



I-405 TRANSMODELER Simulation Model Development

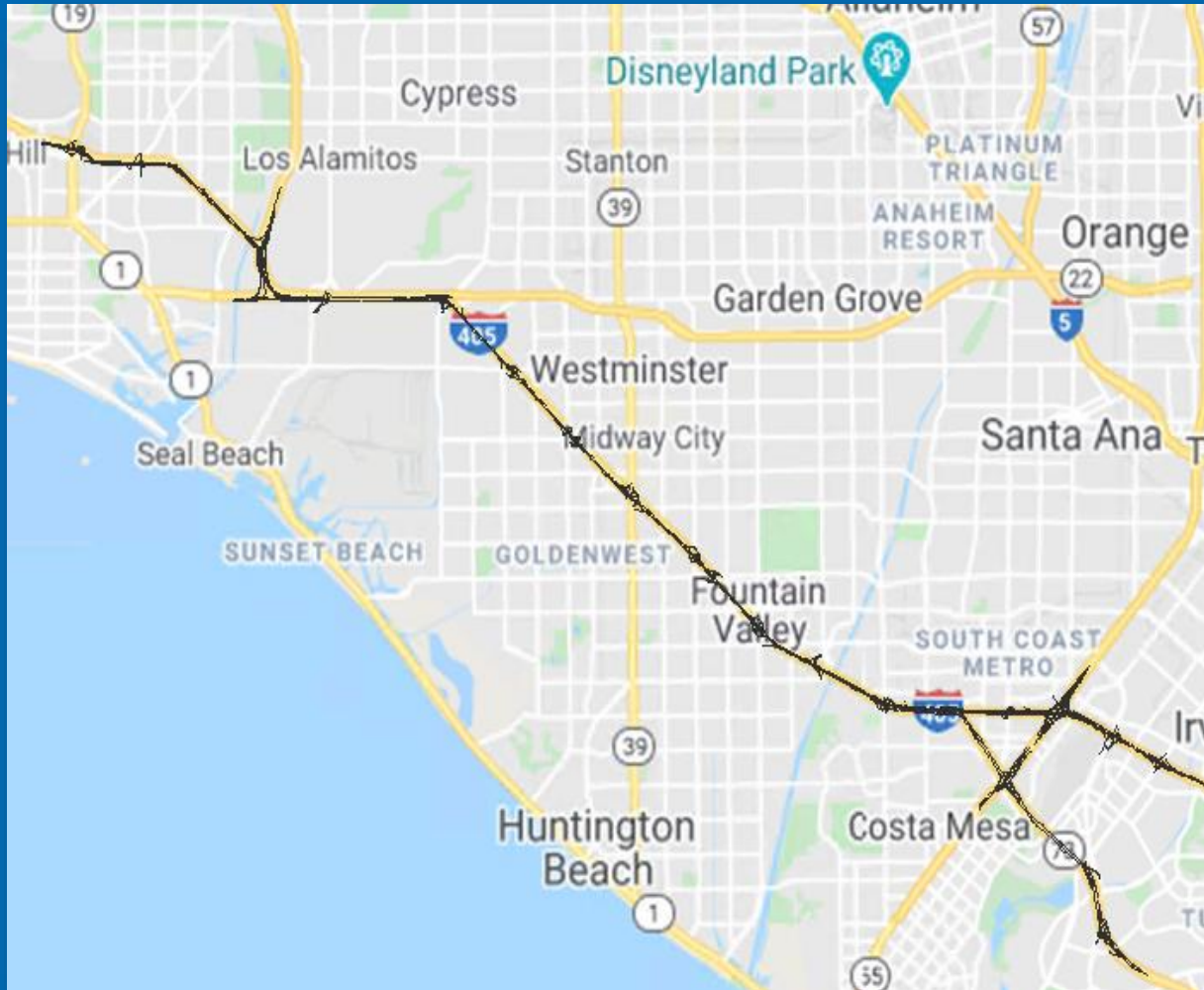


SCAG MODELING TASK FORCE

September 27, 2023



Outline



- ❖ **Introductions**
- ❖ **I-405 Project Overview**
- ❖ **Project Goals**
- ❖ **Existing Model Development**
- ❖ **2025 Model Development**
- ❖ **Next Steps**

Introductions



Archie Tan
Project Manager
OCTA



Anna Luo
Fehr & Peers
Project Manager









Loren Bloomberg
Jacobs
Project Advisor





I-405 Project Overview

-  Improved 16 miles of freeway
-  Conversion of HOV to HOT
-  Improved/replaced 18+ bridges
-  Added 11 new bike lanes
-  Added 11 new sidewalks
-  Collaborated with 6 corridor cities and communities



Model Development Project Goals



Develop a Reliable Operations Model for the I-405 Corridor

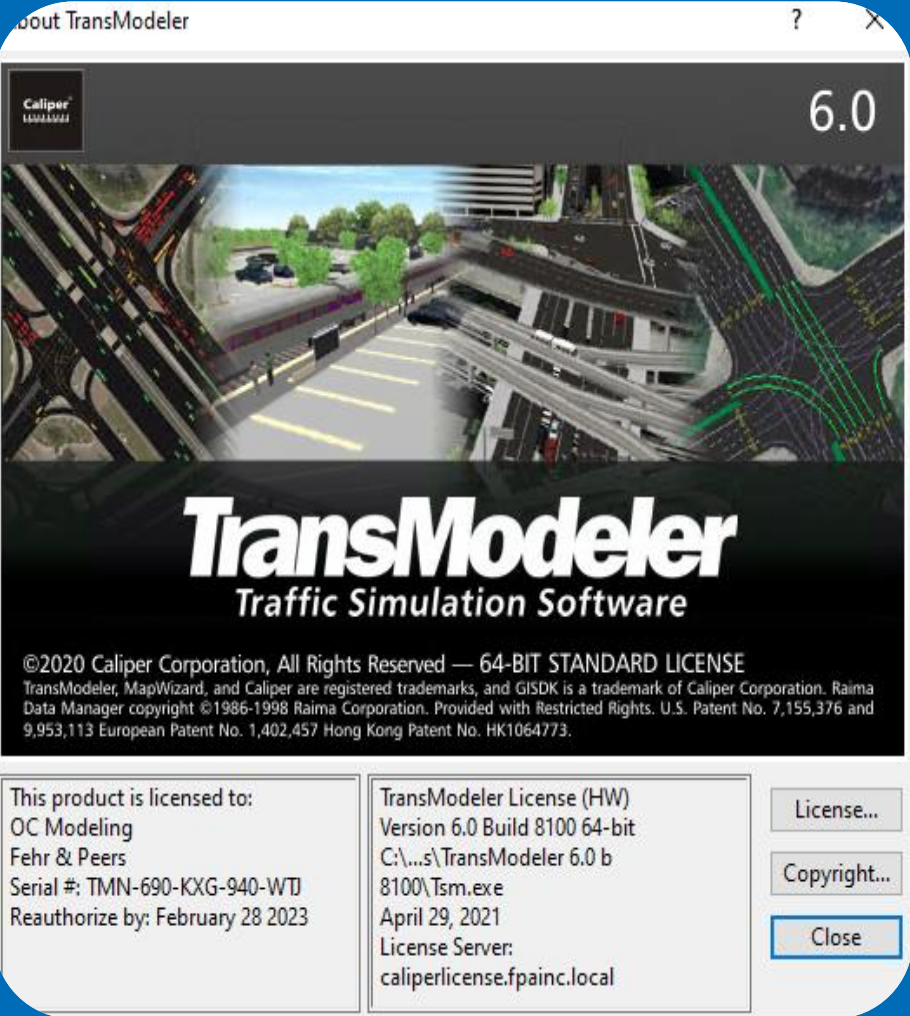


Capture the I-405 Corridor Operational Dynamics under different Toll Pricing Strategies



Apply for Future Corridor Planning Studies





TransModeler Software

- ❖ TransModeler Version 6.0 build 8100 was selected for this project
- ❖ Integration with OCTAM TransCAD Model
- ❖ Incorporate the Dynamic Traffic Assignment (DTA) module
- ❖ Global driving behavior settings supplemented with localized adjustments to replicate location and time of day context



Dynamic Traffic Assignment

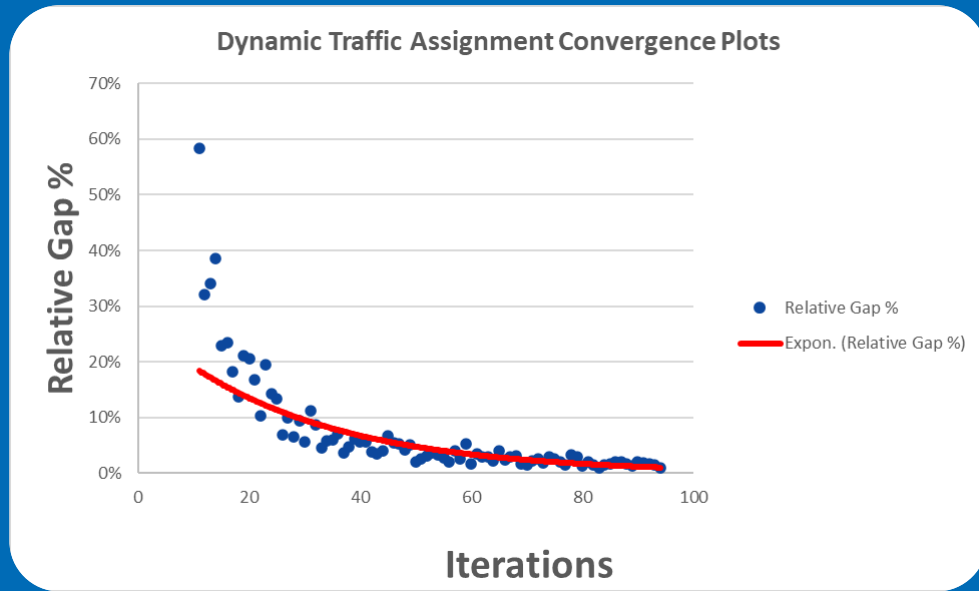
DTA captures the relationship between dynamic route choice behaviors, traffic flows, and cost and time of travel in a coherent manner.

Advantages	Challenges
Realistic traffic flow modeling	More steps/Longer runtime
Better evaluation of policies and investments	Higher data requirements
Identification of bottlenecks and congestion hotspots	
More accurate predictions	





Dynamic Traffic Assignment



Key Parameters	Target Value
Relative Gap for Convergence	1-5%
Time Interval	15 minutes
Seed Iterations	10
Seed Demand	80%
Maximum Iterations	50

TRAFFIC DATA

- 1 Geometric Data
2019 Condition
- 2 Traffic Volumes
PeMS and Big Data
- 3 Traffic Control
- 4 Operational Data
INRIX Speed

EXISTING MODEL

- 1 Update TransModeler
Network
(Include HOV)
- 2 Add Traffic Control
(Ramp Meter)
- 3 Develop Hourly
Traffic Volume for
AM/PM Time Period
- 4 Develop Trip Tables by
Income Level and Vehicle
Occupancy

MODEL CALIBRATION & VALIDATION

Based on FHWA Microsimulation Modeling Guidelines,
→ Calibrate Driver Behavior, Traffic Pattern, etc.
→ Validate the Model to Existing Conditions in DTA Module.

2025 MODEL

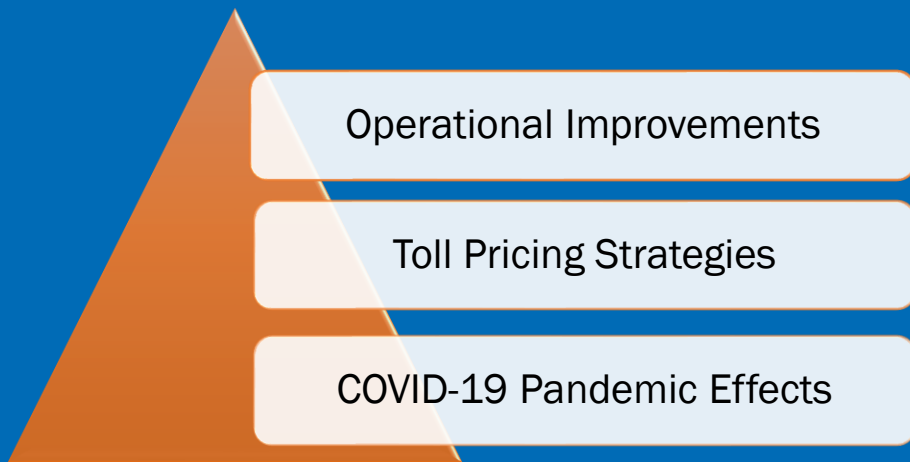
- 1 Update Network
to Reflect I-405
Improvement
- 2 Develop Future
Forecast and Trip Data
Using DCTAM
- 3 Add Toll Lanes and
Pricing Information
- 4 Alternative/Scenario
Analysis

PRODUCT DOCUMENTATION

- 1 Model
Development Report
- 2 I-405 TransModeler
User Guide
- 3 Analysis Summary
& Presentation
Materials
- 4 Recommendation on
Operational Improvement



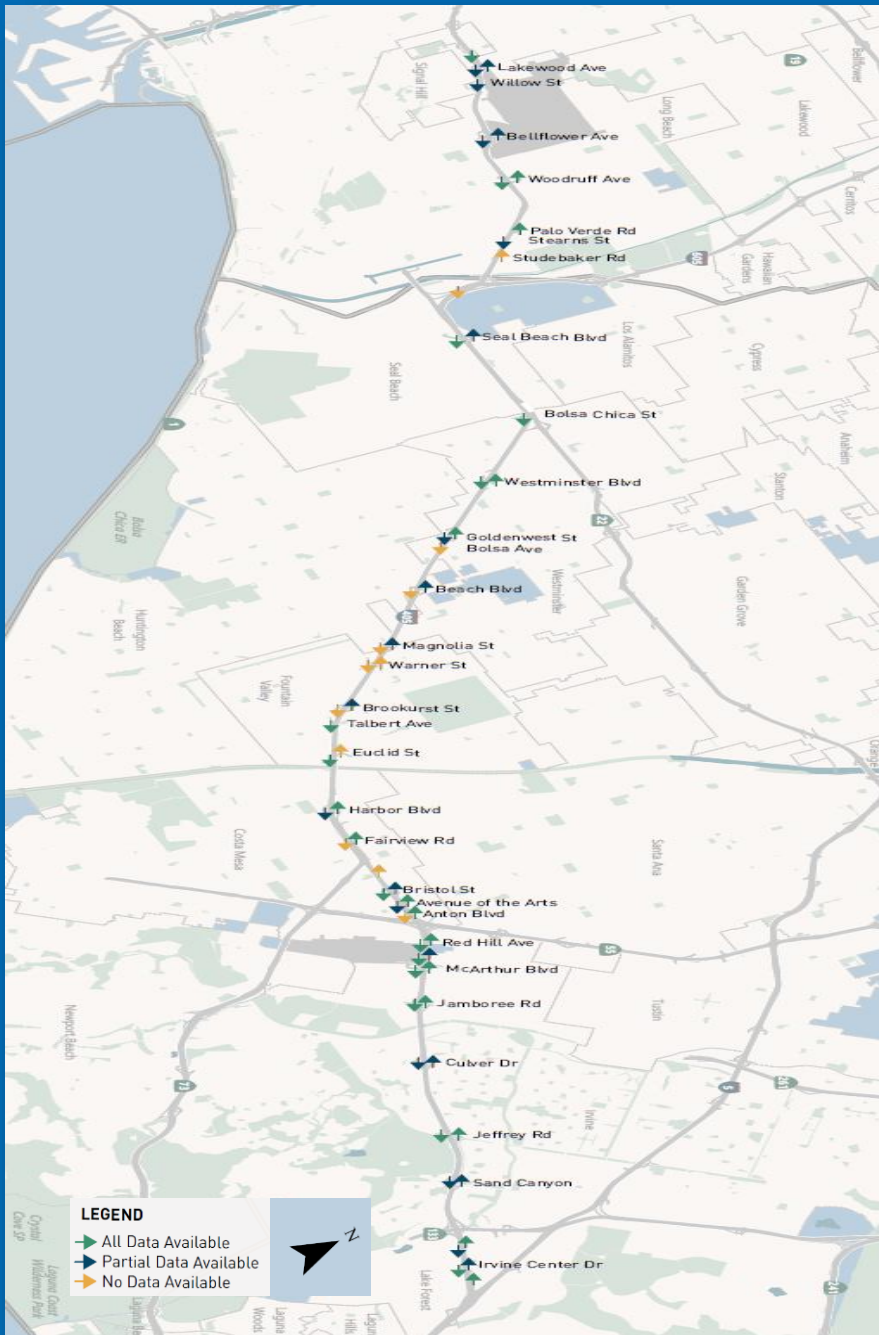
Model Development





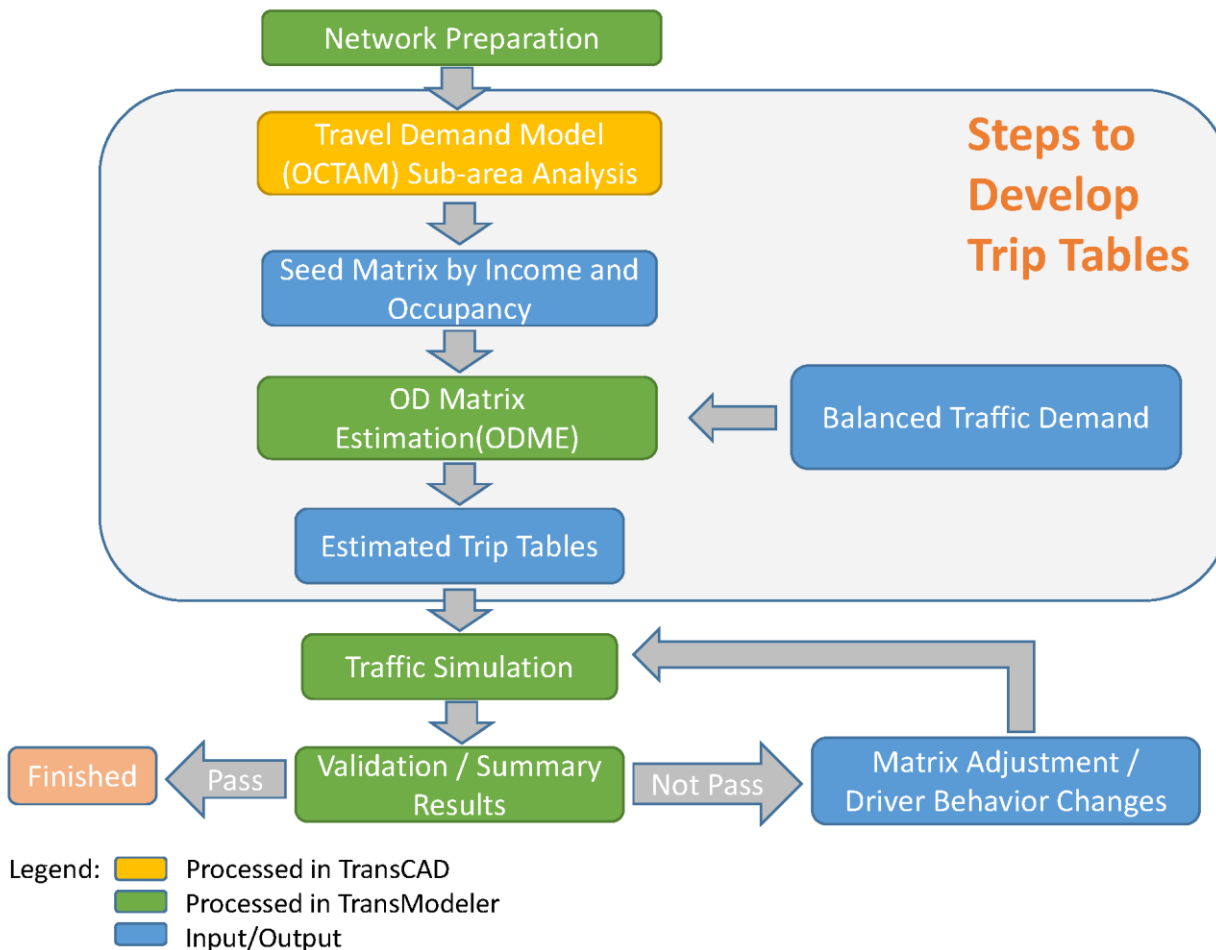
Input Data

- ❖ Oct 2018 as existing conditions to represent pre-COVID and pre-construction conditions.
- ❖ Data sources:
 - PeMS
 - Historical CMP Counts
 - I-405 PA/ED and other related studies
 - INRIX Speed Data
 - Ramp Metering
 - OCTAM and other O-D Data

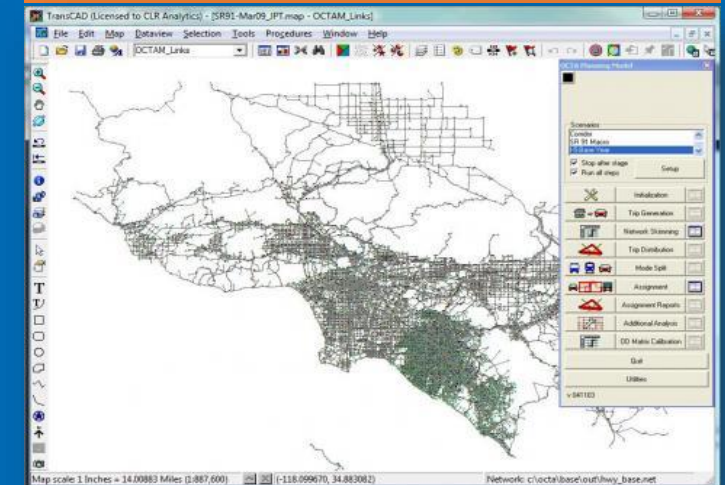




Trip Table Development



Integration with OCTAM



TransModeler (Licensed to Fehr & Peers)

File Edit Matrix Selection Project Demand Route Systems Parameters Simulation

GP Sum

Matrix1 - Estimate

	6304	6305	6314	6316	6353	6366	6375
6304	0.0	0.0	0.00	0.00	0.00	0.00	0.00
6305	0.0	0.0	0.00	0.00	0.00	0.00	0.00
6314	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6316	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6353	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6366	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6375	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8656	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8659	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8663	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8664	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8669	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12489	0.00	0.00	0.00	0.00	5.15	0.00	0.00
12995	0.00	0.00	254.03	0.00	0.00	0.00	0.00
13001	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13003	0.00	0.00	0.12	0.00	0.00	0.00	0.00
13007	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13012	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13022	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Trip Table Development

- ❖ By vehicle classifications: Drive Alone, HOV2, HOV3, Single Unit Truck, and Trailer Truck
- ❖ By each hour: 6-10 AM and 2-8 PM

Existing Model Validation

Peak Hour Validation Results

Criteria	Threshold	AM Model (6-10) (Meets Threshold?)		PM Model (2-8) (Meets Threshold?)	
Link Volume	85% of links within 100 vph for links <700 vph	97%	Yes	90%	Yes
Link Volume	85% of links within 15% for links 700-2700 vph	88%	Yes	88%	Yes
Link Volume	85% of links within 400 vph for links >2700 vph	100%	Yes	100%	Yes
Link Volume	85% of links with GEH ≤ 5	94%	Yes	88%	Yes
Sum of Link Volumes	Within 5%	1%	Yes	0.5%	Yes
Sum of Link Volumes	GEH ≤ 4	3.9	Yes	0.7	Yes
Travel Time	Within 15% of observed	12%	Yes	10%	Yes
Travel Speed/Queuing	Match observations	Match	Yes	Match	Yes

Existing Model Validation

2018 AM Model Speed Heat Map – SB 405

Observed

	Macarthur	SR-55	Bristol	CA-73	Fairview	Harbor	Euclid	Brookhurst	Warner	Magnolia	Beach	Bolsa	Westminster	Valley View	CA-22	Seal Beach	I-605	Palo Verde	Willow	Bellflower	Lakewood	
6:00 AM	65	66	65	68	70		69	70	66	57	50	62	64	61	60	65	64	67	69	69	69	70
6:15 AM	64	66	64	68	68		68	66	62	46	38	43	44	47	48	48	49	59	66	67	67	67
6:30 AM	59	61	62	65	66		65	64	58	39	28	25	27	28	33	39	40	49	66	67	67	67
6:45 AM	50	53	55	55	64		64	61	54	35	24	18	19	24	37	43	42	49	62	66	66	67
7:00 AM	45	34	49	44	60		61	60	44	31	21	15	15	20	43	52	48	54	59	63	64	67
7:15 AM	41	35	35	39	50		54	56	43	32	21	14	13	17	31	52	54	60	63	63	63	62
7:30 AM	33	22	24	19	38		40	43	39	32	20	16	13	14	23	56	61	64	67	68	66	62
7:45 AM	37	20	23	18	34		33	33	33	31	19	16	13	16	29	64	64	67	68	68	67	63
8:00 AM	38	30	23	19	34		34	35	32	28	17	15	13	17	43	63	61	65	67	68	67	66
8:15 AM	42	32	24	20	33		35	34	32	28	17	14	13	17	45	60	58	64	67	68	68	67
8:30 AM	43	32	27	23	37		38	38	32	28	17	15	13	17	46	60	60	66	67	68	67	66
8:45 AM	44	35	38	39	39		40	41	38	30	17	15	13	19	52	68	67	68	68	69	68	67
9:00 AM	46	42	53	44	45		50	52	43	31	18	16	16	30	62	70	68	69	69	70	69	68
9:15 AM	54	47	59	52	58		61	60	53	36	21	20	21	37	61	69	68	69	69	69	68	68
9:30 AM	61	62	64	63	65		64	64	49	35	21	24	27	44	52	67	66	68	68	69	69	68
9:45 AM	62	64	65	64	66		65	62	54	38	26	28	29	37	41	59	64	68	68	69	69	68

Southbound AM Peak Period Travel Speed

Modeled

	Macarthur	SR-55	Bristol	CA-73	Fairview	Harbor	Euclid	Brookhurst	Warner	Magnolia	Beach	Bolsa	Westminster	Valley View	CA-22	Seal Beach	I-605	Palo Verde	Willow	Bellflower	Lakewood	
6:00 AM	47	51	47	42	58		57	54	53	45	45	55	52	50	49	60	61	62	61	59	61	62
6:15 AM	45	49	46	41	57		57	54	52	42	38	48	40	35	37	59	60	61	60	59	47	61
6:30 AM	44	46	44	38	57		57	51	49	32	25	41	32	29	36	59	60	61	60	59	60	61
6:45 AM	42	42	41	32	56		56	50	48	29	20	32	27	27	35	58	60	61	60	59	60	61
7:00 AM	41	34	39	28	53		54	51	48	27	18	23	22	28	36	59	60	60	59	58	46	59
7:15 AM	41	22	37	23	52		52	51	22	48	17	15	22	38	39	57	59	59	59	58	59	59
7:30 AM	41	18	37	28	47		48	50	48	26	17	11	30	44	40	58	59	59	59	58	59	59
7:45 AM	42	13	18	34	47		48	51	49	26	17	11	27	44	40	58	59	59	59	58	46	59
8:00 AM	42	14	12	28	48		49	50	48	26	16	11	24	43	36	58	59	60	59	58	59	60
8:15 AM	41	15	15	33	46		47	49	48	26	16	10	18	41	38	58	59	60	60	58	60	60
8:30 AM	42	15	27	49	47		47	50	49	26	16	11	18	43	40	58	59	61	60	58	59	60
8:45 AM	44	21	50	47	46		47	50	49	26	16	11	18	40	40	58	59	61	60	58	59	60
9:00 AM	48	40	52	40	50		50	49	48	27	16	10	18	38	44	60	60	62	61	61	61	62
9:15 AM	56	57	52	35	52		52	50	49	28	17	10	18	43	56	62	61	63	62	61	61	62
9:30 AM	57	58	50	31	54		53	50	49	27	18	11	20	55	56	62	61	63	62	61	62	56
9:45 AM	56	58	49	31	53		53	50	49	27	18	12	20	55	56	62	61	63	62	61	62	62

Southbound AM Peak Period Travel Speed

Existing Model Validation

2018 PM Model Speed Heat Map – NB 405

Observed

	Macarthur	SR-55	Bristol	CA-73	Fairview	Harbor	Euclid	Brookhurst	Warner	Magnolia	Beach	Bolsa	Westminster	Valley View	CA-22	Seal Beach	I-605	Palo Verde	Willow	Bellflower	Lakewood	
2:00 PM	62	64	62	57	36	26	16	28	52	55	59	65	64	63	65	65	65	67	63	62	63	62
2:15 PM	63	62	58	48	19	9	13	38	58	58	58	62	63	57	63	56	65	68	64	62	63	63
2:30 PM	62	59	45	28	10	11	13	39	59	59	59	57	60	59	55	65	67	63	62	62	63	62
2:45 PM	63	54	35	13	9	9	12	38	59	58	58	54	57	54	57	53	65	67	64	61	61	60
3:00 PM	64	52	28	12	8	8	11	37	58	55	55	53	53	53	55	54	63	60	57	60	60	61
3:15 PM	63	46	20	9	7	7	11	36	54	51	46	57	53	54	54	52	61	60	55	55	58	58
3:30 PM	66	46	17	8	6	7	11	36	53	48	42	51	51	51	52	58	56	50	50	55	48	48
3:45 PM	65	48	13	7	6	6	10	32	47	48	40	51	51	51	54	57	54	53	47	46	45	45
4:00 PM	64	35	7	6	5	6	9	31	44	40	38	48	53	44	53	44	46	43	43	45	46	48
4:15 PM	65	38	10	5	5	6	8	15	38	35	34	46	46	52	49	48	42	45	43	47	51	51
4:30 PM	62	46	12	5	5	5	3	34	32	46	33	43	43	46	43	49	50	46	43	45	47	47
4:45 PM	68	44	14	5	4	5	8	11	31	29	31	41	41	46	46	49	48	41	46	42	47	46
5:00 PM	78	42	14	5	4	5	3	29	27	33	8	49	10	33	46	49	48	41	46	42	47	46
5:15 PM	76	42	11	4	4	5	8	12	33	31	36	50	48	48	43	47	44	34	41	39	41	41
5:30 PM	75	40	9	4	4	5	8	12	32	31	34	44	44	44	44	44	36	36	36	39	40	40
5:45 PM	74	44	12	5	4	5	9	15	37	34	33	44	45	45	40	43	42	31	38	37	43	43
6:00 PM	74	49	18	6	4	5	9	16	45	39	35	43	43	45	43	45	35	43	43	41	47	49
6:15 PM	72	47	20	8	5	6	9	15	36	34	34	42	42	42	39	46	48	45	48	45	51	52
6:30 PM	69	51	32	11	6	6	6	9	15	34	34	40	41	41	43	49	52	51	53	50	53	52
6:45 PM	66	58	44	13	7	7	9	16	36	33	31	45	45	48	49	49	50	49	50	47	49	52
7:00 PM	65	60	51	31	10	8	3	20	34	36	35	49	52	52	57	57	56	54	55	55	57	57
7:15 PM	63	60	52	36	25	10	13	25	42	43	37	52	53	52	54	57	63	62	59	58	59	59
7:30 PM	59	64	59	44	21	29	31	50	52	45	52	54	53	53	55	58	61	65	63	62	61	61
7:45 PM	58	65	64	66	49	43	39	36	57	57	47	54	52	51	58	61	66	68	65	63	63	63

Northbound PM Peak Period Travel Speed

Modeled

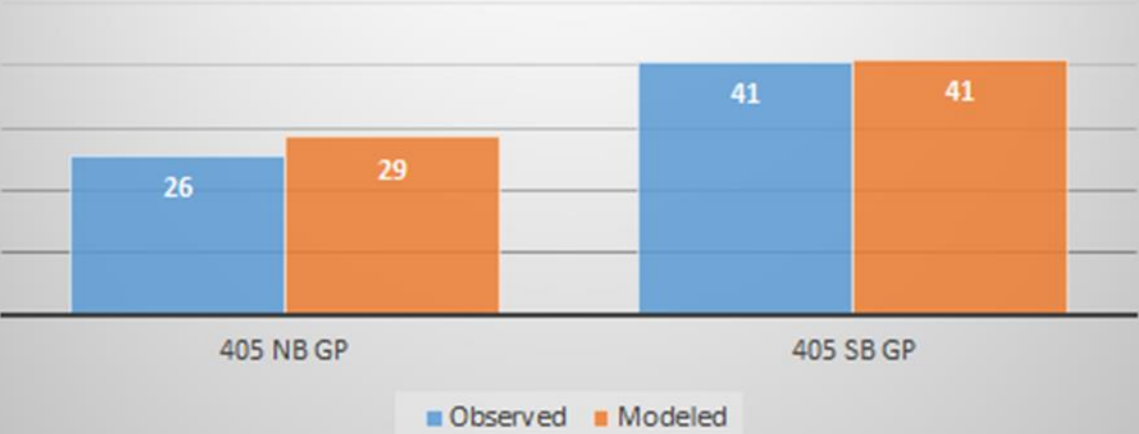
	Macarthur	SR-55	Bristol	CA-73	Fairview	Harbor	Euclid	Brookhurst	Warner	Magnolia	Beach	Bolsa	Westminster	Valley View	CA-22	Seal Beach	I-605	Palo Verde	Willow	Bellflower	Lakewood	
2:00 PM	59	55	47	59	57	31	34	27	61	32	54	56	57	57	60	56	46	50	53	56	54	60
2:15 PM	59	55	50	59	40	11	14	46	61	37	54	57	57	57	60	55	40	44	53	55	54	59
2:30 PM	59	56	49	22	8	11	14	46	61	48	54	57	57	60	55	40	44	53	55	49	54	60
2:45 PM	59	52	12	8	5	7	18	50	61	53	54	57	57	60	55	41	45	53	55	44	58	59
3:00 PM	59	13	7	9	7	12	15	48	61	40	55	57	57	54	54	52	34	49	53	55	42	52
3:15 PM	59	15	10	9	6	8	15	43	61	48	55	57	57	54	54	53	36	50	52	55	39	52
3:30 PM	59	13	9	9	7	11	24	43	50	46	53	53	53	54	54	52	34	55	52	48	44	52
3:45 PM	60	18	10	12	8	12	12	14	50	53	53	53	54	54	54	55	38	56	52	49	52	52
4:00 PM	59	28	12	12	6	9	7	13	50	51	53	53	53	54	54	55	38	54	53	49	48	52
4:15 PM	59	35	12	7	4	6	7	13	50	51	53	53	53	54	54	58	46	51	53	49	48	52
4:30 PM	59	25	11	7	5	8	9	14	50	40	53	53	53	54	54	57	47	53	53	49	54	52
4:45 PM	60	33	14	8	5	10	11	16	38	20	53	53	53	54	54	57	48	52	53	49	53	52
5:00 PM	59	52	13	10	5	10	14	15	53	13	53	53	53	54	54	58	46	53	52	49	53	52
5:15 PM	60	54	21	9	5	10	13	11	8	14	53	54	54	54	54	58	49	54	53	49	53	52
5:30 PM	60	52	24	9	5	10	7	12	9	15	54	54	54	54	54	58	48	54	53	49	54	52
5:45 PM	60	33	27	7	4	7	8	13	18	20	53	54	54	55	54	56	49	54	52	49	54	52
6:00 PM	60	33	21	6	4	6	7	13	50	27	53	53	53	55	62	54	51	54	53	49	54	58
6:15 PM	60	36	12	5	4	7	9	14	50	37	54	54	55	55	62	54	53	55	53	49	54	60
6:30 PM	60	55	16	7	5	9	8	13	62	38	56	58	58	58	62	56	50	55	53	56	56	61
6:45 PM	60	56	46	13	5	9	7	13	63	50	56	58	59	59	62	57	53	56	54	57	56	61
7:00 PM	60	56	54	48	5	9	7	12	63	54	56	59	59	60	62	58	56	55	57	57	57	62
7:15 PM	61	56	56	55	7	8	9	15	62	53	56	59	59	60	62	59	56	57	56	58	58	62
7:30 PM	60	56	57	58	11	11	11	16	61	44	55	58	58	59	61	58	55	55	57	58	58	61
7:45 PM	60	56	57	62	41	11	11	16	62	50	55	58	59	61	61	58	55	58	55	57	58	61

Northbound PM Peak Period Travel Speed

Existing Model Validation

2018 AM Peak Hour

I-405 - GP Travel Times (min)
(MacArthur Blvd to Lakewood Blvd)



2018 PM Peak Hour

I-405 GP Travel Time (mins)
(MacArthur to Lakewood)

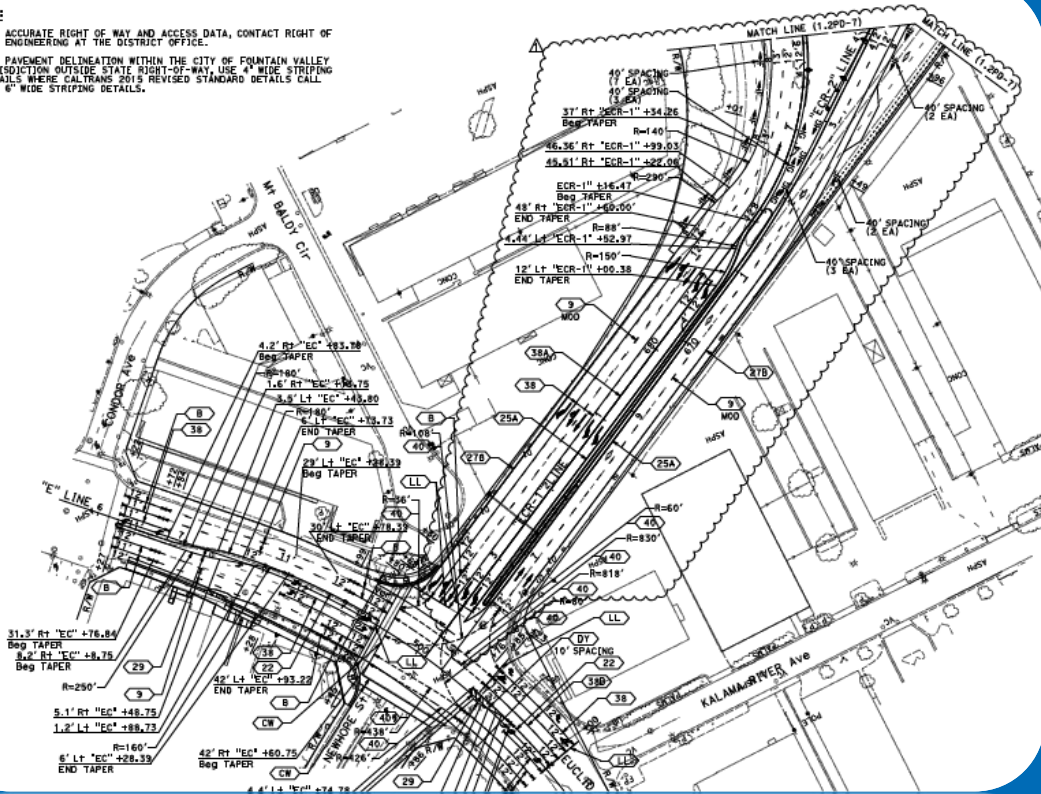




2025 Model Development

NOTES:

1. FOR ACCURATE RIGHT OF WAY AND ACCESS DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. FOR PAVEMENT DELINEATION WITHIN THE CITY OF FOUNTAIN VALLEY JURISDICTION OUTSIDE STATE RIGHT-OF-WAY, USE 4" WIDE STRIPING DETAILS WHERE CALTRANS 2015 REVISED STANDARD DETAILS CALL FOR 6" WIDE STRIPING DETAILS.



❖ 2025 Roadway Network

Two HOT lanes each direction

One additional GP lane each direction

Ramp modifications



2025 Model Development

TransModeler (Licensed to Fehr & Peers)

File Edit Matrix Selection Project Demand Route Systems Parameters Simulation

GP Sum

Matrix1 - Estimate

	GP	HOV2	HOV3	Single Unit Truck	Trailer	6316	6353	6366	6375
6304	0.0					0.00	0.00	0.00	0.00
6305	0.0					0.00	0.00	0.00	0.00
6314	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6316	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6378	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00
6374	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00
6302	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00	0'00

❖ 2025 Trip Table Development

Identify traffic growth in OCTAM

Develop growth by vehicle classification

Add growth to 2018 trip tables



2025 Model Development

The screenshot shows the 'HOT Lane Message Editor' dialog box with the following fields and values:

- Settings** (selected tab)
- Message Sign Properties**
 - Segment: 147169
 - Signal: 4803
 - Position (feet): 197.2
 - Visibility (feet): 328.1
- Origin/Entrance**
 - Name: Magnolia-73
 - ID: 16
 - Signals: 4803,4804
 - Links: 6714604
- Toll Calculation**
 - System: Zone-based
 - Method: Time-Dependent
 - Cycle (sec): [empty]

Buttons: OK, Cancel

❖ 2025 HOT Module

Create HOT lane messages

Define HOT links

Add time of day pricing info by classification



2025 Model Development

405 Toll Policy

- ❖ **Rates based on the I-405 Express Lanes Investment Grade Traffic and Revenue Study**
- ❖ **Toll Policy identified initial peak periods as 6-10 AM and 3-8 PM**
- ❖ **Discount policy:**
 - 1) free for HOV 3+ / motorcycles / disabled plates / disabled veteran plates**
 - 2) free or discounted rates for ILEVs**
 - 3) free at non-peak hours for HOV 2+ for first 3.5 years**






2025 Conditions

❖ Near-term and Long-term Toll Policy

Toll Scenario	SOV	HOV 2	HOV 3+
Near Term	Tolled all times	Free non-peak Tolled in peak	Free all times
Long Term	Tolled all times	Tolled all times	Free all times



2025 Preliminary Results

-  Model developed for AM and PM peak periods under 2025
-  Significantly improve operations on GP lanes from 73 to 605
-  Maintain free flow speeds on HOT lanes from 73 to 605





Next Steps

- ❖ **Potential Model Revalidation in 2024 with Updated T&R**
- ❖ **Evaluation of Potential Toll Pricing Changes**
- ❖ **Model Applications on Future Studies**
- ❖ **Uncertainties (economy, COVID-19 post effect, etc.)**

Thank you!

Archie Tan, Project Manager

OCTA Regional Modeling and Traffic Operations

atan@octa.net