TRANSPORTATION MODEL FORUM

December 15, 2021

SANDAG

Forum Agenda

- Welcome and Introductions
- 2021 Regional Plan Model Overview
- ABM2+ Subarea Enhancements

Welcome and Introductions

- Staffing Updates
  - Departures
  - Arrivals
  - Open position(s)
- New Model Website
- Return to 401 B Street
- Official Retirement: ABM1

2021 REGIONAL PLAN MODEL OVERVIEW

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SANDAG

2021 Regional Plan Model Overview

- Three Key Elements used to Define a Model Version
  - Model Software and Parameters
    - New travel surveys
    - New features
  - Socioeconomic, Demographic, Land Use, Employment Inputs
    - Typically referred to as the land use series such as “Series 14”
  - Plan Assumptions
    - Transportation Networks
    - Policies
- Problems with Previous Model Naming Nomenclature
  - Terms used interchangeably
  - “ABM1” or “Series 13 model” or “2015 RP model”

2021 Regional Plan Model Overview

- RP & RTP Models

	2015 RP	2019 RTP	2021 RP
ABM Model	ABM1	ABM2	ABM2+
ABM Version	13.2.2	14.1.1	14.2.2
Software (Traffic Assignment)	TransCAD	EMME	EMME
Land Use Version	Series 13	Series 14 Ver 17	Build: Series 14 Ver 38 No Build: Series Ver 39

- Naming Problems
  - Multiple Series 14
  - ABM2 vs ABM2+

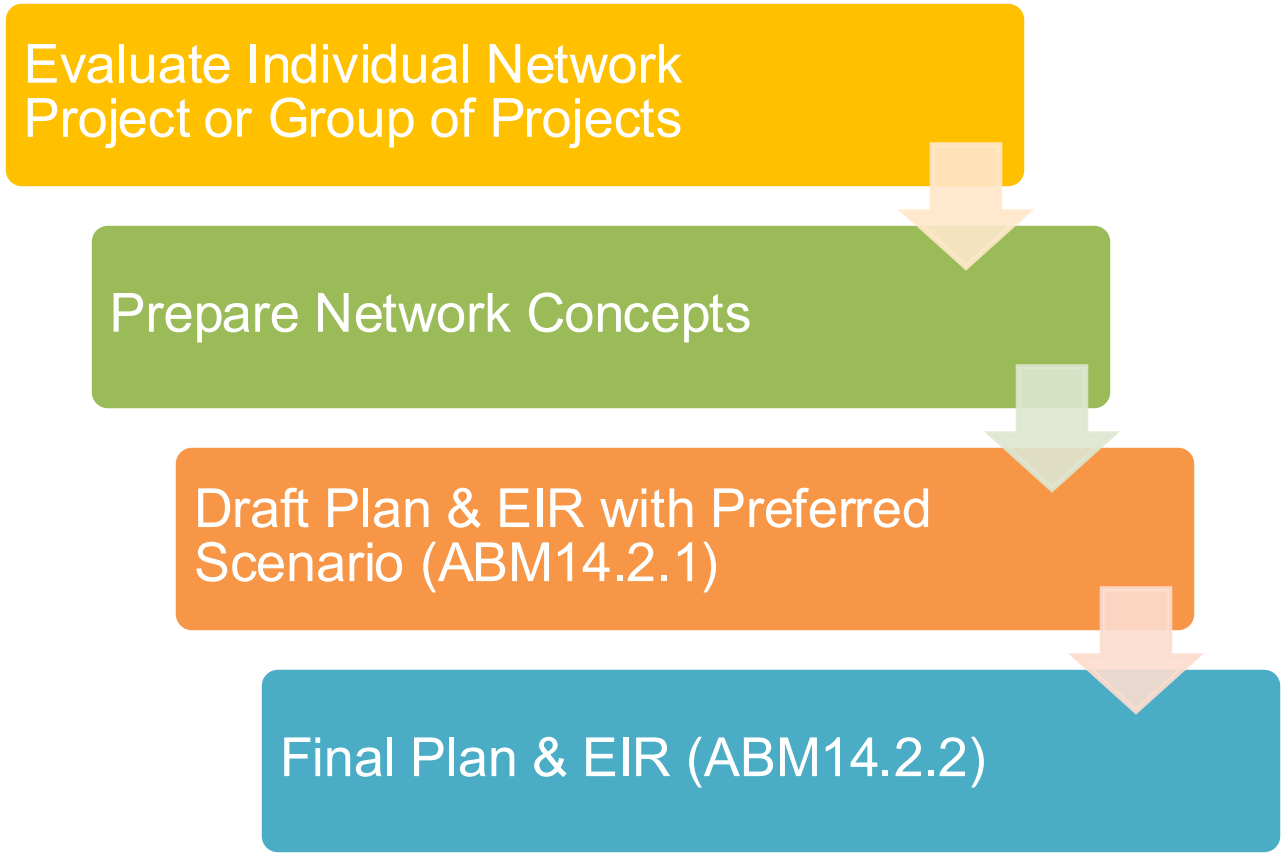
2021 RP Land Use Versions

Series 14 Version ID	Name	Use	Department of Finance Projection Series	Housing Units Added	Conforms to RHNA Targets	Includes NAVWAR
DS-17		2019 RTP & Project Use	2018_1_20	420k	No	No
DS-35	Baseline	Not used	2020_1_20	274k	No	No
DS-41	Baseline Update	Post 2021RP Project Use (ABM2+ w/2021 RP)	2020_1_20	274k	No	No
DS-39	SCS No Build	2021 RP Only	2020_1_20	274k	Yes by 2034	No
DS-38	SCS Build	2021 RP Only	2020_1_20	274k	Yes by 2034	Yes
DS-42	SCS Build Update	Post 2021RP Project Use (ABM2+ w/2021 RP)	2020_1_20	274k	Yes by 2034	Yes

2021 Regional Plan Model Overview

- Three Key Elements used to Define a Model Version
  - Model Software and Parameters
    - ABM2+ version 14.2.2 for 2021 RP
    - ABM2+ version 14.3.0 for post-2021 RP project work
  - Socioeconomic, Demographic, Land Use, Employment Inputs
    - DS-38, 39 for 2021 RP
    - DS-41, 42 for post-2021 RP project work
  - Plan Network and Policy Assumptions
    - Build vs No Build
- Please be specific when requesting data and using data
  - Add Citations to your work
    - SANDAG Activity Based Model #, Release vXX.X.X, Growth Forecast XX.XX, Forecast Year YYYY, Reference Scenario #XXX, Month/Year of Model Run

2021 Regional Plan Process

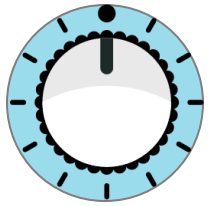


SB 375 Regional Plan Sustainable Communities Strategy (SCS) Climate Targets

GHG Reduction	2020	2035
Targets through Sept. 30, 2018	-7%	-13%
Targets beginning Oct. 1, 2018	-15%	**-19%**

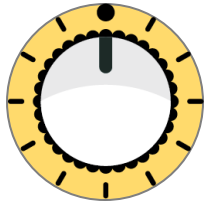
Policy Dials (On vs Off-Model, ABM2+ 2020)

Technology



Smart signals	on-model
ATDM reliability	on-model
Connected and automated vehicles	on-model partially (not in the 21 RP)
Electric vehicle programs	off-model

Economic (Cost)



Managed Lanes/High occupancy toll rates	on-model
Road usage charge	on-model
Parking rates	on-model
Transit fares	on-model

Travel Choice

HOV/Managed Lane occupancy	on-model
TDM ordinance	off-model
Vanpool	off-model
Carshare	off-model
Bikeshare	on-model
Microtransit	on-model
Pooled rides	off-model

2021 Regional Plan Policy Levels

- ML/HOV3+ Free
- Road Usage Charge (RUC)
- Parking Cost by Mobility Hubs
- ATDM
- Smart Signal
- Telework

2021 Regional Plan Off Model Calculators

- Electric Vehicle Programs
- Vanpool
- Carshare
- Pooled Rides
- TDM Ordinance

https://sdforward.com/docs/default-source/final-2021-regional-plan/appendix-s---travel-model-documentation---abm2.pdf?sfvrsn=dac1fd65_2

2021 Regional Plan Performance Measures

- Developed based on measures used in past plans and at other MPOs
- Few and more meaningful measures
- PMs
  - Access to Basic Needs (also for social equity)
  - Comparable Travel Time by Mode by Corridor
  - GHG Emissions
  - Vehicle Miles Traveled
  - Access to Opportunities (also for social equity)
  - Fiscal and Social Responsibility (also for social equity)

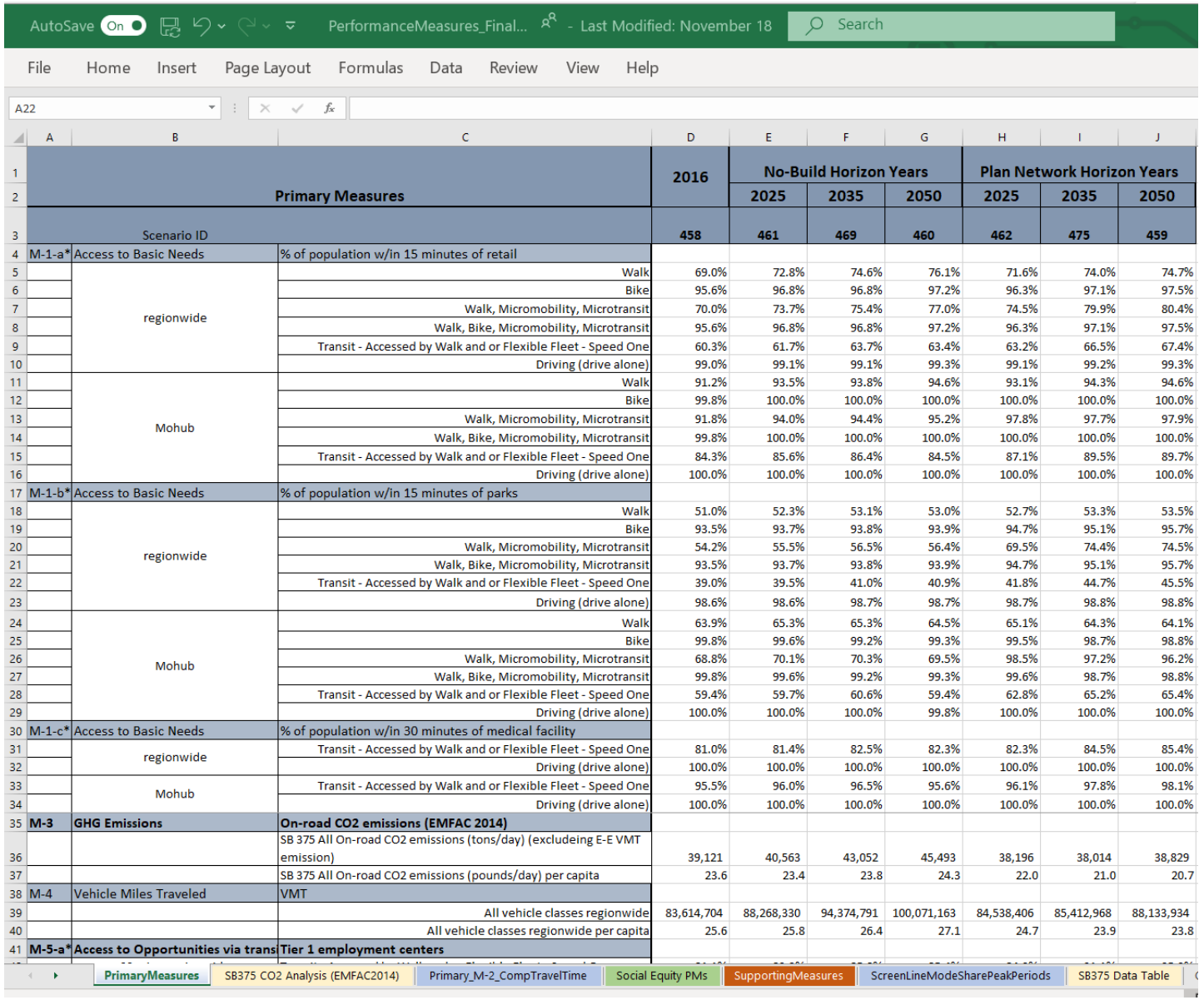
https://sdforward.com/docs/default-source/final-2021-regional-plan/appendix-t---network-development-and-performance.pdf?sfvrsn=dbc1fd65_2

https://sdforward.com/docs/default-source/final-2021-regional-plan/appendix-h---social-equity-engagement-and-analysis.pdf?sfvrsn=84c1fd65_2

2021 Regional Plan Performance Measures

- Supporting Measures
  - Mode shares (work trips/ all trips)
  - Population / jobs within half mile of a station of commuter rail, light rail, or next gen rapid (population also for social equity)
  - Population within quarter mile of a bike facility (class I and II, cycletrack or bike boulevard) (also for social equity)
  - Daily transit boarding (region/ mobility hubs)
  - Truck/commercial vehicle travel times to and around regional gateways and distribution hubs (minutes)
  - Average per person particulate matter 2.5 exposure (also for social equity)
  - Heavy duty truck delay by facility type
  - Change of percent of income consumed by out-of-pocket transportation costs (also for social equity)

2021 Regional Plan Performance Measures



AutoSave On | PerformanceMeasures_Final... - Last Modified: November 18 | Search

File Home Insert Page Layout Formulas Data Review View Help

A22

	A	B	C	D	E	F	G	H	I	J
1	Primary Measures			2016	No-Build Horizon Years			Plan Network Horizon Years		
2					2025	2035	2050	2025	2035	2050
3	Scenario ID			458	461	469	460	462	475	459
4	M-1-a*	Access to Basic Needs	% of population w/in 15 minutes of retail							
5		regionwide	Walk	69.0%	72.8%	74.6%	76.1%	71.6%	74.0%	74.7%
6			Bike	95.6%	96.8%	96.8%	97.2%	96.3%	97.1%	97.5%
7			Walk, Micromobility, Microtransit	70.0%	73.7%	75.4%	77.0%	74.5%	79.9%	80.4%
8			Walk, Bike, Micromobility, Microtransit	95.6%	96.8%	96.8%	97.2%	96.3%	97.1%	97.5%
9			Transit - Accessed by Walk and or Flexible Fleet - Speed One	60.3%	61.7%	63.7%	63.4%	63.2%	66.5%	67.4%
10			Driving (drive alone)	99.0%	99.1%	99.1%	99.3%	99.1%	99.2%	99.3%
11		Mohub	Walk	91.2%	93.5%	93.8%	94.6%	93.1%	94.3%	94.6%
12			Bike	99.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
13			Walk, Micromobility, Microtransit	91.8%	94.0%	94.4%	95.2%	97.8%	97.7%	97.9%
14			Walk, Bike, Micromobility, Microtransit	99.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
15			Transit - Accessed by Walk and or Flexible Fleet - Speed One	84.3%	85.6%	86.4%	84.5%	87.1%	89.5%	89.7%
16			Driving (drive alone)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
17	M-1-b*	Access to Basic Needs	% of population w/in 15 minutes of parks							
18		regionwide	Walk	51.0%	52.3%	53.1%	53.0%	52.7%	53.3%	53.5%
19			Bike	93.5%	93.7%	93.8%	93.9%	94.7%	95.1%	95.7%
20			Walk, Micromobility, Microtransit	54.2%	55.5%	56.5%	56.4%	69.5%	74.4%	74.5%
21			Walk, Bike, Micromobility, Microtransit	93.5%	93.7%	93.8%	93.9%	94.7%	95.1%	95.7%
22			Transit - Accessed by Walk and or Flexible Fleet - Speed One	39.0%	39.5%	41.0%	40.9%	41.8%	44.7%	45.5%
23			Driving (drive alone)	98.6%	98.6%	98.7%	98.7%	98.7%	98.8%	98.8%
24		Mohub	Walk	63.9%	65.3%	65.3%	64.5%	65.1%	64.3%	64.1%
25			Bike	99.8%	99.6%	99.2%	99.3%	99.5%	98.7%	98.8%
26			Walk, Micromobility, Microtransit	68.8%	70.1%	70.3%	69.5%	98.5%	97.2%	96.2%
27			Walk, Bike, Micromobility, Microtransit	99.8%	99.6%	99.2%	99.3%	99.6%	98.7%	98.8%
28			Transit - Accessed by Walk and or Flexible Fleet - Speed One	59.4%	59.7%	60.6%	59.4%	62.8%	65.2%	65.4%
29			Driving (drive alone)	100.0%	100.0%	100.0%	99.8%	100.0%	100.0%	100.0%
30	M-1-c*	Access to Basic Needs	% of population w/in 30 minutes of medical facility							
31		regionwide	Transit - Accessed by Walk and or Flexible Fleet - Speed One	81.0%	81.4%	82.5%	82.3%	82.3%	84.5%	85.4%
32			Driving (drive alone)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
33		Mohub	Transit - Accessed by Walk and or Flexible Fleet - Speed One	95.5%	96.0%	96.5%	95.6%	96.1%	97.8%	98.1%
34			Driving (drive alone)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
35	**M-3**	**GHG Emissions**	**On-road CO2 emissions (EMFAC 2014)**							
36			SB 375 All On-road CO2 emissions (tons/day) (excludeing E-E VMT emission)	39,121	40,563	43,052	45,493	38,196	38,014	38,829
37			SB 375 All On-road CO2 emissions (pounds/day) per capita	23.6	23.4	23.8	24.3	22.0	21.0	20.7
38	M-4	Vehicle Miles Traveled	VMT							
39			All vehicle classes regionwide	83,614,704	88,268,330	94,374,791	100,071,163	84,538,406	85,412,968	88,133,934
40			All vehicle classes regionwide per capita	25.6	25.8	26.4	27.1	24.7	23.9	23.8
41	**M-5-a***	**Access to Opportunities via trans**	**Tier 1 employment centers**							

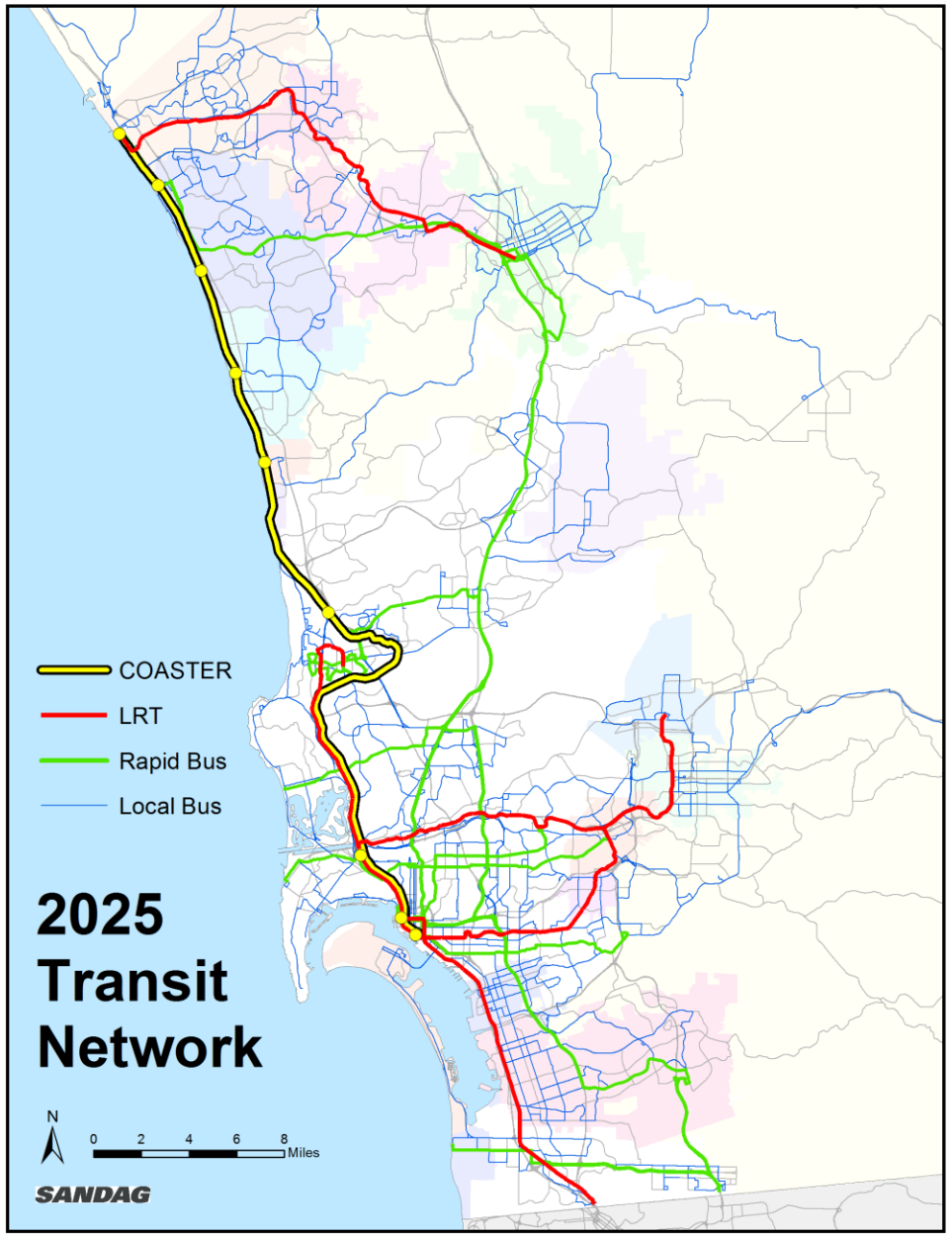
PrimaryMeasures | SB375 CO2 Analysis (EMFAC2014) | Primary_M-2_CompTravelTime | Social Equity PMs | SupportingMeasures | ScreenLineModeSharePeakPeriods | SB375 Data Table

2021 Regional Plan Emissions

- EMFAC 2014 for SB375 GHG Analysis
  - SB375 CO2 emissions
  - SB375 VMT/Trips/emission rates

- EMFAC 2017 for Air Quality Conformity
  - CO2 emissions
  - On-road smog forming pollutants (ROG, NOx)
  - Carbon Monoxide (CO)

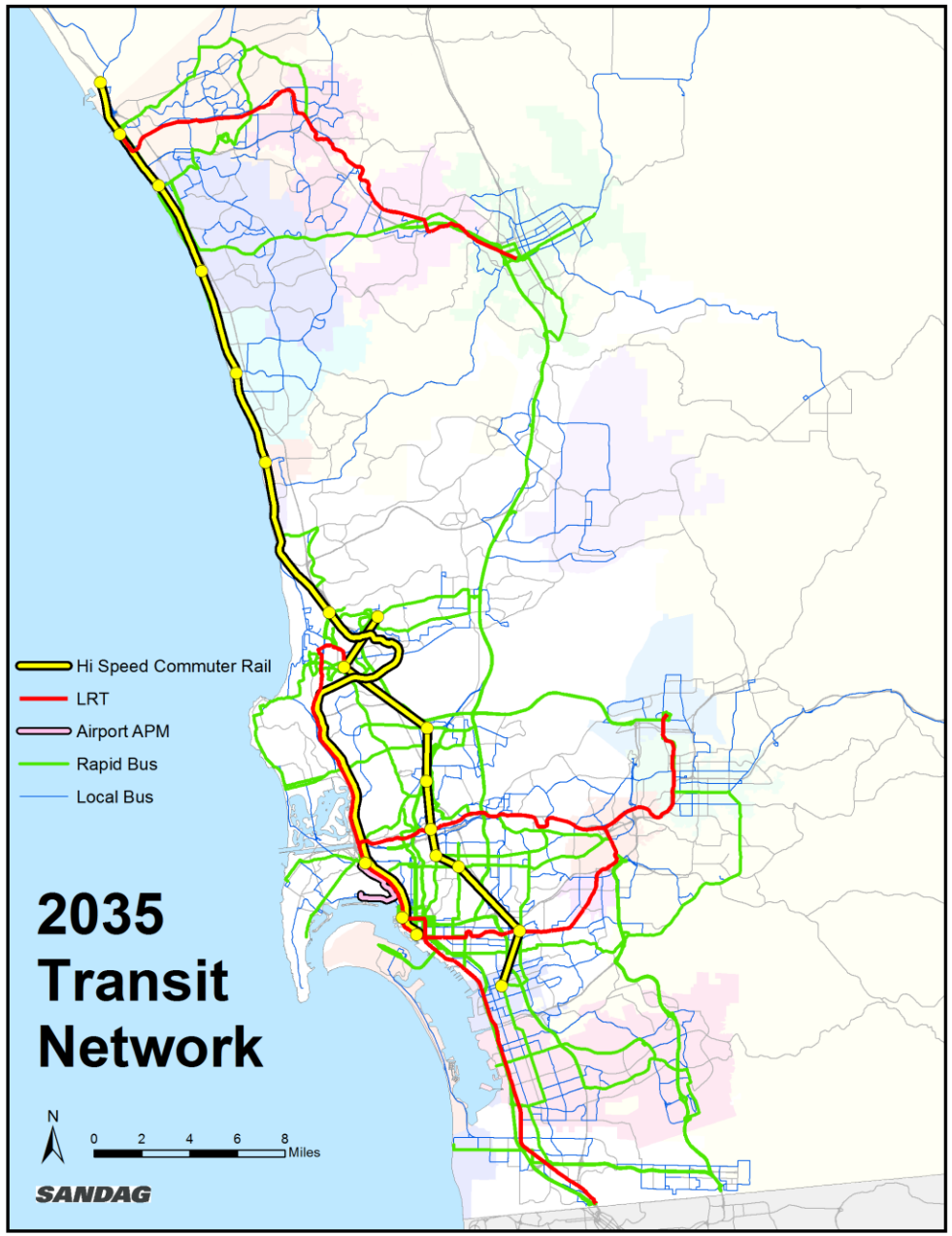
Transit Networks



2025 Highlights

- COASTER Extended to Gaslamp with increased frequencies to 30 pk / 60 off-pk
- Five new Rapid Buses serving PB, Kearny Mesa, Palomar Airport Rd, Ocean Beach, Spring Valley, Imperial Beach and other locations
- Increased frequencies on selected local buses

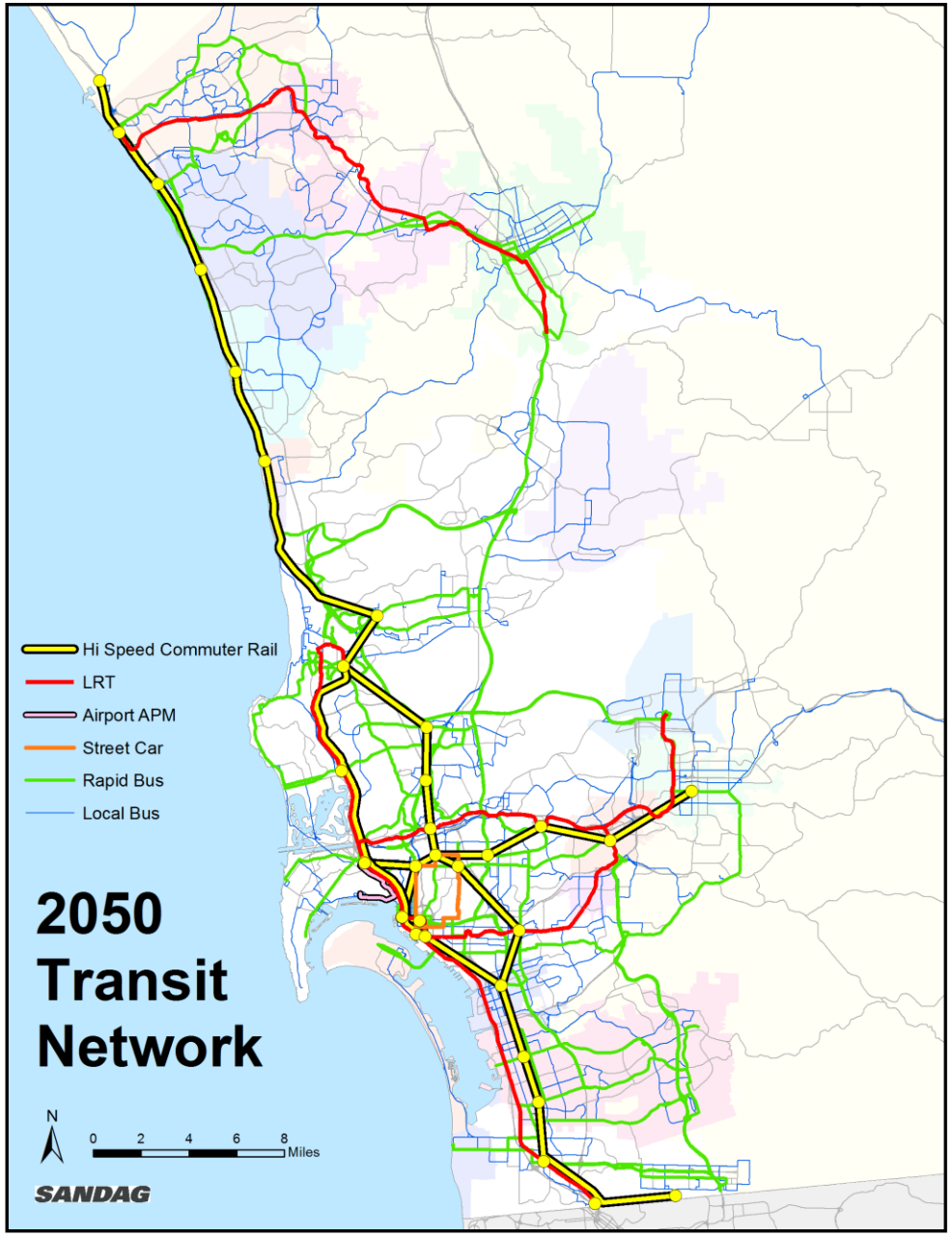
Transit Networks



2035 Highlights

- COASTER converted to a high-speed commuter rail line, extended to Camp Pendleton, Del Mar tunnel added, and frequencies increased to 20 pk / 60 off-pk
- Initial Purple Line high-speed commuter rail line
- Increased SPRINTER frequencies to 15 minutes
- Increased frequencies on all Trolley lines to 7.5 minutes
- Central Mobility Hub at NAVWAR with APM to airport
- 20 new Rapid Buses
- Increased frequencies on local buses

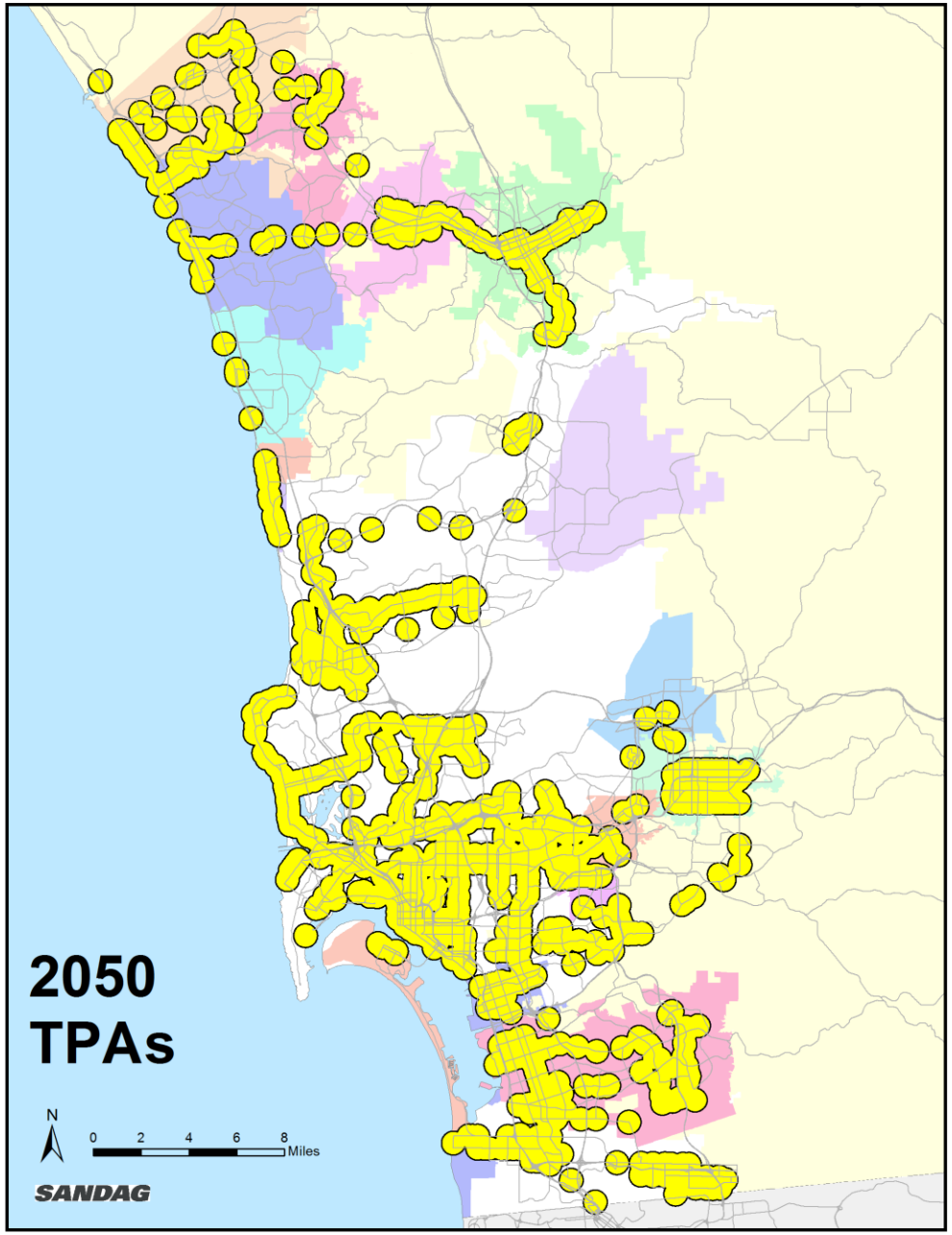
Transit Networks



2050 Highlights

- COASTER tunnels to new Sorrento Mesa and UTC stations plus a station at Balboa Ave
- Purple Line extended to San Ysidro and Rodriguez Field
- 3 Other high speed commuter lines added
- Increased SPRINTER frequencies to 10 minutes and extended to Westfield North County shopping center
- Street Car added in Hillcrest/North Park
- 5 new Rapid Buses

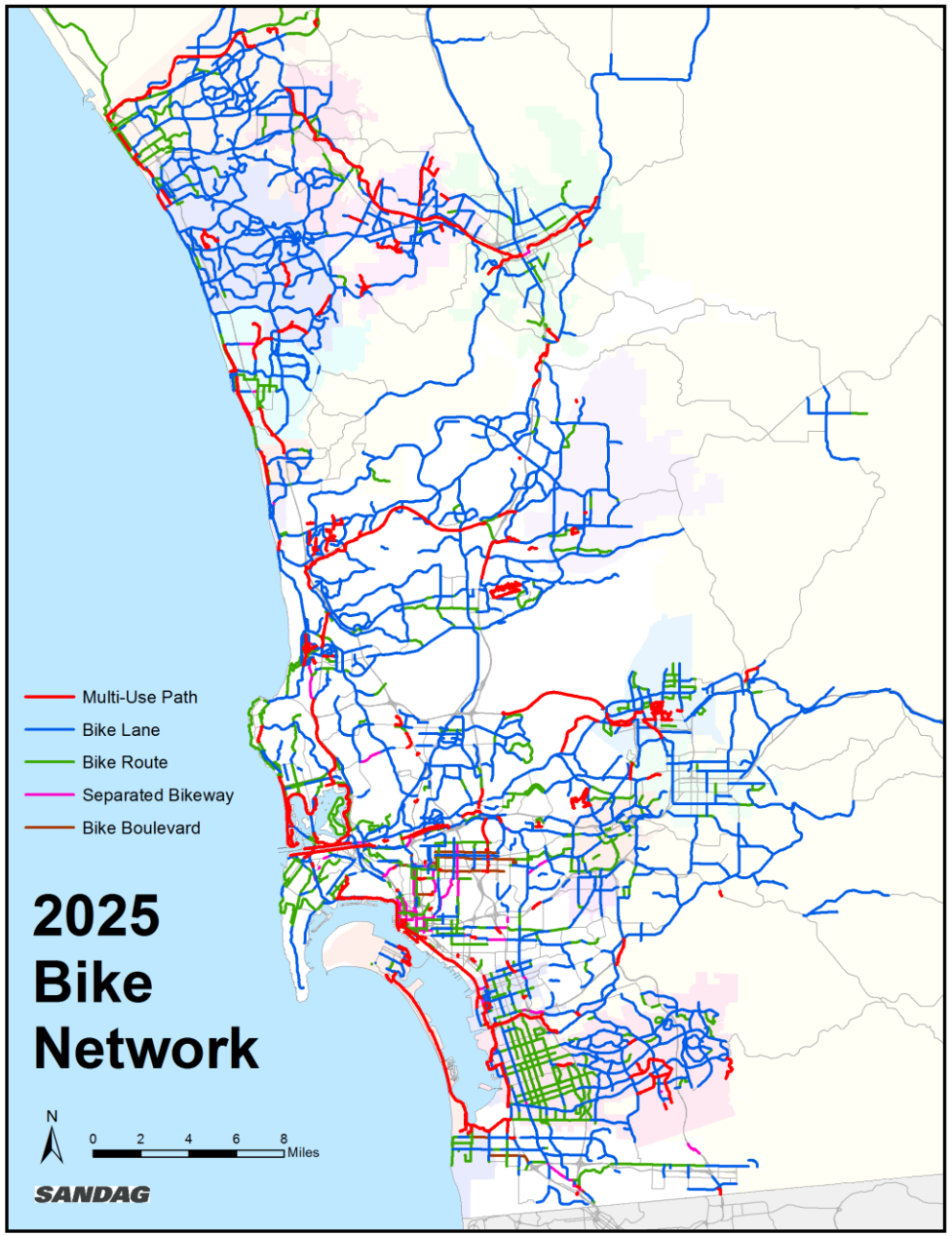
Transit Priority Areas



Half mile buffers around Major Transit Stops, which are defined as

- All rail stations
- Bus stops served by at least 2 buses with 15 minute or better frequencies in the AM and PM peaks
- Now includes all Rapid stops as well

Bike Networks



2025 Highlights

•98 uni-directional miles of new bike network

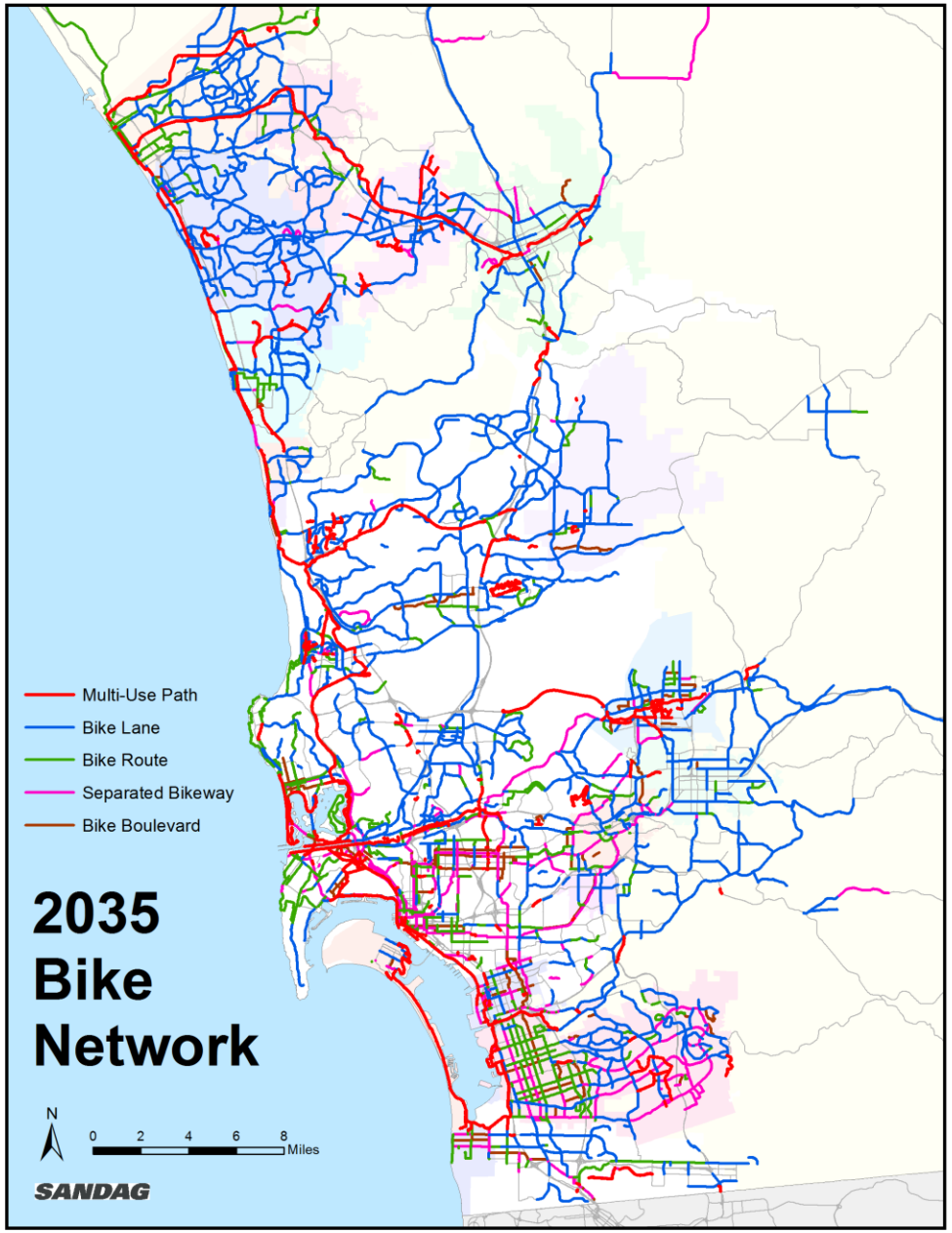
•41 miles of new Multi-Use/Class I Bike Paths

•57 miles of new and 45 miles of upgraded bike lanes/separated bikeways

•32 miles of upgraded on-street bike routes

*compared to 2020 network (3,359 miles of bike network)

Bike Networks

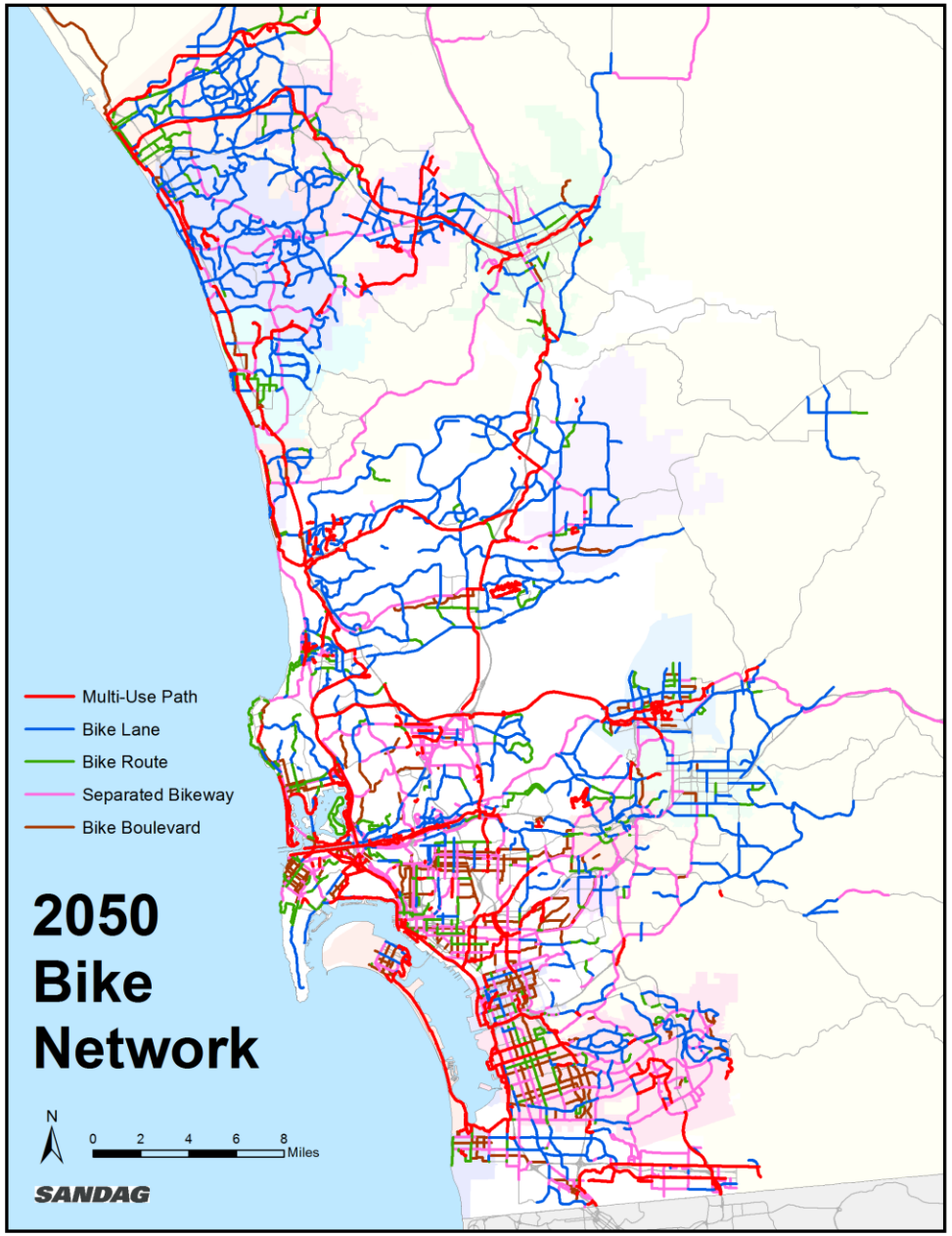


2035 Highlights

- 180 uni-directional miles of new bike network
- 101 miles of new Multi-Use/Class I Bike Paths
- 55 miles of new and 347 miles of upgraded bike lanes/separated bikeways
- 23 miles of new 160 miles of upgraded on-street bike routes

*compared to 2025 network

Bike Networks

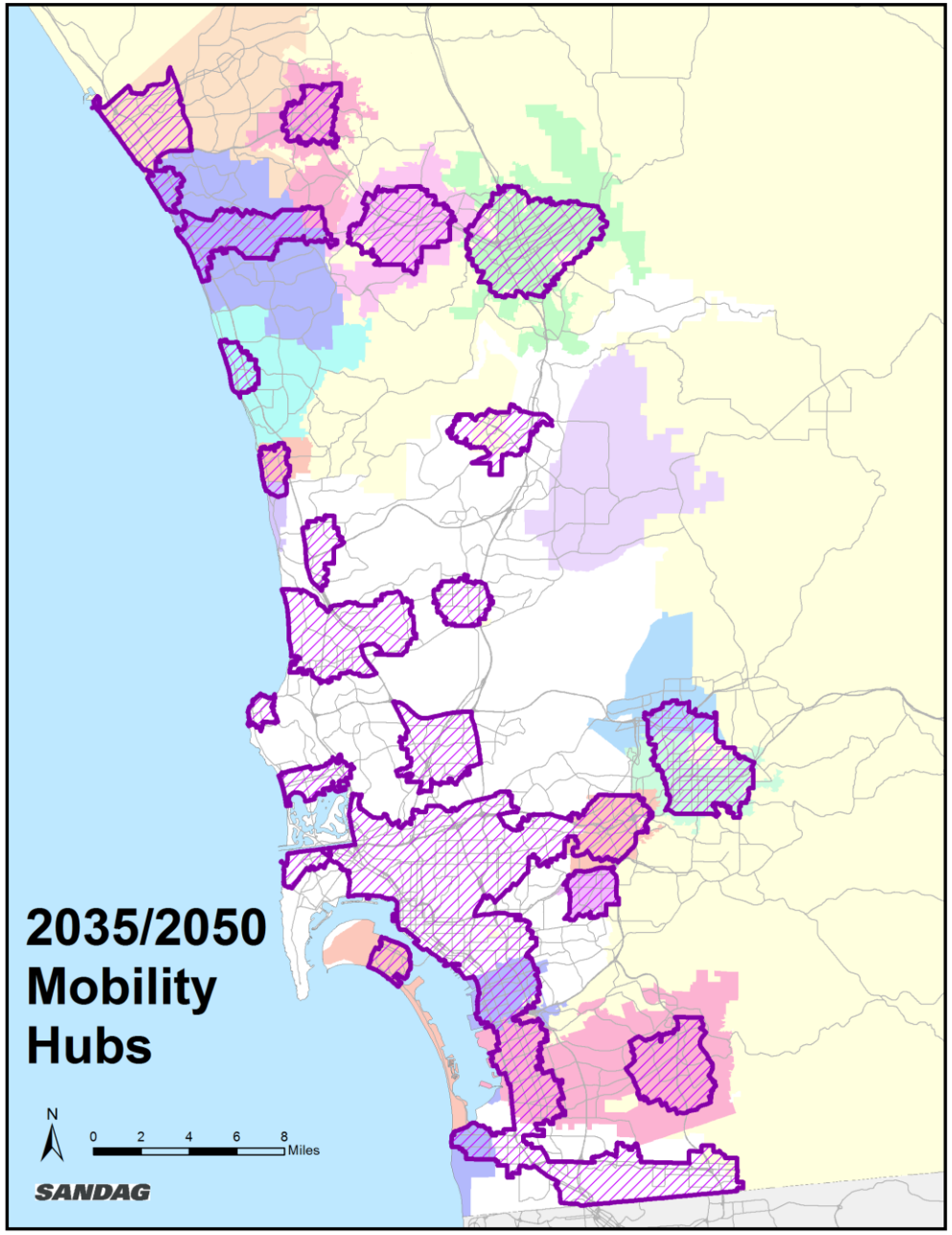


2050 Highlights

- 513 uni-directional miles of new bike network
- 232 miles of new Multi-Use/Class I Bike Paths
- 194 miles of new and 590 miles of upgraded bike lanes/separated bikeways
- 86 miles of new and 230 miles of upgraded on-street bike routes

*compared to 2035 network

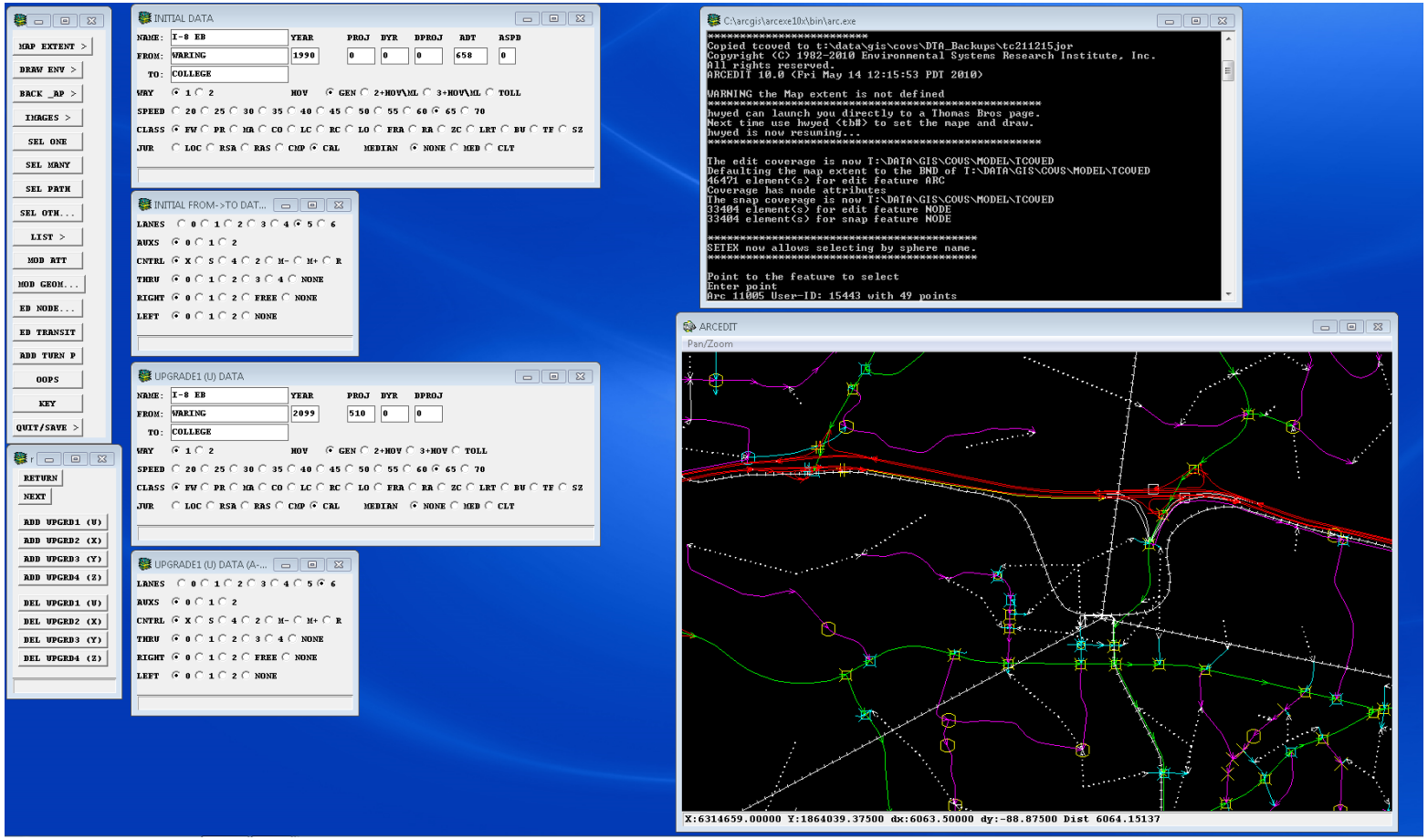
Mobility Hubs



- Intensified Mixed Land Uses
- Increased parking costs
- Micro-transit allowed
- Increased Micro-mobility access

TCOV: The Master GIS Network Layer

- Network editing Geometrics & Attributes
- Project control: Extract, Transfer and Load



Newer Features of hwycov & ABM2+

- For Managed Lanes (HOT) facilities where HOV3+ may enter without paying toll
- HOV2 may be charged a percentage (discount) of the SOV toll

SOV: Pays full per mile ML toll rate as defined in hwycov

HOV2: Pays full per mile ML toll rate as defined in hwycov or parameter file may be modified to charge HOV2 a percentage portion of SOV toll rate

HOV3+: Carpool. Free. No link-based ML fees applied.

New Corridors & Projects for 2021 RP/SCS

- GP Lane expansions kept to the slimmest of minimums in 2021 RP/SCS
  - Only ~7% of GP lane mileage added when compared to the 2015 RP/SCS
- Rural state highway corridor level GP expansions removed
  - Investments in 2021 RP/SCS are more operational and safety focused in nature
- ML Lane network expanded to new corridors
  - I-8, SR-56, SR-163, SR-905
- ML Lane network utilizing additional moveable barrier facilities
  - I-15, SR-52, SR-56, SR-94
- More ML direct connector ramps
  - 2015 RP/SCS: 9 ML connector couplets
  - 2021 RP/SCS: 43 ML connector couplets
- 50% of expanded ML network achieved via conversion of existing GP lanes

Highway Network

2015 RP/SCS

2021 RP/SCS

General Purpose Lane Conversions

- About ½ of the 2050 Managed Lanes network is created from conversion of existing General Purpose lanes.

Lane Miles	2016 '21 Final RP	2025 '21 Final RP	2035 '21 Final RP	2050 '21 Final RP
FREEWAY	2,576	2,643	2,845	2,950
GP Main Line	2,294	2,303	2,060	1,948
AUX	121	134	164	173
HOV/ML	116	150	565	821
TOLL	45	55	55	7
HOV/ML New Construction	N/A	34	202	301
GP Lane New Construction	N/A	9	13	10
AUX Lane New Construction	N/A	13	43	52
GP Lane Conversion	N/A	0	247	404

Data Dissemination

- Regional Models Website (Link)
  - Two main tabs: Transportation Model and Activity Based Model
  - Transportation Model Tab
    - High level overview of modeling applications, survey data, previous model forum slides, and other data dissemination efforts (TFIC, Data Surfer, SB 743 VMT maps)
  - Activity Based Model Tab
    - Summarizes ABMs, links to documentation/GitHub, outlines improvements between ABM2+ and ABM2, and provides links to the next generation (ABM3)

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Transportation Model

The SANDAG transportation model provides a systematic analytical platform so that different alternatives and inputs can be evaluated in an iterative and controlled environment.

Transportation Modeling

San Diego Association of Governments (SANDAG) plans for complex mobility issues facing the San Diego region through the development of a long-range Regional Plan (RP). Transportation and land use models are used to forecast potential future scenarios of where people will live and how they will travel. Models are the principal tools used for alternatives analysis, and they provide planners and decision makers with information to help them equitably allocate scarce resources. The SANDAG transportation model, an activity-based model (ABM), provides a systematic analytical platform so that different alternatives and inputs can be evaluated in an iterative and controlled environment. An ABM simulates individual and household transportation decisions that compose their daily travel itinerary. People travel outside their home for activities such as work, school, shopping, healthcare, and recreation, and the ABM attempts to predict whether, where, when, and how this travel occurs. .

ABM 2+ is the most recent version of the SANDAG ABM. A peer reviewed model, it was designed for application in the 2021 Regional Plan, a bold new vision that provides compelling alternatives to driving. It also considers emerging technologies, including autonomous vehicles, shared mobility, ride hailing, transformative modes, and micromobility. ABM2 was used for the 2019 Federal Regional Transportation Plan and has a base year of 2016. ABM1 was used for the 2015 Regional Plan and has a base year of 2012.

SANDAG Models and Associated Plans:

- 2021 Regional Plan (Fall 2021): ABM2+ with Series 14 Demographic and Land Use Forecast
- 2019 Federal Regional Transportation Plan: ABM2 with Series 14 Demographic and Land Use Forecast
- 2015 Regional Plan: ABM1 with Series 13 Demographic and Land Use Forecast

Transportation Modeling Forum

SANDAG hosts a bi-annual transportation modeling forum as a platform for staff to transfer knowledge regarding development and application of travel demand modeling and provide updates on current projects. Attendees usually include jurisdiction planning and engineering staff, transportation planning and engineering consultants, and state agencies such as Caltrans and Air Resources Board.

- Transportation Modeling Forum - Agenda Overview
- Transportation Modeling Forum - June 2021 [PDF: 5MB]
- Transportation Modeling Forum - June 2021 [YouTube]
- Transportation Modeling Forum - December 2020 [PDF: 7MB]
- Transportation Modeling Forum - July 2020 [PDF: 2MB]
- Transportation Modeling Forum - December 2019 [PDF: 4MB]
- Transportation Modeling Forum - June 2019 [PDF: 2MB]
- Transportation Modeling Forum - December 2018 [PDF: 2MB]
- Transportation Modeling Forum - June 2018 [PDF: 2MB]
- Transportation Modeling Forum - January 2018 [PDF: 3MB]
- Transportation Modeling Forum - June 2017 [PDF: 10MB]
- Transportation Modeling Forum - December 2016 [PDF: 8MB]
- Transportation Modeling Forum - June 2016 [ZIP: 7MB]
- Transportation Modeling Forum - December 2015 [PDF: 10MB]
- Transportation Modeling Forum - June 2015 [PDF: 8MB]
- Transportation Modeling Forum - December 2014 [PDF: 11MB]

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Regional Models
Transportation Model
Demographic and Land Use Model
Activity Based Model
Publications
SERVICES
Public Information Office
Service Bureau
511
FasTrak
iCommute
Keep San Diego Moving
Motorist Aid Services
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Activity Based Model

SANDAG has completed the transition from an enhanced four-steptransportation model to an activity based model (ABM). An ABM simulates individual and household transportation decisions that compose their daily travel itinerary.

SANDAG Activity Based Model

ABM2+ (2021 Regional Plan, Series 14 Land Use)

SANDAG completed the transition from an enhanced four-step transportation model to an activity-based model (ABM1) in 2013 and applied ABM1 in the 2015 Regional Plan. SANDAG has since completed the development of ABM2 and applied it in the 2019 Federal Regional Transportation Plan. SANDAG is currently utilizing ABM2+ to support the 2021 Regional Plan, also known as the 5 Big Moves.

The SANDAG ABM includes a number of methodological strengths. It predicts the travel decisions of San Diego residents at a detailed level, taking into account the way people schedule their day, their behavioral patterns, and the need to cooperate with other household members. When simulating a person's travel patterns, the ABM takes into consideration a multitude of personal and household attributes like age, income, gender, and employment status. The model's fine temporal and spatial resolution ensures that it is able to capture subtle aspects of travel behavior. The SANDAG ABM strives to be as behaviorally realistic as possible and is based on empirical data collected by SANDAG, Caltrans, and the federal government. The model development has been regularly peer-reviewed by the ABM Technical Advisory Committee, a panel of national experts in the travel demand forecasting field.

ABM2+ Documentation

- SANDAG Emme User Guide: ABM2+ is run using the transportation planning software Emme. This document provides an overview of the implemented modeling framework as well as a "how-to" for running the model.
- SANDAG ABM2+ Base Year Validation Report: Interactive data visualizations that show how ABM2+ model results are validated against empirical data.
- SANDAG ABM2+ Sensitivity Report: Contains sensitivity tests that describe the modeled effects of various inputs on metrics such as VMT, mode share, trip length, and transit boardings using ABM2+.
- GitHub: GitHub is a repository used by many organizations and companies to store and keep track of edits to code for projects. SANDAG uses GitHub to keep changes to the ABM transparent to the public. More reports and documents for ABM2+ can be found here.

ABM2 (2019 Federal Regional Transportation Plan, Series 14 Land Use)

SANDAG ABM2 utilizes the 2016-2017 Household Travel Survey (HHTS) and the 2015 Transit On Board Survey (OBS) data to calibrate and validate the existing ABM1 and updated model (ABM2) for the development of the 2019 Federal Regional Transportation Plan. In the long term, SANDAG will re-estimate the ABM2 based on 2016 HHTS and 2015 OBS data and use the updated model for the 2023 Regional Plan.

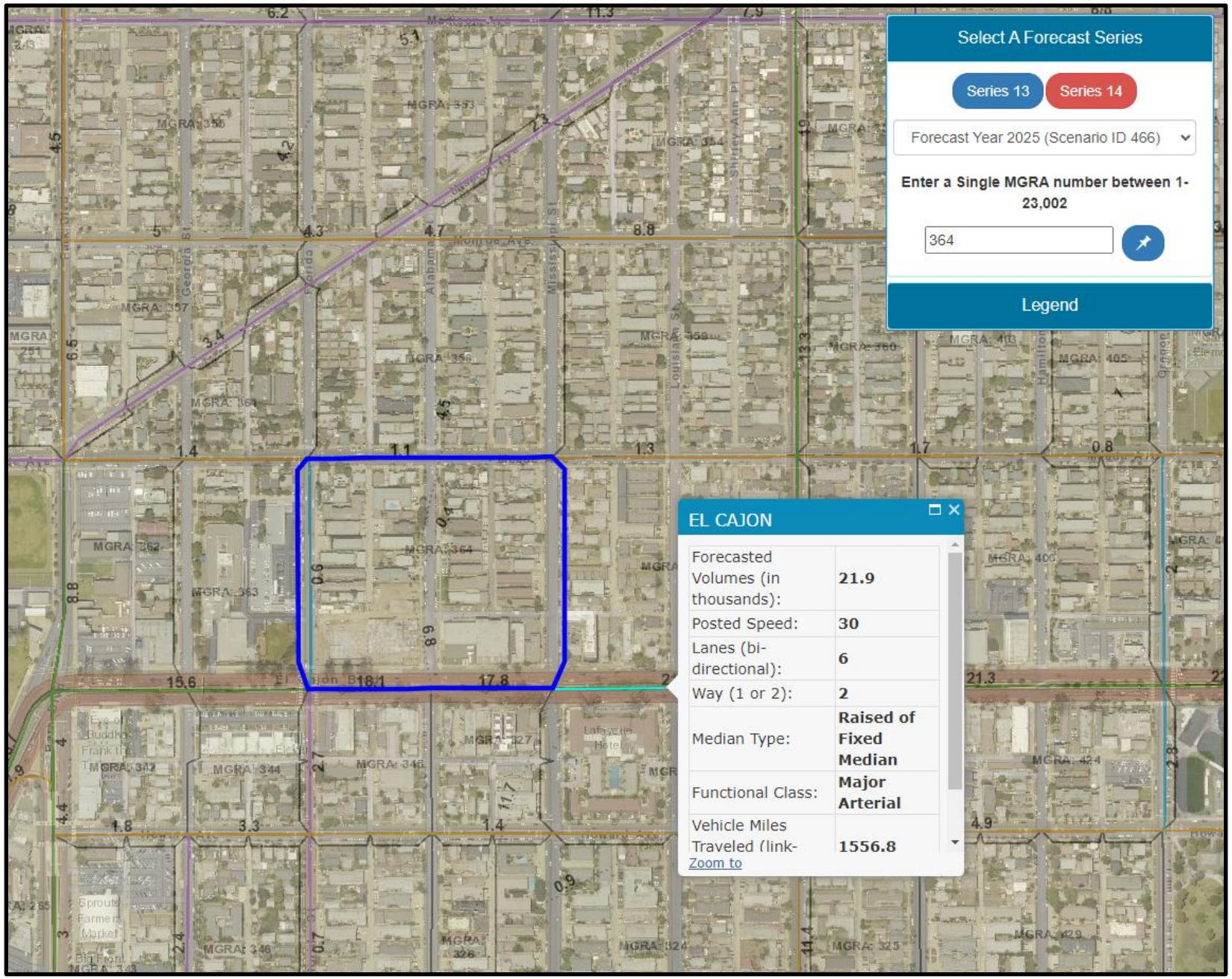
ABM2 Documentation

- 2019 RTP Appendix T
- 2015 Transit On Board Survey
- 2016 Household Travel Survey
- GitHub and More ABM2 Reports

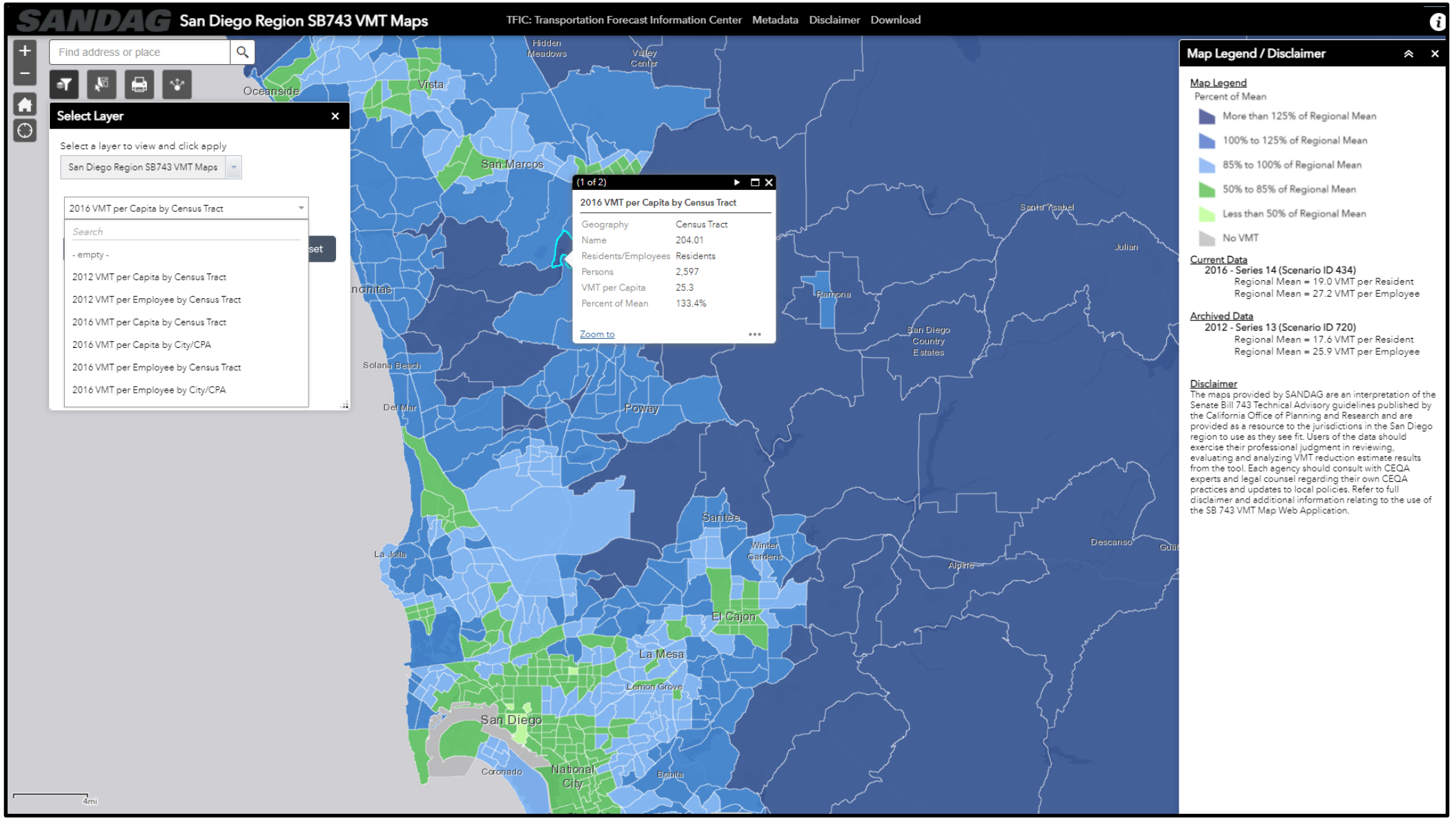
Data Dissemination

- TFIC (Link)
  - Transportation Forecast Information Center
  - Provides quick access to high-level model forecasting information, such as volume, VMT, speed, and number of lanes for select links (freeways, ramps, major roads, and minor roads)
  - Forecast years: 2016, 2025, 2035, 2050
  - SR13 will be retired
- SB743 VMT Maps (Link)
  - Provides SB743 VMT on specified geographies (Census Tract and City/CPA)
    - VMT expressed either by VMT per capita or VMT per employee
    - VMT is also expressed as a percentage of the regionwide average VMT

TFIC


Select A Forecast Series
Series 13
Series 14
Forecast Year 2025 (Scenario ID 466)
Enter a Single MGRA number between 1-23,002
364
Legend
EL CAJON
Forecasted Volumes (in thousands): 21.9
Posted Speed: 30
Lanes (bi-directional): 6
Way (1 or 2): 2
Median Type: Raised of Fixed Median
Functional Class: Major Arterial
Vehicle Miles Traveled (link-
Zoom to

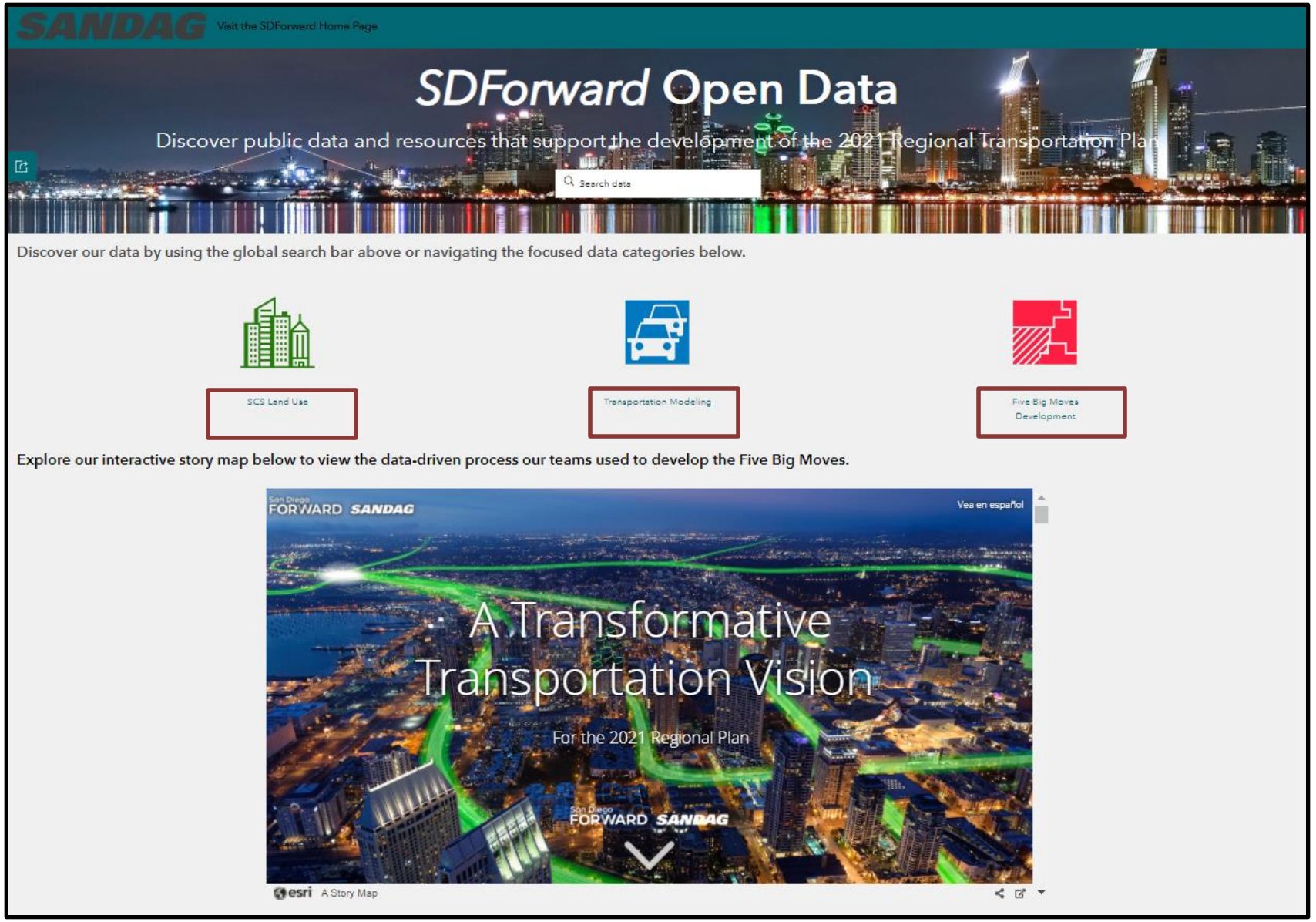
VMT Screening Map



Data Dissemination

- Regional Plan Data Portal
  - https://sdforwarddata-sandag.hub.arcgis.com/
  - One-stop shop to obtain data, documents, and maps that supported the development of the 2021 Regional Plan
  - Three Focused Categories to Pull From
    - SCS Land Use
    - Transportation Modeling
    - Five Big Moves Development (ESRI Story Map included)

Data Dissemination



Questions & Answers

- Chat Box & Live

ABM2+ SUBAREA ENHANCEMENT

Mike Calandra
Ziying Ouyang
Neeco Beltran

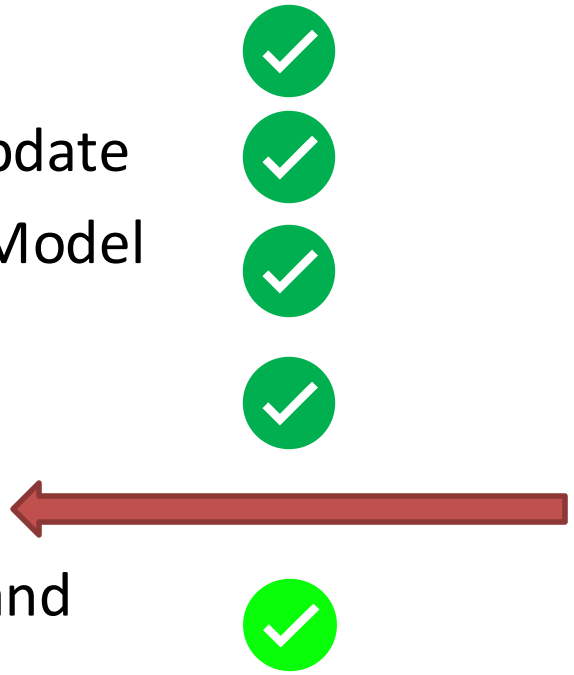
SANDAG

ABM2+ Subarea Enhancement Project Goals

- Implement land use overrides by MGRA in ABM2+
  - Update synthetic population for the study area
  - Update the employment density table
  - Implement new land use unit types
- Allow for use of flexible Traffic Analysis Zone (TAZ) layers
- QA/QC and subarea report automation
- Define reporting thresholds

ABM2+ Subarea Enhancement

- Scope and schedule
  - Project Management
  - Employment Density Update
  - Existing Processes and Model Enhancement Plan
  - Model Enhancements
  - Application Tests
  - Trip Table Data Report and Threshold Definitions
  - Final Report and Workshop
  - As Needed Support



Just about complete

Starting this month

ABM2+ production work begins after Board adoption of the 2021 Regional Plan, with an estimated project start date of January 2022

ABM2+ Subarea Enhancement

- Model enhancements for customized subarea ABM scenarios
  - Convert all scripts to Python
  - Procedures to override residential and non-residential land use assumptions
  - Procedures to update the synthetic population
  - Household sampling
  - Use of a flexible TAZ system to accommodate study areas
    - MGRA is still the atomic geographic unit
    - Build vs No Build
  - The 4D's
  - Automated QA/QC input checking and output reporting

Expected to be implemented in Spring 2022

ABM2+ Subarea Enhancement

- Employment Density Update
  - New unit types for certain land use codes
    - Acres, Beds, Pumps, Berths, Seats and Students

LUC	Description	KSF per Employee	ACRE per Employee	BEDS per Employee	PUMPS per Employee	BERTHS per Empolyee	SEATS per Employee	STUDENTS per Employee
2001	Heavy Industry	300						
2091	Heavy Industry	200						
2101	Industrial Park	600						
2103	Light Industry - General	700						
2104	Warehousing	1250						
2105	Public Storage	22900						
2106	Scientific Research and Development	2650						
2107	Outdoor Vehicle and Equipment Storage	900						
2194	Warehousing	900						
2198	Light Industry - General	550						
2199	Industrial Park	500						
2201	Extractive Industry		1.870					
2301	Scrap Yards/Auto Dismanttling/Landfill	1200						
2399	Scrap Yards/Auto Dismanttling/Landfill	900						

  - City of San Diego and Rollup land use code reconciliation
    - Density updates based on correlations from the previous table

ABM2+ Subarea Enhancement

- Synthetic Population
  - Use PopulationSim's repop feature to update household and person file

```
 95  SET THRESH_HH=50
 96  SET THRESH_TAZ=5
 97  SET MGRA_SF=[]
 98  SET MGRA_MF=[]
 99  SET MGRA_MH=[]
100  SET MGRA_GQ=[]
101  SET MGRA_AF=[]
```

ABM2+ Subarea Enhancement

- Household Sampling
  - Over-sample households in the study area and under-sample households outside the study area

```
198   SET BUFFER1=2.0
199   SET BUFFER2=5.0
200   SET SAMPLE1=4.0
201   SET SAMPLE2=2.0
202   SET SAMPLE3=0.5
```

ABM2+ Variability

- Define the run-to-run stochastic variability of ABM2+ scenarios
- Ten base year 2016 scenarios completed
  - Five with *Fixed* Random Seeds *
  - Five with *Random* Random seeds
- Four jurisdiction-based geographic subareas analyzed
  - Clairemont Mesa Community Plan Area (CPA)
  - Clairemont Mesa Transit Priority Area (TPA)
  - City of La Mesa
  - City of National City (no salt)
- Two project sites analyzed
  - Borrego Springs and Escondido

ABM2+ Variability

- Regionwide and Subarea metrics analyzed
  - Total VMT
  - Sub-Model Trip List VMT
  - SB743 VMT
  - Mode Choice
    - Demographics
    - Internal Capture Rates
    - Intrazonals
    - Trip Lengths
    - Daily Mode Share
    - Peak Period Commute Mode Share
- Analysis Methods
  - Range
    - (Maximum – Minimum)
  - Relative Percent Range
    - (100 * (Maximum – Minimum) / Mean)
  - Maximum across all projects
    - Max values of Range and Percent Range
  - Will be used for Threshold definitions

ABM2+ Variability

- Example: Regionwide Sub-Model Trip List VMT with *Fixed* Random Seeds

Region | Borrego Springs Rams Hill | Clairemont Mesa CPA | Clairemont Mesa CPA + TPA | East Escondido Valley | La Mesa | Maximum Across Projects

model	2016a	2016b	2016c	2016d	2016e	Range	Range Pct.
Airport - CBX	125,822.8	125,826.7	125,800.6	125,800.0	125,777.6	49.07	0.04
Airport - SAN	555,292.5	555,006.2	554,859.1	556,327.3	555,203.9	1,468.14	0.26
Commercial Vehicle	8,076,274.0	8,077,752.8	8,073,563.0	8,068,921.5	8,078,381.5	9,459.99	0.12
Cross Border	1,964,924.3	1,963,941.4	1,962,912.0	1,963,152.2	1,962,519.4	2,404.95	0.12
External-External	798,115.5	798,111.1	798,111.1	798,115.5	798,115.5	4.42	0.00
External-Internal	6,539,894.5	6,539,987.7	6,539,418.2	6,539,982.7	6,539,932.9	569.49	0.01
Individual	57,333,449.9	57,289,674.2	57,316,642.3	57,307,502.5	57,331,917.2	43,775.76	0.08
Internal-External	3,790,531.6	3,792,647.9	3,790,818.2	3,796,335.3	3,793,916.0	5,803.76	0.15
Joint	2,715,938.0	2,704,352.8	2,711,259.3	2,717,712.0	2,709,844.8	13,359.16	0.49
TNC 0-Passenger	337,678.5	337,264.7	336,182.5	338,148.4	341,110.0	4,927.41	1.46
Truck	989,649.7	989,646.2	989,643.0	989,647.7	989,649.8	6.84	0.00
Visitor	1,094,062.0	1,093,274.2	1,094,587.2	1,100,474.1	1,092,800.9	7,673.28	0.70
Total	84,321,633.3	84,267,485.9	84,293,796.5	84,302,119.1	84,319,169.4	54,147.40	0.06

ABM2+ Variability

- Example: Regionwide Sub-Model Trip List VMT with *Random* Random Seeds

Region | Borrego Springs Rams Hill | Clairemont Mesa CPA | Clairemont Mesa CPA + TPA | East Escondido Valley | La Mesa | Maximum Across Projects

model	2016a	2016f	2016g	2016h	2016i	Range	Range Pct.
Airport - CBX	125,822.8	125,847.0	125,850.8	125,812.3	125,808.0	42.82	0.03
Airport - SAN	555,292.5	555,163.7	555,037.8	555,072.8	555,018.5	273.93	0.05
Commercial Vehicle	8,076,274.0	8,044,342.0	8,078,350.8	8,044,322.3	8,034,429.7	43,921.09	0.55
Cross Border	1,964,924.3	1,964,302.2	1,963,746.1	1,963,358.4	1,962,667.7	2,256.60	0.11
External-External	798,115.5	798,250.5	797,677.8	797,335.6	797,664.7	914.85	0.11
External-Internal	6,539,894.5	6,563,497.9	6,564,087.5	6,563,911.9	6,563,446.1	24,192.96	0.37
Individual	57,333,449.9	57,322,571.1	57,311,672.3	57,257,361.2	57,381,529.7	124,168.54	0.22
Internal-External	3,790,531.6	3,779,337.1	3,775,789.5	3,783,947.5	3,780,816.1	14,742.07	0.39
Joint	2,715,938.0	2,692,983.0	2,706,315.8	2,711,243.5	2,716,608.2	23,625.13	0.87
TNC 0-Passenger	337,678.5	335,387.7	338,737.1	337,636.7	334,197.0	4,540.08	1.35
Truck	989,649.7	990,712.2	990,750.8	990,738.5	990,739.9	1,101.06	0.11
Visitor	1,094,062.0	1,093,927.8	1,094,204.2	1,095,138.7	1,096,852.0	2,924.20	0.27
Total	84,321,633.3	84,266,322.1	84,302,220.6	84,225,879.3	84,339,777.8	113,898.52	0.14

ABM2+ Variability

- Example: Regionwide Sub-Model Trip List VMT Maximum Across all Projects

Region | Borrego Springs Rams Hill | Clairemont Mesa CPA | Clairemont Mesa CPA + TPA | East Escondido Valley | La Mesa | Maximum Across Projects

model	Maximum Range	Maximum Range Pct.
Airport - CBX	116.79	31.94
Airport - SAN	137.83	2.36
Commercial Vehicle	12,587.13	178.18
Cross Border	1,407.04	500.00
External-External	0.00	0.00
External-Internal	5.52	0.04
Individual	12,106.54	3.78
Internal-External	1,957.85	8.75
Joint	3,087.35	10.54
TNC 0-Passenger	587.02	17.99
Truck	1.13	0.03
Visitor	1,290.08	25.99
Total	16,951.86	3.33

ABM Versions

Version	ABM	Series 14 Land Use	Purpose	Availability
14.1.1	ABM2	Baseline (17)	2019 RTP & Project Application	2019
14.2.1	ABM2+	SCS & Baseline (38 & 39)	2021 Draft RP & EIR	May 2021
14.2.2	ABM2+	SCS & Baseline (38 & 39)	2021 Final RP, EIR & Project Application	Dec. 2021
14.3.0	ABM2+	SCS & Baseline (41 & 42)	2021 Project Application	Spring 2022

- Version 14.3.0 Updates
  - Mall & Hospital Employment
  - Airport Ground Access
  - Airport Passenger Forecast
  - Border Vehicle Crossing Forecast
  - Auto Operating Costs
  - Networks
  - Setup & Application Efficiencies
  - **Subarea Enhancements**

ABM2+ Parameters

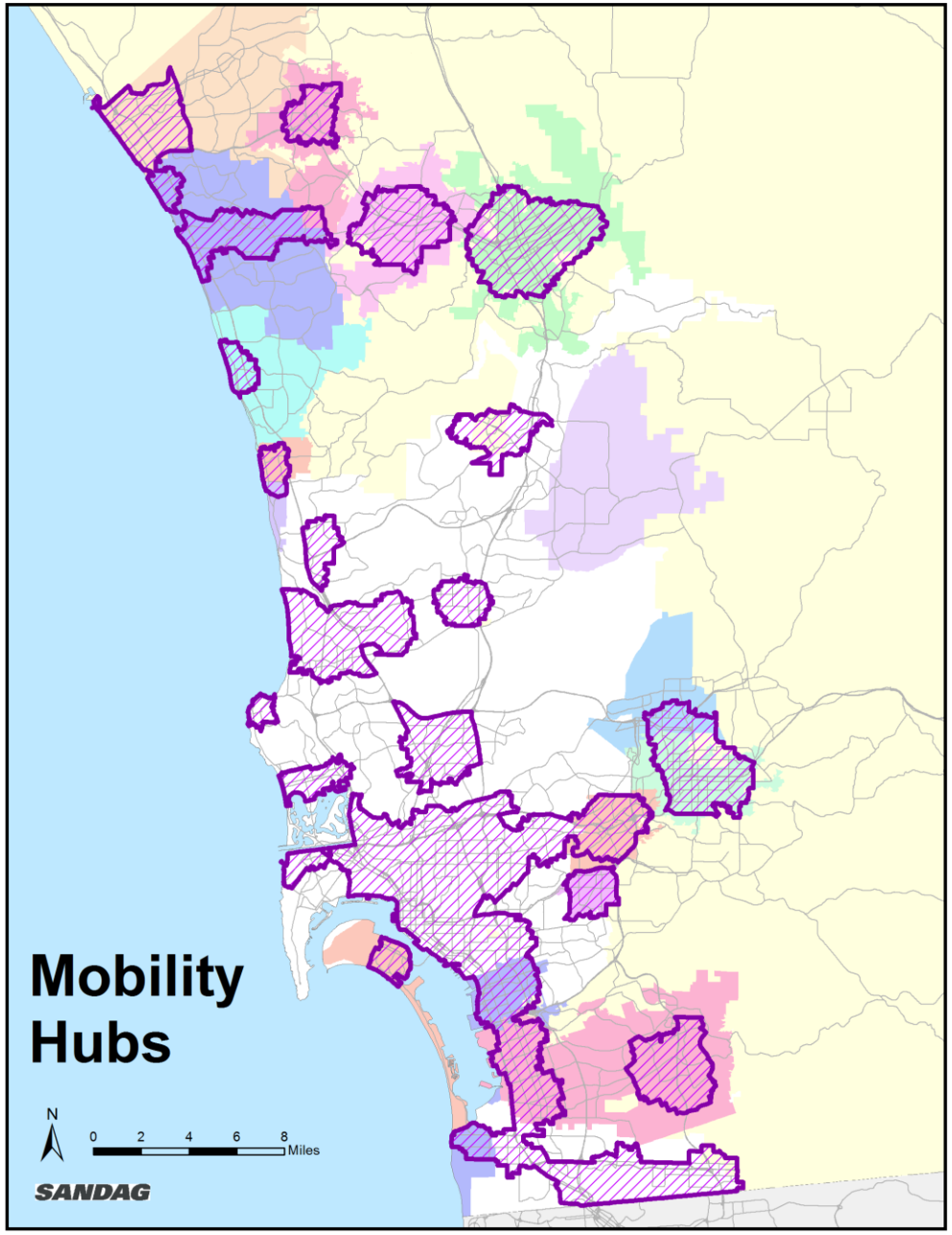
- **Decisions regarding Networks, Land Uses and Policies are required prior to starting on any future year travel demand forecasts**
  - The parameters are interrelated and need to be contemplated carefully depending on the ultimate goal of the project
  - The parameters are consistent for the 2016 base year through the 2025 horizon year but begin to deviate in 2030 and beyond

	5 Big Moves	Existing Plans	Hybrid
Land Use	Sustainable Community Strategy (SCS)	Baseline	Baseline + SCS Parking
Policies	Vision	Baseline	Vision
Parking	Vision	Baseline	Update
Network	Vision	No Build	Vision

ABM2+ SCS Parameters

- Mobility Hubs
  - Places of connectivity where different travel options (walking, biking, transit, and shared mobility) come together
  - Provide an integrated suite of mobility services, amenities, and supporting technologies to better connect high-frequency transit to an individual's origin of destination
  - Correlates with the Tier 1 Commuter Rail network
  - Supports Flexible Fleets
  - Assumes higher land use densities

Mobility Hubs



ABM2+ Land Use Assumptions

- MGRA-level reports are expected to return to TFIC

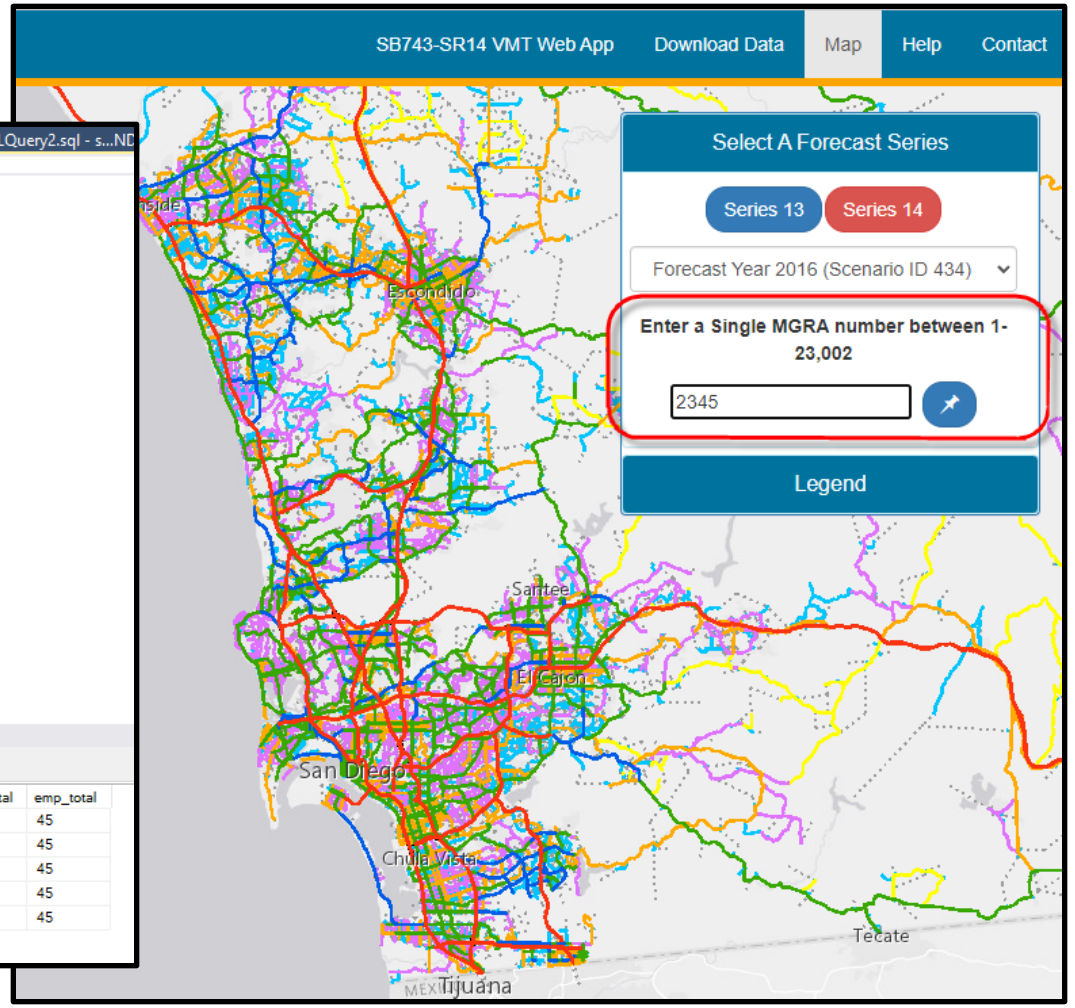
SQLQuery9.sql - D...DAGNET\mca (130))* | SQLQuery8.sql - D...DAGNET\mca (125)) | SQLQuery7.sql - s...NDAGNET\mca (68))* | SQLQuery6.sql - s...NDAGNET\mca (58))* | SQLQuery2.sql - s...ND

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [datasource_id]
      ,[yr]
      ,[mgra]
      ,[lu]
      ,[acres]
      ,[hs_sf]
      ,[hs_mf]
      ,[hs_mh]
      ,[gq_civ]
      ,[gq_mil]
      ,[enrollgradekto8]
      ,[enrollgrade9to12]
      ,[collegeenroll]
      ,[othercollegeenroll]
      ,[adultschenrl]
      ,[hotelroomtotal]
      ,[emp_total]
  FROM [isam].[dbo].[vi_sr14_regional_lu_input]
  where yr = 2016 and mgra = 2345 and datasource_id = 38
```

100 %

Results | Messages

	datasource_id	yr	mgra	lu	acres	hs_sf	hs_mf	hs_mh	gq_civ	gq_mil	enrollgradekto8	enrollgrade9to12	collegeenroll	othercollegeenroll	adultschenrl	hotelroomtotal	emp_total
1	38	2016	2345	101	0.0342225970643939	35	72	0	0	0	0	0	0	0	0	0	45
2	38	2016	2345	101	1.73760639957817	35	72	0	0	0	0	0	0	0	0	0	45
3	38	2016	2345	1200	1.30466032842631	35	72	0	0	0	0	0	0	0	0	0	45
4	38	2016	2345	4118	0.9405453684573	35	72	0	0	0	0	0	0	0	0	0	45
5	38	2016	2345	5007	0.544412206224174	35	72	0	0	0	0	0	0	0	0	0	45



ABM2+ Subarea Land Use Input Overview

lu_code	LU Description	MGRA	Dwelling Unit	Share Affordable	Acre	Employee	Thousand Square Feet (KSF)	Hotel Rooms	Beds	Students	Pumps	Spaces	Seats	Screens	Enplanement	Berths
103	Mobile Home Park	2584	4													
102	Multi-Family Residential	11221	50													
102	Multi-Family Residential	2584	200	0.5												
101	Single Family Detached	2584	29													
1402	Dormitory	11221							250							
5007	Arterial Commercial (Street Commercial)	2584				90										
6001	Office (High-Rise - greater than 100000 SF)	2584					430									
1502	Hotel (High-Rise)	3456				200	40	250								
7206	Convention Center	3456					50									
101	Single Family Detached	10160	6													
9101	Vacant and Undeveloped Land	10160			200	0										
101	Single Family Multiple-Units	11221	225													
5007	Arterial Commercial (Street Commercial)	11221					15									
6806	Elementary School	11221				40	20			250						
7601	Park - Active	11221			MGRA											

README | Project_Data | Project Summary | Project_Data_Example | HotelRoomShare | Land Use Descriptions

ABM2+ Subarea Land Use Input Format Change

- ABM1
  - "**lu.csv**" file with 4 columns
- ABM2+
  - "**client_project_data.xlsx**" file

MGRA	lu_type_id	LU_Code	Amount
2345	1	101	50
2345	1	102	300
2345	3	1501	65
2345	7	1501	95
2345	6	5004	125
2345	3	5008	5
2345	6	6002	15
2345	3	6103	20

lu_code	LU Description	MGRA	Dwelling Unit	Share Affordable	Acre	Employee	Thousand Square Feet (KSF)	Hotel Rooms
101	Single Family Residential	2345	50					
102	Multi-Family Residential	2345	300	10				
103	Mobile Home Park							
1401	Jail/Prison							
1402	Dormitory							
1403	Military Barracks							
1409	Other Group Quarters Facility							
1501	Hotel (Low-Rise)	2345				65		95
1502	Hotel (High-Rise)							
1503	Resort							

lu_code	LU Description	MGRA	Dwelling Unit	Share Affordable	Acre	Employee	Thousand Square Feet (KSF)	Hotel Rooms	Beds	Students	Pumps
101	Single Family Residential	2345	50								
102	Multi-Family Residential	2345	300	10							
1501	Hotel (Low-Rise)	2345				65		95			
5004	Neighborhood Shopping Center (30000 SF or more)	2345					125				
5008	Service Station	2345				5					
6002	Office (Low-Rise - less or equal to 100000 SF)	2345					15				
6103	Library	2345				20					

ABM2+ Subarea Modeling Fees and Schedule

- Fees
  - The existing ABM1 price sheet will be honored until a new cost analysis for running ABM2+ scenarios is complete
    - Anticipated to be rolled out in the summer of 2022
  - Provide an integrated suite of mobility services, amenities, and supporting technologies to better connect high-frequency transit to an individual's origin of destination
- Schedule
  - SANDAG work will still be the first priority
  - Staffing levels and overall demand will play a role in whether there is a queue of jobs, which will help determine reasonable starting dates
  - Budget 2-4 weeks per scenario

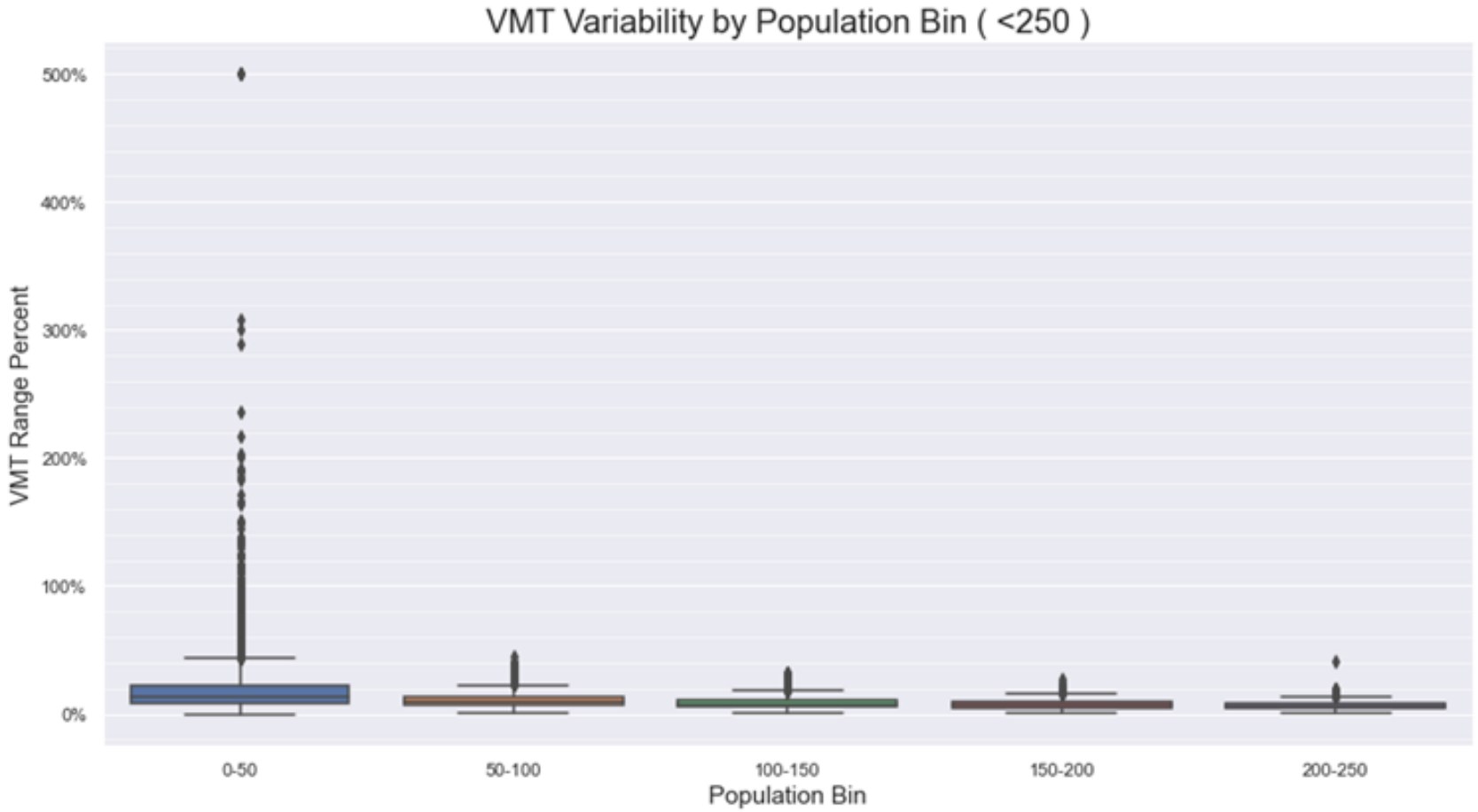
Thresholds & Reports

Thresholds

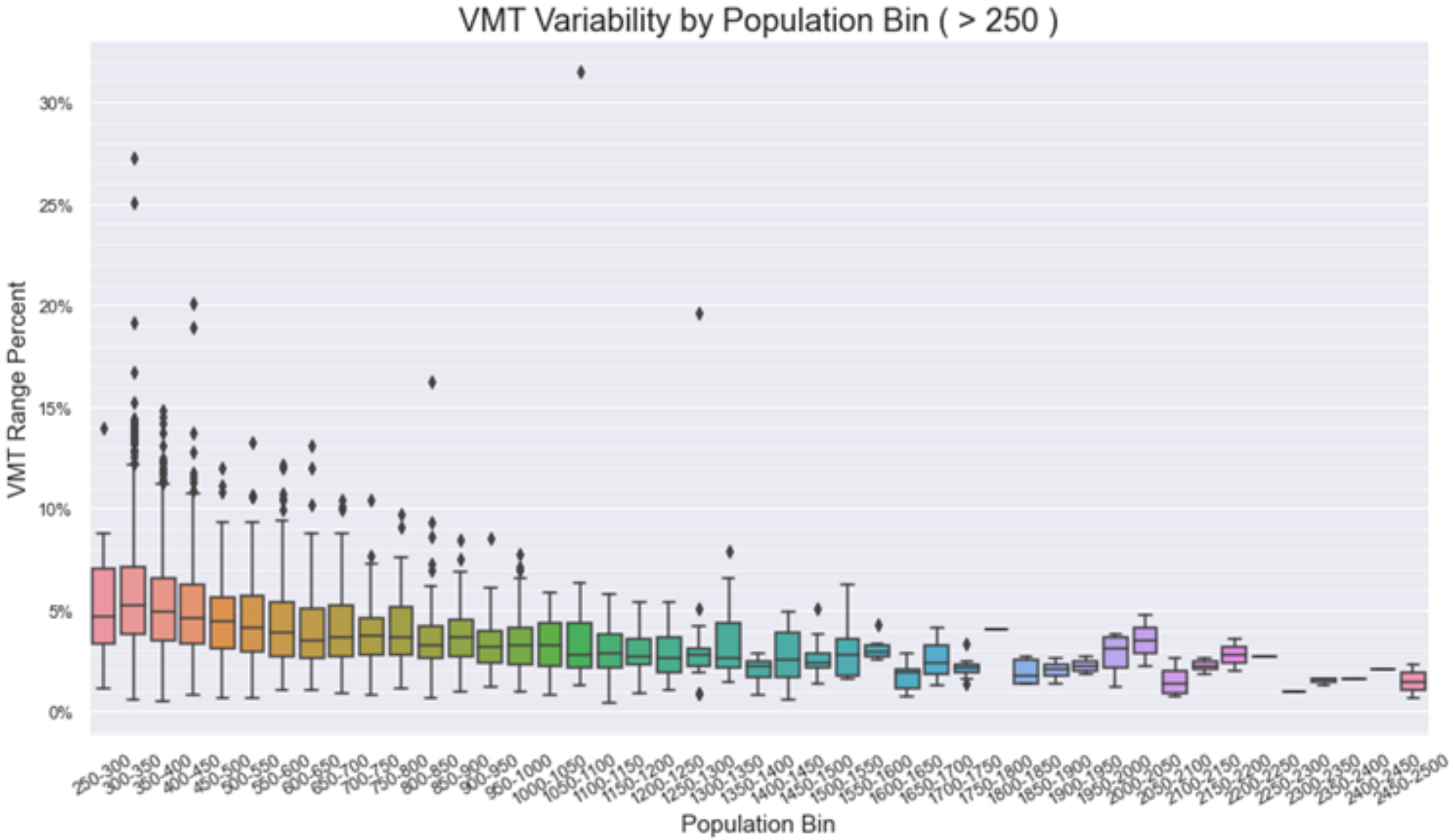
- Part of ABM2+ Subarea Enhancement
- Adjusted sampling to reduce model variability, especially at subregional levels
- Goal: define the amount (threshold) of population and employment needed within a study area to have confidence in metrics for reporting such as SB743 VMT and mode choice

Thresholds & Reports

- Initial Findings: Population (Fixed Seed)

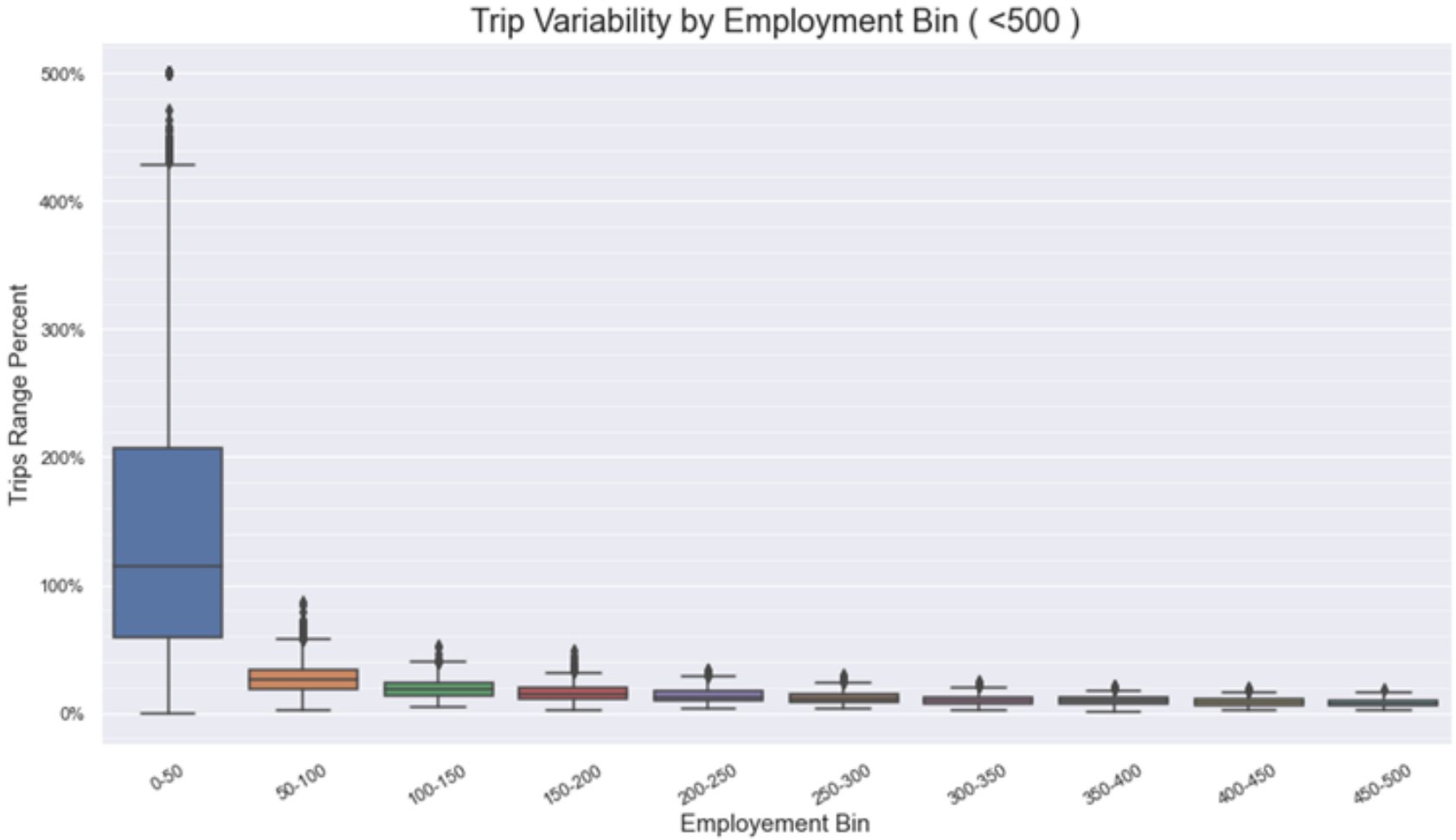


Thresholds & Reports

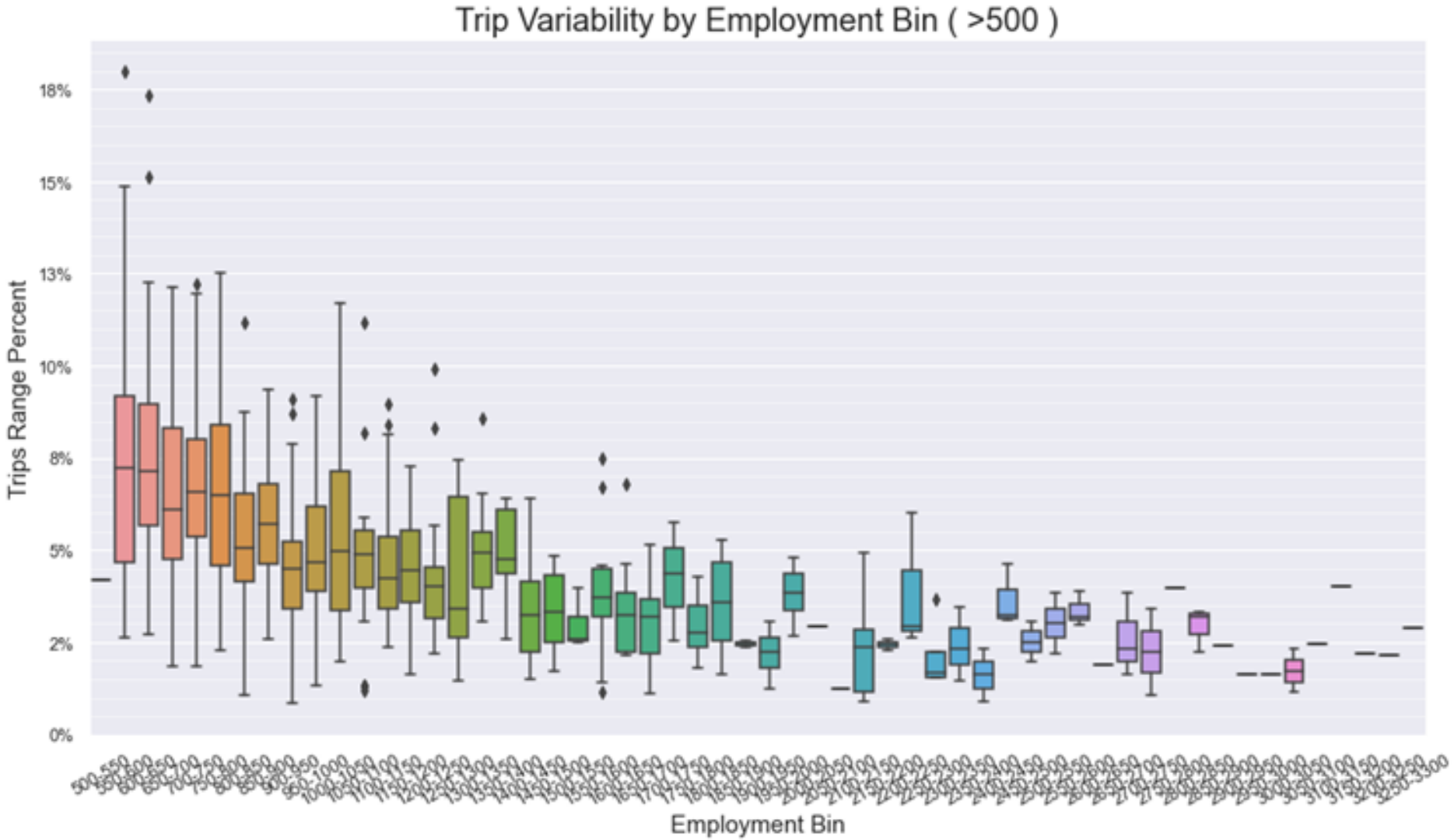


Thresholds & Reports

- Initial Findings: Employment (Fixed Seed)



Thresholds & Reports



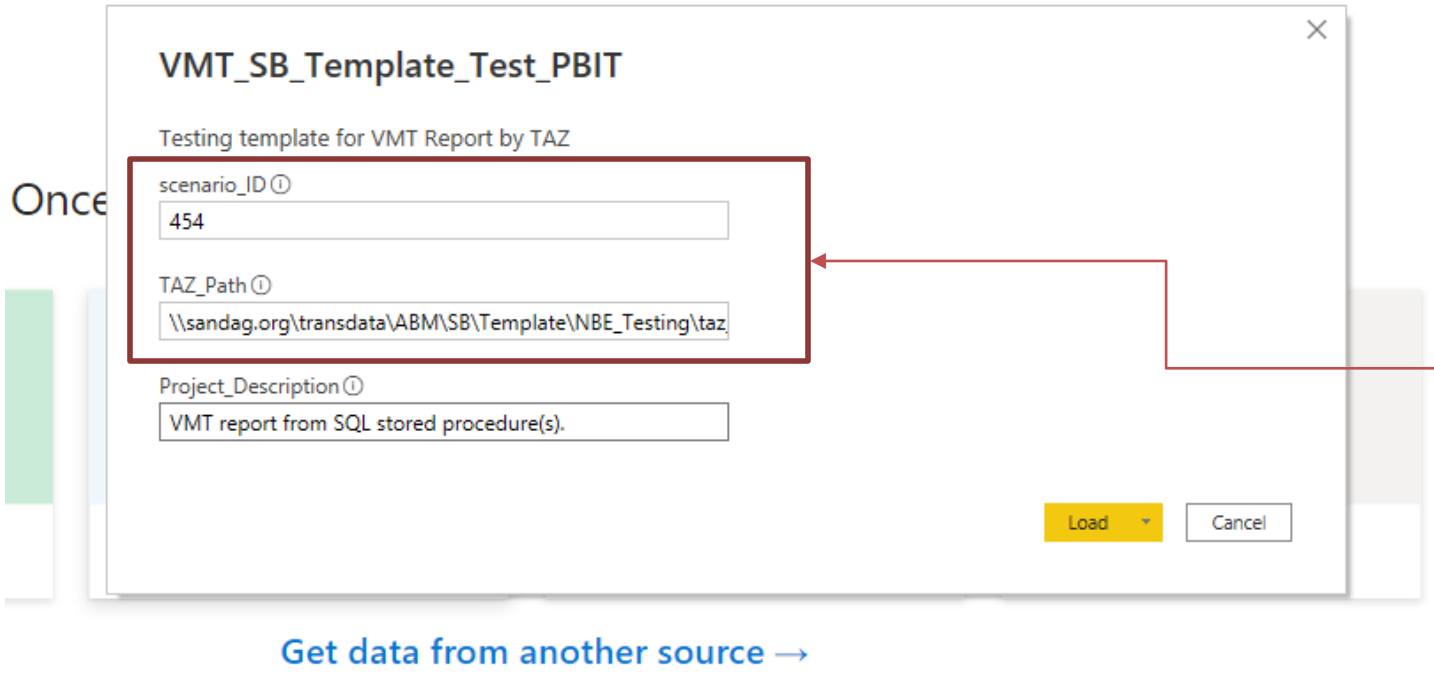
Thresholds & Reports

Reports

- Migration to PowerBI, use of automated PowerBI templates
- Mode Choice Report and SB 743 VMT Report
- Advantages
  - Quicker
  - Less prone to manual error
  - More dynamic/user friendly
- Disadvantages
  - Still a work in progress, reports are relatively simplistic
  - Mapping features, specifically for custom geographies

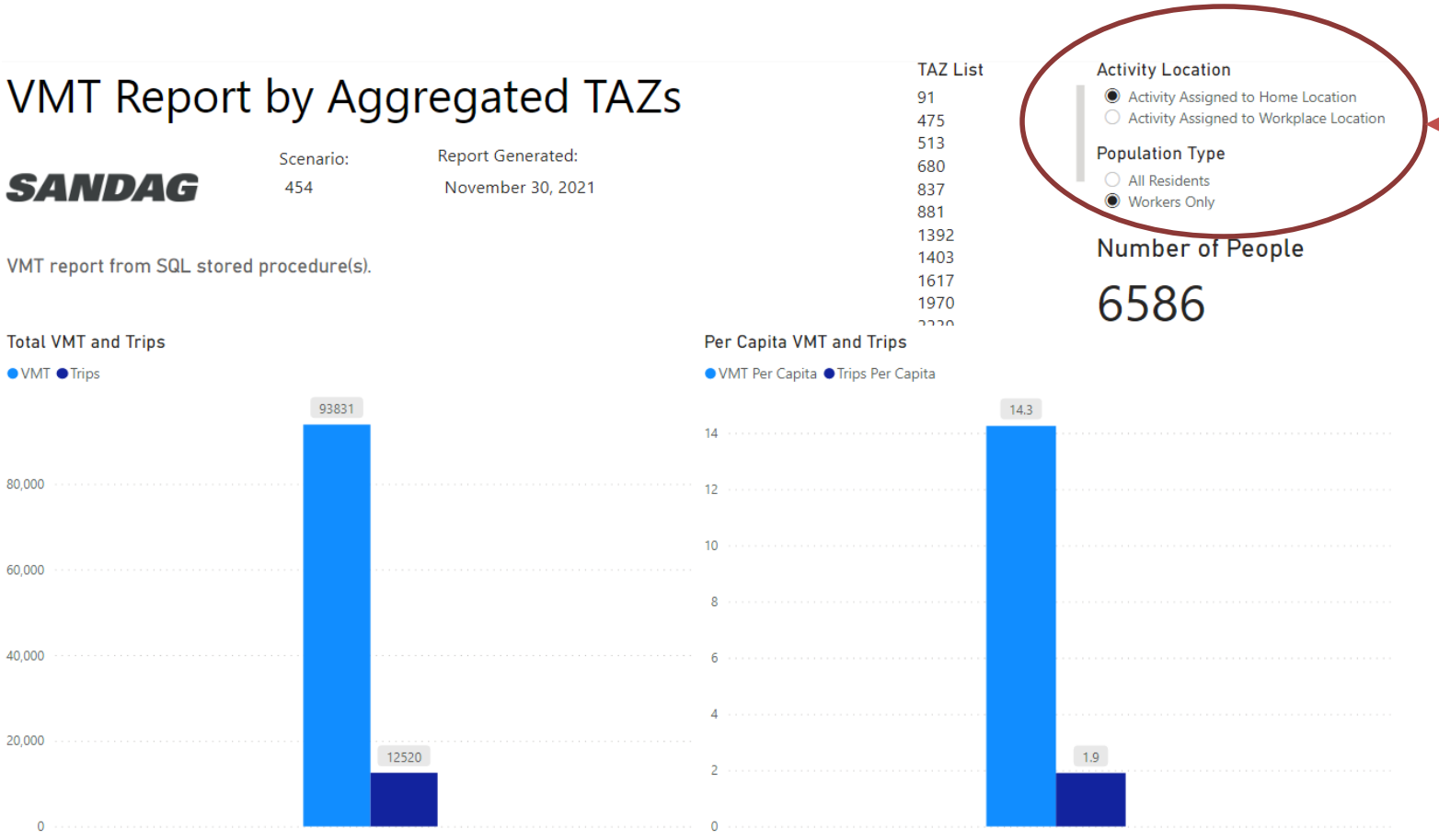
Thresholds & Reports

- Example: SB743 VMT Report



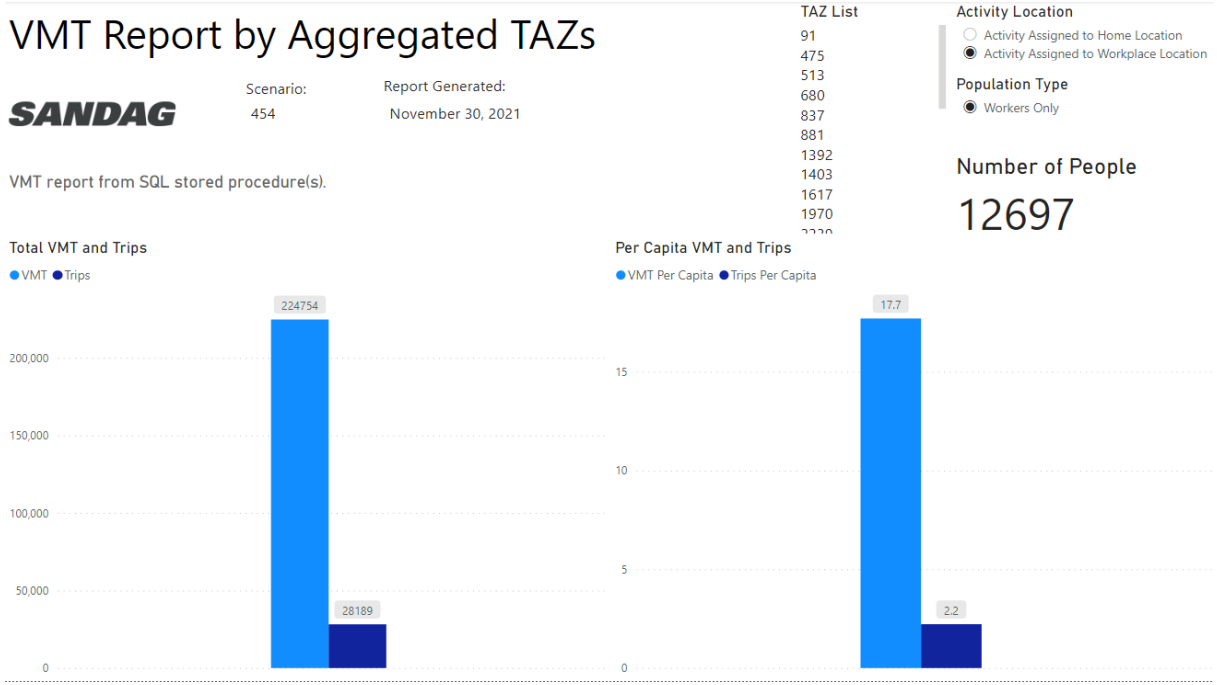
These parameters get populated into a SQL query/stored procedure.

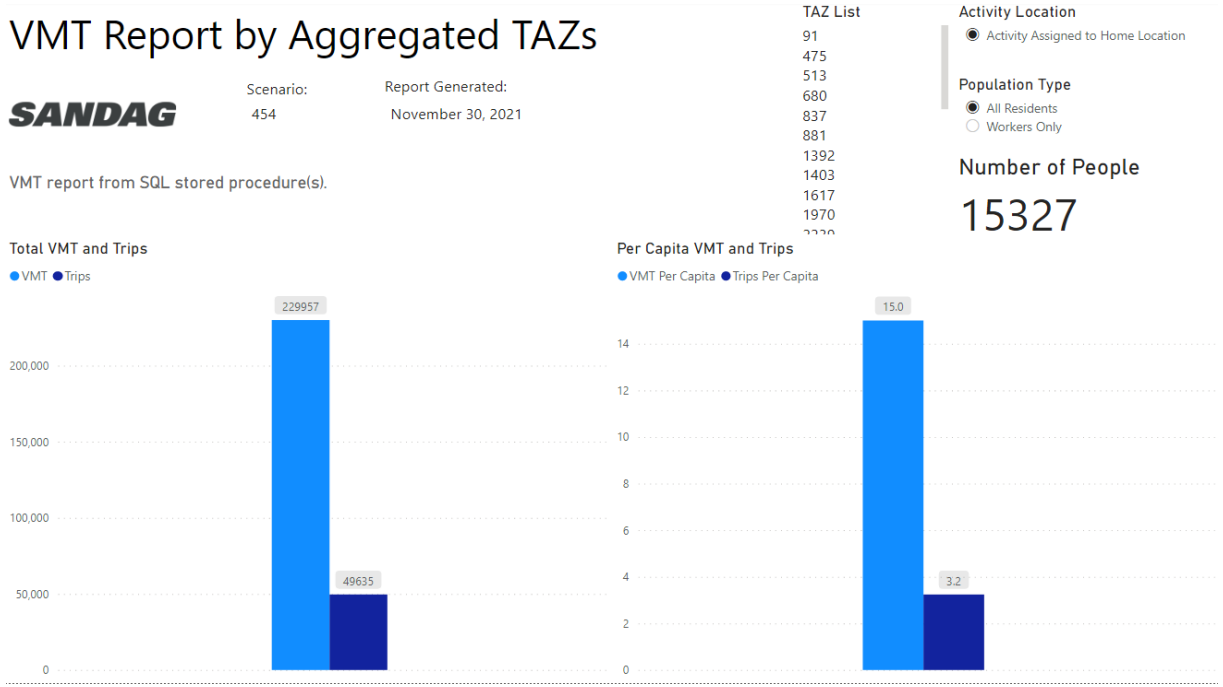
Thresholds & Reports



User can toggle between activity/population types and the data will update accordingly.

Thresholds & Reports





Thresholds & Reports

- Example: Mode Choice Report

Mode Choice Report

Mira Mesa Test Version 2

DEMOGRAPHICS

metric	Format Dem
Population	82,658
Households	32,444
Household Size	2.55
Employed Residents	40,901
Employees	76,966

STUDY AREA TRIPS

metric	Format MGRA
MGRA Intra-zonal	9,940
MGRA Inter-zonal	199,574
Total Trips	708,876
MGRA Intra-zonal Pct.	1.40
Study Area Internal Vehicle Capture Rate	25.69

AVERAGE TRIP LENGTHS

metric	value
Resident Person Trip Length	8.03
Resident Auto-Trip Vehicle Trip Length	8.28
All Model Person Trip Length	8.14
All Model Vehicle Trip Length	8.28
Resident Round-Trip Commuter Tour Length	25.59
Employee Round-Trip Commuter Tour Length	33.35

Scenario ID

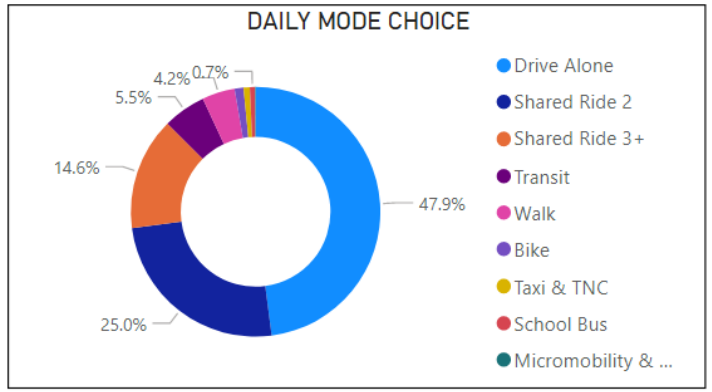
459

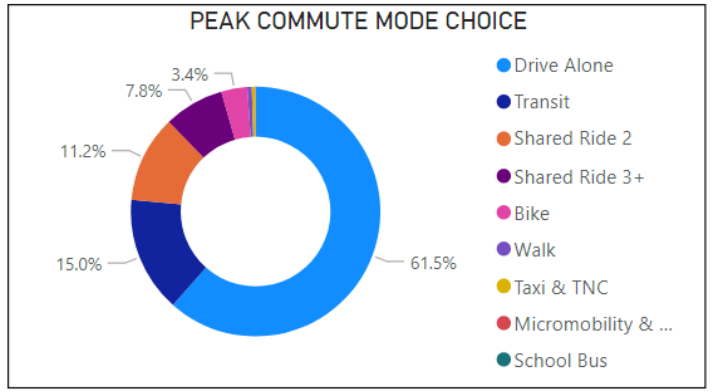
DAILY MODE CHOICE

Mode	Percentage
Bike	1.2
Drive Alone	47.9
Micromobility & Microtransit	0.1
School Bus	0.7
Shared Ride 2	25.0
Shared Ride 3+	14.6
Taxi & TNC	0.8
Transit	5.5
Walk	4.2
Total Trips	**100.0**

PEAK COMMUTE MODE CHOICE

Mode	Percentage
Bike	3.4
Drive Alone	61.5
Micromobility & Microtransit	0.0
School Bus	0.0
Shared Ride 2	11.2
Shared Ride 3+	7.8
Taxi & TNC	0.5
Transit	15.0
Walk	0.6
Total Trips	**100.0**





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Report Generated: 12/1/2021

Stakeholder Feedback

- **Are the Transportation Modeling Forums useful?**
  - The first Forum was held on 12/14/2011, and today 12/15/2021 is the 22nd episode
  - Attendance suggests that it is, however, each Forum requires 60-80 hours of staff time
- **Are there topics that have not been covered that you would like to see?**

- **Is there value in SANDAG continuing to offer customized travel demand modeling service via the Service Bureau?**
  - Member Agency perspective
  - Consultant / Developer perspective

- **Survey**

Questions & Answers

- Chat Box & Live

Forum Agenda Recap

- Welcome and Introductions
- 2021 Regional Plan Model Overview
- ABM2+ Subarea Enhancements

Next Transportation Model Forum:

June 8, 2022

TRANSPORTATION MODEL FORUM

December 15, 2021

SANDAG