An Analytical Modeling Tool for Active Transportation Strategy Evaluation

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Development of OCTAM 3.4.2

- Rolled-out late 2016
- Result of multi-year effort to convert OCTAM from TRANPLAN to TransCAD
- OCP-2010 Modified socio-economic data for Orange County
- SCAG RTP 2012 outside of Orange County
- Existing year 2010 and horizon year 2035

Development of OCTAM 3.4.2

- Generally followed methodology used in TRANPLAN version of OCTAM, with several notable exceptions
- Updated methodology for mode choice to better reflect FTA standards
- Incorporated speed feedback per best practices
- Updated cordon volumes to reflect SCAG RTP 2012

OCTAM GUI

OCTA

Development of OCTAM 4.0

- OCP-2014 Modified socio-economic data for Orange County
- SCAG RTP 2016 outside of Orange County
- Existing year 2012 and horizon year 2040
- Updated toll choice from mode choice to trip assignment to better model complex toll systems

Development of OCTAM 4.0

- Updated modeled roadway speeds based on observed data collected for the Corridor Operations Performance Report
- Updated volume-delay functions in trip assignment
- Active transportation tool

Traditional Regional Travel Demand Model

- ✓ **Being relied on to provide key performance metrics, such as:**

  VMT, Delay, Congestion

- ✓ **Worked well when agencies focused on roadway and transit improvements**
- ✓ **But may not fully address new challenges**

  New types of strategies/New metrics/New technologies and behaviors

- ✓ **Need for a new approach**

Literature Review

- ✓ **Infrastructure Impact on Active Transportation Trips**

Study Location	Study Year	Study	Results		
			Infrastructure Variable	Mode Variable	Elasticity Value, Change in Mode Variable for 1% Increase in Infrastructure Variable
California Cities (24 medium sized)	2010	Marshall and Garrick, 2010	Percent of citywide street length with bike lanes	% Commuting by Bicycle	0.35 to 0.36
				% Commuting by Driving	-0.04 to -0.010
33 Large US Cities	2000	Dill and Carr, 2003	Miles of On-Street Bike Lanes per square miles	% Commuting by Bicycle	0.32
			Average state spending of federal funds per capita on bicycle and pedestrian infrastructure	% Commuting by Bicycle	0.32
Philadelphia Metro Area	1991	Noland and Kunreuther, 1995	Perceived Bicycle Parking Availability	Probability of Bicycling	0.83
San Francisco Bay Area, CA	1997	Cervero and Kockelman, 1997	Average Sidewalk Width	Non-private vehicle choice for non-work trips	0.09
Chapel Hill, NC	1997	Rodriguez and Joo, 2004	Proportion of Route with Sidewalks	Commute trips by Walking	1.23
Raleigh-Durham, NC	2006	Fan, 2007	Sidewalk length	Daily walking time per person	0.12
Portland, OR	1994	Ewing et al., 209	Sidewalk coverage	Walk mode choice	0.27

Notes: Obtained from Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emission Policy Brief (Handy & Boarnet, 2014)

Literature Review

- ✓ **Built Environment Attributes on Active Transportation Trips**

Study Location	Study Year	Study	Results		
			Built Environment (BE) Variable	Mode Variable	Elasticity Value, Change in Mode Variable for 1% Increase in BE Variable
Travel and Built Environment, Meta-Analysis	-	Ewing and Cervero, 2010	Household / population density	Walking Use	0.07
			Job Density		0.04
			Commercial Floor Area		0.07
			Land Use Mix (Entropy Index)		0.15
			Jobs-housing Balance		0.19
			Distance to store		0.25
			Intersection / Street density		0.39
			% Four-way Intersections		-0.06
			Job within One Mile		0.15
			Distance to Nearest Transit Stop		0.15

Literature Review

- ✓ **Seattle TB Model Elasticities**

Model	Home-based Work	Home-based School	Home-based Recreation	Home-based Shop/Personal Business	Work-based
Walk mode (using walk buffer = 1 mi)					
Destination total Employment	.21				
OD avg. int. density				.23	.17
OD avg. fraction rise	-.77	-.03	-.11		
Origin only avg. fraction rise				-.16	
Origin only percent no sidewalk*	-.18		-.19	-.22	
Complex multi-stop tour	-.20	-.12	-.03	-.05	-.02
Bike Mode (using bike buffer = 2 mi)					
Destination mixed-use entropy	.02				
OD fraction Class 1 bike path	.37	.31			
Origin int. density	.90				
Origin avg. fraction rise	-.82				
Complex multi-stop tour	-.32	-.17	-.08	-.16	-.06
Transit mode (using walk buffer = 1 mi)					
Origin transit stop density	.85	.10	.72	0.32	0
Destination transit stop density	.37	.10	.72	1.21	2.09
Destination total employment	.32				
Origin intersection density	.11				
Origin percent no sidewalks**		-.14	-.70		
Destination percent no sidewalks		-.21			
Complex multi-stop tour	-.20	-.13	.25	-.09	-.07

Notes: Obtained from *NCHRP 770 - Estimating Bicycling and Walking for Planning and Project Development: A Guidebook*
* Average for all purposes combined, assuming typical urban proportions of trip purposes, is about 0.15
** Average for all purposes combined, assuming typical urban proportions of trip purposes, is about 0.18

Goals of an Active Transportation Tool:

- ✓ **Develop methodology to augment existing travel model by:**
  - ❑ **Enhancing sensitivity to active transportation investment**
  - ❑ **Allowing dynamic assessment of active transportation need/costs/benefits as land-use changes**
  - ❑ **Provide means to forecast benefit without precision of detailed network**

Goals of an Active Transportation Tool:

- ✓ **Ensure applicability across the modeling area**
- ✓ **Limited to available data on hand**
- ✓ **Develop quantitative relationships wherever possible for local conditions**

PROJECT APPROACH

To build a quick response tool that can work with travel demand models to provide credible estimates on various land use and active transportation strategies.

PROJECT APPROACH

CA Household Travel Survey

- ✓ Local travel survey data provides quantitative relationships
- ✓ About 100K trip records (individual trips) for the Southern California region
- ✓ 80% are auto trips, 20% are other modes
- ✓ Trip Length by mode
- ✓ Includes trips of all types

Key Observations

- ✓ Walking is much more prevalent than we expected

  20% of all trips (or portions of trips) in the survey were walking

- ✓ Significant variation in walking and biking by land use

  <10% --- >40%

- ✓ Key transportation factors

  Bike Lanes/Sidewalk/Roadway Speed/Bus Stop/Intersection density/etc.

PROJECT APPROACH

Place Type

Density

Mix of Uses

Street Connectivity

Location/Accessibility

Urban

Compact

Standard

PROJECT APPROACH

Tool Development

Using multinomial logistic regression technique , focusing on the probability of using the various available modes of travel, including walking and biking.

Tool Outputs

- ✓ Mode share and trips by mode and by zone (before and after land use/AT investment)
- ✓ VMT by zone (before and after land use/AT investment)
- ✓ Non-motorized miles traveled by zone (Walk and Bike)

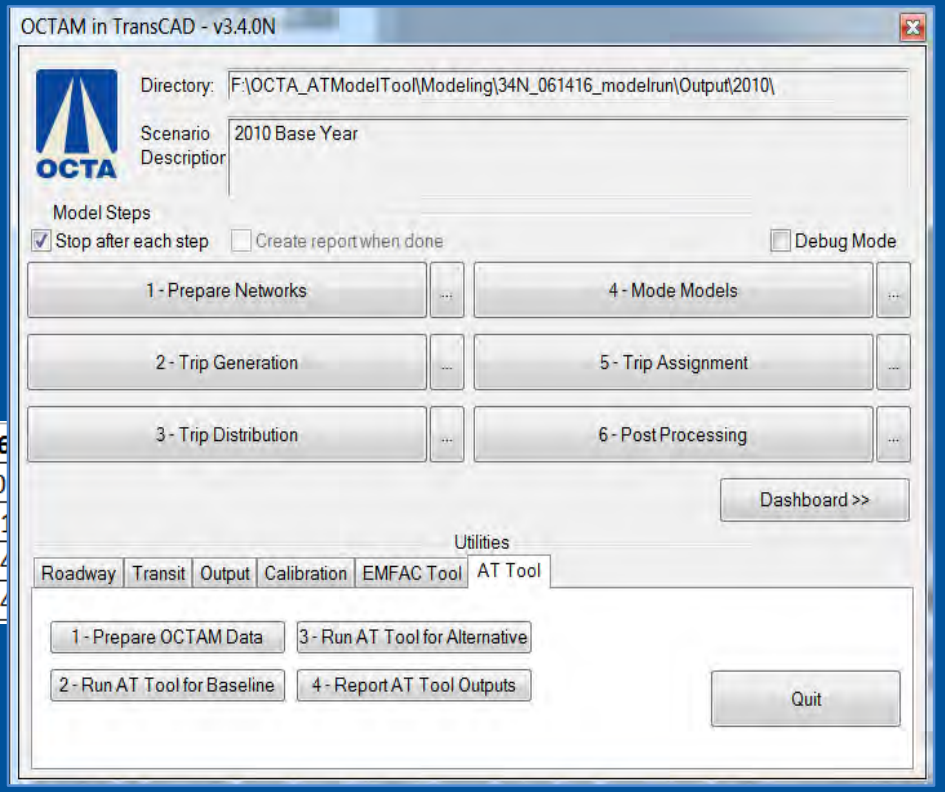
Significant Input Variables

- ✓ Generic socioeconomic variables
- ✓ Mixed use land use variables
- ✓ Place Type
- ✓ AT Facility Variables
- ✓ Roadway density variables
- ✓ Transit variables
- ✓ Travel demand model outputs

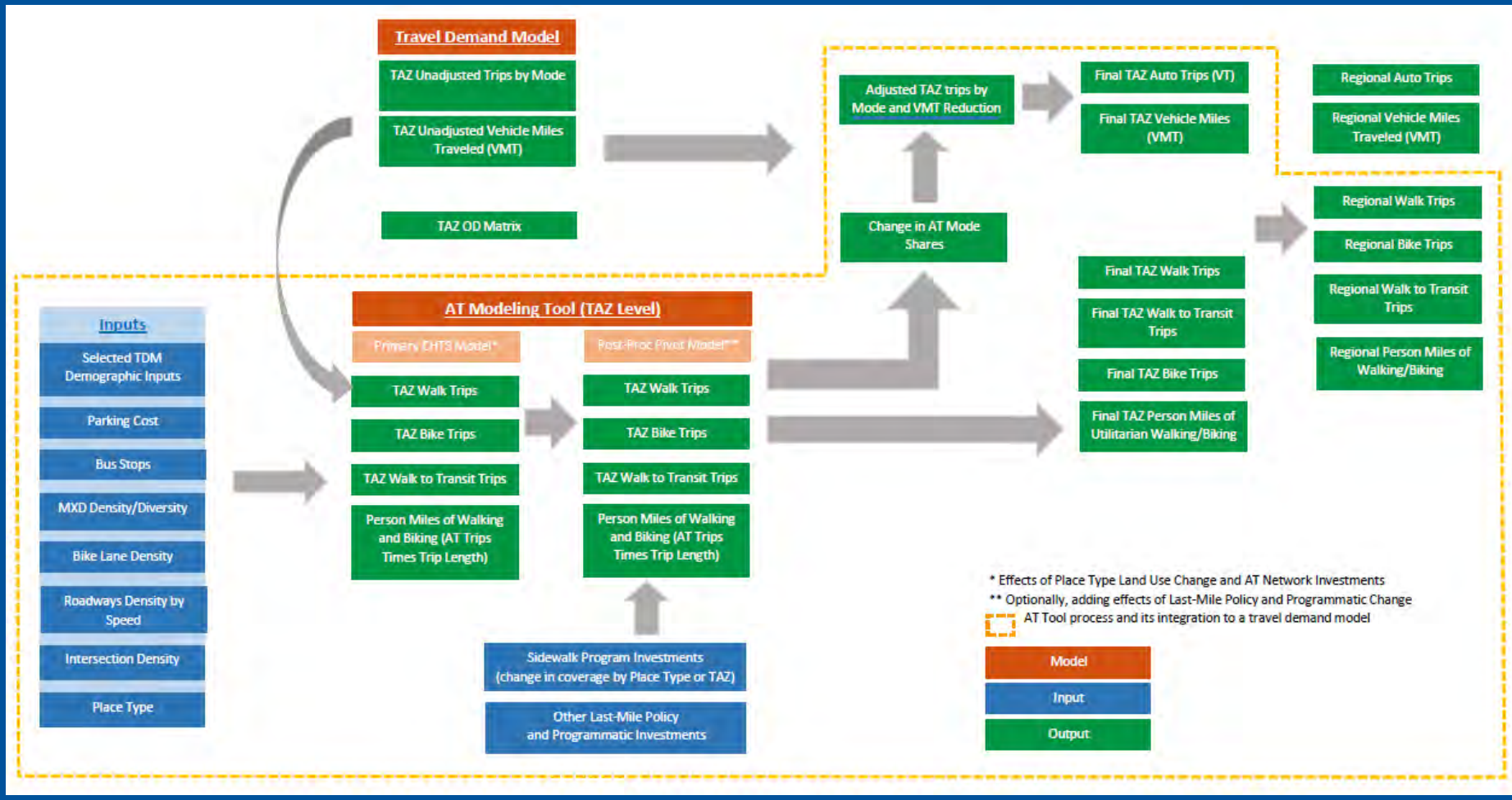
Integration of the AT Tool to OCTAM

- ✓ Spreadsheet-based Tool
- ✓ GISDK-based Tool

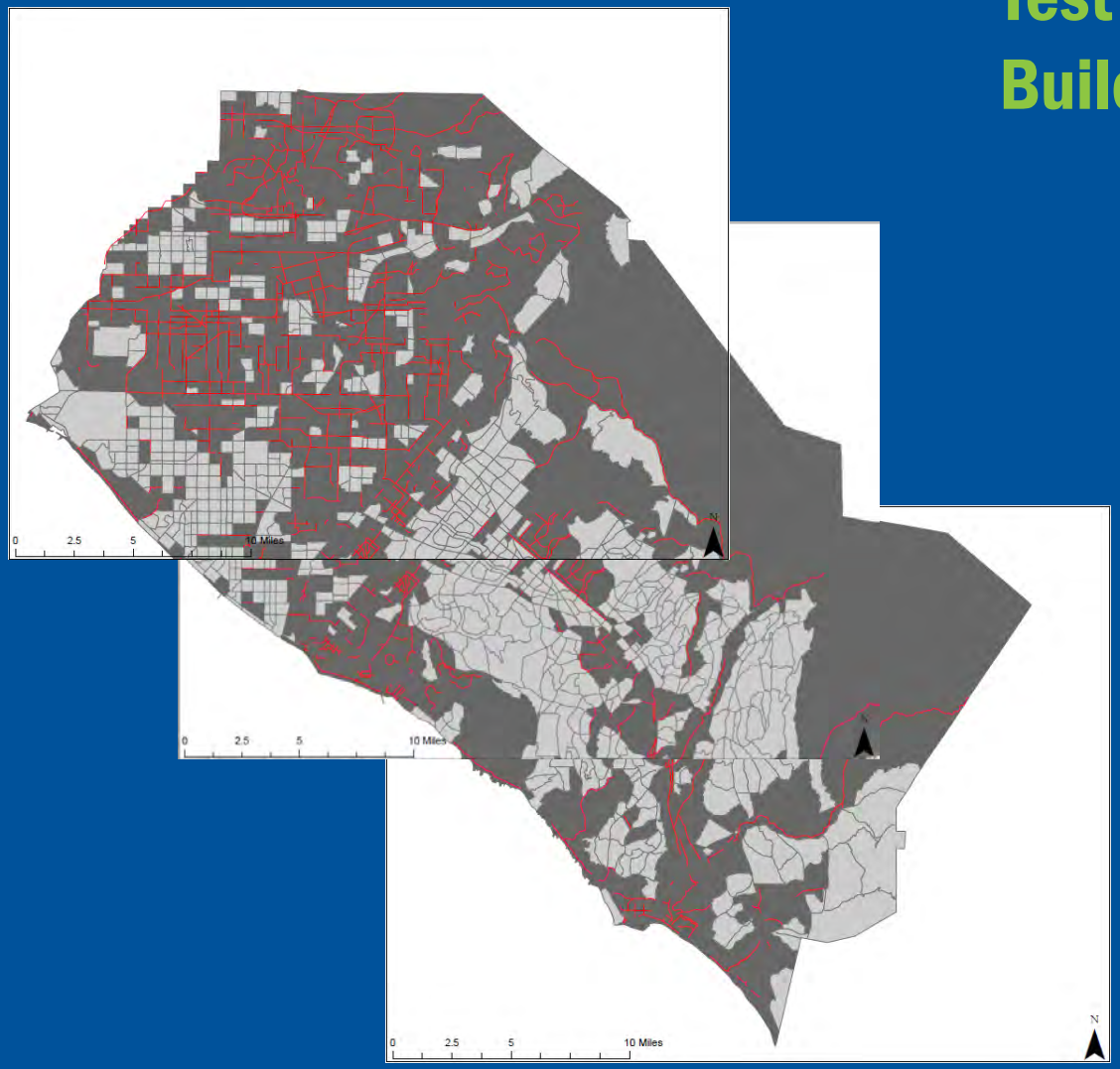
Variables	Constant	worker	kid	nw1624	nw6
Transit	-5.25	-0.3218919	1.34452647	1.52349075	-0
Walk	-2.15	-0.5421407	0.45436267	0.47766225	-0.1
Walk-Transit	-4.15	0	-0.4334021	1.27687211	-0.4
Bike	-3.65	0	0.54050942	1.05922445	-0.4



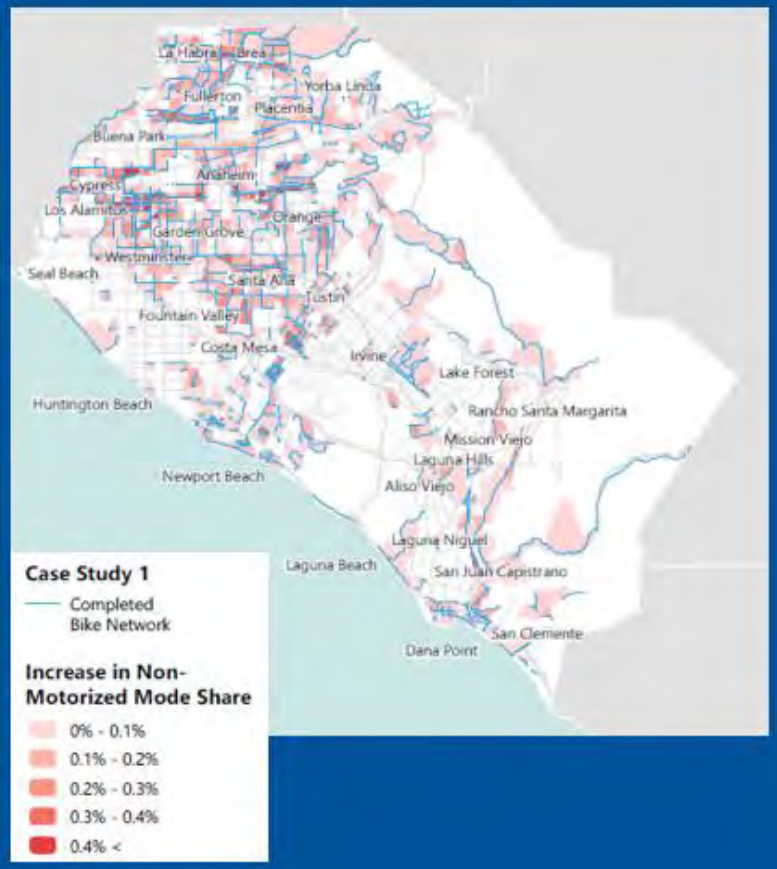
Integration of the AT Tool to a Travel Demand Model



Test Case #1: Completion of Build-out Bikeway Network

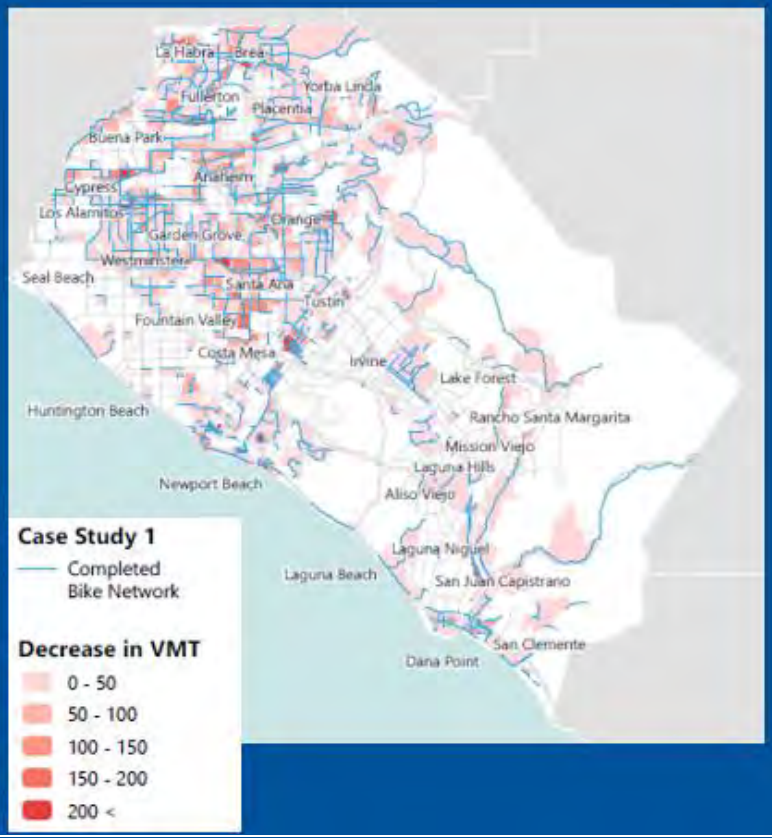


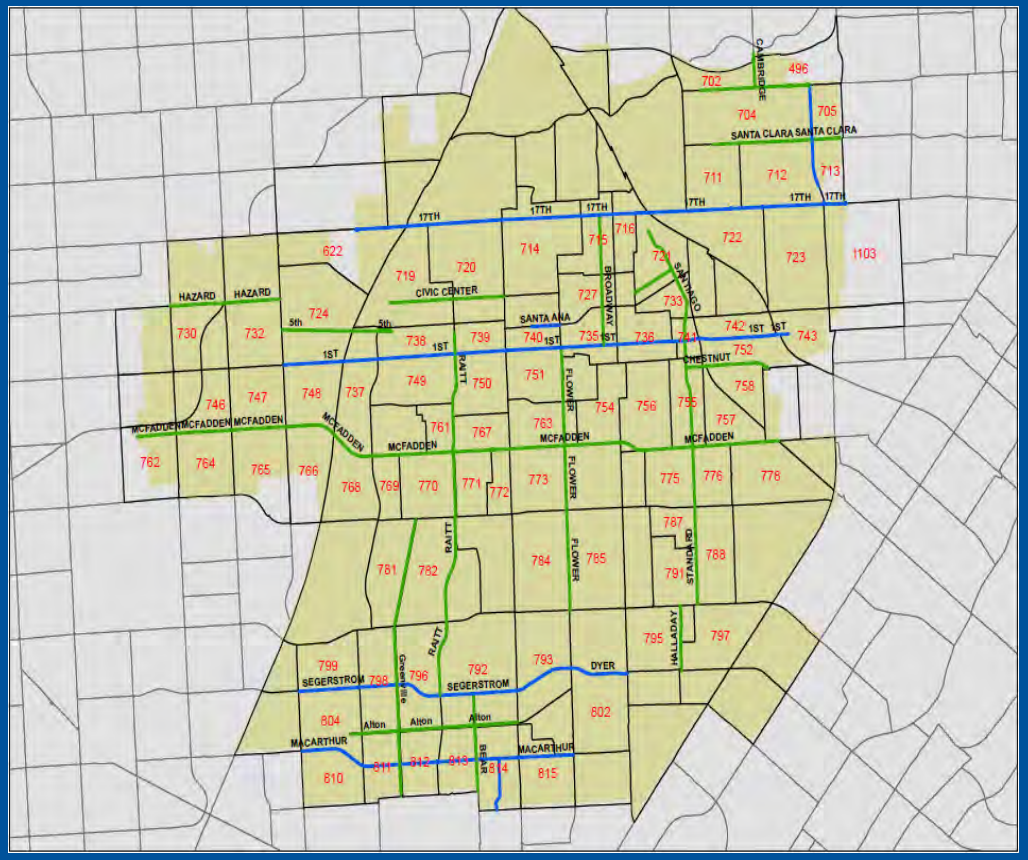
Affected TAZ
Unaffected TAZ
New Bike Facility

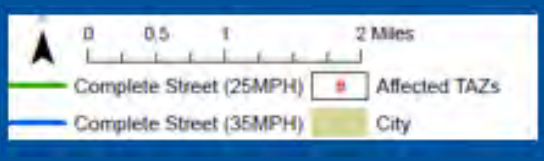


Test Case #1: Completion of Build-out Bikeway Network

- ✓ **Geographic Distribution of Project Impact**







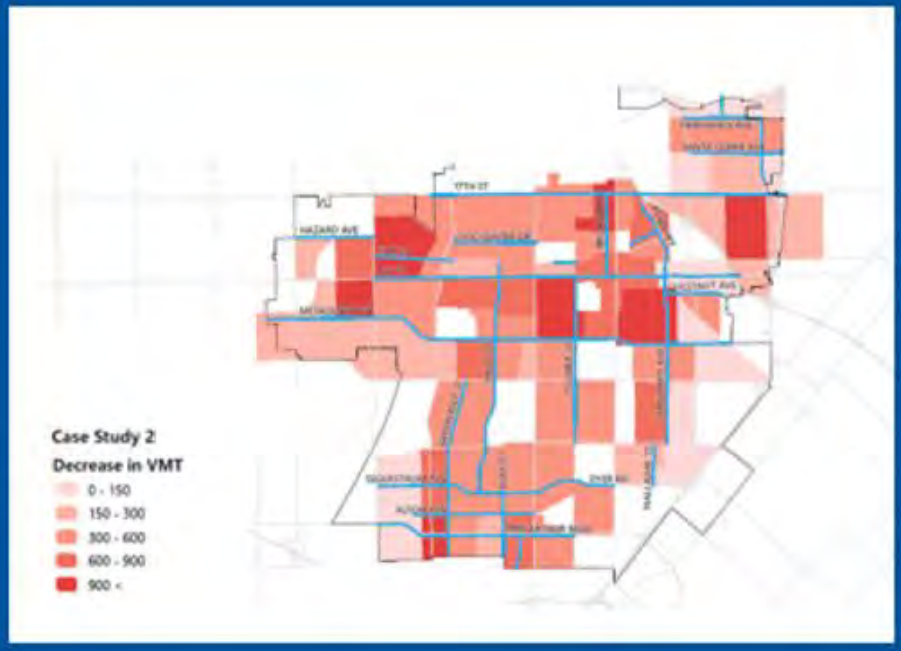
Test Case #2: Complete Streets

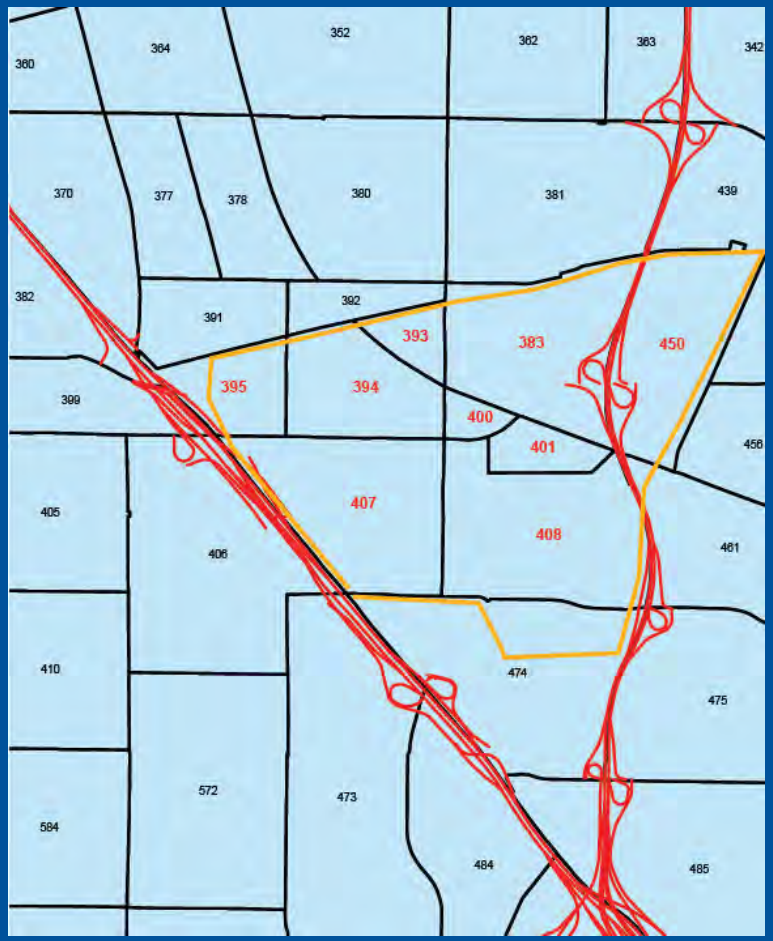
Assumptions:

- ✓ "High" level of pedestrian infrastructure in TAZs with Complete Streets.
- ✓ Class I bicycle facilities on designated Complete Streets
- ✓ 25% increase in parking costs on Complete Streets (if parking costs currently in place)
- ✓ 15% increase in intersection density in TAZs with Complete Streets
- ✓ 15% increase in bus stop density in TAZs with Complete Streets

Test Case #2: Complete Streets

- ✓ **Geographic Distribution of Project Impact**





Test Case #3: Build-out Community

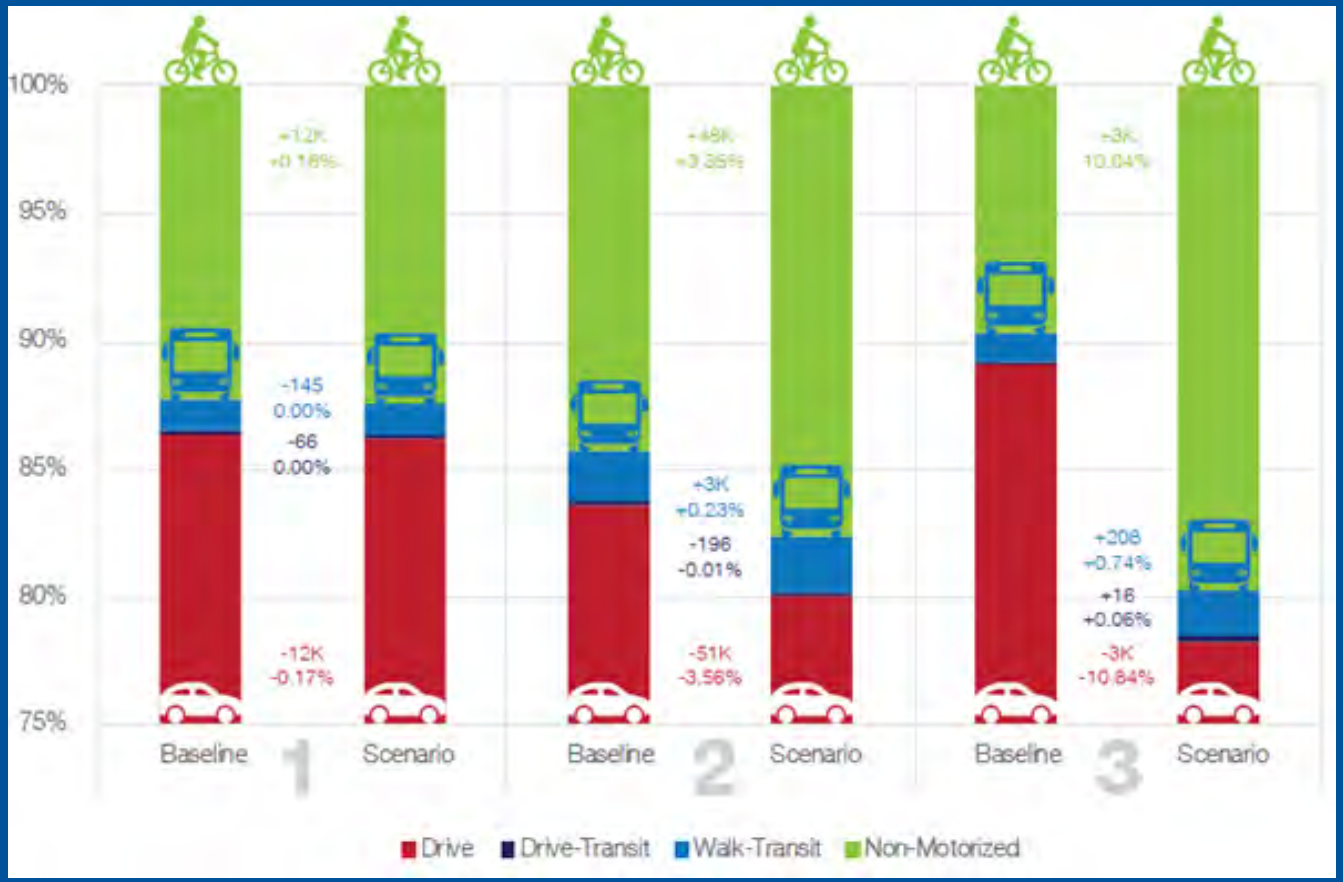
Assumptions:

- ✓ Future build-out socioeconomic data from TBF for target community
- ✓ Place Type Group 1 for project TAZs
- ✓ 15% increase over existing roadway density (less than 25mph).
- ✓ 15% increase over existing intersection density
- ✓ 15% increase over existing bus stop density
- ✓ Build-out of proposed bikeways in project TAZs
- ✓ "High" level of pedestrian infrastructure in project TAZs

Test Case #3: Build-out Community

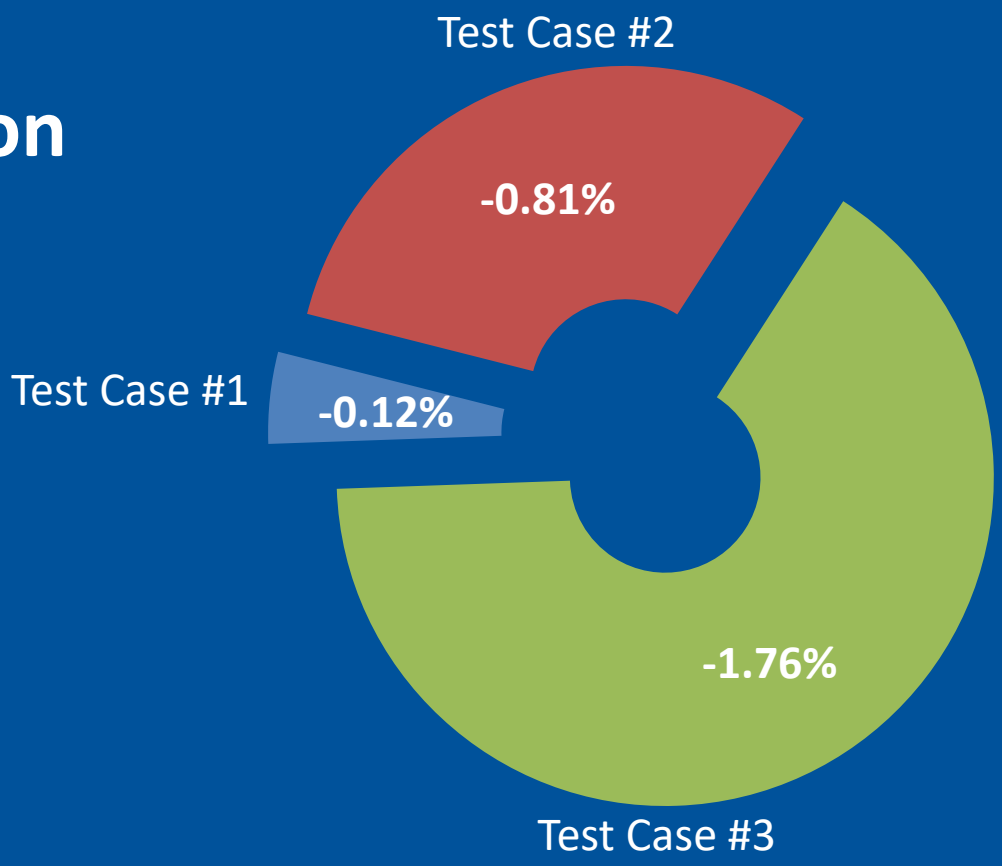
- ✓ **Geographic Distribution of Project Impact**

Mode Share & Trip Comparison – Project Area Only



VMT Comparison – Project Area Only

VMT Reduction

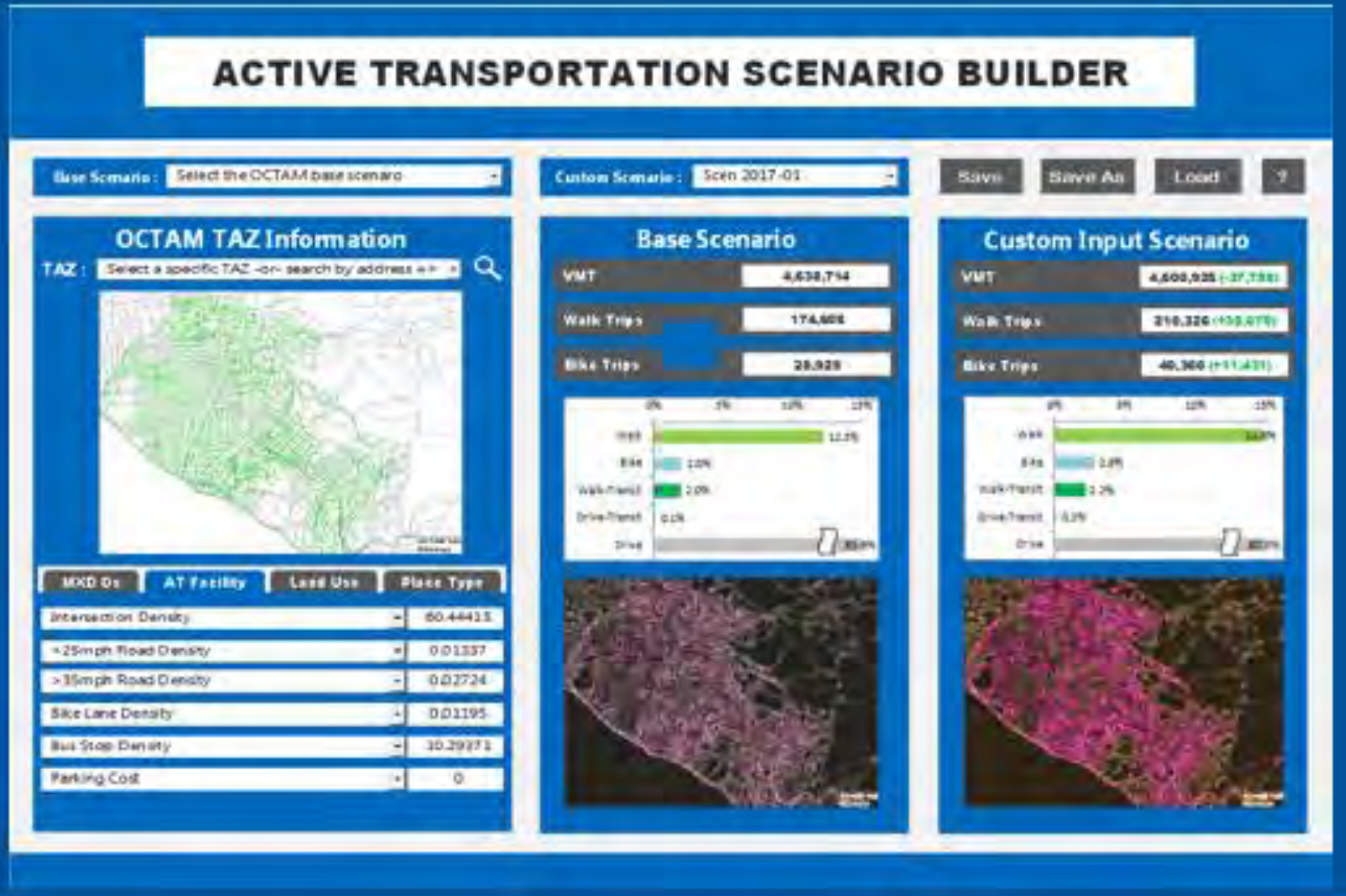


To develop a GIS-based quick response tool to assist communities in AT analysis

- ✓ Enhance the tool for the following functionalities:
  - ❑ Induced non-motorized travel
  - ❑ Pedestrian facility quantification
  - ❑ Using localized data if available
- ✓ Build a GIS-based user-friendly interface
- ✓ Dynamic data visualization

NEXT STEP

To develop a GIS-based quick response tool to assist communities in AT analysis



QUESTIONS?

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