fuel level, location, and any appropriate comments on the vehicle's condition. With many vehicles, this can be extremely taxing on staff resources and overly dependent on users' honesty. A more advanced system would log this vehicle automatically (once the ID number is entered) and either archive in-vehicle for regular retrieval or submit it in real-time via radio-frequency towers or satellites. Advanced options may include automatically-produced records and bill statements.

6. Examples of Carsharing Fee Structures

Different CSOs around the country use different rate structures based on their costs and members' habits. Examples of the three largest are:

City CarShare (San Francisco, Oakland, Berkeley)

- $30 application fee
- $300 deposit
- $10 monthly administrative fee
- $3.50 per hour
- $.37 per mile

Zipcar(Boston, Washington D.C., New York, Denver)

- $30 application fee
- $300 deposit
- $30 monthly or $75 yearly administrative fee
- $5-$14 per hour, depending on city, vehicle type, day of the week, and time of day
- $.40 per mile

Flexcar (Seattle, Portland, Washington D.C.)

- $25 application fee
- 5 hours/50 miles for $35 per month

- 10 hours/100 miles for $65 per month
- 25 hours/250 miles for $150 per month
- 50 hours/500 miles for $275 per month
- 100 hours/1000 miles for $525 per month
- $.35 for each additional mile

7. Changes in VMT and Emissions Due to Carsharing

The effects of carsharing on VMT and emissions can be highly variable and depend upon a great many factors including type of vehicle, carsharing model, location, worksite culture, and specific circumstances of the individual users. If the fleet is made up of mostly electric vehicles (or even SULEV's) then there can be significant emission reductions, even if overall VMT were to rise. Appendix B gives a preliminary emission reduction estimate of the effects a carsharing program might have.

There are two areas where carsharing can effect the greatest gains in VMT reductions. The first is through reduced vehicle ownership. If a carsharing program meets the needs of its users satisfactorily, then they may dispose of one of their household's personal vehicles. With one (or more) fewer cars in their household, they are less likely to make extraneous trips. This is especially true when they are paying for their shared trips by the mile and hour; in these cases, they are more likely to think about the need for each individual trip and have incentives to trip chain.

The other primary VMT reduction can come about through modal shifts in participants' commutes. If users drove by themselves before joining the program, but become transit riders, carpoolers, vanpoolers, bicyclists, etc. then each individual might reduce his or her daily VMT anywhere from a few miles (i.e., bicyclists) to 100 (i.e., train riders). This does not mean that the carsharing program needs to be transit-based; the availability of a vehicle at work may encourage people to carpool, bike, or bus directly to work, especially if parking is expensive and/or difficult. This type of VMT reduction can be extremely variable. All the employees at a particular worksite may have no alternative but to drive solo to work, besides moving, even if they would prefer to carpool or take transit. At another worksite, employees who drive 75 miles each way might be able to use Amtrak because of carsharing.

Each of the three models discussed in this document may contribute to VMT/emissions reduction differently, although the exact same model in two locations may exhibit drastically different results. But, all else being equal, each of the models might have the following effects:

- **Neighborhood:** This model can exhibit several disparate changes in VMT. At its simplest, it merely exchanges personal vehicle trips for shared vehicle trips; this results in no VMT change, but perhaps sizable changes in emissions if an electric fleet is used. It can lead to increases in VMT if there is a shift for

some trips from transit, walking, etc. to a shared vehicle. It is also possible that it will encourage people to dispose of a personal vehicle or postpone the purchase of one, leading to a significant decrease in VMT. Even if the majority of participants increase their VMT somewhat, the overall mileage may decrease if just a few are able to dispose of a vehicle.

- **Transit/Based and Station Car:** This model is designed to shift trips to transit, thus leading to sizable VMT reductions. In a city like Sacramento, it is unlikely that a commuter would go to a transit station, take the train/bus, and the carshare on the other end if they could drive the whole way in under 20 minutes. Therefore, the users of this system would be biased long distance commutes, compounding the VMT reductions. Again, it is possible that it would be used by members who have no other vehicle and thus are increasing their VMT, but this would require them to have easy access to the specific transit line. It is relatively simple to approximate some of the maximum VMT reductions by calculating the maximum distance one can take on transit to the transit station in question.

- **Business Subscriber:** Again, if these users are simply switching their travel from personal vehicles to shared vehicles, there will be little change in VMT, although noticeable changes in emissions if electric vehicles are utilized. Theoretically however, the presence of shared vehicles at or near a person's workplace allows them to eschew solo driving on days that they need a car during the day. Thus, someone who generally vanpools three days a week and drives two days because of off-site meetings may be able to vanpool every day. One possible drawback, however, is that they may be more inclined to make casual trips (e.g., driving to lunch rather than walking to a near establishment).

Appendix A

Potential Shared Car / Station Car & Community Electric Vehicles For Sacramento

POTENTIAL SHARED CAR / STATION CAR & COMMUNITY ELECTRIC VEHICLES FOR SACRAMENTO (Dwight MacCurdy, SMUD)				
	Station Car Connection to Lightrail Line	Shared Car Program at Employer Site	Community Electric Vehicle Shared Car Program	Employer Campus LSV Program
SACTMA				
· Downtown Intermodal Transportation Complex -- SC/SC connections to many downtown employer sites	X	X		
· CalEPA building SC/SC program	X	X		
· Wells Fargo building SC/SC program	X	X		
· Identify other employer sites for SC/SC programs	X	X		
· UCD Medical Center campus LSV program for onsite business applications				X
· UCD Med Center electric pickups or SC/SC program	X	X		X
· Identify other sites for LSV programs				X
· CEV Program at 6th and S Cooperative Housing Units			X	
· CEV Program at 27th and H condominium complex			X	
· Identify other sites for CEV programs at high density housing complexes			X	
· Connection to each Freeport Lightrail Station (5?)	X			
SNTMA				
· South Natomas East Business Park shared car program		X		
· South Natomas West Business Park shared car program		X		
· Identify other opportunities for Business Park shared car programs		X		
· Identify sites for CEV programs at high density housing complexes			X	
· Identify sites for employer LSV programs				X
· Station car program at each DNA lightrail station (2?)	X			
NNTMA				
· Heritage at NN CEV Program for new housing development			X	
· Identify other sites for CEV Program at new multi-family housing developments			X	
· Natomas Marketplace Shared Car Program		X		
· Identify other employer sites for shared car programs		X		
· Identify potential sites for LSV programs				X
· TOD shared car program at each six DNA lightrail station ()	X			

Deleted: 6?

PWTMA/McClellan				
· USAA SC/SC program	X	X		
· CalFarm SC/SC program	X	X		
· Cal Expo SC/SC program	X	X		
· Arden Fair onsite campus LSV program				X
· Kaiser Hospital shared car program (invite to next monthly meeting)		X		
· Kaiser onsite LSV program				X
· U.S. Post Office at Royal Oaks -- variety of programs	X	X		X
· Station Car Program at each lightrail station (3-5?)	X			
· Identify sites for CEV programs at high density housing complexes			X	
PIBTA				
· Granite Park SC/SC program (Power Inn lightrail station)	X	X		
· Depot Park SC/SC program (1-2 miles from Power Watt Ave and Butterfield stations)	X	X		
· CSUS SC/SC program	X	X		
· Identify other potential business sites for SC/SC programs	X	X		
· Depot Park onsite LSV program				X
· CSUS campus LSV program				X
· Other potential LSV programs				X
· Identify sites for CEV programs at high density housing complexes			X	
50 CORRIDOR TMA				
· Intel Bradshaw onsite LSV program				X
· Intel Bradshaw SC/SC program, Butterfield Station	X	X		
· Identify opportunities for Sunridge new development SC/SC and CEV programs	X	X	X	
· NEC SC/SC and LSV onsite campus program	X	X		X
· HP SC/SC and LSV programs	X	X		X
· Intel Folsom SC/SC and onsite LSV program	X	X		X
· Franchise Tax Board SC/SC program, Butterfield Station, and LSV program	X	X		X

Appendix B

Carsharing/Station Car – Emission Reduction Estimate

Carsharing/Station Car – Emission Reduction Estimate by Jeff Weir
(Not official ARB estimate -- for discussion purposes only)

Assumptions:

Trip reduction:

- 1.0 commute trips reduced per day per participant (ave trip length, 16 miles)
  - Assume 50 percent switch from single occupancy vehicle to alternate mode.

- 1.0 "other" trips per day reduced per participant (ave trip length, 5 miles)
  - From increased non-commute transit use, not having a vehicle at work, and overall reduced household vehicle travel due to average decrease in number of household vehicles.

"Cleaner" trips:

- 8 cleaner trips per day per vehicle*
  - 2 cold (commute) starts per day
  - 6 average starts per day
  - 40 miles per day

* Based on 10 average uses per day (CarLink demo project). Assume 80 percent of trips would have been taken in another vehicle. Assume "another vehicle" is equal to average statewide fleet.

Results:

Reduced trips:

Reduced commute trip emissions:
per participant per commute day -- 10.2 grams ROG, 9.6 grams NOx
per participant per year -- 5.6 lbs ROG, 5.3 lbs. NOx

Reduced "other" trip emissions:
per participant per day -- 3.7 grams ROG, 3.4 grams NOx
per participant per year -- 3.0 lbs ROG, 2.7 lbs. NOx

Cleaner trips

Emissions reduced per vehicle per day -- 30.5 grams ROG, 26.8 grams NOx
Emissions reduced per vehicle per year -- 24.5 lbs. ROG, 21.5 lbs. NOx

Large-Scale Program – Estimated Emission Reduction Benefits

Assumptions:

- 1,000 vehicles and 15,000 participants*
- 2006 emission factors**
- Car share vehicles are half ZEV and half SULEV.

* Ratio of members per car for current California and nationwide carshare programs is 32 members for every one car. The ratio for California station car programs is 5.5 members for every one car. Assuming that half the programs are carsharing and half are station car programs, the ratio would be about one car for every 18 members, rounded conservatively to 1:15.

** Specific-year average emission factors for passenger vehicles developed from ARB's emissions model (EMFAC2000) were used for trip reduction. Average statewide emission factors and grams/mile standards for zero emission vehicles (ZEVs) and Super Ultra Low Emission Vehicles (SULEVs) were used for cleaner trips. 2006 emission factors used assuming it would take a few years for program to reach large scale.

Results:

Reduced "trip reduction" emissions
64 tons/yr, 0.176 tons/day ROG
60 tons/yr, 0.16 tons/day NOx

Reduced "cleaner trip" emissions
15.3 tons/yr, 0.034 tons/day ROG
13.4 tons/yr, 0.04 tons/day NOx

TOTAL (in 2006)
79.3 tons/yr, 0.21 tons/day ROG
73.4 tons/yr, 0.20 tons/day NOx

ROG = Reactive organic gases
NOx = Nitrogen oxides
ROG and NOx combine in the presence of sunlight to form ground level ozone, or smog. Thus, these two pollutants are called ozone "precursors".

Sample Calculations (for ROG):

Trip reduction

{[(1 commute trip/start)*(1.714 grams/commute start)] + [(16 miles per commute) * (0.532 grams/mi)]*(250 commute days)} + {[(1 “other” trip/start)*(1.003 grams/ave start)]+[(5 miles per trip)*(0.532 grams/mi)]}*(15,000 participants)/(454 grams/lb)/(2000 lbs/ton) = (64.28 tons/yr)/(365 days) = 0.176 tons/day

“Cleaner” trips

{[(2 cold starts)*(1.714 grams/cold start)] + [(6 average starts) * (1.003 grams/average start)] + [(40 miles) * (0.532 grams/mi)]} – [(20 miles)*(0.01 grams/mi SULEV)] * (1,000 vehicles) / (454 grams/lb) / (2000 lbs/ton) = 0.0336 tons/day