



# Transportation Model Forum

December 6<sup>th</sup> 2022

# Forum Agenda



**Welcome and Introductions**



**2021 Regional Plan Amendment  
Update**



**Roadmap to 2025 Regional Plan**



**Service Bureau Update**

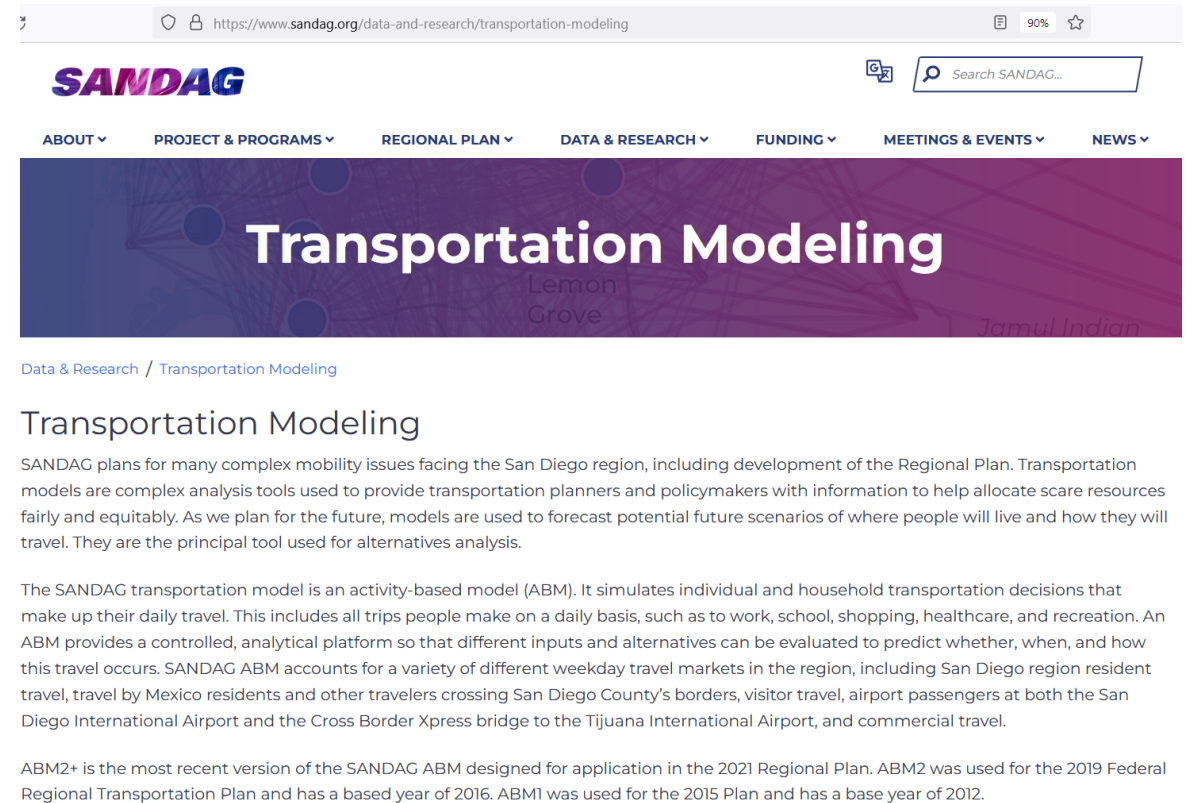


**Induced Demand Methodology**

# Welcome and Introductions

- **Housekeeping**
- **Welcome**
- **Staffing Updates**
- **New SANDAG Website**

# New SANDAG Website



SAME: <https://www.sandag.org>

NEW: <https://www.sandag.org/data-and-research/transportation-modeling>





# 2021 Regional Plan Amendment Update

Ziying Ouyang

December 6<sup>th</sup> 2022

# Board Actions on September 23, 2022

- Board of Directors voted to:
  - Prepare a focused amendment to the 2021 Regional Plan (RP) without the regional road usage charge (RUC)
  - Update revenue assumptions
  - Prepare supplemental EIR
  - Complete work within one year for Board consideration

# Differences of 2021 RP and Amendment

	RP Amendment	2021 RP
Series 14 Regional Growth Forecast	DS-42 <ul style="list-style-type: none"><li>• Employment allocation correction</li><li>• Population distribution adjustments at micro zone level</li></ul>	DS-38
ABM2+	14.2.2 updated <ul style="list-style-type: none"><li>• Cross-border model bug fix</li></ul>	14.2.2
RUC	No	Yes (starting in 2030)

# Amendment Status Update

- Model runs
  - 2016
  - 2020, 2025, 2035 and 2050
  - 2023, 2026, 2029 and 2040
  - Supplemental EIR no project 2035 and 2050
  - Supplemental EIR alternatives
- Performance measures
- Emission outputs for air quality conformity
- Internal and external QA/QC



# Next Steps

- Complete modeling and peer review results
- Initiate air quality conformity with federal agencies
- Prepare supplemental EIR for public review in spring
- Board of Directors consideration in summer

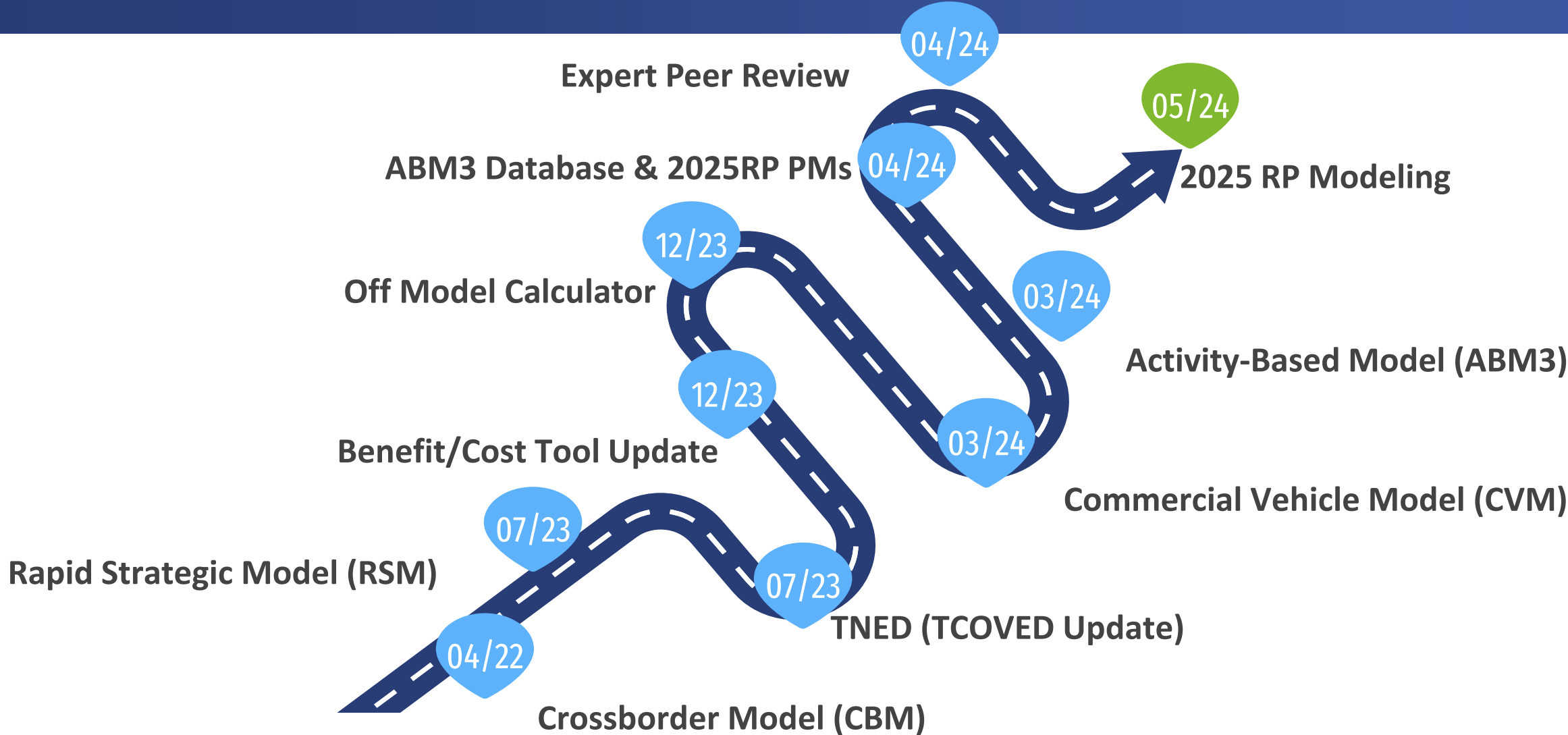


# Roadmap to 2025 Regional Plan

Bhargava Sana

December 6<sup>th</sup> 2022

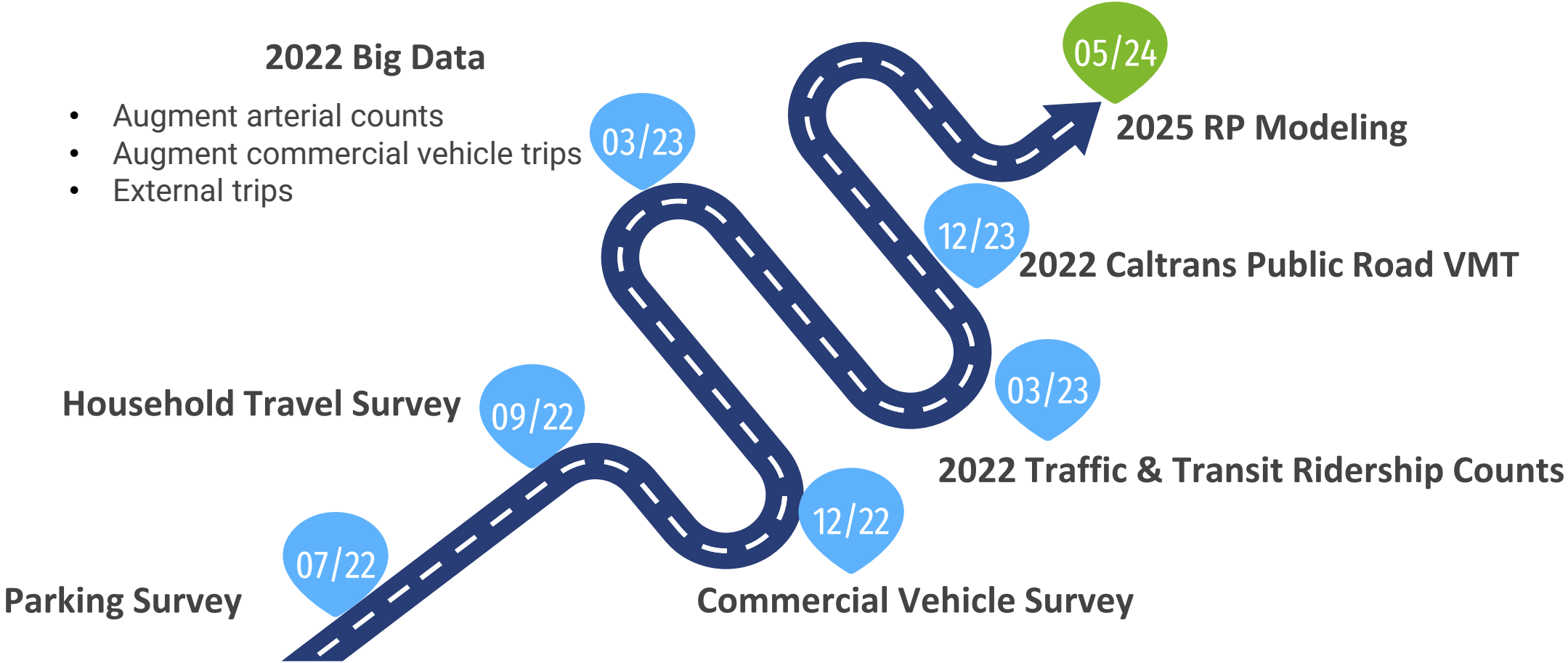
# Modeling Roadmap to 2025RP



# Bread & Butter Data for 2025RP

## 2022 Big Data

- Augment arterial counts
- Augment commercial vehicle trips
- External trips







# Service Bureau Update

Dr. Nimish Dharmadhikari

December 6<sup>th</sup> 2022



# Board of Directors Meeting

September 23, 2022

## Summary of Options for removing the Road Usage Charge (RUC) from the Regional Plan

	<b>Option 1: Focused Amendment without a Supplemental CEQA Analysis  (Up to 6 months)</b>	<b>Option 2: Focused Amendment with a Supplemental CEQA Analysis  (12 months)</b>	<b>Option 3: Expanded Amendment with a Supplemental CEQA Analysis  (24-30 months)</b>	<b>Update of the Regional Plan (Presented on July 8, 2022):  (36 months)</b>
<b>Description</b>	Focused amendment to remove the RUC, update revenue assumptions, and conduct federal air quality conformity analysis without updating the CEQA analysis.	Focused amendment to remove the RUC, update revenue assumptions, conduct air quality conformity analysis and update CEQA analysis.	Expanded amendment to remove the RUC, update revenue assumptions, conduct air quality conformity analysis and update CEQA analysis as well as analyze other changes as directed by the Board.	Major update to the Regional Plan using 2022 transportation data and updated modeling tools and new CEQA analysis.
<b>Timeline</b>	Up to 6 months to amend the plan and conduct air quality conformity analysis and refile with CARB and FHWA.	12 months to amend the plan, develop the supplemental CEQA analysis, conduct air quality conformity analysis and refile with CARB and FHWA.	24- 30 months to amend the plan, develop the supplemental CEQA analysis, conduct air quality conformity analysis and refile with CARB and FHWA.	36 months to develop an updated plan with the latest data and planning assumptions. Scenarios presented to the Board for consideration in Spring, 2023.
<b>Impacts to other programs</b>	3-4-month delay to all Service Bureau modeling projects.	6-7-month delay to all Service Bureau projects, as well as delays to CMCP projects.	8-10-month delay to Service Bureau projects, as well as delays to CMCP projects.  2025 Regional Plan Schedule is at significant risk of not being completed on time.	No additional delays.

# Progress since BOD Decision

- Modelers & Planners discussed path forward and reprioritized project work
- Sent memorandum to active Service Bureau clients
  - Those presently in the queue
- Started reaching out to individual clients
- Commenced 2021 RP amendment model runs
- Presented to the ITE Transportation Capacity and Mobility Task Force that included jurisdiction staff and consultants

# Projects in Service Bureau Queue

Queue Position	Project	Client	Jurisdiction
1	SB-214: Oceanside General Plan Update	CRA	Oceanside
2	SB-215: Harmony Grove Industrial Park	CRA	Escondido
3	SB-219: County CAP Modeling	F&P	County of SD
4	SB-239: City of San Diego Blueprint	WSP/SD	San Diego
5	SB-222: Hillcrest Community Plan Update	SD	San Diego
6	SB-225: Carlton Oaks Modeling	IM	Santee
7	SB-227: Carroll Canyon On Point II	LLG	San Diego
8	SB-228: South Otay Southwest Village	LOS	San Diego
9	SB-229: Legoland Expansion Project	LLG	Carlsbad
10	SB-231: Carlsbad Housing Element Update	F&P	Carlsbad
11	SB-233: City of Vista General Plan Update	CRA	Vista
12	SB-234: Santee Auto Dealership	LLG	Santee
13	SB-235: Encinitas Circulation Element Update	WSP	Encinitas
14	SB-237: City of San Marcos General Plan Update	KA	San Marcos
15	SB-238: Oceanside Transit Center & NCTD Office Redevelopment	Stantec	Oceanside
16	SB-221: University Community Plan Update	SD	San Diego

# Response to Memo from Service Bureau Clients



## MEMO

Date: September 30, 2022

Memo to: Service Bureau Clients and Member Agency Staffs

From: Dr. Cindy Burke, Senior Director Data Science

Subject: Delays in Service Bureau Projects that Require Transportation Modeling

On Friday, September 23, 2022, the SANDAG Board of Directors directed SANDAG to prepare a focused amendment to the 2021 Regional Plan with a supplemental CEQA analysis that would remove the road usage charge (RUC) from the 2021 Regional Plan. The amendment is a 12-month process and will occur at the same time staff is preparing for the 2025 Regional Plan.

Preparing an amendment to the 2021 Regional Plan while staying on schedule to complete a 2025 Regional Plan by the December 2025 deadline will require multiple planning and modeling projects to be put on hold. This includes modeling work that SANDAG conducts for local jurisdictions and external agencies via Service Bureau, which will be delayed approximately six to seven months.

Please know that all entities currently in our Service Bureau queue will be contacted individually in the next ten business days to discuss the delay and decide potential alternatives to complete requests.

We recognize that many firms have been patiently waiting for SANDAG modeling services to complete important jurisdictional work and we sincerely regret this delay.

# Service Bureau General Workflow

## Study Workspace & Scenario Creation

- Done via ABM Workspace/Scenario Tool
- Available on servers

## Network Editing / Zone Splitting

- Done via in-house TCOVED network editing software
- Not available on modeling servers

## Land Use Converter

- Done via Land Use Converter Tool
- Available on servers

## Run the Model

- Done via Emme
- Available on servers\*

## Reporting Procedures & Analyses

- Some rely on the SQL Database (next slide)
- Unavailable to external users\*\*

\*Subject to Emme licensing agreement with Bentley (previously INRO)

\*\*SQL Server available on modeling servers, but external users may be unable to log in.

All outputs used in SQL-dependent procedures are available in scenario directory



# Options for Service Bureau Clients

<b>Option 1: Wait for the 2021 Regional Plan Amendments</b>	<b>Option 2: Work with consultants to develop independent procedures</b>	<b>Option 3: Provide limited access to SANDAG servers based on contract</b>
Additional 6 months; 2nd quarter of 2023	<ul style="list-style-type: none"><li>• Customized for individual clients/jurisdictions</li><li>• Standard/common approach via a consortium</li></ul>	

# Options for Service Bureau Clients

## Option 2: Service Bureau Clients Work with Consultants

Pros	Cons
<ul style="list-style-type: none"><li>• Clients can distribute the workload to multiple consulting firms</li><li>• Flexibility and customization with summarization and reporting</li><li>• An alternative approach not constrained by SANDAG staff and server resources in the long term</li><li>• A bench of consulting firms with ABM expertise</li></ul>	<ul style="list-style-type: none"><li>• Will require consultants to develop their own modeling workflow and reporting procedures</li><li>• Will require consultants to set up the SANDAG ABM on their end</li></ul>



# Induced Demand Methodology

Joaquin Ortega

December 6<sup>th</sup> 2022

# History

- ARB guidance from the 2<sup>nd</sup> cycle RP/SCS (2015) recommended consideration towards applying an adjustment to SB-375 VMT and GHG to account for effects of induced demand in subsequent plans.
- SANDAG modeling documentation has included a discussion on induced demand since 2004.
- SANDAG models do not account for a portion of induced demand effects.

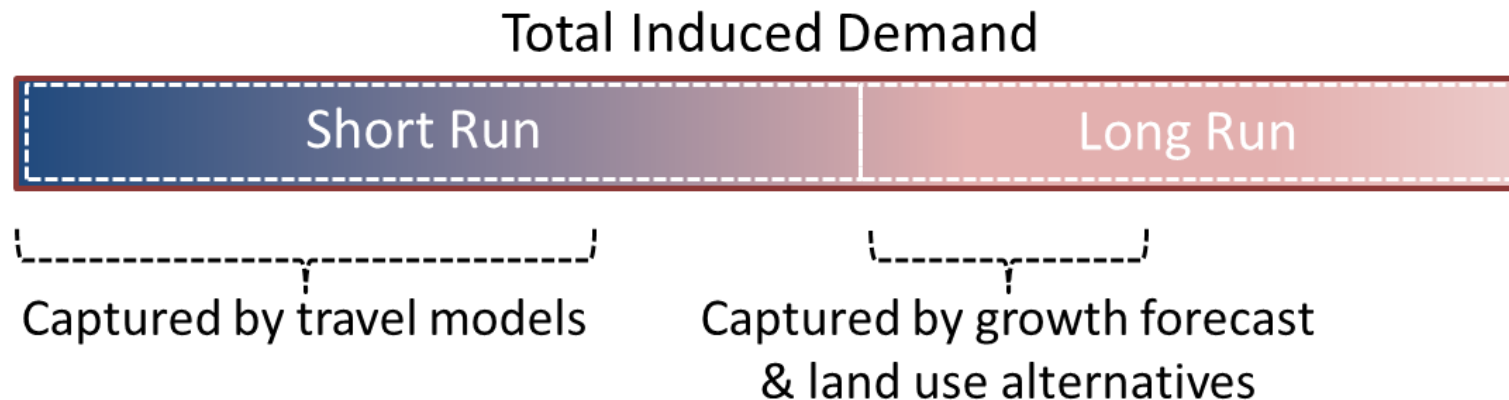
# Induced Demand Components

- Short run vs. Long run Induced Demand
- Existing Tools and Research
- Components of Roadway Expansion in the 2021 RP/SCS
- SANDAG Model Tests
- Determination of elasticities
- Final Analysis Tool for 2035 SANDAG SCS



# Induced Demand Classification

- Short Run Elasticity: Changes to travel behavior that take place due to added utility on the network. This may affect trip length, path, frequency, time of day, or location. These changes can take place from several months to several years after capacity is added.
- Long Run Elasticity: Changes to longitudinal household choices or public policy due to added utility. This may affect work, home, or school location choice. Household auto ownership levels can change. It can also have effects on population, land use policy, or facility management.



# Induced Demand Components in ABM

Effect	Scale	Model Component
Trip Length	Corridor	Skimming Traffic Assignment
Trip Path	Corridor	Skimming Traffic Assignment
Trip Frequency	Corridor	Tour Generation Household Scheduling
Trip TOD	Corridor	Household Scheduling Daily Activity Pattern
Trip End Location	Corridor	Tour Generation Stop Location
Trip Mode	Corridor	Mode Choice
Transponder Ownership	Corridor	Transponder Ownership Model
Auto Ownership	Region	Auto Ownership Model
Work Location	Region	Work Location Choice Model
School Location	Region	School Location Choice Model
Population	Region	Growth Forecast
Land Use Policy	Region	Growth Forecast
Home Location	Region	Growth Forecast

# Existing Tools and Research

- National Center for Sustainable Transportation & UC Davis Induced demand calculator. Web based tool.
- Regression based analysis. “For every 1% increase in lane mileage = 1% increase in VMT”
- Literature: Duranton and Turner (2012)
  - Instrumental variable estimation to establish one-way causality for the effects of increasing lane kilometers on vehicle kilometers traveled (i.e. increase in lane kilometers causes increase in VKT and not vice-versa)
  - After controlling for permutations of geography, census division, population, and socioeconomic characteristics, elasticity is about 1.0 (10% change in lane kilometers causes 10% change in VKT).

# National Center for Sustainable Transportation & UC Davis Induced Demand Calculator

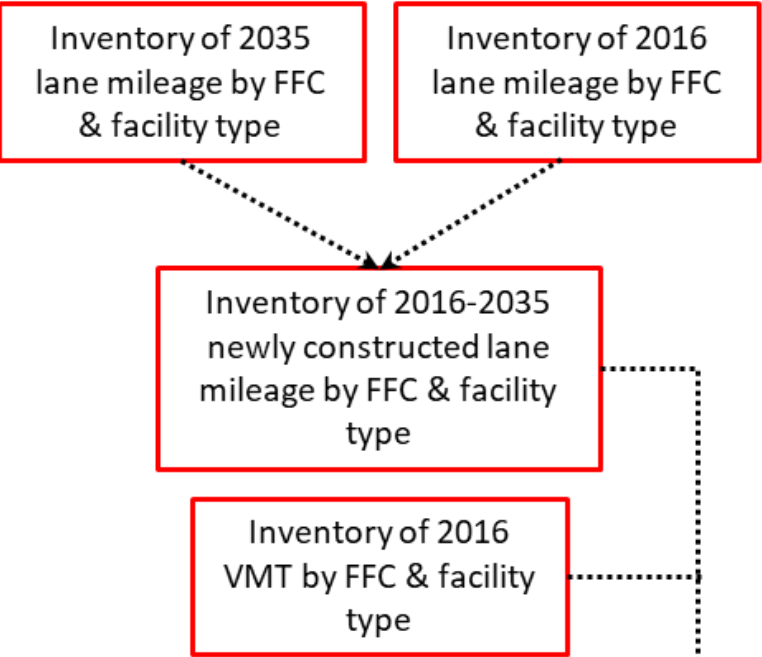
$$\varepsilon = \% \Delta \text{ VMT} / \% \Delta \text{ Lane Miles}$$

- Annualized additional VMT
- 2016 Base year
- Uses elasticities of 1.0 and 0.75
- Limited to the addition of General Purpose & HOV lanes only
- Limited to urbanized areas only
- Population growth not handled the same way as a long term RP/SCS
- Limited to Freeway, State Highway, and some prime facility types
- Does not account for GP conversion, AUX, HOT, or Toll lanes

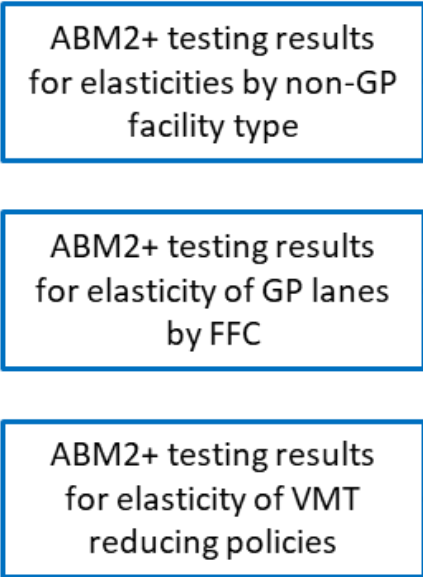


# Methodology Overview

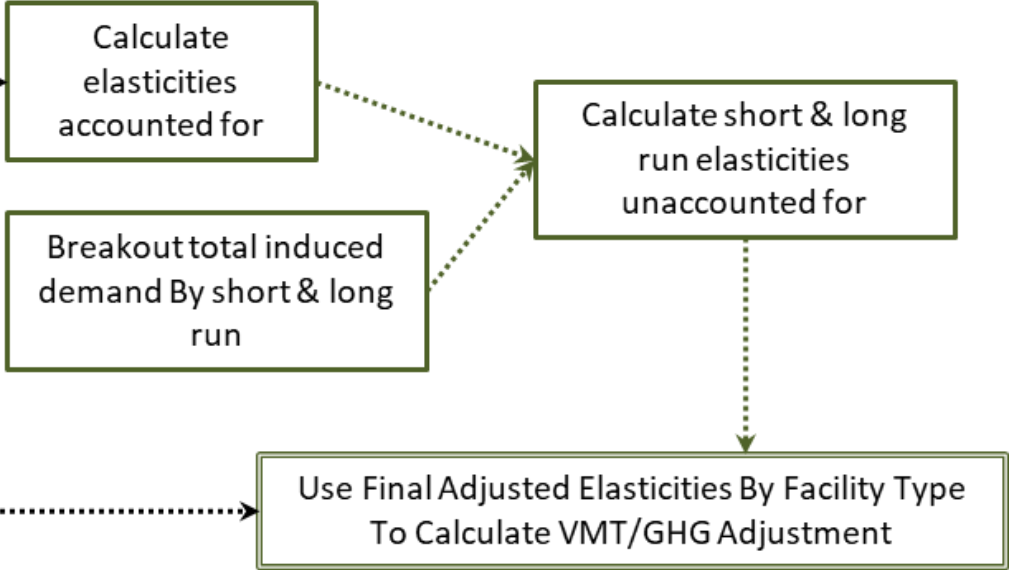
## DATA COLLECTION



## ABM2+ TESTING



## INDUCED DEMAND CALCULATOR





# Roadway Expansion Inventory in SANDAG 2021 RP/SCS

## Inventory of Added Lane Miles, 2016–2035 and 2036–2050, by Facility Class and Type

Federal Functional Class	Facility Type	2016–2035 Added Lane Miles	2036–2050 Added Lane Miles
Class 1	General Purpose	0	2
Class 1	Auxiliary	21	5
Class 1	Managed	144	32
Class 2	General Purpose	14	0
Class 2	Auxiliary	23	5
Class 2	Managed	59	66
Class 2	Toll	10	0
Class 2	Toll to General Purpose Conversion	0	48
Class 3	General Purpose	14	5

# ABM2+ Test Program

- Use ABM2+ to test for various elasticities based on existing research and evaluation tools.
  - Facility based elasticities: Run individual tests to determine the elasticity of General Purpose (GP), Auxiliary (AUX), Managed/High Occupancy Toll (ML/HOT), and Toll lanes.
  - SCS policy elasticity: Run tests to determine the elasticity of VMT reducing policies in the 2021 RP/SCS.

# Facility Based Test Result Highlights

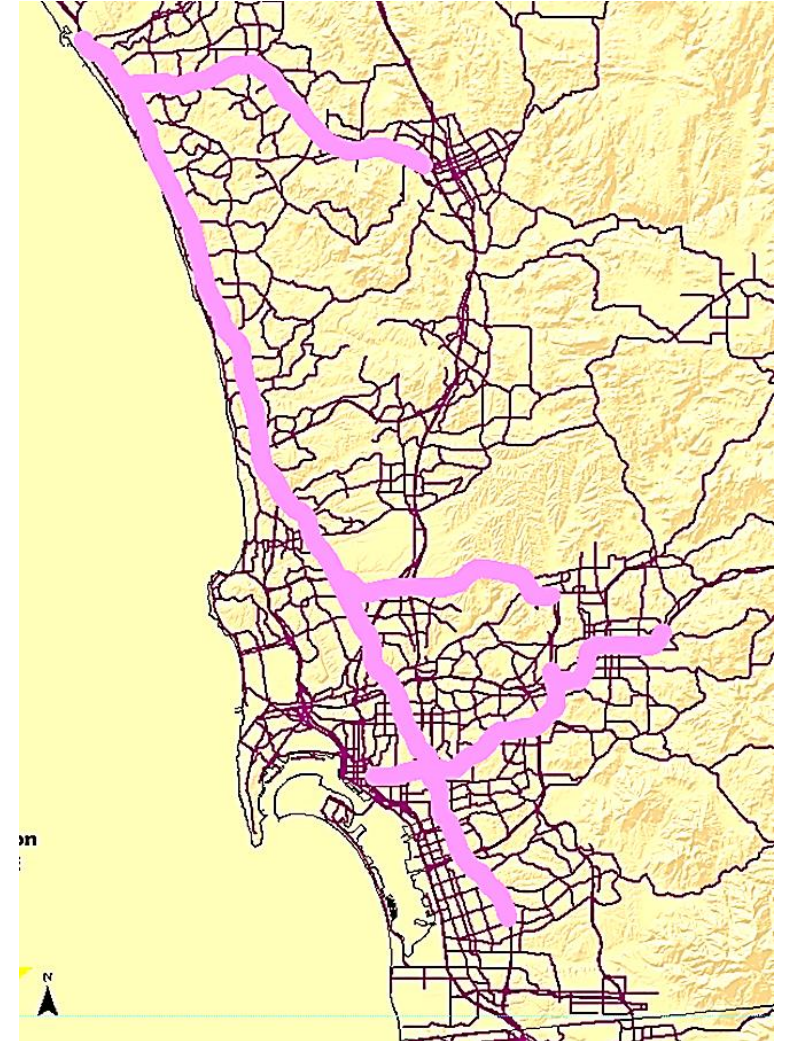
Corridor	FHWA Class	Lane Type	Test	Elasticity	Relative Elasticity
I-5	1	GP	Add one GP lane in each direction	0.31	1
I-5	1	Aux	Add auxiliary lanes between ramps where none exist	0.06	0.19
I-5	1	ML	Add one ML lane in each direction	0.23	0.75
SR-52	2	GP	Add one GP lane in each direction from I-5 to SR-125	0.14	0.75
SR-52	2	AUX	Add auxiliary lanes between ramps where none exist	0.05	0.26
SR-52	2	ML	Add one ML lane in each direction from I-5 to SR-125	0.07	0.36
SR-78	2	GP	Add one GP lane in each direction from I-5 to I-15	0.16	0.75
SR-78	2	AUX	Add auxiliary lanes between ramps where none exist	0.06	0.28
SR-78	2	ML	Add one ML lane in each direction from I-5 to I-15	0.11	0.50
SR-78	2	Toll	Add one Toll lane in each direction from I-5 to I-15	0.10	0.45

# Facility Based Test Results

Lane Type	FHWA Class	Relative Full Elasticity
GP	1	1
ML	1	0.75
Aux	1	0.2
GP	2	0.75
ML	2	0.26
Aux	2	0.49
Toll	2	0.46
GP	3	0.75

# Facility Based Tests & Results

- Modify RP/SCS no build networks
- Add GP lane capacity on FFC1 & FFC2 facilities
- Test #1 no added lane capacity with no RP/SCS policies
- Test #2 added lane capacity with no RP/SCS policies
- Test #3 added lane capacity with RP/SCS policies
- Results (December 2022):
  - VMT reducing elasticity of .2808





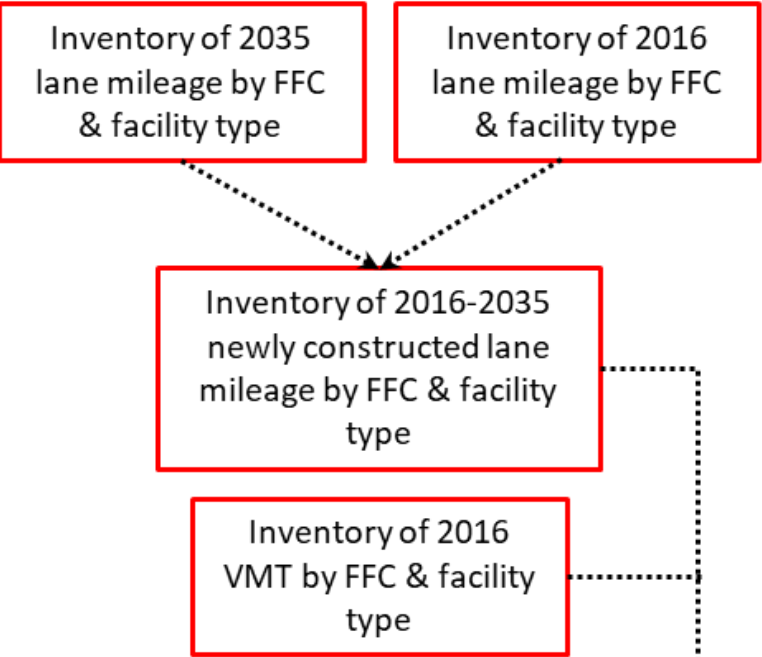
# Final Elasticities

- Assert that for regional planning forecast applications short and long run elasticity is evenly divided at 50/50
- Assert that the transportation model accounts for 50% of long run induced demand.

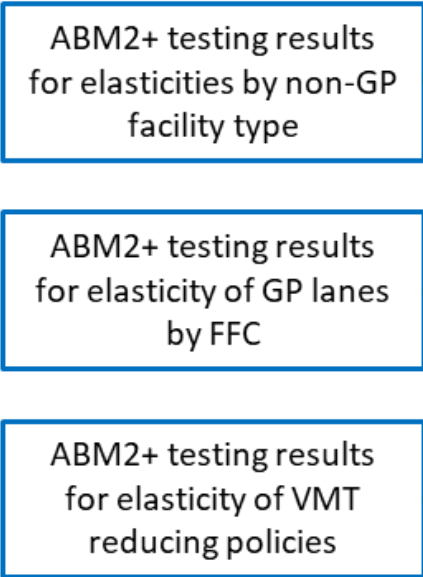
FACILITY TYPES		ABM TESTING	50/50 SPLIT*		MODEL ELASTICITIES ACCOUNTED FOR		MODEL ELASTICITIES UNACCOUNTED FOR		POLICY TEST	FINAL ELASTICITY
Class	Type	Relative Full Elasticities	Short-Run Elasticity	Long-Run Elasticity	Model Short Run	Model Long Run*	Model Short-Run	Model Long-Run	Policy Reduction	Full Elasticity
FFC Class 1	GP	1.000	0.500	0.500	62%	50%	0.190	0.250	0.281	<b>0.159</b>
FFC Class 1	AUX	0.200	0.100	0.100	60%	50%	0.040	0.050	0.056	<b>0.034</b>
FFC Class 1	ML	0.750	0.375	0.375	61%	50%	0.145	0.188	0.211	<b>0.122</b>
FFC Class 2	GP	0.750	0.375	0.375	40%	50%	0.225	0.188	0.211	<b>0.202</b>
FFC Class 2	AUX	0.263	0.131	0.131	46%	50%	0.071	0.066	0.074	<b>0.063</b>
FFC Class 2	ML	0.488	0.244	0.244	45%	50%	0.134	0.122	0.137	<b>0.119</b>
FFC Class 2	TOLL	0.458	0.229	0.229	44%	50%	0.129	0.114	0.128	<b>0.115</b>
FFC Class 3	GP	0.750	0.375	0.375	45%	50%	0.205	0.188	0.211	<b>0.182</b>

# Methodology Overview

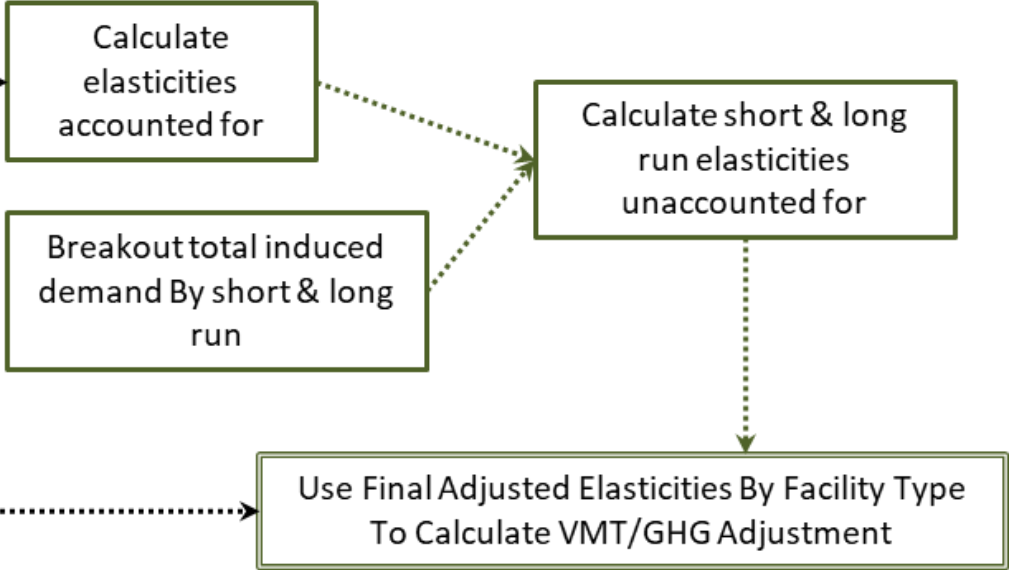
## DATA COLLECTION



## ABM2+ TESTING



## INDUCED DEMAND CALCULATOR



# Limitations

- Existing GP to ML/HOT conversions not considered in this analysis.
- Does not consider large changes to exogenous variables. (fuel prices, recessions, housing prices, etc.)
- Cannot disaggregate by special travel markets. (commercial, cross-border, military, tourism, etc.)
- Only applicable for regional planning purposes.

# Conclusions

- Final added VMT values will be calculated along with the conclusion of 2021 RP/SCS amendment modeling.
- Current induced demand research and tools are not turnkey applications for long range regional plans such as an SCS.
- SANDAG models and documentation has accounted for a portion of induced demand.
- More guidance needed for other applications. (project evaluation, corridor studies, policy guidance, etc.)
- Acknowledgments: Rick Curry & Neeco Beltran

# Forum Agenda Recap

Next  
Transportation  
Model Forum:  
Summer 2023



**Welcome and Introductions**



**2021 Regional Plan Amendment  
Update**



**Roadmap to 2025 Regional  
Plan**



**Service Bureau Update**



**Induced Demand Methodology**



# Transportation Model Forum

December 6<sup>th</sup> 2022