



Gen3 Model Development Project

Travel Forecasting Subcommittee Meeting

March 25, 2022

IN PARTNERSHIP WITH



Metropolitan Washington
Council of Governments

Discussion Topics

- Phase 1 Sensitivity Testing Results
- Phase 2 Development Tasks and Schedule





Phase 1 Sensitivity Testing

Purpose of Sensitivity Tests

- Systematically vary model inputs to better understand model sensitivities across a range of potential policies
- Inform Phase 2 scope
- Knowledge transfer from RSG to COG: Setup and run model and output summary procedures
- Results are not final – tests will be repeated in Phase 2!

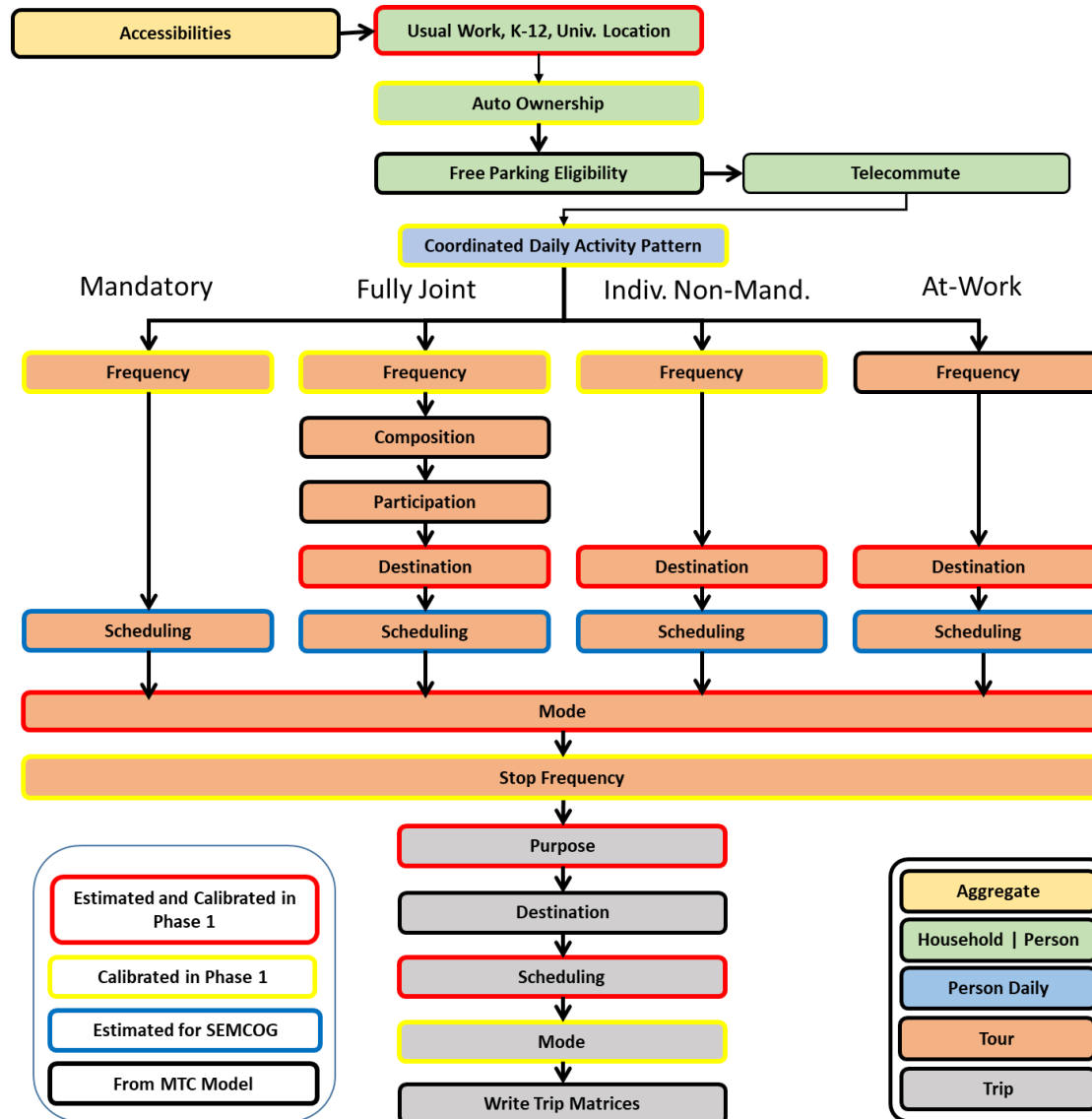


Sensitivity Tests Run with Gen3 Phase 1 Model

- Increased Auto Operating Cost (RSG/BMG)
- District of Columbia Increased Telecommuting (RSG/BMG)
- Arlington Memorial Bridge Closed to Auto and Truck Traffic (COG)
- Frequency of All High-Capacity Transit Services Doubled (COG)
- Peak-period Toll Rates Increased by 50% (COG)



GEN3 PHASE 1 MODEL STRUCTURE





Increased Auto Operating Cost

Increased Auto Operating Cost Test

- Auto operating cost in model includes the cost of fuel, maintenance, repair, and tires and is averaged across all vehicle types (based on AAA Your Driving Costs 2018)
- Auto operating cost used in tour and trip mode choice models was increased by 10 cents per mile (from 19.26 cents per mile to 29.26 cents per mile, 52% increase)
- Emulates a vehicle-mile tax policy scenario
- Does not affect commercial vehicles, external-internal trips, or other 'special market' models
- Baseline auto operating cost (AOC) is based on AAA reported average AOC for 2018
 - Discovered and fixed bug where trip mode choice AOC was not consistent



Increased Auto Operating Cost: Expectations

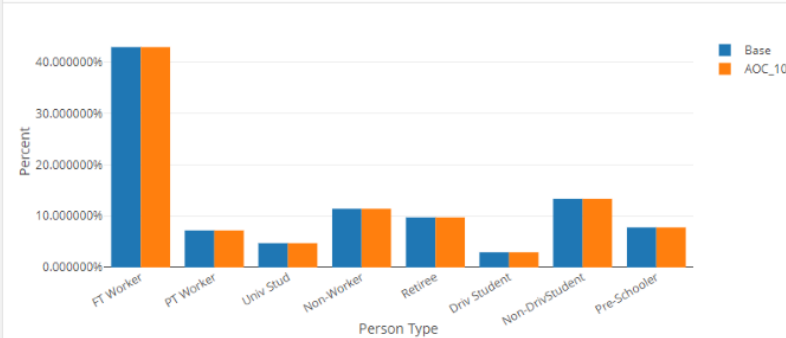
- Small changes to tour frequency (especially mandatory tour frequency) - models are affected by tour mode choice logsums but change in cost is not huge compared to other variables in model
- Decreased tour length and stop out-of-direction length due to increased cost of auto
- Mode shifts from auto to non-motorized and transit modes
- Somewhat lower fewer stops generated per tour as tour lengths decrease
- Decreased vehicle miles of travel and total estimated traffic due to decreases in the magnitude of travel, decreased tour and trip length, and decreased auto mode share
- Increased transit boardings due to increased transit mode share



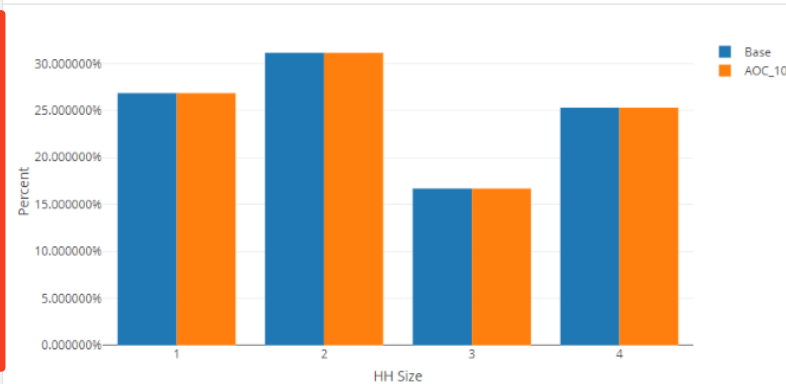
Increased Auto Operating Cost: Overview

Base	AOC_10
Sample Rate: 100%	Sample Rate: 100%
7,250,066 Population	7,250,066 Population
2,790,357 Households	2,790,357 Households
8,928,377 Total Tours	8,931,239 Total Tours
23,216,628 Total Trips	23,189,941 Total Trips
5,359,874 Total Stops	5,327,463 Total Stops
106,098,762 Total VMT	100,706,264 Total VMT

Person Type Distribution



Household Size Distribution (non-GQ)



Base	AOC_10
Tours per Person 1.23	Tours per Person 1.23
Trips per Person 3.2	Trips per Person 3.2
Stops per Person 0.74	Stops per Person 0.73
Trips per Household 8.32	Trips per Household 8.31



Increased Auto Operating Cost: Tour Lengths

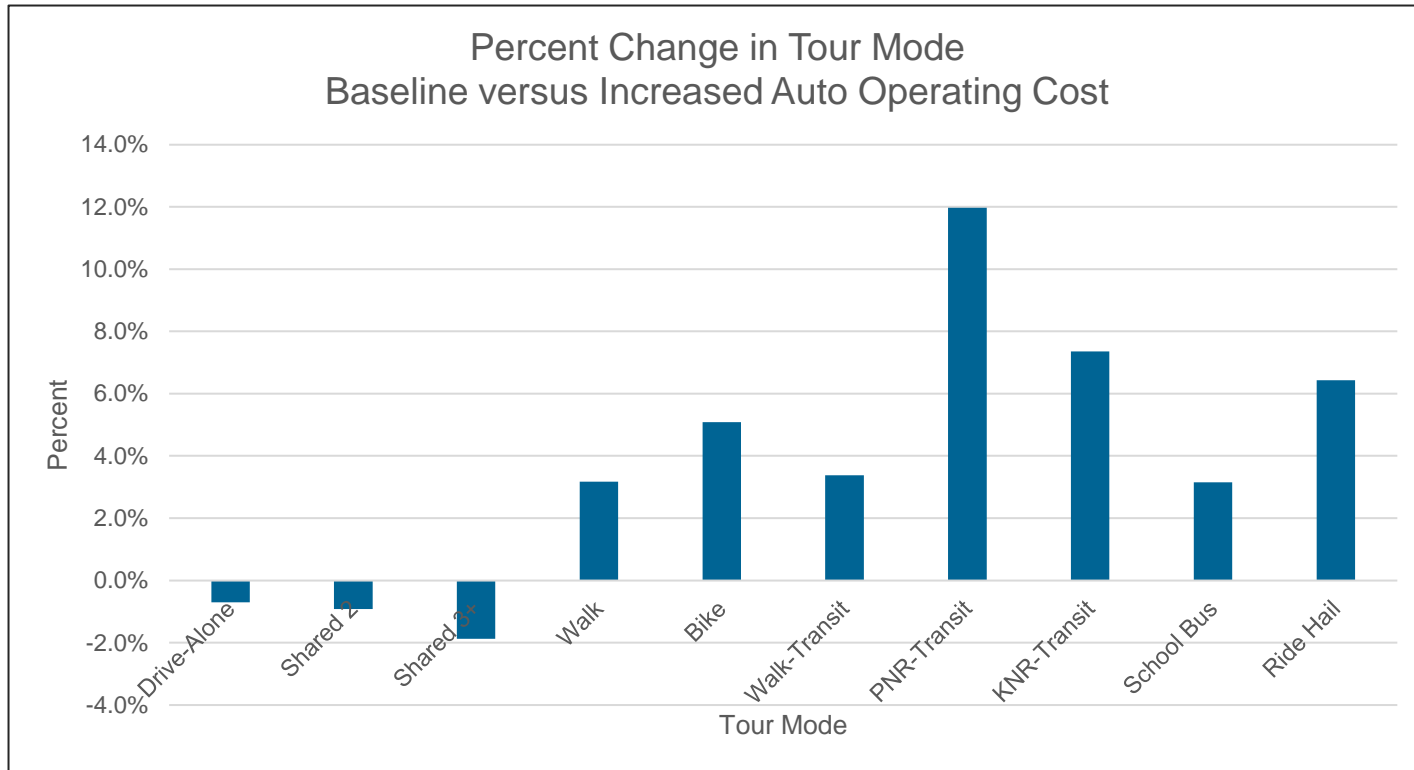
Purpose	Baseline Scenario	AOC Scenario	Difference	Percent Difference
Work	13.0	12.8	-0.2	-1.3%
University	6.5	6.3	-0.2	-2.5%
School	4.0	3.9	-0.1	-1.8%
Escorting	4.3	4.0	-0.3	-6.1%
Individual Maintenance	5.7	5.3	-0.4	-6.5%
Individual Discretionary	6.2	5.7	-0.5	-8.7%
Joint Maintenance	7.2	6.6	-0.6	-7.8%
Joint Discretionary	7.3	6.5	-0.8	-10.3%
At-Work	5.0	4.9	-0.2	-3.0%
Total	5.9	5.5	-0.4	-7.5%

Decreases in all tour lengths as expected

Greater decreases in non-mandatory tour purposes as expected



Increased Auto Operating Cost: Tour Mode



Auto modes decrease, non-motorized and transit increase

Shared-ride decreases by more than drive-alone (AOC not divided by occupancy)

Similar changes observed for trip mode choice (not shown)



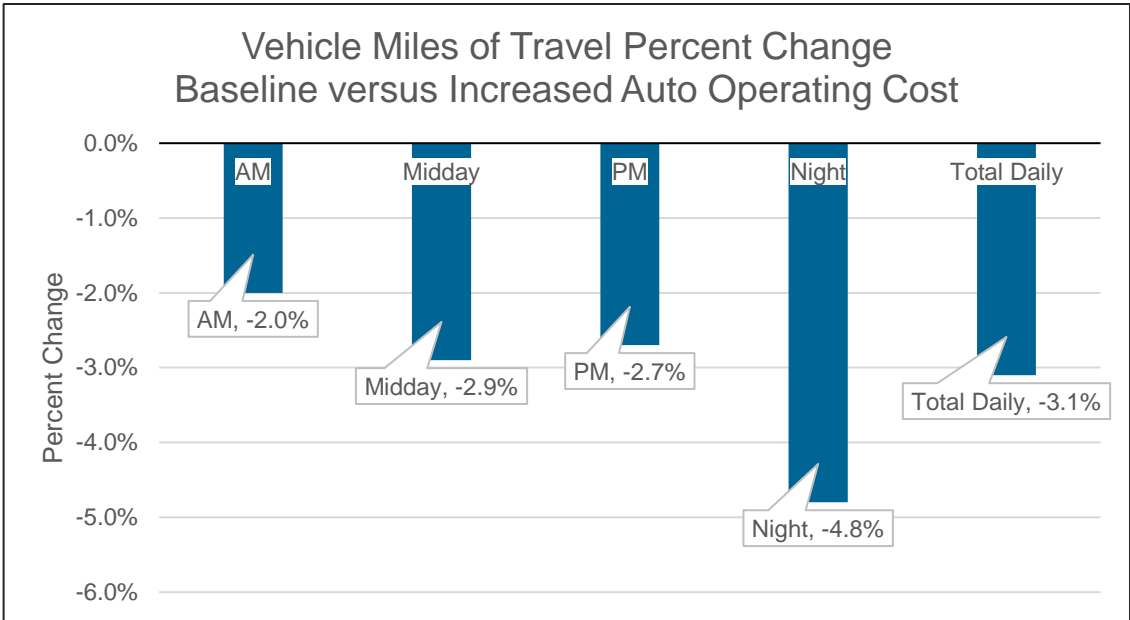
Increased Auto Operating Cost: Intermediate Stop Distance Comparison

Tour_Purpose	Baseline Scenario (mi)	AOC Scenario (mi)	Difference (mi)	Percent Difference
Work	3.5	3.2	-0.3	-9.4%
University	3.7	3.3	-0.4	-10.8%
School	3.6	3.2	-0.4	-12.2%
Escorting	3.6	3.2	-0.4	-9.7%
Individual Maintenance	3.5	3.2	-0.3	-9.3%
Individual Discretionary	3.6	3.2	-0.4	-9.7%
Joint Maintenance	3.7	3.3	-0.4	-10.4%
Joint Discretionary	3.6	3.2	-0.4	-10.1%
At-Work	2.2	2.0	-0.2	-9.4%
Total	3.5	3.2	-0.3	-9.7%

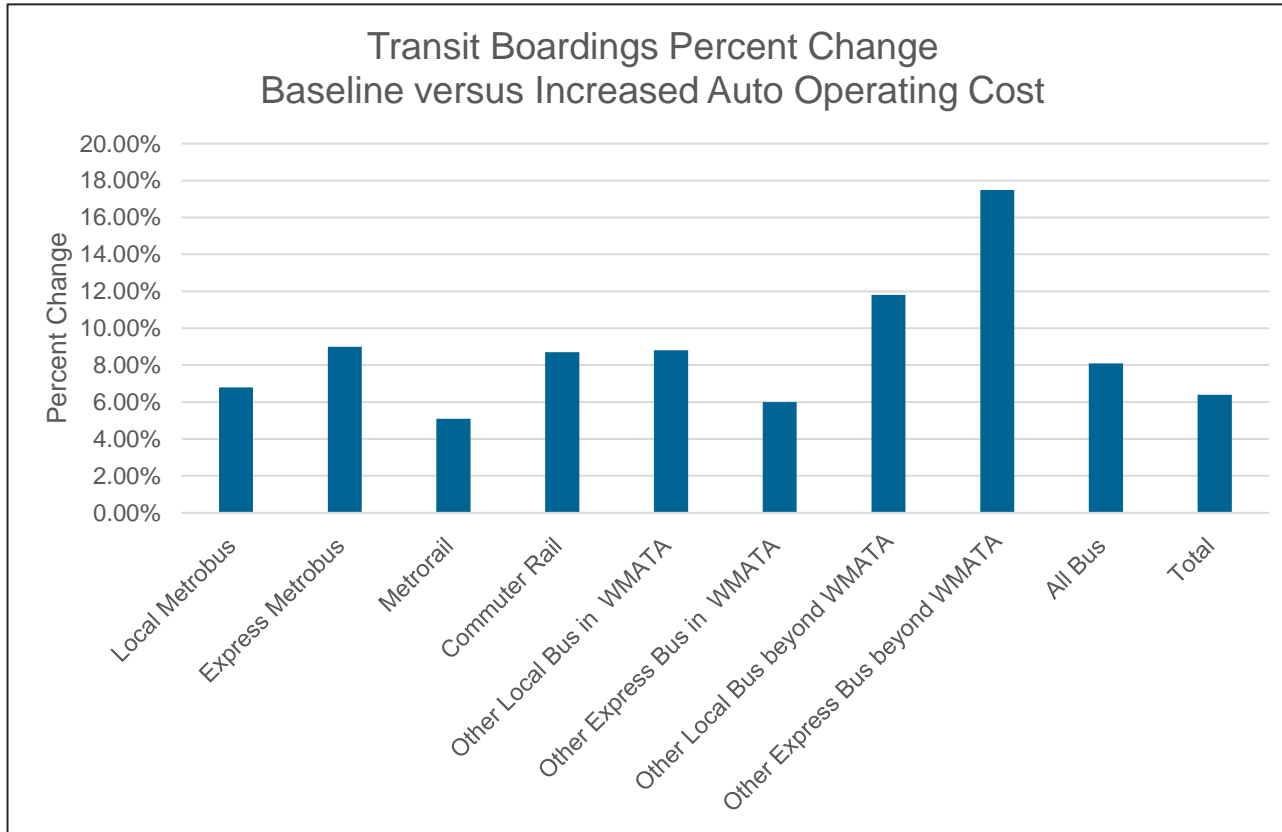
Decreased intermediate stop location distances across all tour purposes



Increased Auto Operating Cost: Vehicle Miles of Travel



Increased Auto Operating Cost: Transit Boarding Comparison





Increased District of Columbia Telecommuting

Increased D.C. Telecommuting Scenario

- Adjusted the telecommute frequency model to reflect a higher share of telecommuting for workers with a workplace in the District of Columbia (DC)
- Can represent the types of travel changes that might be expected if there were a large increase in telecommuting to DC, which could occur during a pandemic or in reaction to a strategy designed to lower greenhouse gas (GHG) emissions
- Telecommute frequency model predicts the frequency of telecommuting for every worker in the synthetic population with a usual out-home workplace
 - No telecommuting or less than 1 day per week
 - Telecommutes 1 day per week
 - Telecommutes 2-3 days per week
 - Telecommutes 4 or more days per week



Calculating Telecommute Frequency Targets for D.C. Workers

Assumed telecommute frequency shares by employment type in D.C.

Employment Type	1-day	2-3 days	4 days
Industrial	20%	10%	5%
Retail	10%	0%	0%
Office	0%	20%	60%
Other	20%	10%	5%

Employment by Type in D.C.

Employment Type	Percent
Industrial	4%
Retail	10%
Office	79%
Other	6%



Telecommute Frequency	Initial Share	Target Share	Final Share
Less than 1 day per week	82%	32%	34%
1 day per week	8%	3%	3%
2-3 days per week	7%	17%	16%
4+ days per week	3%	48%	47%
Total	100%	100%	100%

Telecommute frequency model calibrated to target shares for workers in D.C.

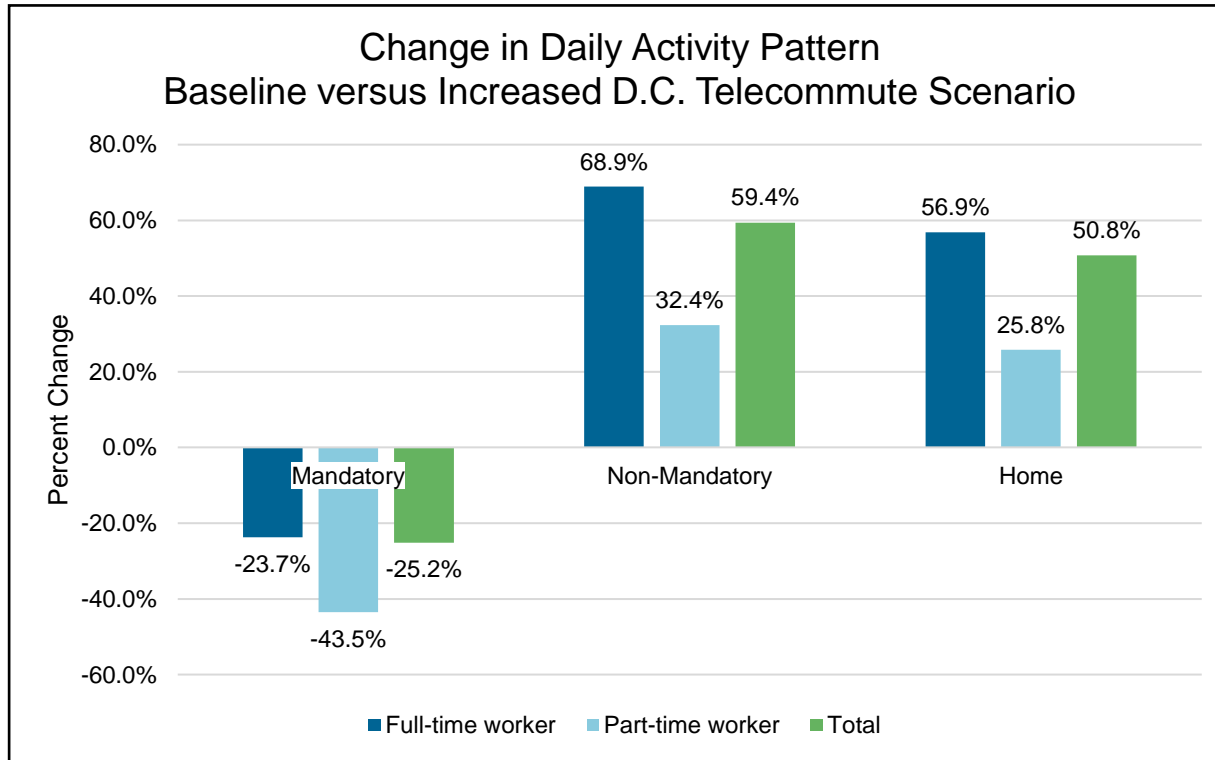


Increased D.C. Telecommute Scenario: Expectations

- A decrease in the share of workers who work in DC with a mandatory activity pattern, and a corresponding decrease in work travel for those workers
- An increase in non-mandatory travel for workers who work in DC, since people who work from home are more likely to make non-work trips during the day
- Some offsetting changes to non-mandatory travel in terms of less trips per tour (since non-mandatory travel for telecommuting workers tends to be less complex than for others)
- A decrease in total trips to DC, vehicle miles of travel, and transit boardings



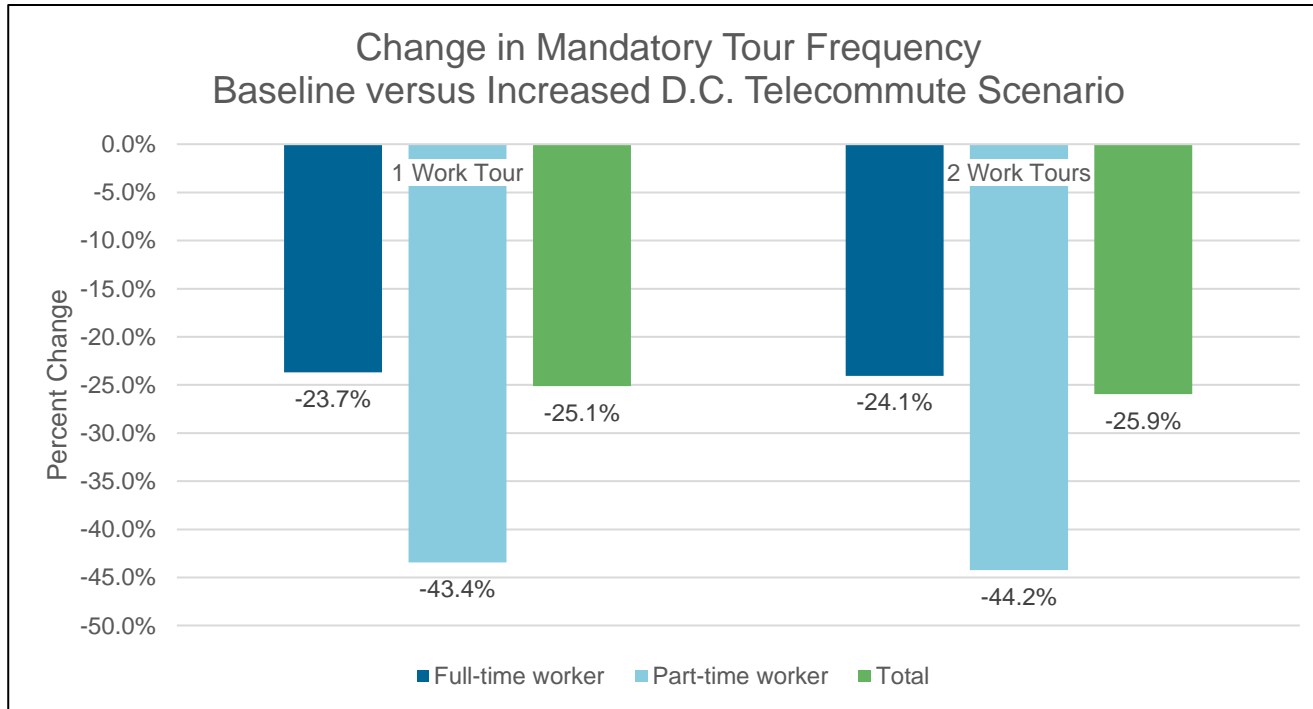
Increased D.C. Telecommute Scenario: Change in Daily Activity Pattern



Summary limited to workers who work in D.C.
Decrease in Mandatory patterns
Increase in Non-mandatory and (Stay at) Home patterns



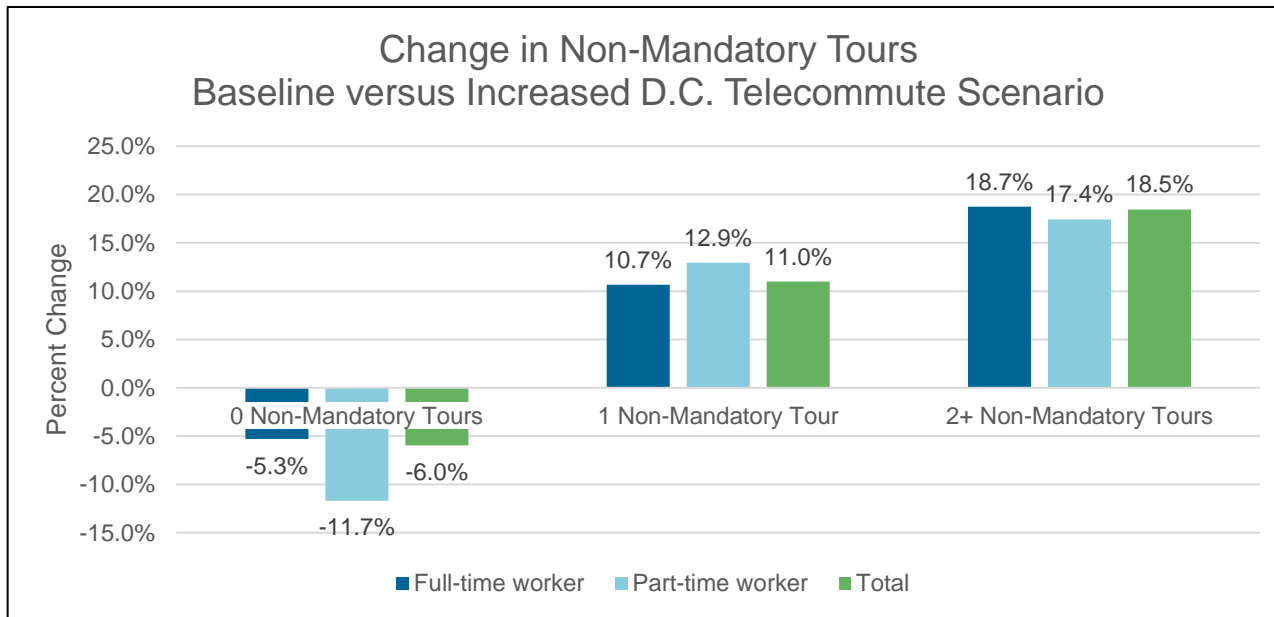
Increased D.C. Telecommute Scenario: Change in Work Tours



Decreases in work tours for all workers who work in D.C.
Larger percent decrease for part-time workers



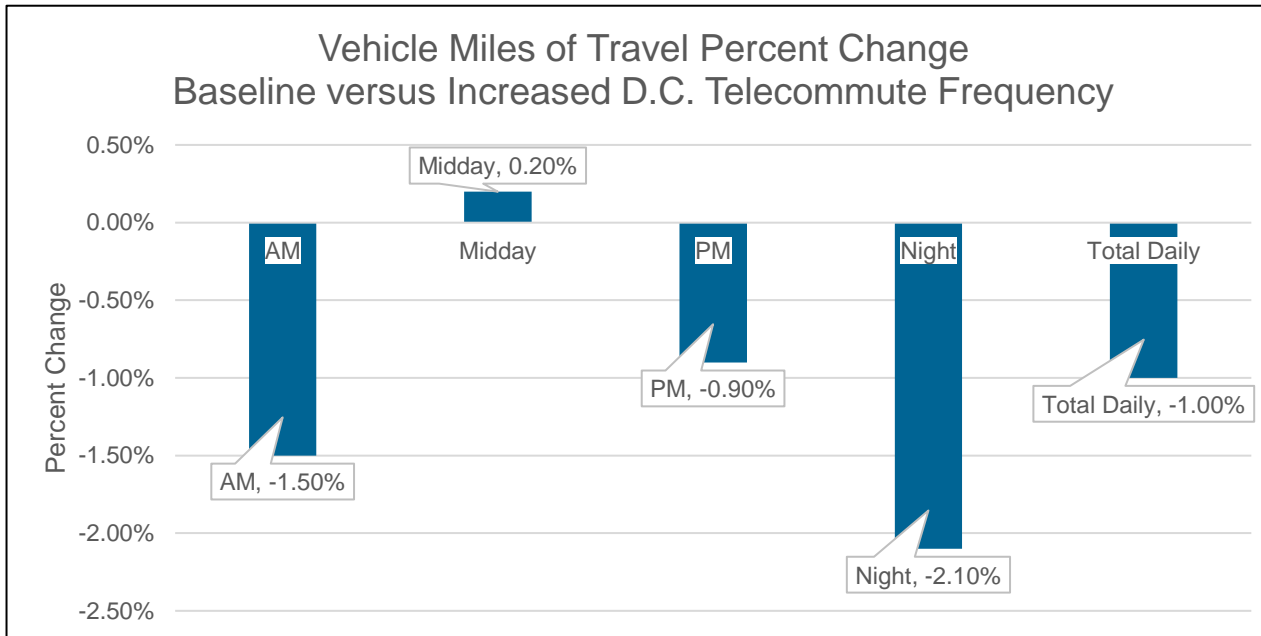
Increased D.C. Telecommute Scenario: Change in Non-Mandatory Tours



Decreased share of workers who make no non-mandatory tours
Increased share of workers with 1 and 2+ non-mandatory tours



Increased D.C. Telecommute Scenario: Frequency Vehicle Miles of Travel



Small “bounce-back” effect in Midday period
Decreases in other time periods
D.C. VMT decreases by 3.4%

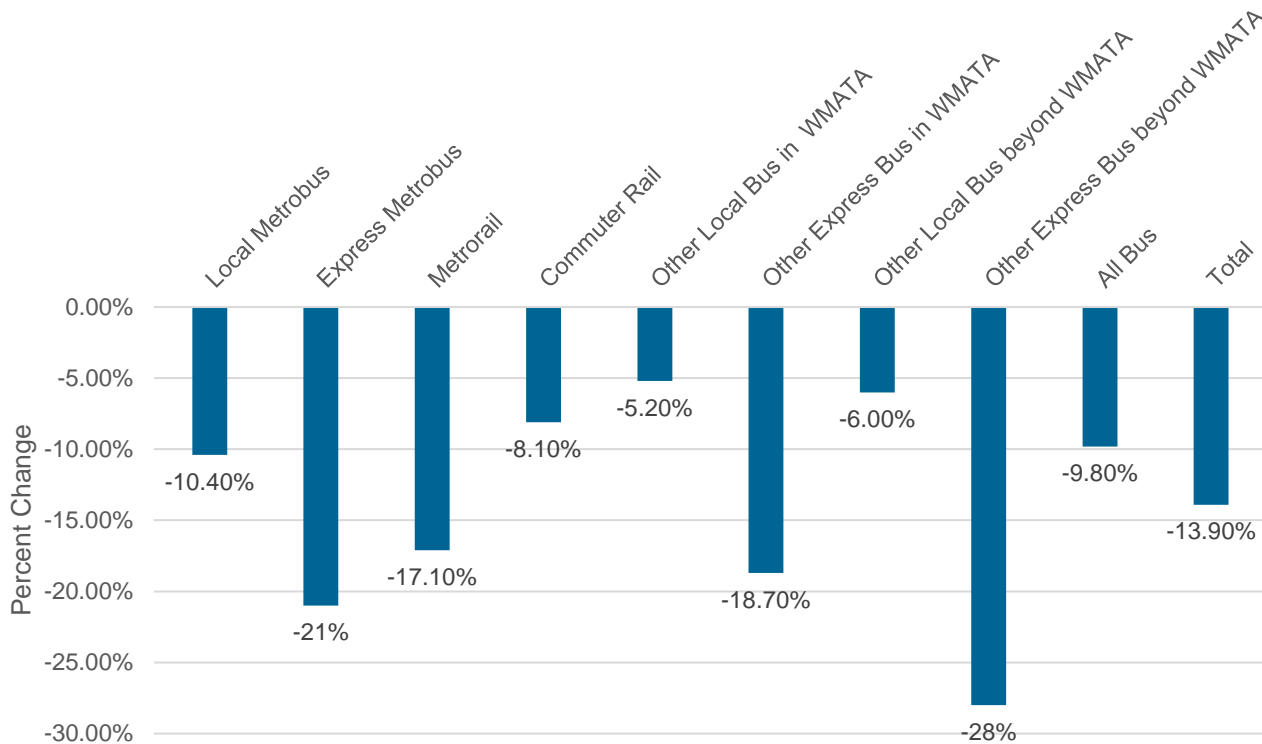
Note: Slight increase in workers choosing to work in DC with feedback process (+1%); will investigate in Phase 2

Jurisdiction	Percent Difference
0 District of Columbia	-3.4%
1 Montgomery County	-1.1%
2 Prince George's County	-1.6%
3 Arlington County	-2.1%
4 City of Alexandria	-1.9%
5 Fairfax County	-1.0%
6 Loudoun County	-1.0%
7 Prince William County	-0.4%
9 Frederick County	-0.4%
10 Howard County	-0.3%
11 Anne Arundel County	-0.4%
12 Charles County	-1.2%
14 Carrol County	-0.1%
15 Calvert County	-1.0%
16 St. Mary's County	-0.4%
17 King George County	-0.7%
18 City of Fredericksburg	-0.1%
19 Stafford County	-0.4%
20 Spotsylvania County	-0.1%
21 Fauquier County	-0.6%
22 Clarke County	-0.5%
23 Jefferson County	-0.2%
Total	-1.0%



Increased D.C. Telecommute Frequency Scenario: Transit Boardings

Transit Boardings Percent Change
Baseline Versus Increased D.C. Telecommute Scenario



Express buses experience largest percentage decrease





Gen3 Phase 2 Work Plan and Schedule

Gen3 Phase 2 Task List (tasks 0->2)

- 0 Project Management
- 1 Phase 2 ActivitySim Deployment
 - 1. Implement vehicle type models
 - 2. Extend vehicle type models to consider AVs
 - 3. Implementation refinements
- 2 Model Estimation
 - 1. Transit subsidy model
 - 2. Telecommute frequency model
 - 3. Auto ownership model - COG staff lead
 - 4. CDAP model - COG staff lead
 - 5. Mandatory tour frequency model - COG staff lead
 - 6. Non-mandatory tour frequency model - COG staff lead
 - 7. Trip mode choice model
 - 8. Documentation (COG staff document 2.3->2.6)



Gen3 Phase 2 Task List (tasks 3->5)

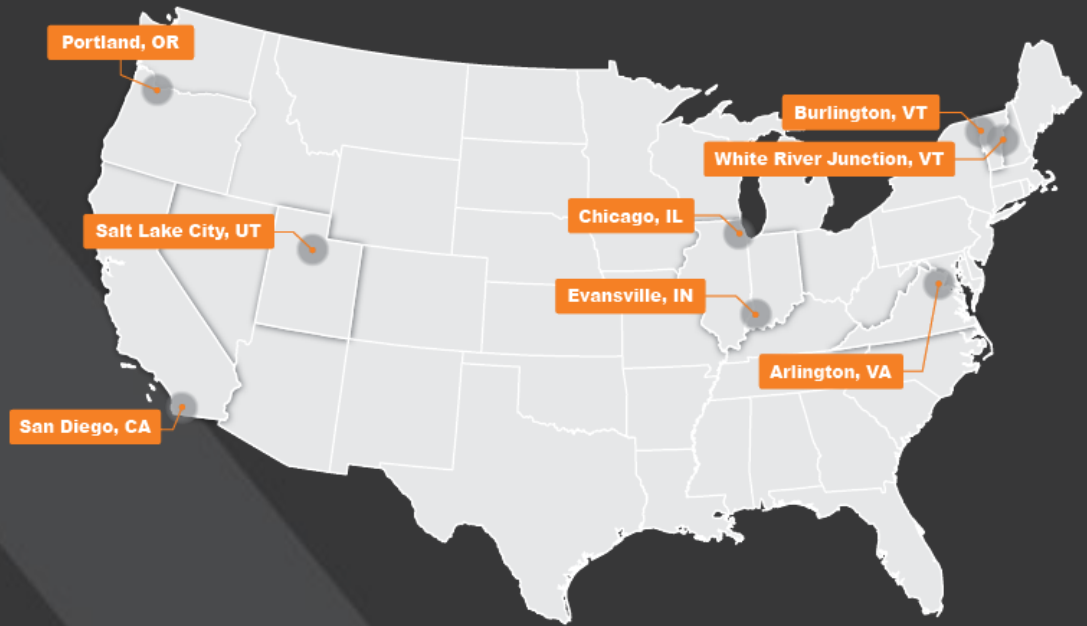
- 3 Calibration and Validation
 1. Calibrate re-estimated models
 2. Calibrate district constants
 3. Calibrate mode choice
 4. Validation
 5. Documentation
- 4 Sensitivity Testing
 1. Definition of Sensitivity Tests for Phase 2
 2. Sensitivity Test 1
 3. Sensitivity Test 2
 4. Add'l Sensitivity Tests - COG Staff Lead
 5. Documentation
- 5 Final Documentation & Training
 1. Draft and Final Model Development Report
 2. Draft and Final Model Users Guide



Gen3 Phase 2 Schedule

	CY	2022										2023					
	FY	2022				2023											
Task	Description	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0	Project Management	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
1	Phase 2 ActivitySim Deployment	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
2	Model Estimation	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
3	Calibration and Validation	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
4	Sensitivity Testing	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
5	Final Documentation & Training	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█





the science of insight



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