



# Connected Corridors Face-to-Face Meeting

Tuesday, July 26th, 2016 – 1:30 – 3:30 pm  
Caltrans D7 HQ

July 26th, 2016



# Agenda

2

- **Introductions**
- **Schedule Update**
- **Outreach**
- **Requirements Update**
- **High Level Design and Gap Analysis**
- **Infrastructure and Partner projects**
- **AMS and Response Plan Design**
- **Action Items and Closing**



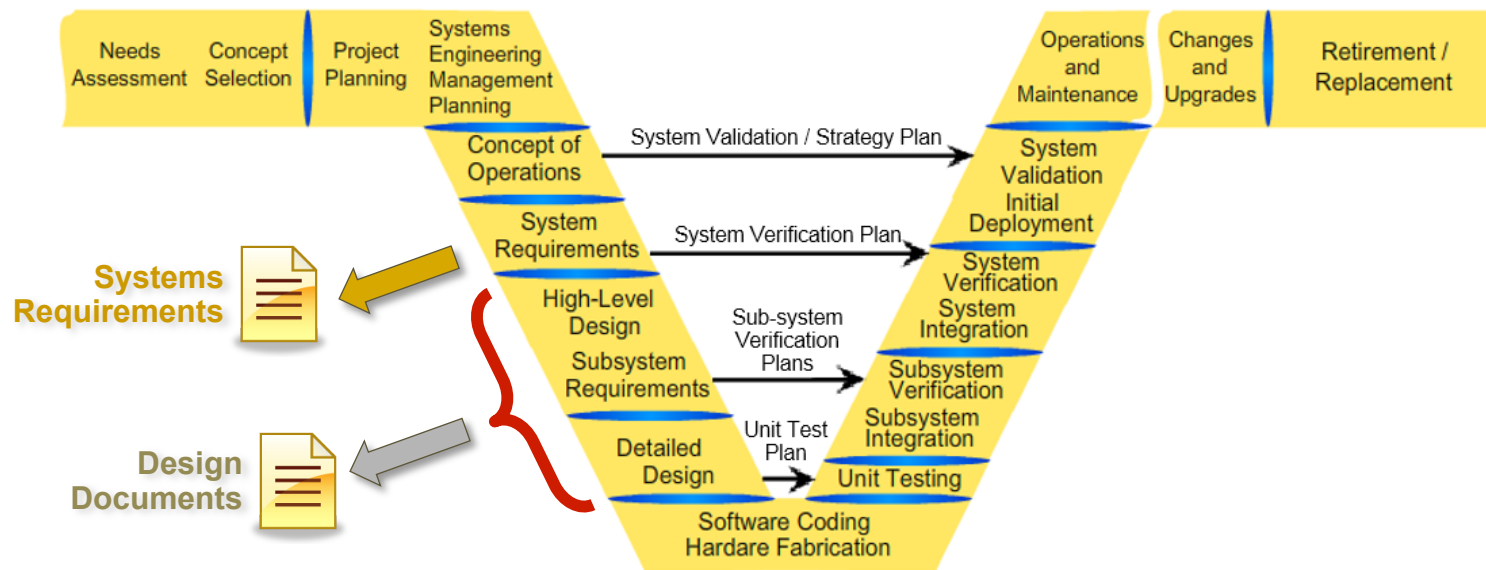
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# Systems Engineering Next Steps

4

- ❑ **Systems Requirements – What should the ICM system do**
- ❑ **Design Documents – How will the requirements be met**

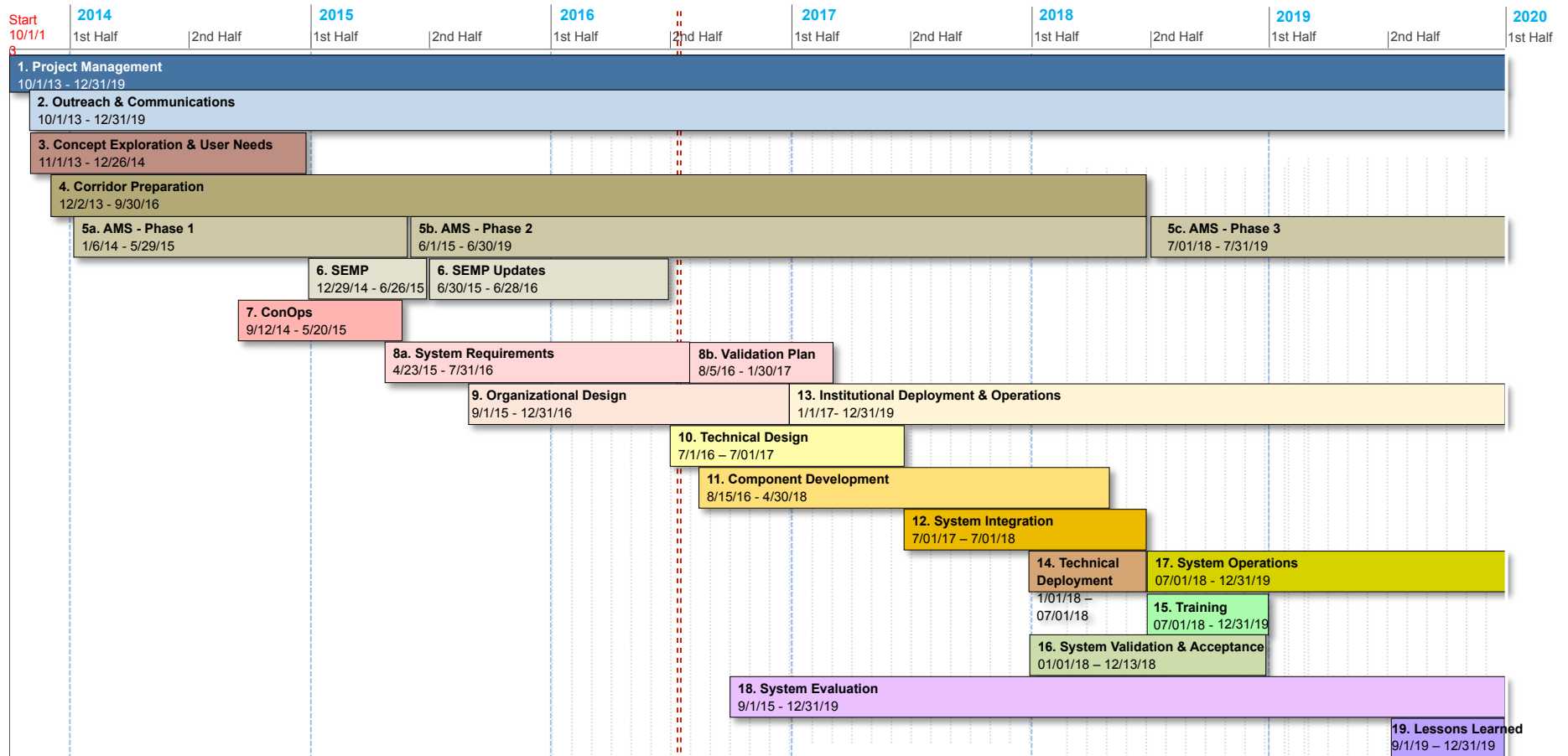


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## Schedule Update

# Schedule

6



7

## Outreach and Communications

ATCMTD Federal grant application submitted by  
CT D7 on June 24 (\$9M)

Connected Newsletter

Job Descriptions and Duties/Tasks

Project Charter Amendment

Meeting with Duarte City Council

# Summer Connected Newsletter

8

- Articles are under development
  - ▣ New IT series (first article is on “CC in the Cloud”)
- Will be distributed in August
- Also posted to CC website





# Project Charter Amendment

9

## □ Contents:

- ▣ Background, including the 9 items that were agreed to in the original Project Charter
- ▣ Documents that have been drafted since June 2015 (when the Project Charter was executed) including the ConOps, Project Management Plan, SEMP, and AMS Report Phase 1
- ▣ Nearly completion on the System Requirements leading to the next phase: Design
- ▣ Stakeholder participation in meetings, workshops, individual meetings, etc.
- ▣ Funding: SHOPP and Metro 2015 Call for Projects



# Project Charter Amendment, continued

10

## □ What is being amended/added

- Primary Contact Person at various agencies
- Review and approve the System Requirements and the design documents
- City and County agreement on the Summarized Requirements (one page); CT agreement on the Summarized Requirements (under review)
- Cities/County/Foothill Transit agreement that the infrastructure and/or software improvements in the Metro 2015 Call for Projects will be purchased by CT D7 but owned, operated, and maintained by the local agencies; an “Asset Transfer Agreement” (or similar document) will be executed
- Agreement to execute additional agreements for various aspects of the project such as an Operations and Maintenance Plan



# Meeting with Duarte City Council

11

- **Raphael has requested that we update the Duarte City council on CC status**
  - ▣ Update
  - ▣ Funding
  - ▣ Time frame
  - ▣ 10-15 minutes
  - ▣ Would be pleasant if Metro could also attend
  
- **Sean believes that the Monrovia city council may also be interested in a presentation**
  - ▣ We believe this would be the first presentation



12

## Requirements Definition

# Requirements

13

- **We have completed the next draft of the requirements**
  - ▣ Will be released on Friday
- **We have met/communicated with all core stakeholders regarding the summarized Caltrans' requirements**
- **I believe we have agreement on all but one requirement:**
  - ▣ “County, in consultation with cities and Caltrans, will create and maintain coordination timing plans for use during incidents. Cities and/or county shall load the timing plans onto the controller for use during an incident.”
  - ▣ “The project stakeholders will create and maintain coordination timing plans for use during incidents for all signals on agreed upon detour routes (including Caltrans signals). Caltrans shall load the timing plans onto their controllers for use during an incident.”



# Summarized Caltrans Requirements – 1

14

Corridor Management	ICM CORE SYSTEM Functions	Sensing and Data
Caltrans shall be responsible for overall ongoing management and success of the I-210 corridor management function.	Caltrans shall be responsible for operating and maintaining the ICM Core Software and Hardware System 1) Security 2) Maintenance 3) Working with stakeholders to implement upgrades	Caltrans shall communicate special events/road closures and recommended detour information to the CM that may affect traffic operations on identified detour routes. Caltrans shall disseminate information.
Caltrans shall fill the following leadership roles: <b>Corridor Manager</b> – Responsible for overall corridor management success, stakeholder relationships, and response planning (rules, models and analysis) <b>Corridor Technical Manager</b> – Responsible for ensuring all hardware and software are operational and maintained <b>Corridor Data Analyst</b> – Responsible for ensuring and encouraging data quality, data availability and performance analysis	Caltrans shall be responsible for operating and maintaining corridor and asset monitoring and display capabilities: 1) Corridor Asset Inventory and Health 2) Corridor Asset State 3) Corridor Measured and Estimated State 4) Calculation and Display of Corridor Metrics 5) Calculation of Historical Patterns	Caltrans shall maintain up-to-date definitions/inventory of freeway network elements
Caltrans shall be responsible for maintaining: Corridor Strategic Plan Corridor Data Strategic Plan Data Dictionary Data Quality Specs	Caltrans shall be responsible for operation and maintenance of Response Plan capabilities: 1) Incident creation and validation 2) Response plan creation 3) Response plan implementation	Caltrans shall communicate forthcoming approved/ pending changes in roadway geometry and operations affecting traffic conditions, restrictions, and traffic control devices on the freeway to the CM
Caltrans shall be responsible for guiding system integration 1) Integrated Reporting, Visualization, and Control functions 2) Single point of ownership for data and control functions within the Core ICM System	Caltrans shall be responsible for operation and maintenance of all data management capabilities: 1) Storage of data 2) Standard access to data 3) Management of Data	Caltrans and cities shall work together to assist in resolving data, hardware, and software issues in a timely manner (the definition of timely manner will be determined at design time).
Caltrans shall be responsible for Training and Documentation	Caltrans shall be responsible for operation and maintenance of the Decision Support System capabilities: 1) Rules Capture and Execution 2) Estimation 3) Prediction	Caltrans and cities shall ensure that system detection at key ICM freeway and arterial locations meets system reliability goals. (Response time to be determined during design).



# Summarized Caltrans Requirements –2

15

Incident/Event Response Plans	Road Network Management	Outreach, Agreements, Funding Personnel
Caltrans will work with CM in defining and maintaining rules for building response plans, handling special situations, messages to be displayed on CMS signs, selecting response plans and sending response plans to corridor assets.	Caltrans shall permit the Core ICM System to select and implement preapproved signal plans for intersections on preapproved detour routes.	Caltrans shall attend and lead meetings and/or teleconferences, and meet quarterly or as needed regarding incident/event responses
LA County, in consultation with cities and Caltrans, will create and maintain coordination timing plans for use during incidents for all signals on agreed upon detour routes (including Caltrans signals). Caltrans shall load the timing plans onto their controllers for use during an incident.	Caltrans shall permit the Core ICM System, using the CMS control software, to select and implement preapproved messages for display on preapproved freeway CMS signs. Caltrans shall be allowed access to the CMS control software to make changes within their jurisdiction.	Caltrans shall assist with editing, reviewing, and executing documents and agreements.
Where possible, the ICM system shall determine the end-time of a Caltrans initiated incident/event. Where not possible, Caltrans shall indicate when an incident/event has terminated or is expected to terminate. The ICM system determination may be over-ridden by Caltrans.	Caltrans shall permit the Core ICM System to contact designated Caltrans personnel with requests for performing preapproved actions	Caltrans shall provide updated information on Caltrans contacts. Caltrans shall disseminate information.
Caltrans CM, as necessary, will request meetings with Caltrans and city personnel in order to review rules used during incidents/events to determine if they worked correctly and, if they did not, resolve any issues	The overall ICM system goal is to function correctly 85% of the time. <ul style="list-style-type: none"> <li>• Signals 99%</li> <li>• Detection 85%</li> <li>• Communication 85% (70%-75%)</li> <li>• Software 95%</li> </ul>	Caltrans will work with Cities and County to apply for federal, state, regional, and local funding sources.
	Caltrans and stakeholder agree to share video feeds as long as videos are not stored	ICM Steering Committee shall define roles, responsibilities, and reporting structures for the ICM system. Caltrans shall ensure key personnel and support personnel are in place and trained.
	Caltrans shall permit the Core ICM System, through requests to the Caltrans' ramp metering software, to select and implement preapproved ramp metering plans on ramps on preapproved detour routes.	



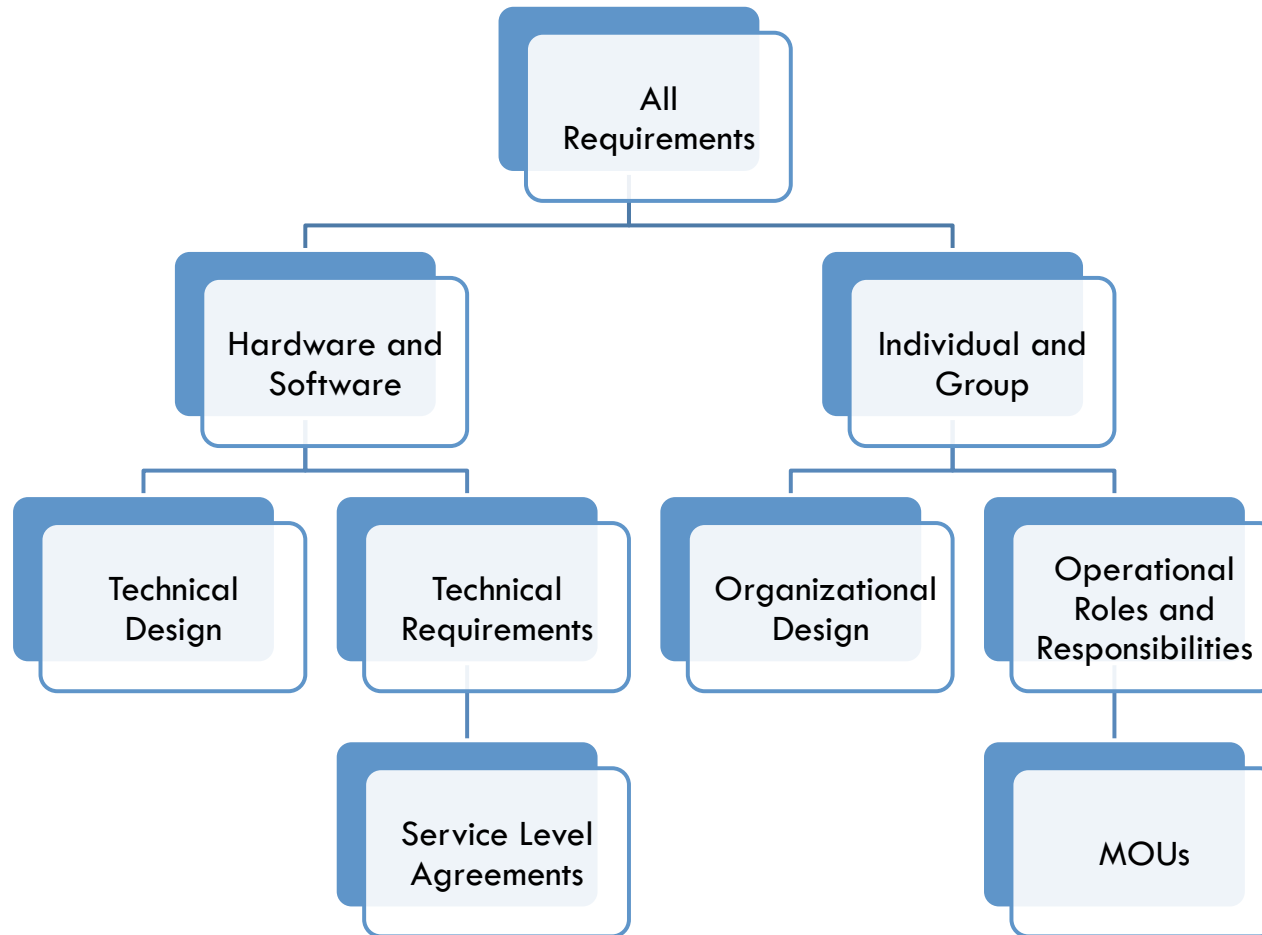


# High Level Design



# High Level Design

17



# Job Descriptions and Duties/Tasks

18

- ❑ Subset of the I-210 System Requirements document
- ❑ Separate attachment to the System Requirements
- ❑ Will take another month to finalize; Caltrans is reviewing format



# Job Descriptions and Duties/Tasks

19

PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY  
INSTITUTE OF TRANSPORTATION STUDIES  
UNIVERSITY OF CALIFORNIA, BERKELEY

## I-210 Pilot System Requirements:

### Job Descriptions and Duties/Tasks

July 21, 2016



Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

## 1. REQUIREMENTS: JOB DESCRIPTIONS AND DUTIES/TASKS

The purpose of this document is to provide a list of the Job Descriptions and the associated roles and tasks that are in the System Requirements for the I-210 Pilot. It contains the job title and the job description, and then matches them to the duties and tasks that the job function performs. By doing so, the document is an easy reference for the corridor stakeholders and others to understand the Knowledge, Skills, and Abilities (KSAs) that are required for each job.

### 1.1. CORRIDOR MANAGER

The Corridor Manager ensures that the Integrated Corridor Management (ICM) process and project are successful. This is the most important role described in this document and requires organizational, managerial, and technical skills and awareness.

#### 1.1.1. INSTITUTIONAL SUPPORT

Institutional Support focuses on strategic planning and on how organizations and people are structured, funded, motivated, and informed in order to execute those plans. It is based on the premise that active collaboration among people and organizations is the cornerstone on which an ICM project is built.

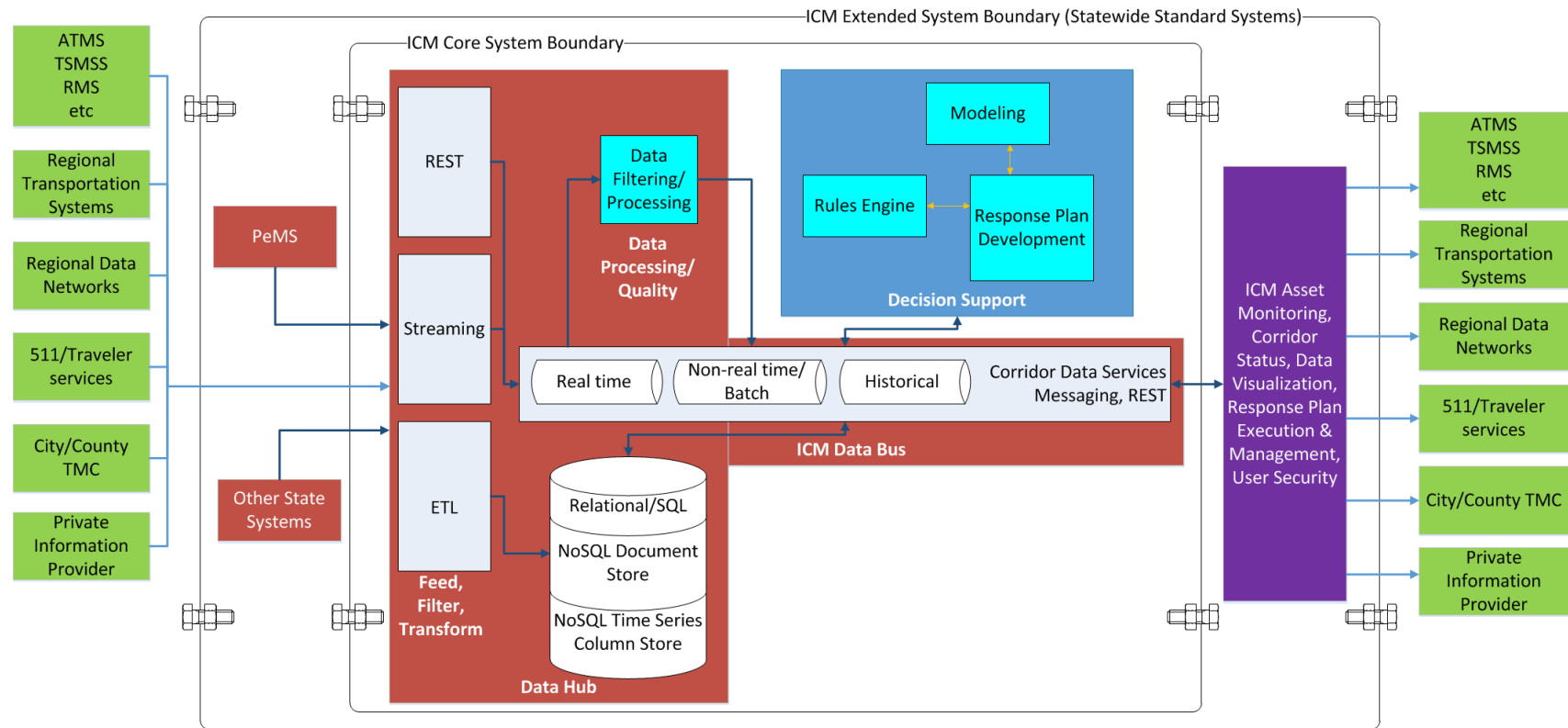
In this context, the Corridor Manager works with stakeholders and other ICM personnel to mobilize and drive efforts around strategic planning, securing funding, promoting an ICM culture, engaging third-party relationships, and maintaining awareness and oversight of the corridor and the ICM system.

Responsibility	Requirement source
1. Oversee the drafting and maintenance of the Corridor Strategic Plan. a. With the Corridor Technical Manager and Corridor Data Analyst, determine if the Strategic Plan is complete and have the plan approved by the Stakeholders. b. Resolve Strategic Plan deficiencies (with appropriate assistance).	
2. Along with the Outreach and Communications Manager, research and track funding opportunities; prepare and submit funding applications.	
3. In coordination with the Outreach and Communications Manager, survey personnel and their managers to determine if personnel understand ICM and the cultural changes required.	
4. Coordinate with agencies on contracting and relationships with third-party organizations.	
5. In consultation with the Stakeholders, review changes to the corridor network, new technologies, and new governmental requirements in order to determine required changes to data collection and performance metrics.	



# Current Proposed ICM Architecture

20



# Office of Technology

21

- Caltrans IT has joined the CC team!
  - ▣ Mike Nyugen, Chief, Division of IT Infrastructure is the IT Liaison
- Go ahead given for design of Caltrans data hub
- TMS Pilot Corridor Reporting Coordination
- Continued participation with the DCCM DSS RSCS



# Update on Core System

22

- **Data Management**

- Approved for design

- **Data Quality**

- Working on algorithms and processes
- PEMS 30 second filter working in the cloud

- **DSS**

- Rules Engine: Working on rules engine and rules capture
- Estimation
  - Freeway Estimation function demonstrated running in the cloud
  - Designing Arterial Estimation
- Prediction: Working with TSS to integrate Corridor Model into workflow



# High Level Design – Gap Analysis

23

- **Divide requirements into technical and organizational**
- **Map organizational requirements to**
  - ▣ Organizations
  - ▣ Job Roles and Responsibilities – (Corridor Manager, Data Analyst, etc)
- **Map technical requirements to**
  - ▣ Organizations
  - ▣ Subsystems (DSS, PEMS, etc.)
- **Determine gaps**
  - ▣ Lack of owning organizations
  - ▣ Lack of funding



## Partner Projects

Caltrans' Shop Project

Metro Call for Projects

Pasadena Upgrade Completed

IEN Upgrade

RIITS, 511, ATMS, PEMS, TSMSS, Lane Closure



# I-210 Pilot – SHOPP Project Update

25

- EA 30640 – Freeway Improvements (SHOPP Project)
  - Finish Construction July, 2018
- Awaiting a CPM schedule from contractor to determine when work up to the 605 will be completed
- Includes communication, signal upgrades, cameras, etc.



# Call for Projects - Approaching a final list

26

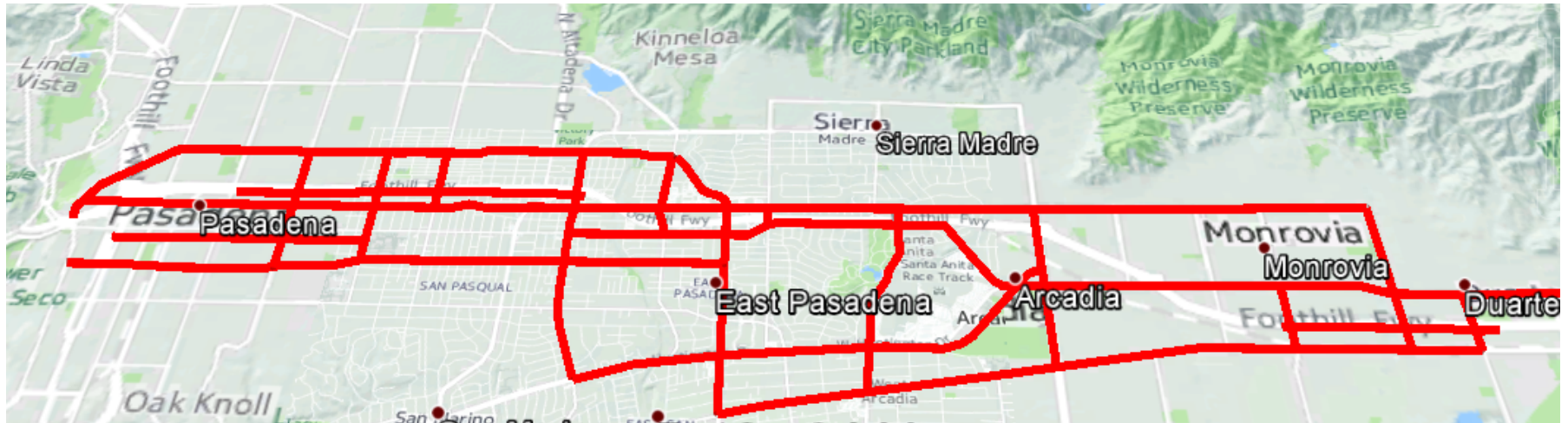
- ▣ Agreements reached with cities in meetings over the last week
  - Signs – 200 or so at major intersections
  - Sensing and upgrades as agreed
  - No trenching in this contract
  - O&M will be assumed by cities for elements in their jurisdiction
- ▣ Process Issues:
  - Method Caltrans will use for procurement
- ▣ Design-Build Contract:

■ Contingency (10%)	\$ 600,000
■ RFP & PS&E Oversight	\$ 300,000
■ Construction Oversight	\$ 100,000
■ <u>Construction+Design</u>	<u>\$ 5,000,000</u>
■ Total	\$ 6,000,000



# Agreed Upon Reroutes

27



# Intersections Requiring Signs

28



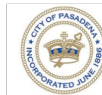
# Potential Sign

29



VL-3201-128x48-8-A-SF

- ☐ Must cost around 5K
- ☐ Attaches to existing poles and power
- ☐ Weight – 35 to 50 lbs
- ☐ 4 by 2 or so color matrix



# Pasadena System Upgrade Completed

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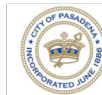
- **All signals on**
  - ▣ Transparency
  - ▣ SCATS
- **Still need to discuss possible additional software modules**



# IEN

31

- ❑ **Upgrade Planned**
- ❑ **Preparing CC requirements for hopeful inclusion in upgrade**
- ❑ **Risk of IEN upgrades not being completed by early 2018**



# 1EN, RIITS, 511, ATMS, PEMS

32

- **RIITS – Upgrade Planned**
  - ▣ Need to speak with RIITS personnel
- **511- Upgrade Planned**
  - ▣ Need to speak with 511 personnel
- **ATMS**
  - ▣ Need to develop an upgrade plan
- **TSMSS**
  - ▣ Need to develop an interface plan
- **PEMS**
  - ▣ Need to develop an upgrade plan





# Data Quality



# Corridor Data

34

- **Good progress being made on configuration and basic hardware issues on freeway**
- **All cities (Pasadena, Arcadia, Monrovia and Duarte) have agreed to start sharing their traffic data (where available) for analysis. This is an important step.**



# Freeway data quality

35

Weekly Average Data Quality	Eastbound I-210 Marengo/Corson to Sunflower Ave						Westbound I-210 Sunflower to Maple					
	Fwy-Fwy	Mainline	On Ramp	HOV	Off Ramp	Total	Fwy-Fwy	Mainline	On Ramp	HOV	Off Ramp	Total
Mar 6-12	0.0%	78.8%	95.0%	68.4%	69.0%	76.9%	62.5%	72.2%	95.2%	63.3%	79.8%	73.9%
Mar 13-19	0.0%	75.5%	92.5%	66.7%	67.0%	74.2%	62.5%	66.7%	92.1%	57.9%	73.4%	68.7%
Mar 20-26	0.0%	76.3%	91.9%	68.0%	69.0%	75.0%	62.5%	71.0%	96.8%	62.9%	77.8%	73.0%
Mar 27-Apr 02	0.0%	65.7%	74.5%	56.7%	56.7%	63.5%	53.6%	60.3%	80.4%	53.3%	68.5%	62.1%
April 3-9	71.4%	71.0%	75.8%	61.9%	61.0%	68.8%	62.5%	70.5%	88.9%	64.1%	71.9%	71.4%
April 10 -16	100.0%	82.2%	88.2%	74.0%	72.4%	80.5%	35.7%	77.0%	93.7%	68.7%	77.8%	76.4%
April 17 -23	100.0%	90.4%	90.1%	80.5%	72.9%	86.7%	62.5%	84.0%	93.1%	76.8%	76.8%	82.4%
April 24-30	100.0%	83.9%	85.7%	74.5%	73.3%	81.4%	35.7%	79.0%	94.7%	74.9%	79.8%	78.8%
May 1-7	100.0%	76.8%	85.7%	67.5%	73.3%	76.1%	42.9%	74.3%	90.5%	66.0%	77.8%	74.0%
May 8-14	100.0%	87.1%	81.4%	80.5%	73.3%	83.8%	33.9%	86.8%	92.1%	75.3%	78.8%	83.2%
May 15-21	100.0%	86.4%	83.2%	82.3%	72.4%	83.8%	25.0%	83.0%	87.8%	73.0%	74.9%	79.3%
May 22-28	100.0%	79.2%	89.4%	73.2%	73.3%	78.8%	25.0%	74.3%	86.8%	67.6%	76.8%	73.4%
May 29 - Jun 04	100.0%	68.6%	80.1%	64.1%	68.6%	69.4%	25.0%	69.8%	85.7%	61.8%	69.0%	68.8%
Jun 05-11	100.0%	81.9%	81.4%	76.6%	70.5%	79.7%	89.3%	79.8%	87.8%	72.6%	73.9%	79.2%
Jun 12-18	100.0%	90.2%	88.8%	84.4%	73.3%	87.0%	100.0%	85.0%	90.5%	77.6%	76.8%	84.0%
Jun 19-25	71.4%	87.0%	87.6%	78.8%	72.9%	83.8%	92.9%	81.2%	87.8%	71.0%	73.9%	80.0%
Jun 26-Jul2	0.0%	80.8%	91.3%	70.6%	73.3%	78.7%	75.0%	74.6%	89.9%	62.9%	78.8%	75.0%
Jul3-9	0.0%	78.4%	88.8%	68.4%	70.0%	76.2%	75.0%	71.3%	86.2%	59.1%	75.4%	71.7%
Jul10-16	0.0%	86.9%	91.9%	77.1%	68.6%	82.7%	75.0%	75.9%	87.8%	64.1%	76.4%	75.5%
Jul17-23	42.9%	87.6%	93.2%	80.1%	71.4%	84.5%	85.7%	72.3%	81.5%	62.2%	73.9%	72.4%
Loops in category	2	138	23	33	30	226	8	156	27	37	29	257



# Arcadia Arterial Data Quality

36

Weekly Data Quality (%)	Arcadia								
	Detour Routes			Not Detour Routes			All Detectors		
	Good	Bad	No Data	Good	Bad	No Data	Good	Bad	No Data
31-Jan-2016 To 06-Feb-2016	61.42	32.59	5.99	15.76	29.06	55.17	49.99	31.70	18.31
07-Feb-2016 To 13-Feb-2016	60.96	33.05	5.99	15.86	28.97	55.17	49.67	32.03	18.31
14-Feb-2016 To 20-Feb-2016	56.06	37.95	5.99	15.86	28.97	55.17	45.99	35.70	18.31
21-Feb-2016 To 27-Feb-2016	56.22	37.79	5.99	15.86	28.97	55.17	46.11	35.58	18.31
28-Feb-2016 To 05-Mar-2016	53.42	40.59	5.99	15.76	29.06	55.17	43.99	37.70	18.31
06-Mar-2016 To 12-Mar-2016	53.55	40.45	5.99	15.07	29.75	55.17	43.92	37.77	18.31
13-Mar-2016 To 19-Mar-2016	48.65	45.36	5.99	13.69	31.13	55.17	39.90	41.80	18.31
20-Mar-2016 To 26-Mar-2016	45.06	48.95	5.99	14.48	30.34	55.17	37.40	44.29	18.31
27-Mar-2016 To 02-Apr-2016	46.58	47.43	5.99	14.48	30.34	55.17	38.54	43.15	18.31
03-Apr-2016 To 09-Apr-2016	47.33	46.68	5.99	14.48	30.34	55.17	39.11	42.59	18.31
10-Apr-2016 To 16-Apr-2016	47.99	46.02	5.99	14.48	30.34	55.17	39.60	42.09	18.31
17-Apr-2016 To 23-Apr-2016	46.31	47.70	5.99	14.48	30.34	55.17	38.34	43.35	18.31
24-Apr-2016 To 30-Apr-2016	47.89	46.12	5.99	14.38	30.44	55.17	39.50	42.19	18.31
01-May-2016 To 07-May-2016	38.81	41.77	19.42	9.16	29.26	61.58	31.38	38.64	29.98
08-May-2016 To 14-May-2016	56.68	37.33	5.99	13.89	30.94	55.17	45.97	35.73	18.31
15-May-2016 To 21-May-2016	60.17	33.84	5.99	14.98	29.85	55.17	48.85	32.84	18.31
22-May-2016 To 28-May-2016	63.53	30.48	5.99	15.07	29.75	55.17	51.39	30.30	18.31
29-May-2016 To 04-Jun-2016	61.92	32.09	5.99	14.38	30.44	55.17	50.01	31.68	18.31
05-Jun-2016 To 11-Jun-2016	52.40	41.61	5.99	10.34	34.48	55.17	41.87	39.82	18.31
12-Jun-2016 To 18-Jun-2016	46.77	47.24	5.99	10.34	34.48	55.17	37.65	44.04	18.31
19-Jun-2016 To 25-Jun-2016	48.85	45.16	5.99	11.53	33.30	55.17	39.50	42.19	18.31
26-Jun-2016 To 02-Jul-2016	51.09	42.92	5.99	9.36	35.47	55.17	40.64	41.06	18.31
03-Jul-2016 To 09-Jul-2016	51.25	42.76	5.99	8.97	35.86	55.17	40.66	41.03	18.31
10-Jul-2016 To 16-Jul-2016	49.18	44.83	5.99	8.97	35.86	55.17	39.11	42.59	18.31



# Response Plans



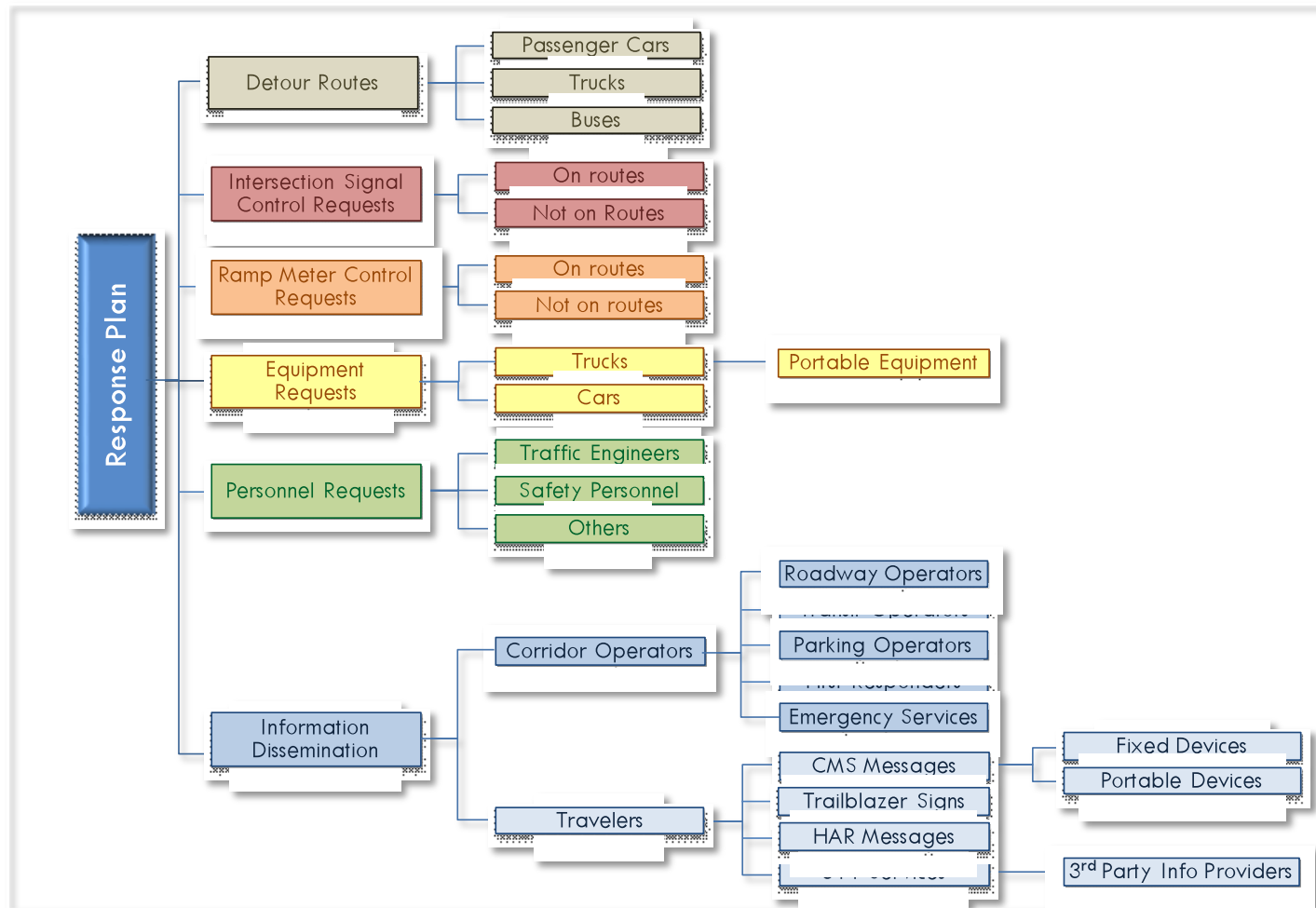
# Response Plan Meetings

38

- **Would like to replace the next face to face with a half day response plan and model review meeting in Arcadia**
  - ▣ 4th week in August ( 23<sup>rd</sup> ) and 3<sup>rd</sup> week in October (with FHWA)
  - ▣ Validate Reroutes
  - ▣ Discuss inputs into rerouting decisions
  - ▣ Discuss inputs into timing plan decisions
  - ▣ Review Corridor (Micro/Meso) Model
  - ▣ Run Simulations
  - ▣ Discuss thresholds for severity
  - ▣ Discuss metrics to use in making decisions



# Response Plan Elements



# Response Plan Builder Demo

40

Incident data entered by manager:

Incident	Freeway:
	I210
	E
	Initial Postmile:
	R28.707 DR (PAS) EB ON SAN GABRIEL BLVD
	End Postmile:
R28.462 DH (PAS) SIERRA MADRE BL UC	
Downtime:	
7 : 17	
Duration:	
240	
Weather:	
0	

Classification/Score:

TIM/MUTCD Severity Classification:	Major Traffic Incident
Impact Score for Response:	70

Response plan determined by rules:

Detour Routes
Passenger Cars
Walnut-Foothill via San Gabriel Blvd and R29.459 SIERRA MADRE VILL
Colorado Blvd-St-Pi / Huntington via Sierra Madre Bl / Altadena Dr and R29.744 NB ROSEMI
Walnut-Foothill via Hill Ave and R30.949 BALDWIN AVE
Trucks
Buses
Intersection Signal Control Requests
On Routes
Items
Walnut-Foothill: Flush Eastbound
Colorado Blvd-St-Pi / Huntington: Flush Eastbound
Off Routes
Ramp Meter Control Requests
On Routes
Items
R29.459 SIERRA MADRE VILL: Uncontrolled





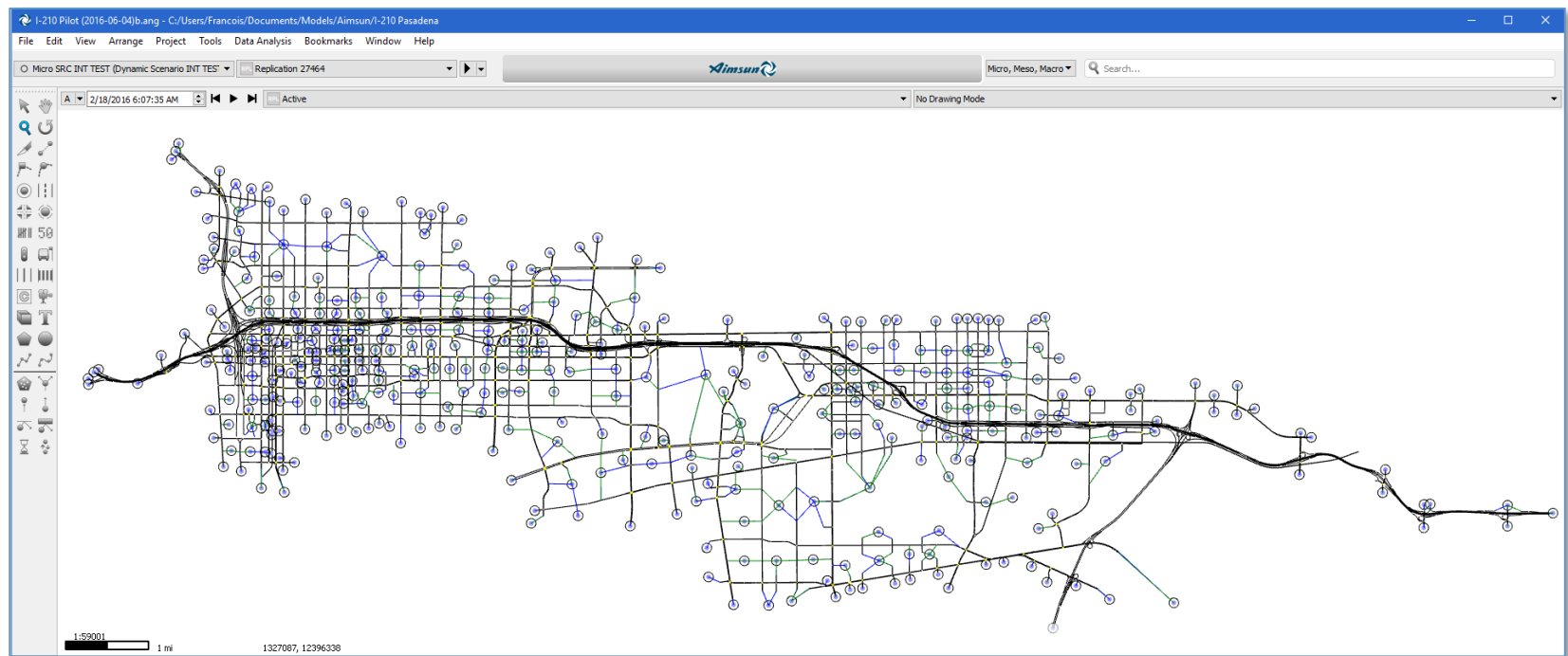
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# Simulation Modeling

# Aimsun Model

42

- Coding of geometrical and basic control elements completed



# Aimsun Model

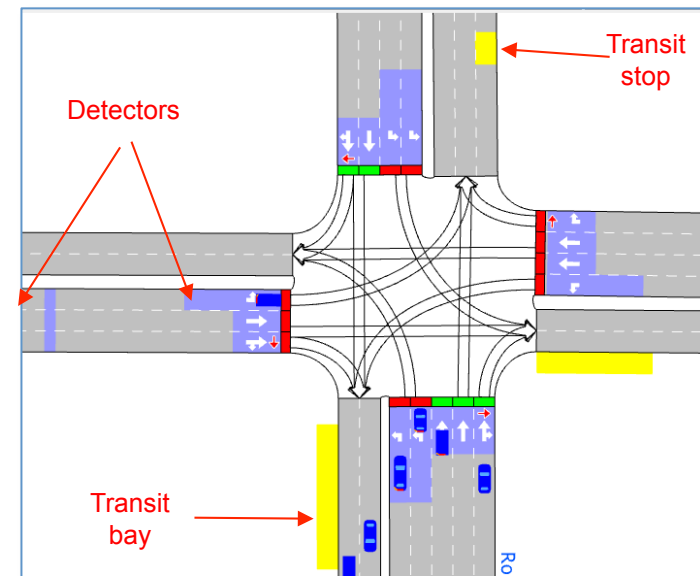
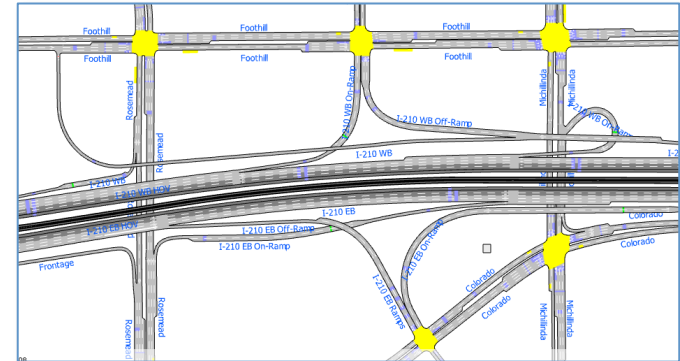
43

## □ Freeway elements

- ▣ Roadways (Mainline, HOV, etc)
- ▣ Speed limits
- ▣ Truck restrictions
- ▣ Traffic detectors
- ▣ Ramp meters
- ▣ Changeable message signs

## □ 450 Intersections

- ▣ Lane markings
- ▣ Speed limits
- ▣ Movements within intersection
- ▣ Traffic detectors
- ▣ Traffic signal operations
- ▣ Stop-controlled intersections



# Demand Modeling

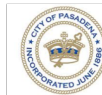
44

- ❑ Completed the mapping of modeled traffic origin/destination nodes to the regional Tier 1 Traffic Analysis Zones (TAZ)
- ❑ Available freeway (PeMS) and arterial traffic counts (from studies) entered into Aimsun
- ❑ Obtained **Caltrans 2008 Regional Travel Demand Model**
- ❑ Requested **SCAG** origin-destination data from the **2012 Regional Travel Demand Model**
- ❑ Really appreciate SCAG's pleasant and important assistance 😊



# Aimsun Corridor Model Demonstration

45



# Action Items and Next Meeting Time



**Thank  
You**

