





# Study Motivation

- ❑ Since UPA/CRD are demonstration programs, strong emphasis on evaluation and learning
  - FHWA-sponsored evaluation at all six UPA sites, plus in-depth household surveys in **Seattle** and **Atlanta** to study impacts on traveler behavior
- ❑ Survey addresses the impacts of tolling on:
  - Route and mode choice
  - Trip departure times
  - Origin-destination patterns
  - Overall VMT and daily travel time budgets
  - Carpooling
  - Telecommuting
  - Equity

# Outline

- ❑ Survey Methodology Summary
- ❑ Key Findings from Seattle
- ❑ Recap/ Future Work

# Approach and Methodology

- ❑ Household Panel Study: same households before and after tolling
  - 2-day travel diary plus questions on demographics, typical commute, technology ownership, attitudes and values
- ❑ Sample corridor users
  - Drivers: license plate capture during AM and PM peak, with match to registered address; mail study invitations to households
  - Transit intercept in-person
  - Vanpool members: via email to vanpool participants
- ❑ Invite ALL adult members of household to participate
- ❑ Online survey with option to take by phone
- ❑ Pilot Study
- ❑ Incentives (\$15/\$30 Amazon gift card)
- ❑ Panel maintenance
- ❑ Focus groups in Seattle to get initial impressions of tolling & refine Wave 2 survey
- ❑ Weighting of data to adjust for stratified sampling approach



# Survey Invitation

- ❑ Advance notification postcard
- ❑ Introductory letter
- ❑ FAQs

**Lake Washington Transportation Study**  
**MEMORY JOGGER**

To log your trips, go to  
<http://www.rgsurvey.com/seattle/portal>

DAY 1 Name \_\_\_\_\_ Travel Date \_\_\_\_\_

	When did your trip...		Traveled by	Traveled with	Where did you go?	
	Start?	End?			Description	Address/Intersection
Example	8:05AM	8:35AM	Car	Eloise	Daycare	99 Spring St., Seattle
Example	8:50AM	9:10AM	Walking	ryfs	Work	701 5th Ave., Seattle
1st Trip						
2nd Trip						
3rd Trip						
4th Trip						
5th Trip						
6th Trip						
7th Trip						
8th Trip						
9th Trip						
10th Trip						

DAY 2 Name \_\_\_\_\_ Travel Date \_\_\_\_\_

	When did your trip...		Traveled by	Traveled with	Where did you go?	
	Start?	End?			Description	Address/Intersection
Example	8:15AM	8:50AM	Car, then Bus	Mark & Jim	Work	701 5th Ave., Seattle
Example	10:45AM	10:55AM	Walking	Steve	Coffee	Columbia St. & 3rd, Seattle
1st Trip						
2nd Trip						
3rd Trip						
4th Trip						
5th Trip						
6th Trip						
7th Trip						
8th Trip						
9th Trip						
10th Trip						

This sheet is for your use only. We do not need you to return this form.  
 If you have questions, please email [seattle@rgsurvey.com](mailto:seattle@rgsurvey.com)



- ❑ Memory Jogger
- ❑ Reminder postcards and emails

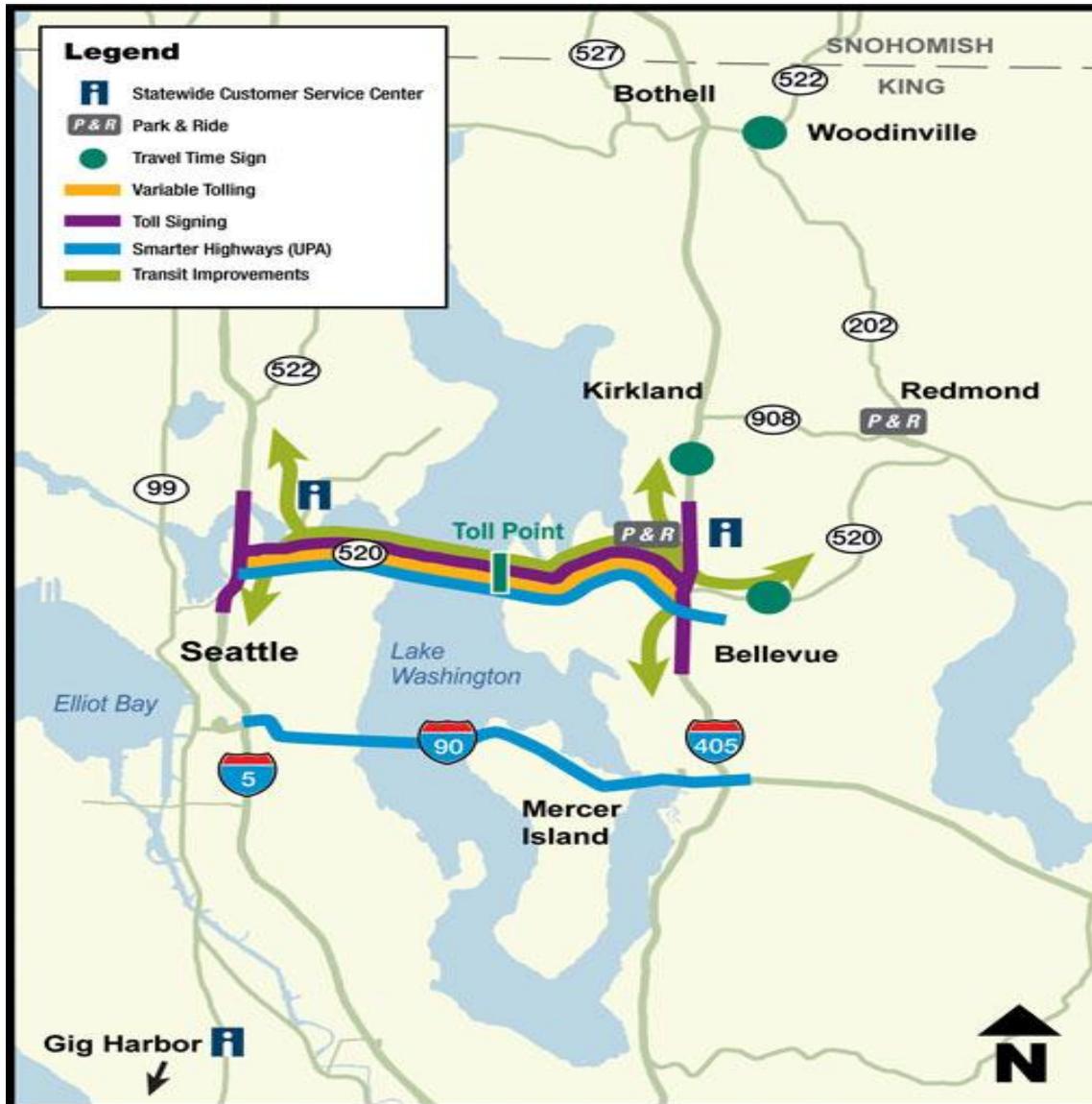
# Overall Response and Sample Size Summary

	Seattle	Atlanta
Net Survey Invitations	31,873	37,888
Wave 1 Completed Households (Entire Survey Completed by All Adult Household Members)	3356	2412
Wave 1 Response Rate (As Share of Initial Contacts)	10%	6%
Households Retained in Wave 2	<b>2063</b>	<b>1655</b>
Wave 1 to Wave 2 Panel Retention Rate	61%	69%
Overall Response Rate (as Share of Initial Contacts, by Mode)	6%	4%

# Sample Demographics

- ❑ Panels were demographically similar to other survey samples of their regions/corridors
- ❑ However, compared to the Census, there were higher levels of education and income; more respondents from middle age groups

# Seattle: SR-520 Project Overview



# External Factors

- ❑ Gasoline prices: increased 35% from Wave 1 (\$3.06) to Wave 2 (\$4.13)
- ❑ Transit fares: base Metro bus fare up \$0.25 per ride since Wave 1
- ❑ Employment levels: total nonfarm employees in region about 3% higher in Wave 2

# Results: Overall Travel

- ❑ Significant drop in overall corridor travel, especially on SR-520
- ❑ Not offset by any increase in off-corridor travel
- ❑ Diary data consistent with respondents' self-estimates of "typical" weekly travel

Travel Diary Summary, Wave 1 to Wave 2

	Trip Segment Count	Imputed VMT
<b>Overall Corridor</b>	<b>-18%</b>	<b>-23%</b>
<i>SR-520</i>	<i>-43%</i>	<i>-50%</i>
<i>I-90</i>	<i>-13%</i>	<i>+1%</i>
Non-Corridor	-13%	-9%
<b>TOTAL</b>	<b>-14%</b>	<b>-17%</b>

*"I do what I can to avoid the premium rate and any travel to Seattle that isn't necessary, i.e. I used to hop over to the U-Village or City People's on a regular basis. Not any more."*

# Mode Choice

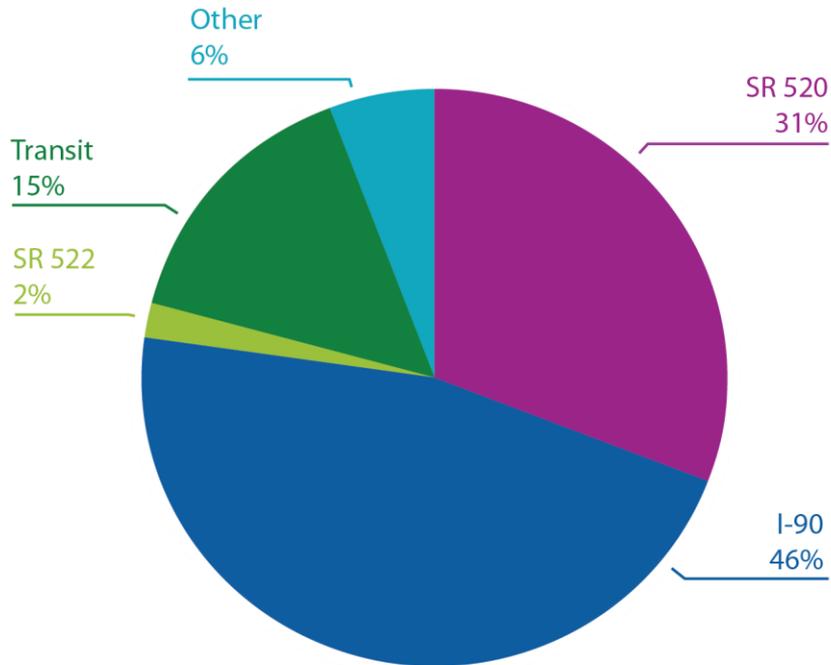
- ❑ Transit mode share on corridor rose from 15% to 18%
- ❑ Share of commuters reporting transit as a “typical” commute mode rose 1.5 percentage points
- ❑ Avoiding tolls was common motivation for switching to transit (45%) but respondents also mentioned reduced stress (44%) and gasoline costs (39%); few cited improved bus service (8%)

*“I have also been taking the bus with some frequency. I expected to be inconvenienced by these changes, but surprisingly, I do not feel that way. I enjoy my new travel arrangements.”*

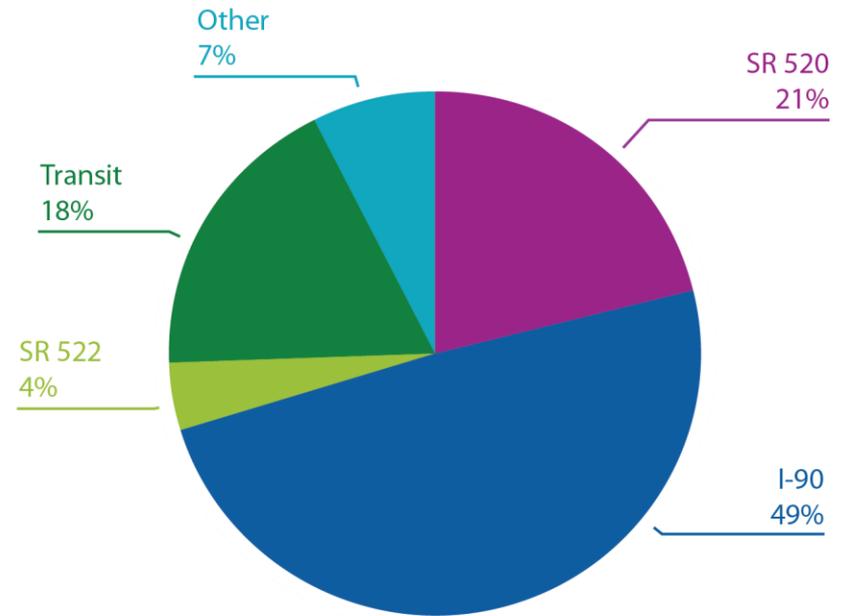
# Route Choice

- ❑ SR-520's share of corridor trips fell, while shares for I-90 and SR-522 both increased
- ❑ 86% of those who switched from SR-520 to I-90 or SR-522 cited avoiding the toll as a motivation; no other factor came close

# Summary of Lake Wash. Corridor Trips by Route/Mode



Wave 1



Wave 2

# Trip Purpose

Biggest Drops in VMT, Wave 1 to Wave 2		Most Stable, Wave 1 to Wave 2	
Shopping	-29%	Social/rec.	+1%
Dining	-29%	Child care	-1%
Pick-up/Drop-off	-27%	Return home	-14%
School	-26%	Go to work	-17%

*“We have greatly reduced our trips to the eastside, except for our child, who takes a school bus now.”*

# Vehicle Occupancy

- ❑ Mean private vehicle occupancies rose slightly on corridor, 1.48 to 1.56
- ❑ On SR-520, rose from 1.42 to 1.61; solo trips fell from 76% to 69%
- ❑ However, no indications of a major shift to carpooling for commuting; held steady at 13%-14%

# Telecommuting

- ❑ Two measurements: recorded telecommuting on assigned travel days & self-reported typical telecommuting
- ❑ Both showed no significant change from Wave 1 to Wave 2
- ❑ About 15% of employed respondents telecommuted during at least part of one assigned travel day
- ❑ In follow-up questions, any changes to telecommuting patterns were most frequently attributed to work-related factors, not transportation- or toll-related

*“It has motivated us to take transit or telecommute as much as possible, but that's not always do-able.”*

# Trip Departure Time

- Little net change in the peak vs. off-peak distribution of trips in the corridor
  - On I-90, peak share fell from 61% to 56%
  - On SR-520, peak share rose from 53% to 57%

*“Because traffic has increased on the I-90 bridge due to the 520 tolling, I leave 15 minutes earlier from both home and work to try to beat the congestion on Mercer Island.”*

*“Decreased traffic means I can sleep in later in the morning and get to/from work faster.”*

# Origin-Destination Patterns

- ❑ Cross-lake travel declined slightly more than overall travel (-18% vs. -14%)
- ❑ Open-ended comments frequently mention staying on own side of Lake Washington
  - Otherwise, there do not appear to be other large shifts in overall O-D patterns
  - We are analyzing in GIS in more detail

# Tracking the Choices of SR-520 Users

- ❑ Among those using SR-520 as their primary route in Wave 1:
  - 55% were still using it in Wave 2
  - 24% switched to I-90
  - 7% switched to SR-522
  - 8% switched to transit
  - 4% switched to another route/mode
  - 1% no longer crossed the lake regularly
- ❑ Those who switched to I-90 were more likely to be male, lower-income, with less schedule flexibility

# Trip Satisfaction Ratings

- ❑ There was a significant increase in trip satisfaction levels on SR-520
  - For example, for peak-period trips, mean score on satisfaction with travel speed on SR-520 rose from 3.4 to 5.2 (on 7-point scale)
- ❑ Satisfaction with I-90 trips fell slightly, especially among existing I-90 users
- ❑ On transit, satisfaction was mixed: up slightly for travel time, down slightly for seating availability

# Equity Issues and Toll Payment

- ❑ Transponder ownership and use of pay-by-plate were both correlated with higher incomes
- ❑ Higher income HHs generally paying more tolls
  - Highest income HHs (>\$200K) recorded about \$3 in tolls paid over 2-day period, vs. about \$1 for HHs under \$50K
  - Avg. toll paid was roughly equal (c. \$3) – difference was in the number of trips
- ❑ Lower-income HHs cut back on travel much more
  - HHs below 3x poverty level: Cross-lake trips down 38%, esp. in “discretionary” trip categories
  - HHs over 3x poverty level: Cross-lake trips also down, but only by 18%-19%

# Recap of Key Survey Findings

- ❑ Significant decline in overall Lake Washington corridor travel, particularly on SR-520
- ❑ Diversion to toll-free alternative routes & transit
- ❑ Small increases in vehicle occupancy on SR-520
- ❑ Some small variations in trip-making behavior by purpose and destination
- ❑ Little to no change in telecommuting

# Recap of Key Survey Findings

- ❑ Demographic differences between those who stayed with SR-520 vs. switched to I-90
- ❑ Significant increase in trip satisfaction levels for trips on SR-520
- ❑ Differences in response to tolling among income groups

# Planned Future Work

- ❑ GIS-based analysis of changes in origin-destination patterns
- ❑ Archiving of anonymized survey data for use by other researchers

# Thank you!

Sean Peirce

sean.peirce@dot.gov

# Study Motivation

- ❑ Since UPA/CRD are demonstration programs, strong emphasis on evaluation and learning
  - FHWA-sponsored evaluation at all six UPA sites, plus in-depth household surveys in **Seattle** and **Atlanta** to study impacts on traveler behavior
- ❑ Survey addresses the impacts of tolling on:
  - Route and mode choice
  - Trip departure times
  - Origin-destination patterns
  - Overall VMT and daily travel time budgets
  - Carpooling
  - Telecommuting
  - Equity

# Outline

- ❑ Survey Methodology Summary
- ❑ Key Findings from Seattle
- ❑ Recap/ Future Work

# Approach and Methodology

- ❑ Household Panel Study: same households before and after tolling
  - 2-day travel diary plus questions on demographics, typical commute, technology ownership, attitudes and values
- ❑ Sample corridor users
  - Drivers: license plate capture during AM and PM peak, with match to registered address; mail study invitations to households
  - Transit intercept in-person
  - Vanpool members: via email to vanpool participants
- ❑ Invite ALL adult members of household to participate
- ❑ Online survey with option to take by phone
- ❑ Pilot Study
- ❑ Incentives (\$15/\$30 Amazon gift card)
- ❑ Panel maintenance
- ❑ Focus groups in Seattle to get initial impressions of tolling & refine Wave 2 survey
- ❑ Weighting of data to adjust for stratified sampling approach



# Survey Invitation

- ❑ Advance notification postcard
- ❑ Introductory letter
- ❑ FAQs

**Lake Washington Transportation Study**  
**MEMORY JOGGER**

To log your trips, go to  
<http://www.rgsurvey.com/seattle/portal>

DAY 1 Name \_\_\_\_\_ Travel Date \_\_\_\_\_

	When did your trip...		Traveled by	Traveled with	Where did you go?	
	Start?	End?			Description	Address/Intersection
Example	8:05AM	8:35AM	Car	Eloise	Daycare	99 Spring St., Seattle
Example	8:50AM	9:10AM	Walking	ryfs	Work	701 5th Ave., Seattle
1st Trip						
2nd Trip						
3rd Trip						
4th Trip						
5th Trip						
6th Trip						
7th Trip						
8th Trip						
9th Trip						
10th Trip						

DAY 2 Name \_\_\_\_\_ Travel Date \_\_\_\_\_

	When did your trip...		Traveled by	Traveled with	Where did you go?	
	Start?	End?			Description	Address/Intersection
Example	8:15AM	8:50AM	Car, then Bus	Mark & Jim	Work	701 5th Ave., Seattle
Example	10:45AM	10:55AM	Walking	Steve	Coffee	Columbia St. & 3rd, Seattle
1st Trip						
2nd Trip						
3rd Trip						
4th Trip						
5th Trip						
6th Trip						
7th Trip						
8th Trip						
9th Trip						
10th Trip						

This sheet is for your use only. We do not need you to return this form.  
 If you have questions, please email [seattle@rgsurvey.com](mailto:seattle@rgsurvey.com)



- ❑ Memory Jogger
- ❑ Reminder postcards and emails

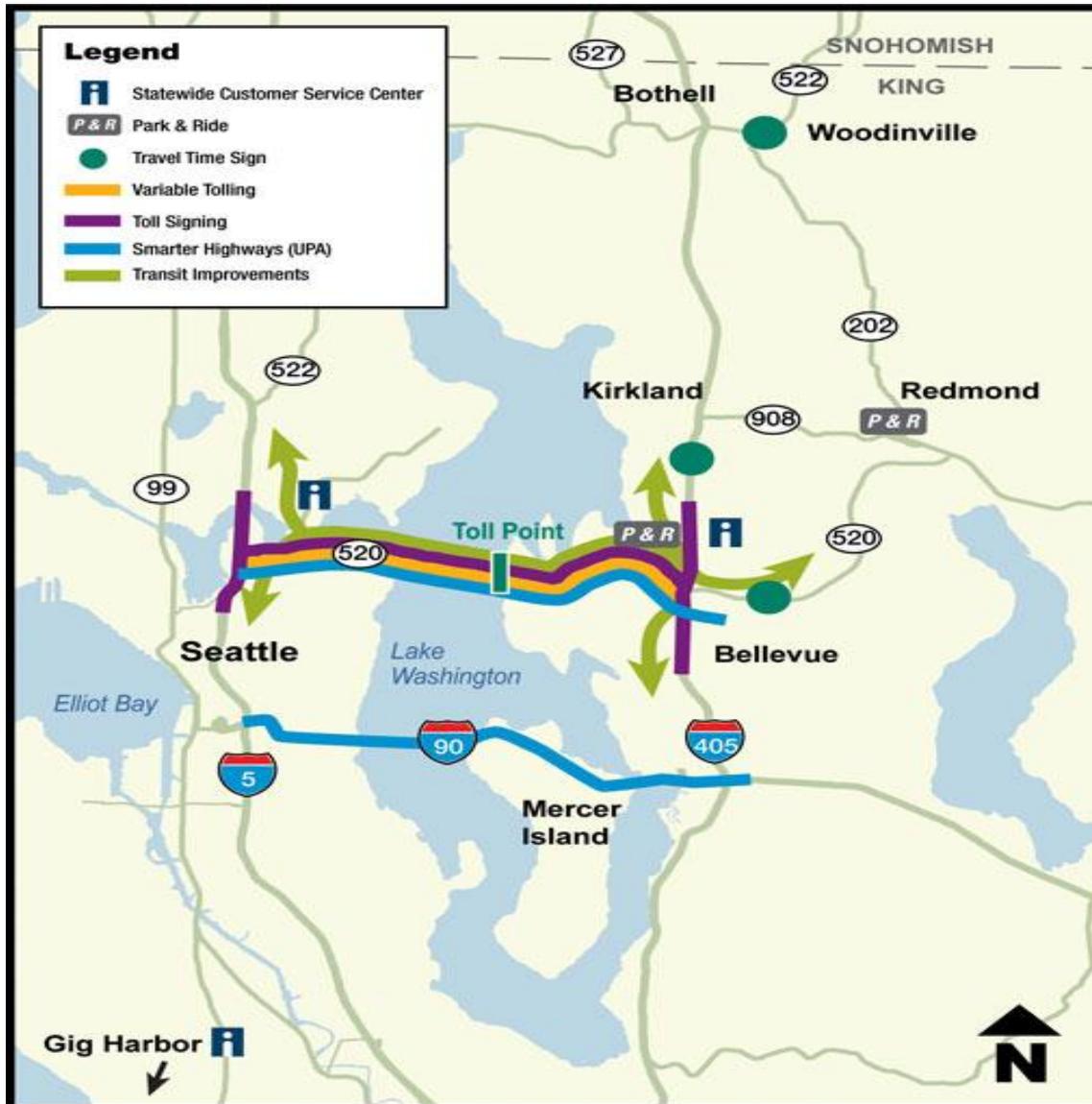
# Overall Response and Sample Size Summary

	Seattle	Atlanta
Net Survey Invitations	31,873	37,888
Wave 1 Completed Households (Entire Survey Completed by All Adult Household Members)	3356	2412
Wave 1 Response Rate (As Share of Initial Contacts)	10%	6%
Households Retained in Wave 2	<b>2063</b>	<b>1655</b>
Wave 1 to Wave 2 Panel Retention Rate	61%	69%
Overall Response Rate (as Share of Initial Contacts, by Mode)	6%	4%

# Sample Demographics

- ❑ Panels were demographically similar to other survey samples of their regions/corridors
- ❑ However, compared to the Census, there were higher levels of education and income; more respondents from middle age groups

# Seattle: SR-520 Project Overview



# External Factors

- ❑ Gasoline prices: increased 35% from Wave 1 (\$3.06) to Wave 2 (\$4.13)
- ❑ Transit fares: base Metro bus fare up \$0.25 per ride since Wave 1
- ❑ Employment levels: total nonfarm employees in region about 3% higher in Wave 2

# Results: Overall Travel

- ❑ Significant drop in overall corridor travel, especially on SR-520
- ❑ Not offset by any increase in off-corridor travel
- ❑ Diary data consistent with respondents' self-estimates of "typical" weekly travel

Travel Diary Summary, Wave 1 to Wave 2

	Trip Segment Count	Imputed VMT
<b>Overall Corridor</b>	<b>-18%</b>	<b>-23%</b>
SR-520	-43%	-50%
I-90	-13%	+1%
Non-Corridor	-13%	-9%
<b>TOTAL</b>	<b>-14%</b>	<b>-17%</b>

*"I do what I can to avoid the premium rate and any travel to Seattle that isn't necessary, i.e. I used to hop over to the U-Village or City People's on a regular basis. Not any more."*

# Mode Choice

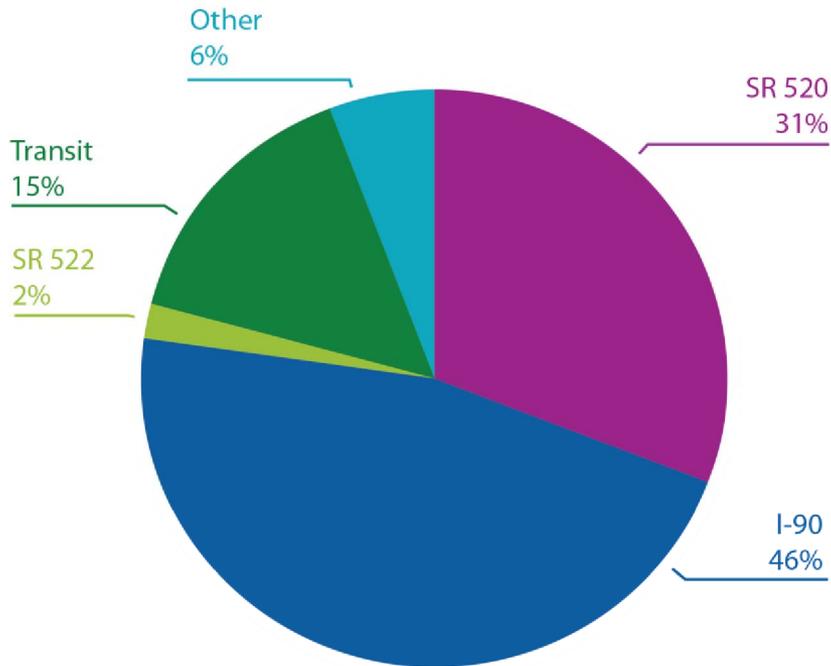
- ❑ Transit mode share on corridor rose from 15% to 18%
- ❑ Share of commuters reporting transit as a “typical” commute mode rose 1.5 percentage points
- ❑ Avoiding tolls was common motivation for switching to transit (45%) but respondents also mentioned reduced stress (44%) and gasoline costs (39%); few cited improved bus service (8%)

*“I have also been taking the bus with some frequency. I expected to be inconvenienced by these changes, but surprisingly, I do not feel that way. I enjoy my new travel arrangements.”*

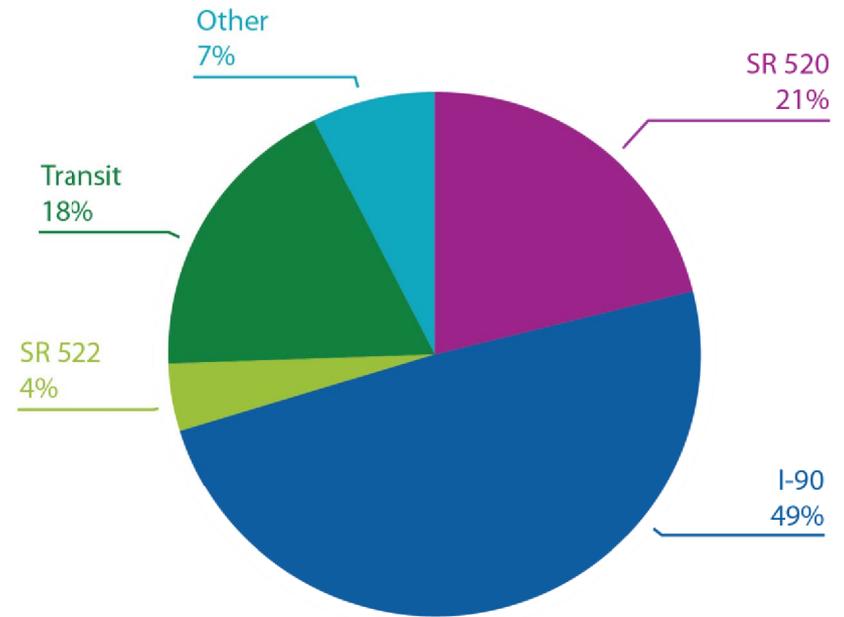
# Route Choice

- ❑ SR-520's share of corridor trips fell, while shares for I-90 and SR-522 both increased
- ❑ 86% of those who switched from SR-520 to I-90 or SR-522 cited avoiding the toll as a motivation; no other factor came close

# Summary of Lake Wash. Corridor Trips by Route/Mode



Wave 1



Wave 2

# Trip Purpose

Biggest Drops in VMT, Wave 1 to Wave 2		Most Stable, Wave 1 to Wave 2	
Shopping	-29%	Social/rec.	+1%
Dining	-29%	Child care	-1%
Pick-up/Drop-off	-27%	Return home	-14%
School	-26%	Go to work	-17%

*“We have greatly reduced our trips to the eastside, except for our child, who takes a school bus now.”*

# Vehicle Occupancy

- ❑ Mean private vehicle occupancies rose slightly on corridor, 1.48 to 1.56
- ❑ On SR-520, rose from 1.42 to 1.61; solo trips fell from 76% to 69%
- ❑ However, no indications of a major shift to carpooling for commuting; held steady at 13%-14%

# Telecommuting

- ❑ Two measurements: recorded telecommuting on assigned travel days & self-reported typical telecommuting
- ❑ Both showed no significant change from Wave 1 to Wave 2
- ❑ About 15% of employed respondents telecommuted during at least part of one assigned travel day
- ❑ In follow-up questions, any changes to telecommuting patterns were most frequently attributed to work-related factors, not transportation- or toll-related

*“It has motivated us to take transit or telecommute as much as possible, but that's not always do-able.”*

# Trip Departure Time

- Little net change in the peak vs. off-peak distribution of trips in the corridor
  - On I-90, peak share fell from 61% to 56%
  - On SR-520, peak share rose from 53% to 57%

*“Because traffic has increased on the I-90 bridge due to the 520 tolling, I leave 15 minutes earlier from both home and work to try to beat the congestion on Mercer Island.”*

*“Decreased traffic means I can sleep in later in the morning and get to/from work faster.”*

# Origin-Destination Patterns

- ❑ Cross-lake travel declined slightly more than overall travel (-18% vs. -14%)
- ❑ Open-ended comments frequently mention staying on own side of Lake Washington
  - Otherwise, there do not appear to be other large shifts in overall O-D patterns
  - We are analyzing in GIS in more detail

# Tracking the Choices of SR-520 Users

- ❑ Among those using SR-520 as their primary route in Wave 1:
  - 55% were still using it in Wave 2
  - 24% switched to I-90
  - 7% switched to SR-522
  - 8% switched to transit
  - 4% switched to another route/mode
  - 1% no longer crossed the lake regularly
- ❑ Those who switched to I-90 were more likely to be male, lower-income, with less schedule flexibility

# Trip Satisfaction Ratings

- ❑ There was a significant increase in trip satisfaction levels on SR-520
  - For example, for peak-period trips, mean score on satisfaction with travel speed on SR-520 rose from 3.4 to 5.2 (on 7-point scale)
- ❑ Satisfaction with I-90 trips fell slightly, especially among existing I-90 users
- ❑ On transit, satisfaction was mixed: up slightly for travel time, down slightly for seating availability

# Equity Issues and Toll Payment

- ❑ Transponder ownership and use of pay-by-plate were both correlated with higher incomes
- ❑ Higher income HHs generally paying more tolls
  - Highest income HHs (>\$200K) recorded about \$3 in tolls paid over 2-day period, vs. about \$1 for HHs under \$50K
  - Avg. toll paid was roughly equal (c. \$3) – difference was in the number of trips
- ❑ Lower-income HHs cut back on travel much more
  - HHs below 3x poverty level: Cross-lake trips down 38%, esp. in “discretionary” trip categories
  - HHs over 3x poverty level: Cross-lake trips also down, but only by 18%-19%

# Recap of Key Survey Findings

- ❑ Significant decline in overall Lake Washington corridor travel, particularly on SR-520
- ❑ Diversion to toll-free alternative routes & transit
- ❑ Small increases in vehicle occupancy on SR-520
- ❑ Some small variations in trip-making behavior by purpose and destination
- ❑ Little to no change in telecommuting

# Recap of Key Survey Findings

- ❑ Demographic differences between those who stayed with SR-520 vs. switched to I-90
- ❑ Significant increase in trip satisfaction levels for trips on SR-520
- ❑ Differences in response to tolling among income groups

# Planned Future Work

- ❑ GIS-based analysis of changes in origin-destination patterns
- ❑ Archiving of anonymized survey data for use by other researchers

# Thank you!

Sean Peirce

sean.peirce@dot.gov