UNIVERSITY OF CALIFORNIA Berkeley
Transportation Sustainability
RESEARCH CENTER

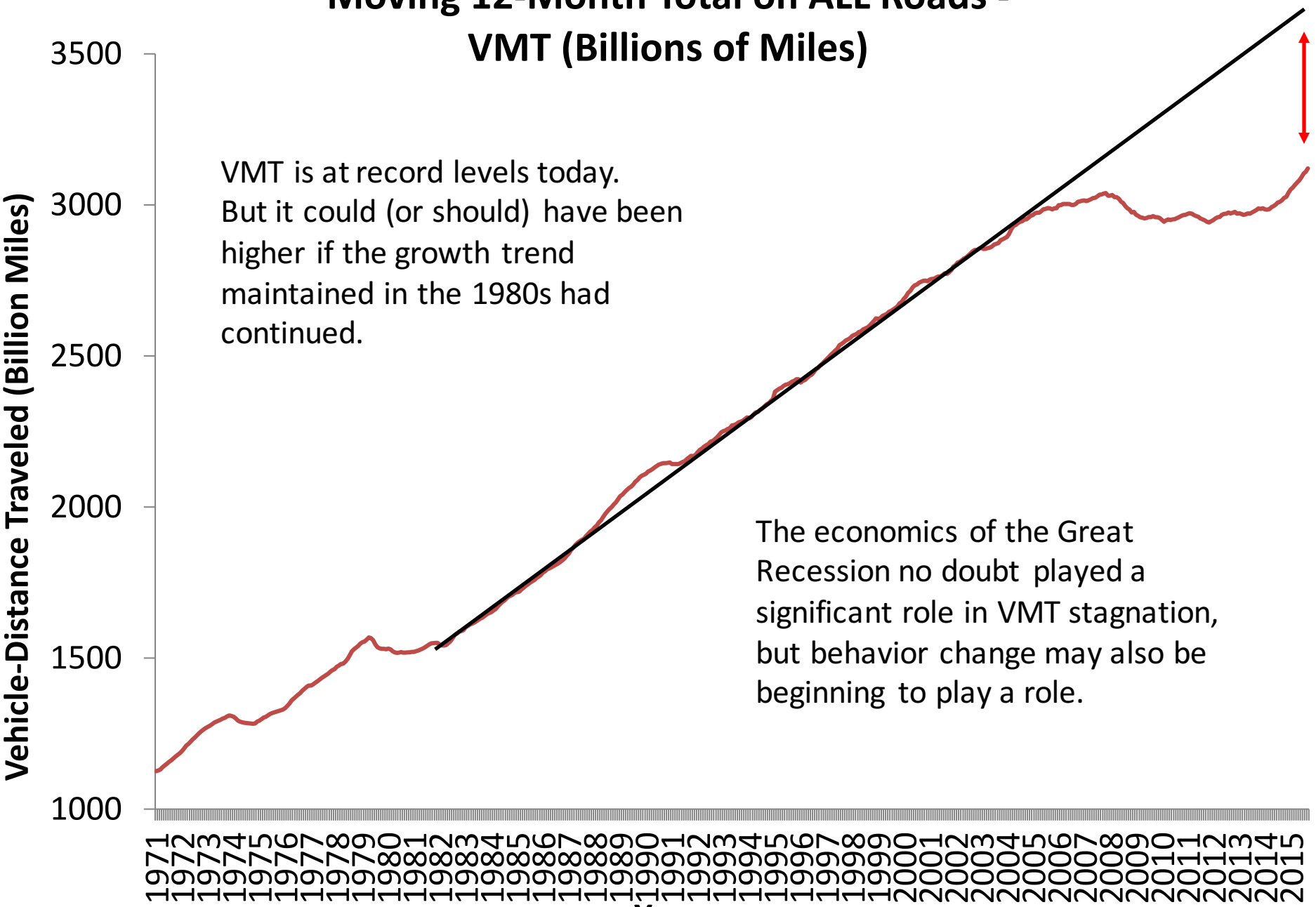
Travel Behavior Change
Why we care, how we measure, recent results

Elliot Martin, Ph.D.
University of California, Berkeley

Changing Travel Behavior
SPUR, San Francisco
July 20th, 2016

ITS Berkeley
Institute of Transportation Studies

Moving 12-Month Total on ALL Roads - VMT (Billions of Miles)



Martin et al., 2016

Behavioral Change

- We care about behavioral change because:
  - A vehicle mile avoided uses less energy and emissions than a vehicle mile driven on clean power sources.
  - Vehicles on the road cause congestion, on-road injuries, and use space that could otherwise be put to more efficient use.

How do we Measure Behavior Change?

- Aggregate level data:
  - Infrastructure-based sensor data (e.g., VMT, pedestrian sensors)
  - Vehicle registrations, odometer data
  - Smart phone and other probe data, etc.

- Survey data
  - Household travel surveys (general population surveys)
  - System user surveys (surveys of individual systems)

- Activity data
  - Ridership data (rail, bus, vehicle occupancy measures)
  - System use data (e.g., bikesharing, carsharing, etc.)

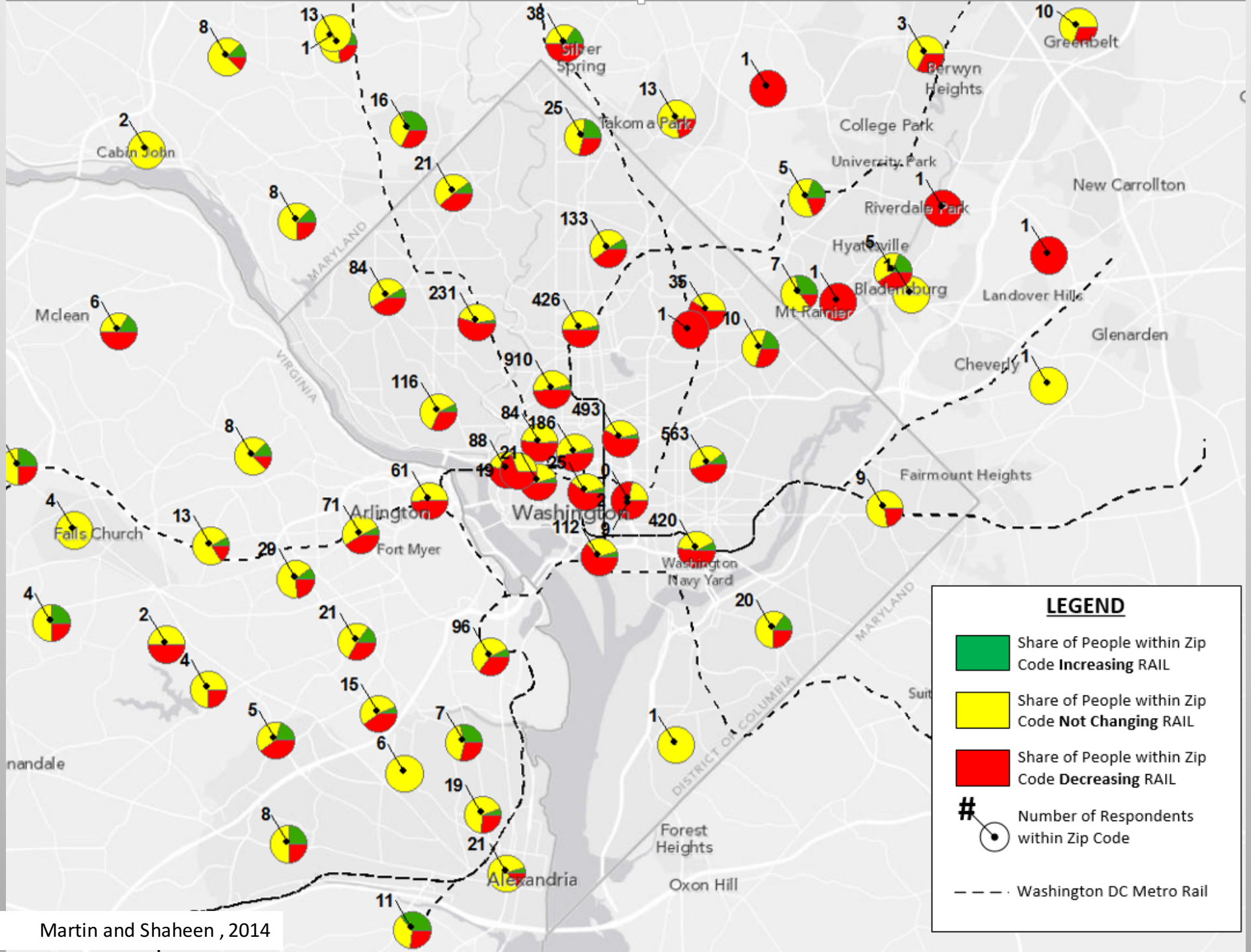
Survey Data
Advantages and Disadvantages

- Survey data has the advantage of:
  - Producing tailored insights that are not easily measurable with aggregate and sensor data.
  - Providing a better understanding of the cause behind changes

- Survey data has the disadvantage of:
  - Taking people's time
  - Having some measurement uncertainty

Probing Causality in Surveys

- Surveys can tell us how a person's travel is changing, and if we ask people correctly, they will tell us why.
- Did a particular intervention cause your change in behavior?
- Particular in the case of travel, people generally know why they do things.
- We may see change in aggregate data, but:
  - We cannot always tell easily why its happening
  - We cannot always easily disaggregate, if at all.



Martin and Shaheen , 2014

Recent Study of One-Way Free-Floating Carsharing

Methodology:

- Online survey from ~9,500 North American car2go members residing in Calgary; San Diego; Seattle; Vancouver; and Washington, D.C.

- Activity data analysis

Martin and Shaheen, 2016

Recent Study of One-Way Carsharing

Key Findings:

- Between 2% to 5% of members sold a vehicle due to carsharing across study cities.

- 7% to 10% of respondents did not acquire a vehicle due to car2go.

- Car2go took estimated 28,000-plus vehicles off of road and reduced parking demand

Martin and Shaheen, 2016

Vehicle and GHG Impacts from Free-Floating One-Way Carsharing

City	Vehicles Sold	Vehicles Suppressed (foregone purchases)	Total Vehicles Removed per Carsharing Vehicle	Range of Vehicles Removed per Carsharing Vehicle	% Reduction in VMT by Car2go Hhd	% Reduction in GHGs by Car2go Hhd
Calgary, AB (n=1,498)	2	9	11	2 to 11	-6%	-4%
San Diego, CA (n=824)	1	6	7	1 to 7	-7%	-6%
Seattle, WA (n=2,887)	3	7	10	3 to 10	-10%	-10%
Vancouver, BC (n=1,010)	2	7	9	2 to 9	-16%	-15%
Washington, D.C. (n=1,127)	3	5	8	3 to 8	-16%	-18%

Martin and Shaheen, 2016

Conclusion

- Transportation technologies are like enzymes to people's mobility needs.
- Some technologies will facilitate or catalyze change in behavior.
- Others will have no effect, even if offered at zero cost.
- Continued evaluation of user populations through surveys and supporting aggregate and activity data are necessary to maintain an understanding of these impacts.

Elliot Martin
Assistant Research Engineer
University of California, Berkeley
Transportation Sustainability Research Center
elliot@berkeley.edu

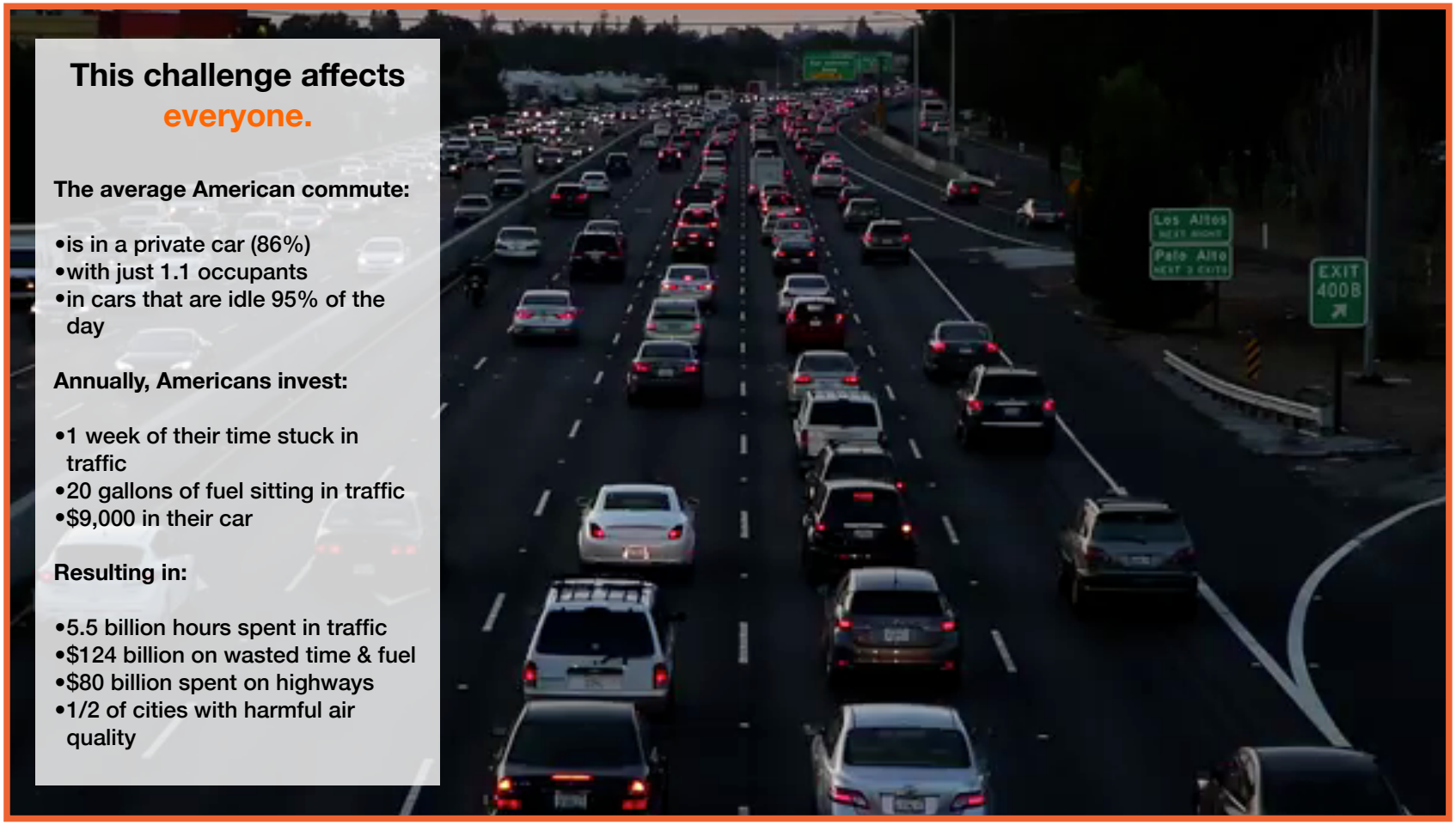
www.tsrc.berkeley.edu


carma

Mobility Reality

Freedom of mobility is unavailable to the 99%

carma



This challenge affects everyone.

The average American commute:

- is in a private car (86%)
- with just 1.1 occupants
- in cars that are idle 95% of the day

Annually, Americans invest:

- 1 week of their time stuck in traffic
- 20 gallons of fuel sitting in traffic
- $9,000 in their car

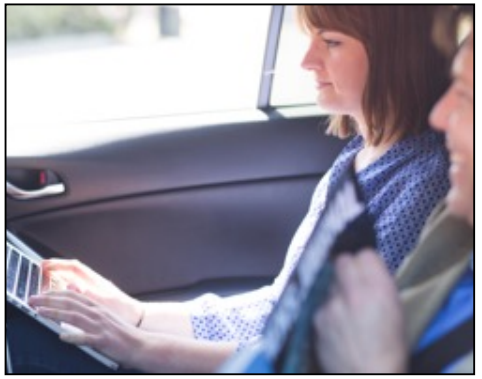
Resulting in:

- 5.5 billion hours spent in traffic
- $124 billion on wasted time & fuel
- $80 billion spent on highways
- 1/2 of cities with harmful air quality

That's something worth improving.

Carma Mobility Solutions

Extending mobility freedom to everyone

	CarmaCar Carshare where people really live and work	CarmaZoom High-occupancy commute carshare	CarmaCarpool Peer-to-peer commute carpool
			
USP:	San Francisco's orginal carshare service (2002); non-profit; 400 cars.	World first high-occupancy carshare service introduced 2015	World's leading commute carpool solution since 2007.
Competition:	+ + = 95% US Market Share	First-to-market. Closest business is Bridj.	(Only new entrants focus on the commute; Waze in Israel)
Momentum:	• Agressive pod expansion • Introduction of corporate carshare • Close government partnerships • Data-driven momentum • Roll-out of new app, hardware • 3-minute sign-up and approval	• Extends utilization to off-peak hours • Extends utilization to new areas • Ideal employment campus solution • Far less costly than a new shuttle • Valet service, simple reservations	• Market leader • 250+ APIs, being used globally • Government partnerships • Toll rebates for verified carpools • Community management expertise • Employer partnerships
Vision:	High-occupancy in our fleet of cars; then high-occupancy in every car.		

PPP Partnerships

In partnership with local governments and transportation agencies

carma

Tolling

- Texas Department of Transportation, Central Texas Regional Mobility Authority; Bay Area Toll Authority; Contra Costa Transportation Authority, Caltrans

Carpooling

- Washington State DOT; Northern Virginia Regional Council; US Dept of Defense; Metropolitan Transportation Commission; and Federal Highway Administration

Carsharing

- *City and County of San Francisco; City of Berkeley; and University of California and Metropolitan Transportation Commission*

Parking

- San Francisco Metropolitan Transportation Authority

CENTRAL TEXAS Regional Mobility Authority

BAY AREA TOLL AUTHORITY

CONTRA COSTA transportation authority

WSDOT

METROPOLITAN TRANSPORTATION COMMISSION

SFMTA Municipal Transportation Agency

Caltrans

Texas Department of Transportation

Statens vegvesen Norwegian Public Roads Administration

esa

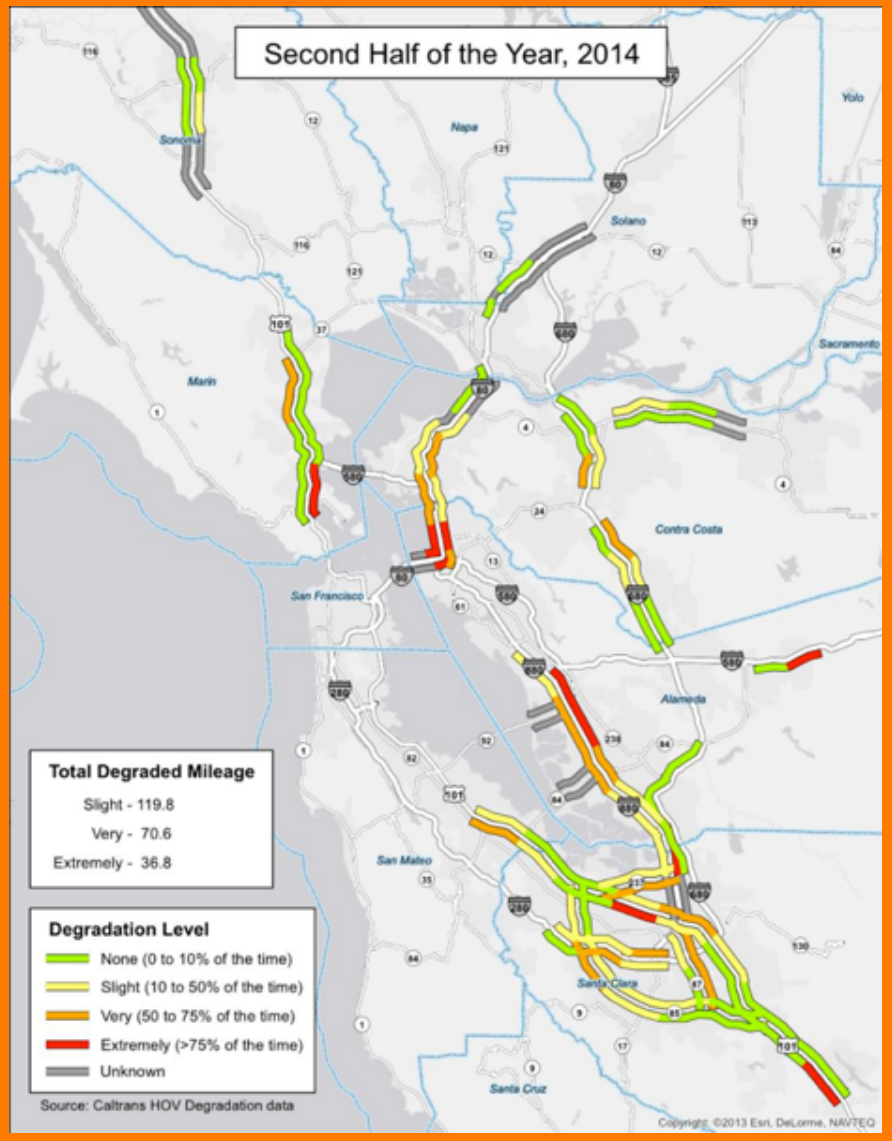
Carpooling Challenges

Free Parking
- The No#1 killer to getting people to change their mind. No one wants to drive to SF, but Free parking in MV

HOV 2
- Speeds <45 mpg
- Electric vehicles
- Enforcement

Free Driving
- Managed lanes
- Congestion based pricing

Cheap Gas
- Decades without a gas tax increase
- Electric vehicles demand a new tax model to fund roads (e.g. VMT)



Policy Recommendations

① Migrate to PT (Passenger Throughput) performance measures
- Currently DOT is measured on VT (Vehicle Throughput)
- Improve the TRUE efficiency of our highway infrastructure

② Encourage HOV discounts on all toll roads/bridge
- Increase all tolls significantly
- FREE access for HOV 3+ carpoolers
- Pass legislation to allow for congestion based pricing

③ Implement automated vehicle occupancy enforcement
- Get cops off the side of the road
- Increase revenues and speeds

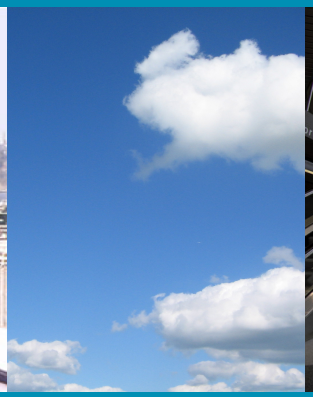
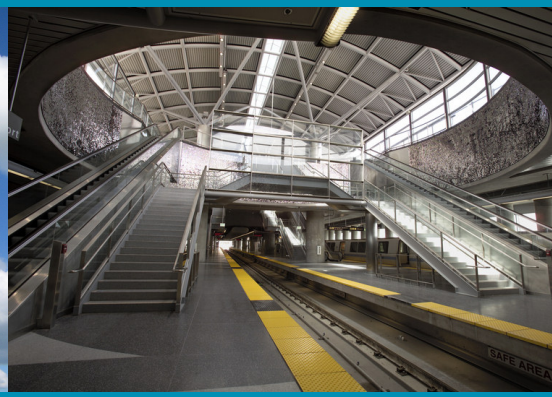
④ Improve roadside ridesharing through physical infrastructure
- Bus stops, parking garages as ridesharing pick-ups
- VMS/DMS showing capacity/throughput

④ Charge for Parking
- All peninsula cities must move in concert and charge SOVs to park


carma

BART Perks: Travel Incentives Program

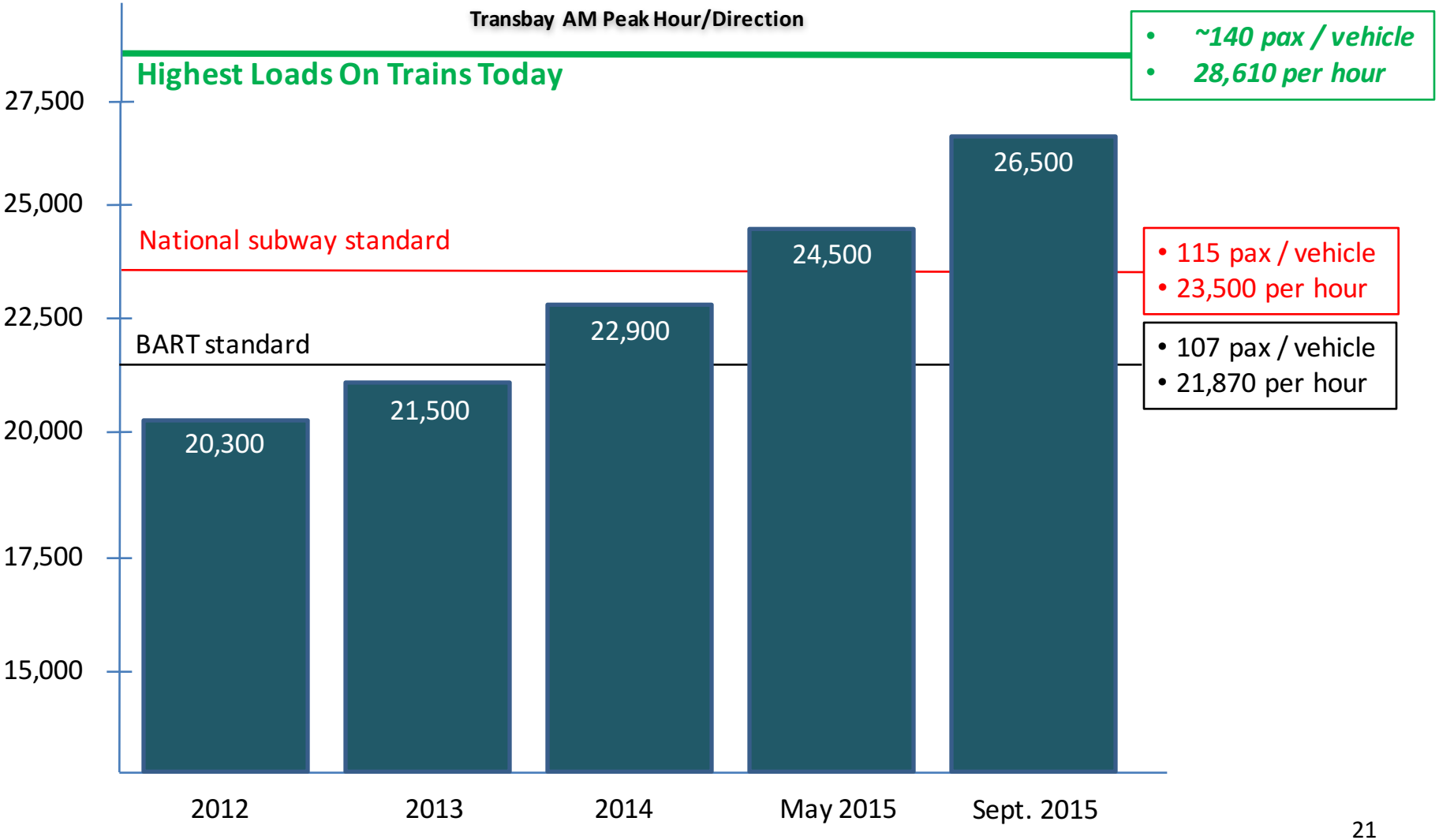


SPUR Lunchtime Forum
July 20, 2016

BART Background

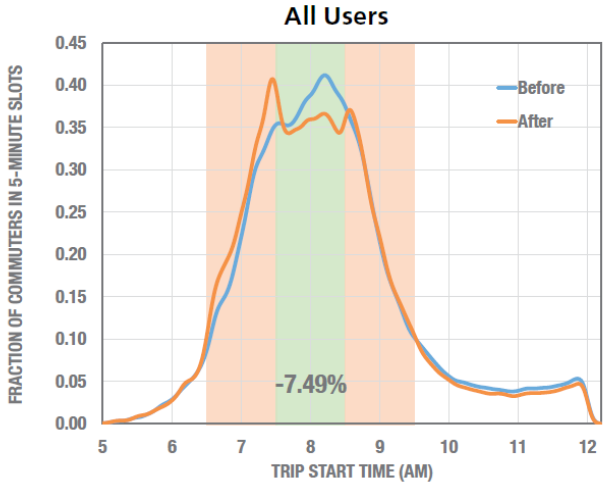
BART Trains to San Francisco Increasingly Crowded



BART Perks

Inspired by Singapore Program

- Singapore transit peak incentive study conducted by Stanford
- Use behavioral economics and network optimization to shift behavior
  1) Incentives (“I win”)
  2) Loyalty program (“frequent flyer”)
  3) Social networking (“my friends”)
  4) Gamification (“make it fun”)
- Encourage shifts from “Congested” to “Decongested” times
- Shifted 7.5% of participants to travel outside of peak hours



Ashby

Montgomery

Clipper Card

Commuter

Commuting History

Earn points per mile

BARTPerks.com

Credit History

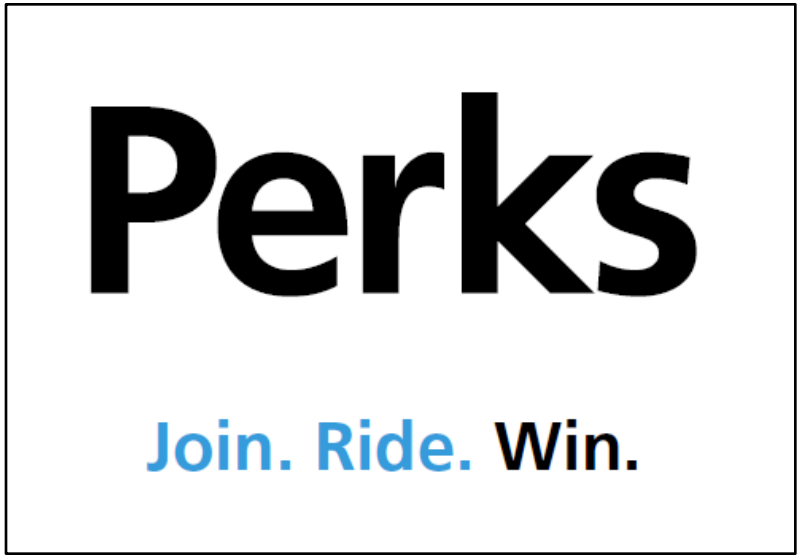
Date	Time	Credits
15th May 2014	09:00:19	20
16th May 2014	08:10:45	10
16th May 2014	16:20:17	22
18th May 2014	06:15:20	20

Micro-raffles

BART Background

Program Overview

- Opt in program
- Up to 25k participants
- 6 months + duration
- Mobile-friendly website
- Points earned for all weekday travel on BART
- Incentivized behavior earns more points
- Points cashed out or used to play a game
- Value redeemed via PayPal



Program Goals

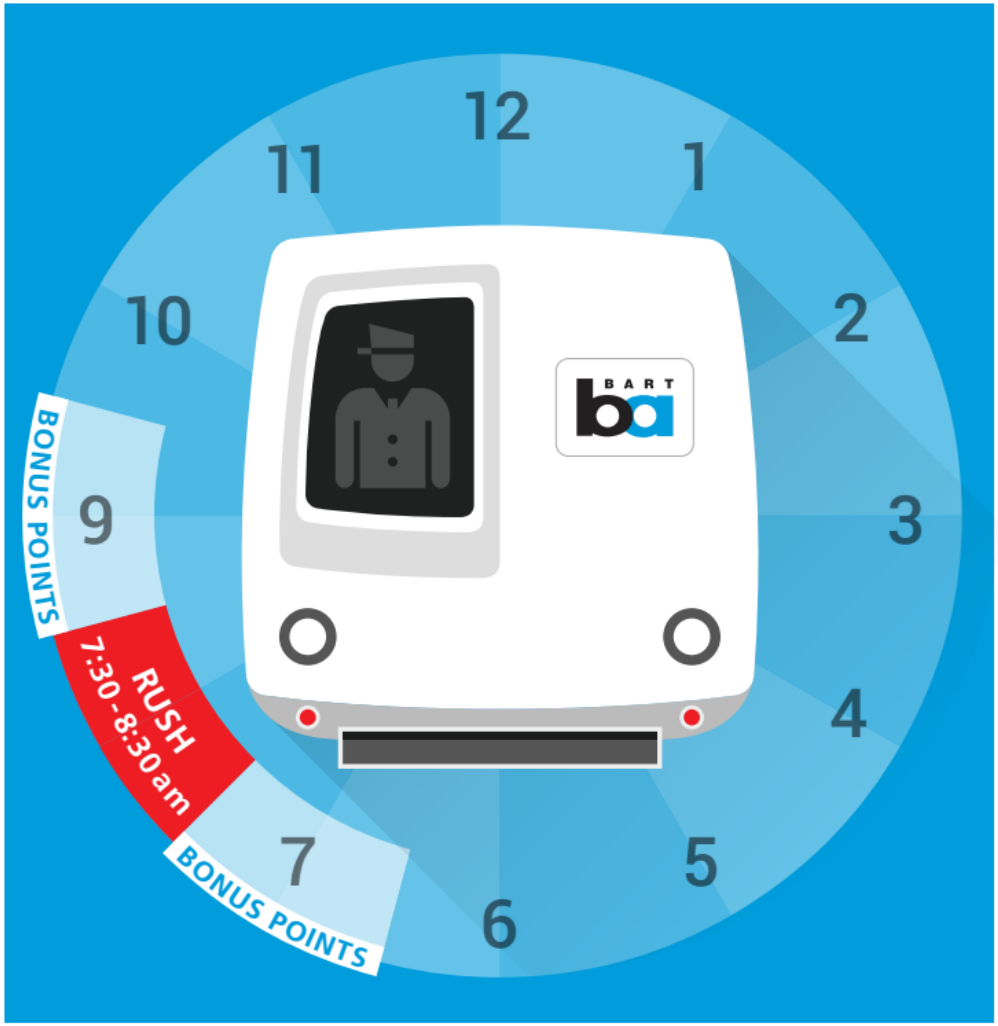
- Engage the public and provide a quality customer experience
- Optimize available Transbay train capacity

Program Goals

- Evaluate 'incentive-based' approach to demand management
  - Cost effectiveness
  - Equity
  - Other lessons learned
- Increase employer support for flexible work schedules

How the Program Works

Earning Points



How the Program Works

Earning Status

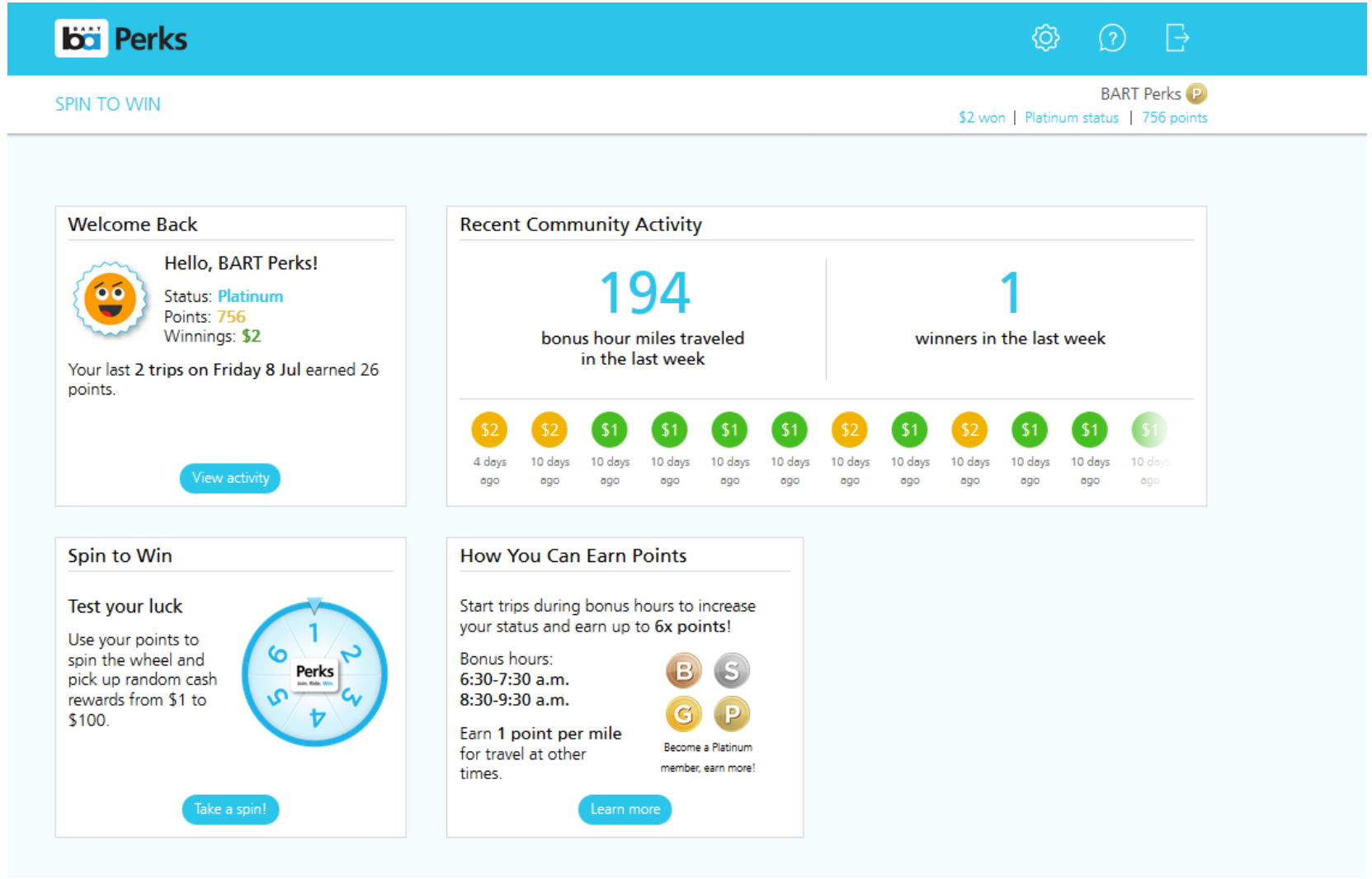
	Bronze	Silver	Gold	Platinum
Earned Points Multiplier	X3	X4	X5	X6
Maximum Reward	$10	$20	$50	$100
# Bonus Hour Trips Required for Status		2/week	3/week	4/week

How the Program Works

Bonus Box

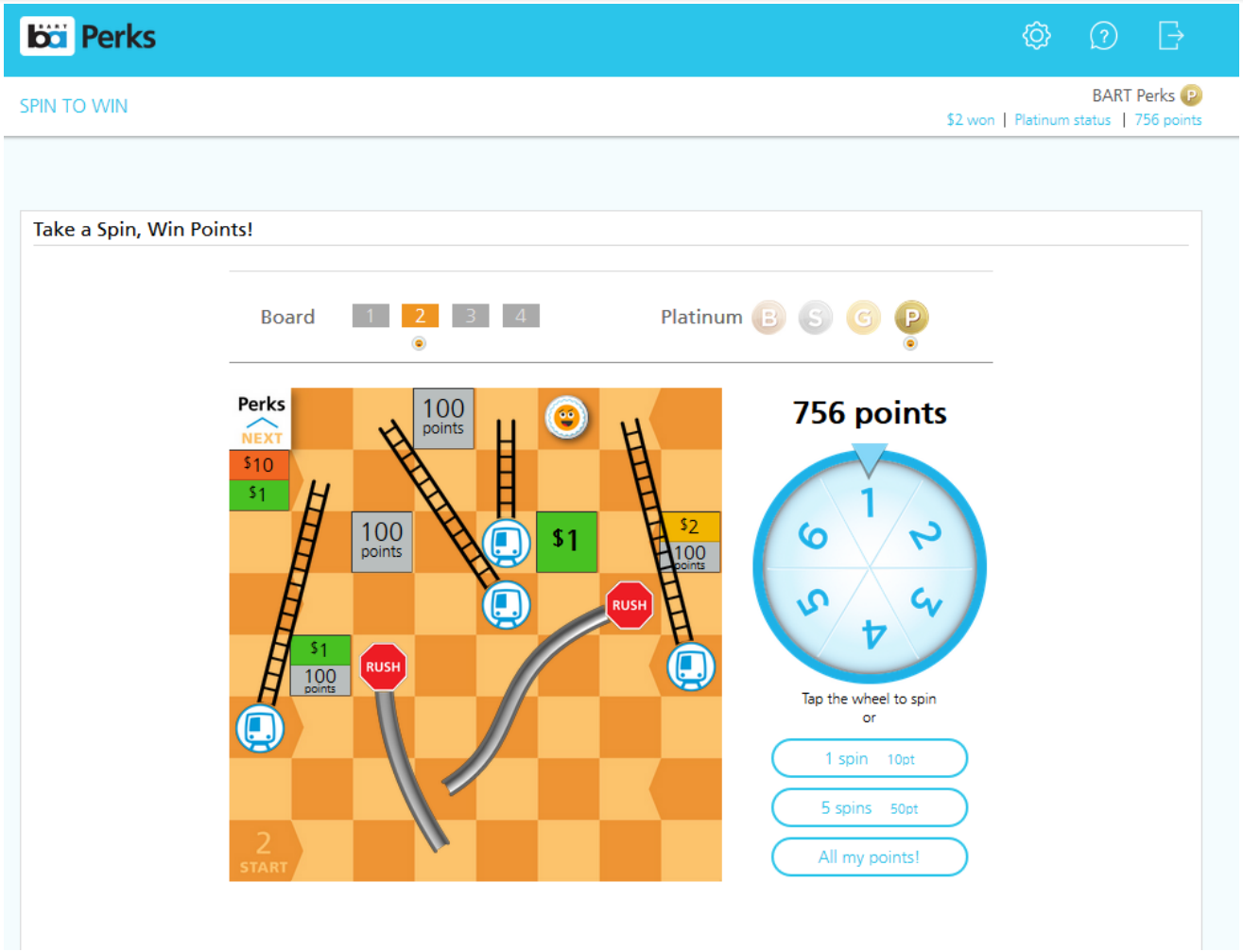
- General promotions and recruitment (e.g. friend invitations, give aways, etc)
- Extra rewards for specific behaviors:
  - Transbay tube shift
  - Shift to different times
- Participant Surveys

How the Program Works
User Interface



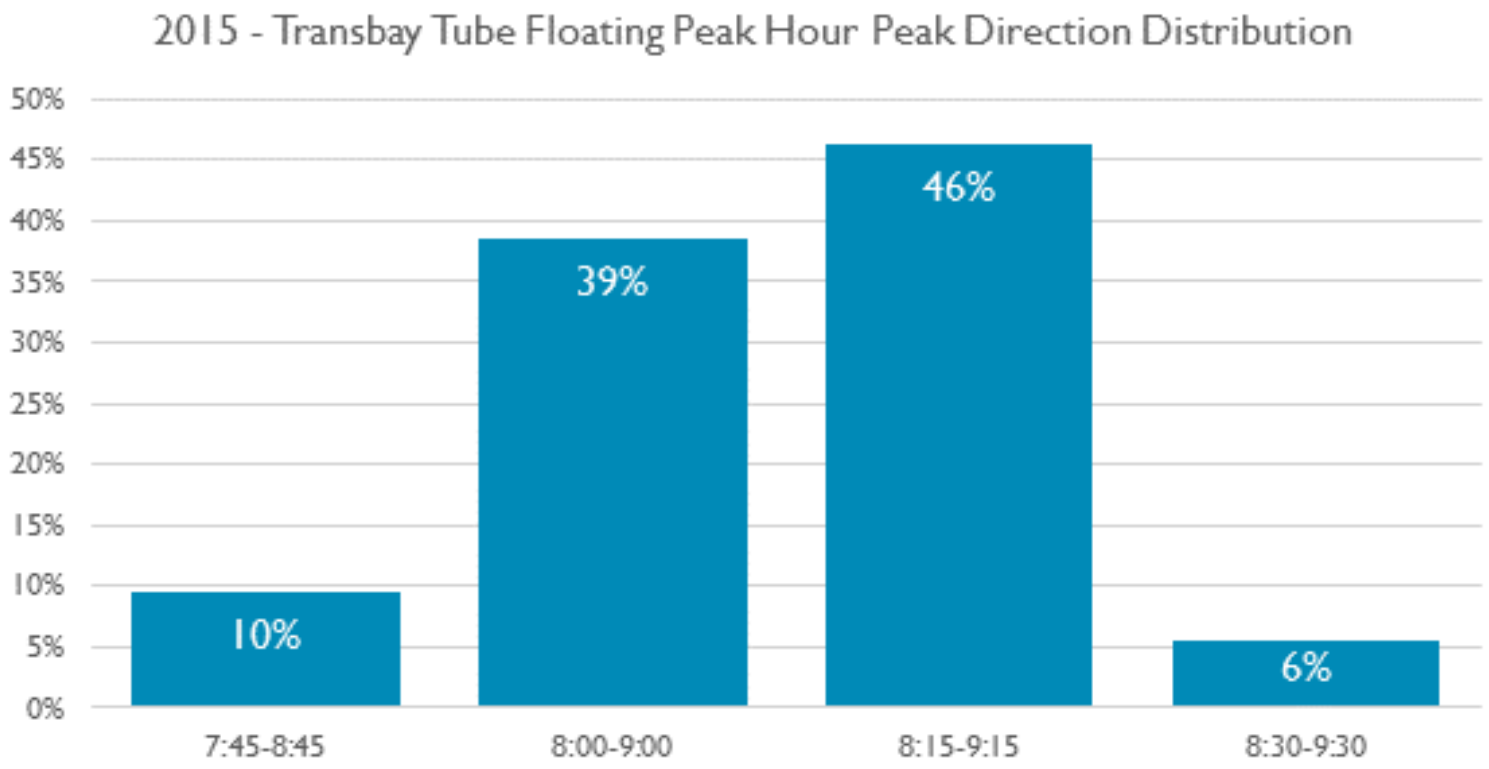
How the Program Works

Spinning the Wheel



Designing the Program

Selecting the Peak Hour



Designing the Program

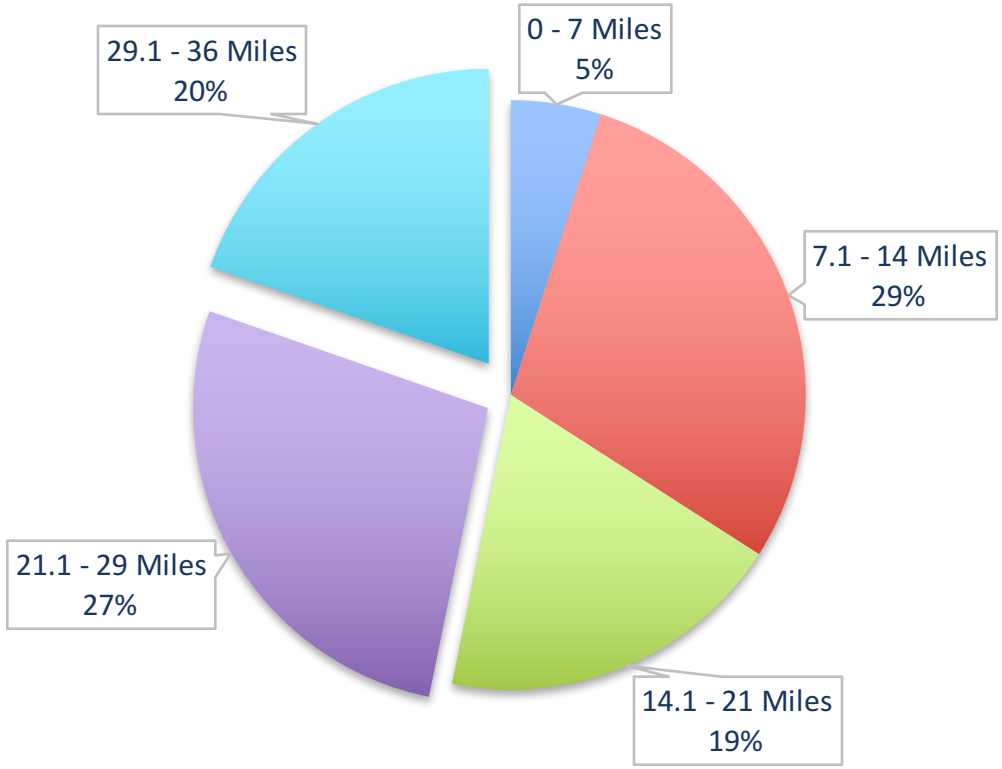
Implementation Schedule

- Pilot preparation - ongoing
- Pilot launch (targeting end of month)
- Program monitoring, continuation of ongoing employer outreach & marketing (August – January 2017)
- Phase I pilot ends (January 2017)
- Phase II pilot begins (early 2017)

Designing the Program

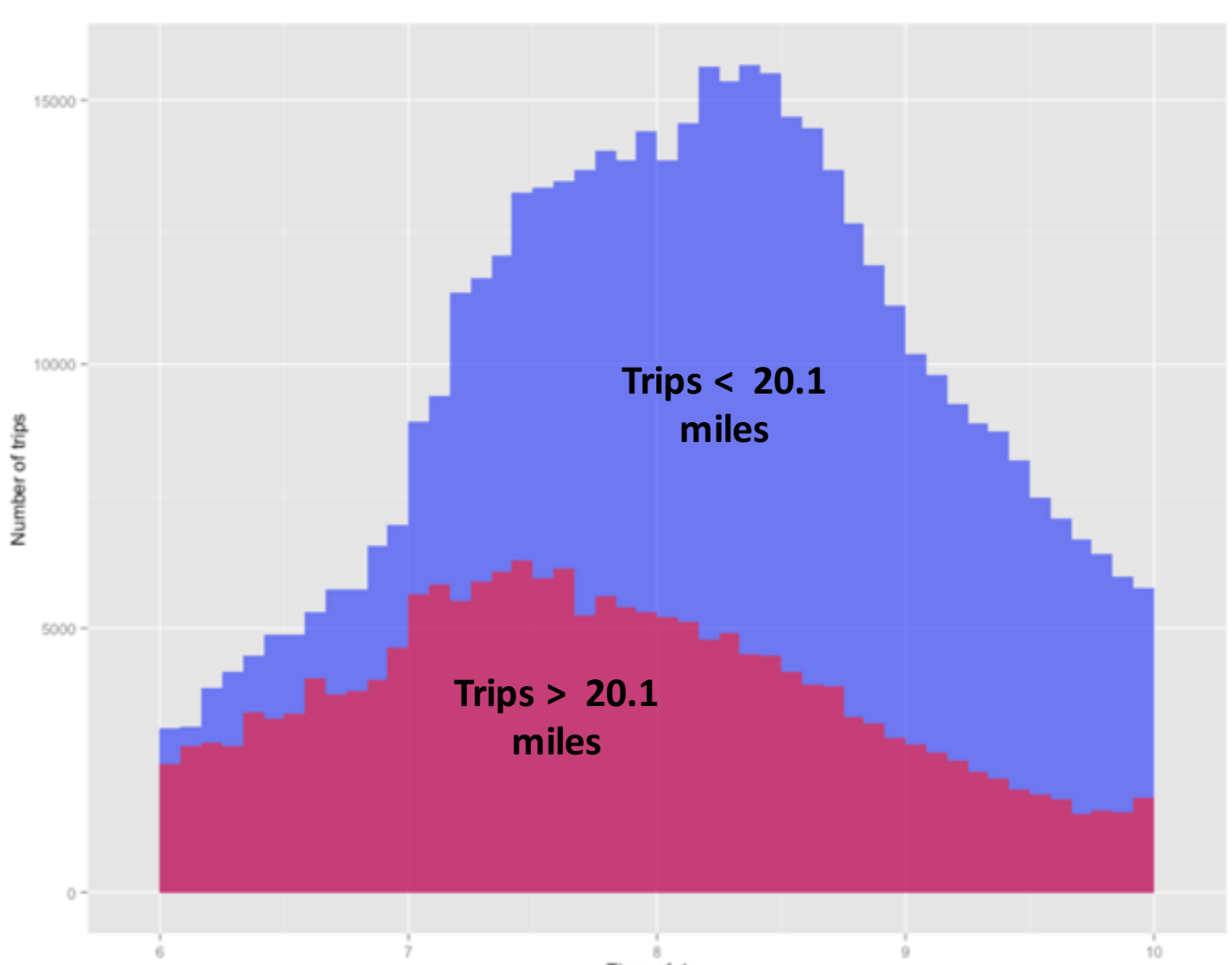
Points Earned for Trips or Miles?

Share of Weekday AM (7-9 AM) Westbound Transbay Tube Trips by Miles from Station Origin to Downtown SF



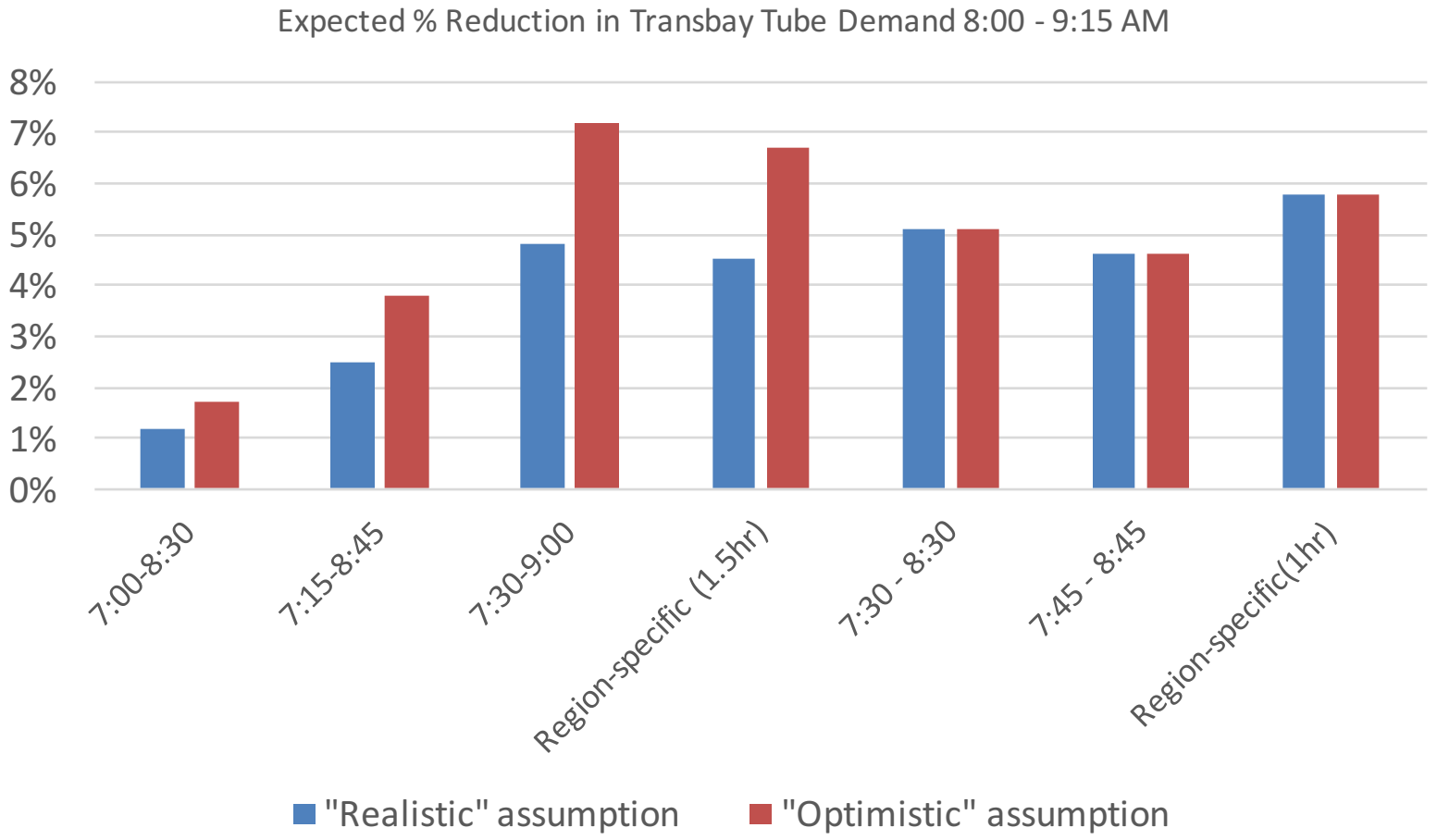
Designing the Program

Rewards Based on Miles



Designing the Program

Selecting the Peak Hour



Selecting the Rush Hour – 7:30 to 8:30 Performed Best Under Realistic Assumptions