Connected Corridors
Face-to-Face Meeting

Tuesday, August 4th, 2015 – 1:30 – 3:30 pm
Caltrans D7 HQ

August 4th, 2015

Introductions and Remarks

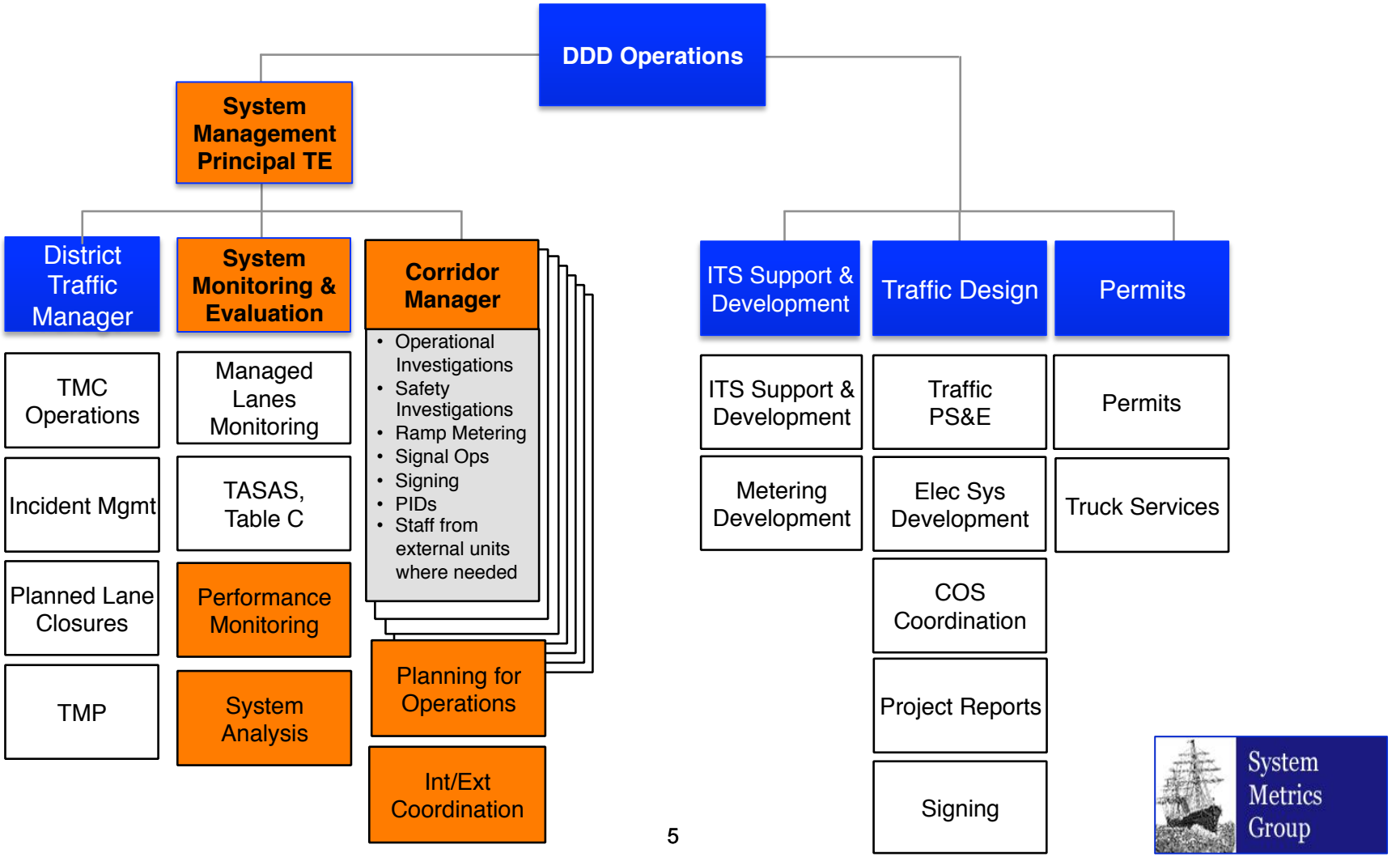
- **Introductions**
  - New folks joining the effort
- **Remarks**
  - Ali Zaghari
  - Tom Hallenbeck

Agenda

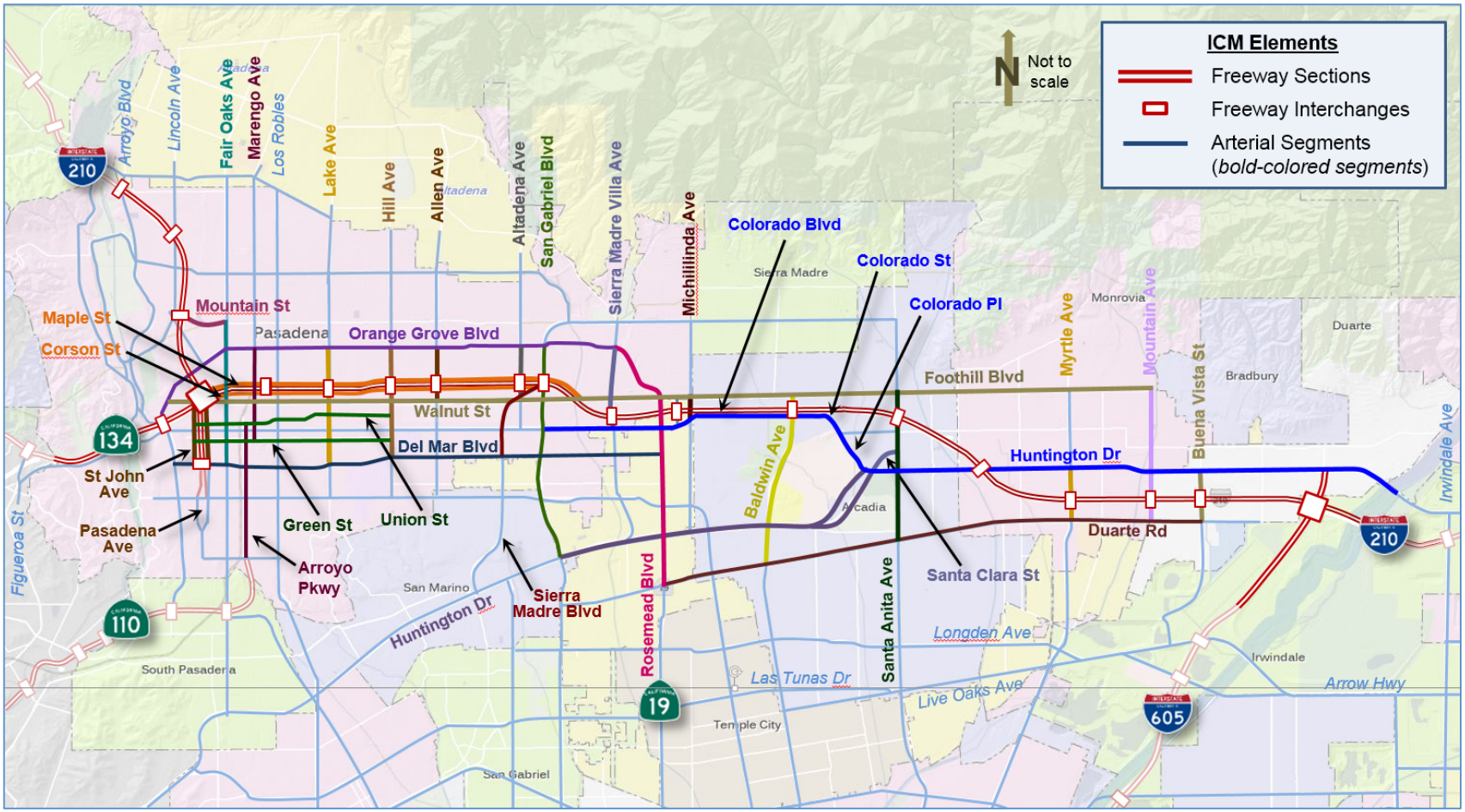
- Meet the new Corridor Manager !
- Review Schedule
- Outreach - Lisa
- Systems and Interfaces – Joe (for Alan Clelland)
- Requirements Gathering – Joe (for Alan Clelland)
- Traffic Intervention Strategies – Tom Choe
- Evaluation Plan – Tom Choe
- Action Items and Closing

Meet the New Corridor Manager

Long-term TSM&O-focused Organization



Our Corridor: The I-210



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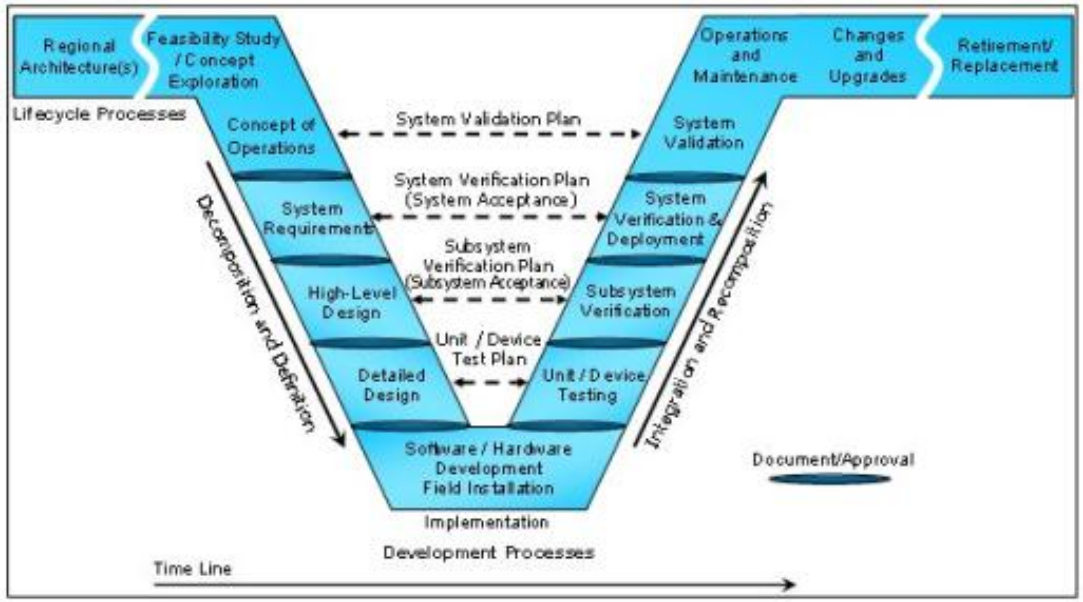
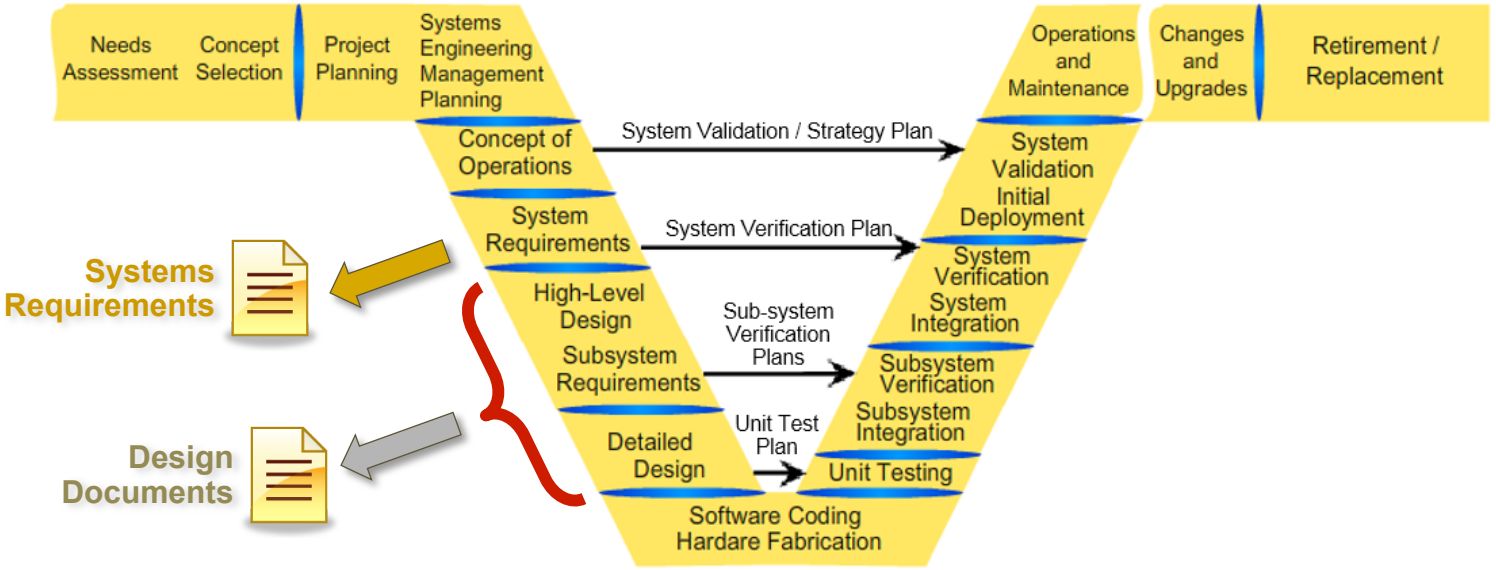
System Engineering "Vee" diagram

- **Planning:** **Resource Allocation and Concept Refinement**
- **Definition:** **Requirements, System Architecture and Response Strategies**
- **Build:** **System Implementation and Testing**
- **Operation:** **Deployment, Operation and Evaluation**

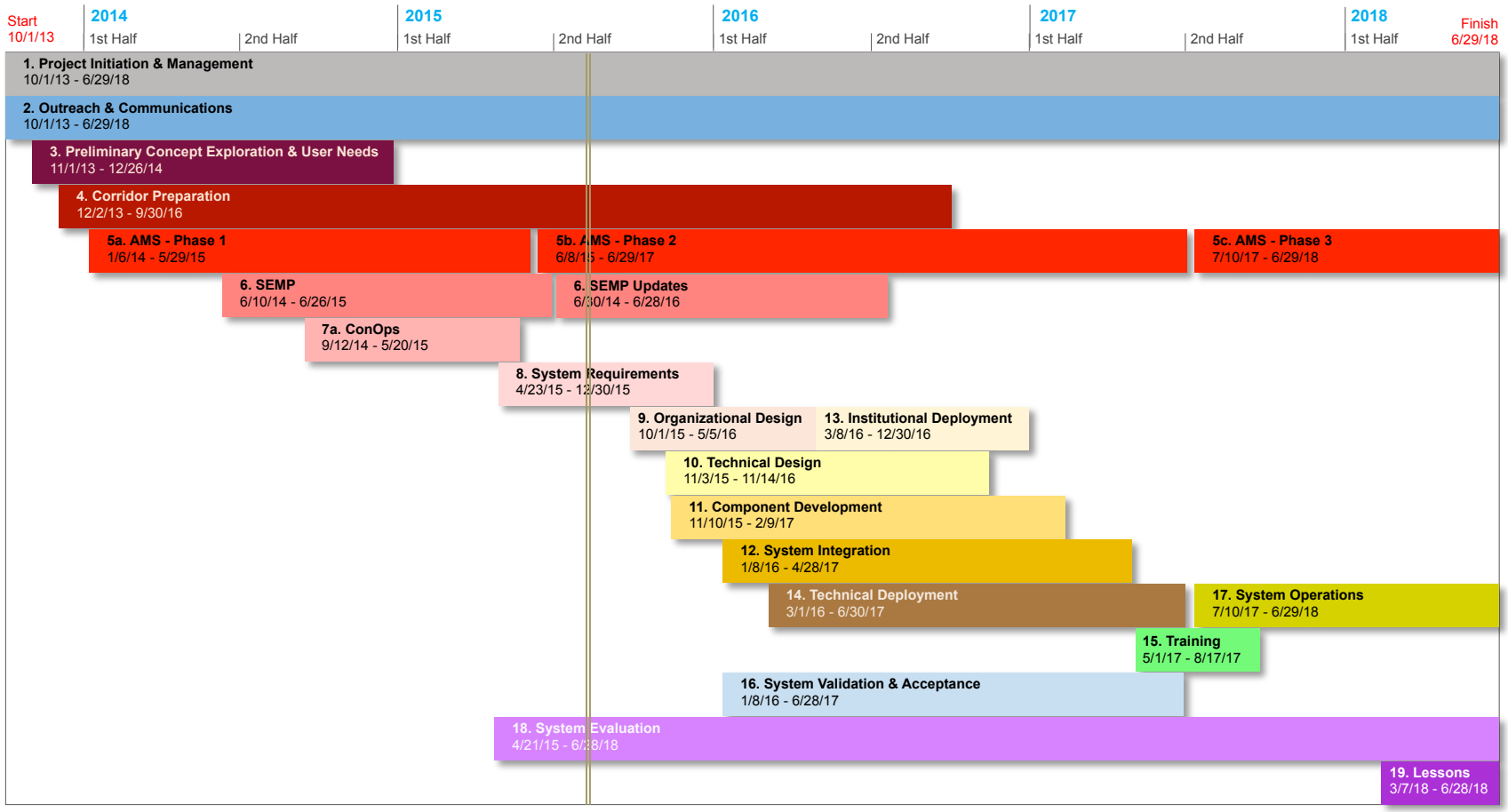


Systems Engineering Next Steps

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



Current I-210 Pilot Schedule



Status – Doing Well

- **Planning Phase Complete and Successful**
  - New Caltrans organization in place and personnel being hired
  - PM, Conops, SEMP, AMS documents completed
  - Funding – Shopp and Metro funding on track
  - Project Charter Signed by 13 stakeholders
  - Integration across organizations and efforts underway
  - Corridor Management occurring via human interactions
  - Positive can do attitude

Outreach and Funding

Outreach

- Project Charter Signed by all stakeholders
- Call for Projects Update
- MOU Discussion
- New "Connected" Newsletter
- ITS California Get Together
- ICM Session at ITS California
- Web Site – Begin public release of planning documents and information

MOU – Memorandum of Understanding

- **Describes the overall project with a focus on operational, organizational and funding agreements**
- **More detailed than the Project Charter; subject to legal review**
- **Possible MOU sections:**
  - Background
  - Project Purpose
  - Project Description
  - Governance/Dispute Resolution
  - Stakeholder Responsibilities
  - Operations Strategies and Principles (after Requirements)
  - Cost and Funding
  - Amendment Process, Terms, Renewals
  - Signatures

Connected

Summer 2015

A Quarterly Newsletter for Connected Corridors Stakeholders

Welcome Samson!

Caltrans is pleased to announce Samson Teshome as the first Corridor Manager under Caltrans' innovative reorganization plan. Samson will oversee day-to-day operations for the I-210 corridor. More information will be included in the Fall 2015 edition of the Connected newsletter.

Call for Projects Application Recommended For Funding

LA Metro recently released the list of projects recommended for funding, which includes the I-210 Connected Corridors Pilot! While none of the projects are considered funded until the Metro Board approves the list in September, this is GREAT news for the Pilot. The funding will support the arterial components of the project and will supplement the SHOPP funding discussed on page 3. Some of the project elements include Bluetooth readers and air quality sensor stations for all jurisdictions, controller firmware and communication improvements, signal detection upgrades, interfaces with transit systems, new traffic signals, and upgrades to existing ramp signal detection systems.

The team applied for a total of $6.704 million and we are very hopeful that the full amount will be awarded. A HUGE thanks to all of our stakeholders for your time and energy preparing the application, including staff from System Metrics Group; LA County Public Works; the cities of Pasadena, Arcadia, Monrovia, and Duarte; Pasadena Transit and Foothill Transit; and Caltrans District 7 (the lead agency). Your commitment and support of the Pilot is what makes this project unique and will continue to be instrumental to its success.

THANK YOU TO ALL THE I-210 PILOT STAKEHOLDERS FOR YOUR COMMITMENT TO THE PROJECT

ITS CALIFORNIA
I-210 CONNECTED CORRIDORS CELEBRATION

Monday, Sept. 21, 2015, 8:45PM
LAX Hilton - Landings Bar
The first beverage is on us!

Connected Corridors

www.connected-corridors.berkeley.edu

- *Phase 1 is Complete*
- *The Project Charter is Signed*
- *Multi-Agency Call for Projects Application is on the draft list of funding*

ICM Session at ITS California

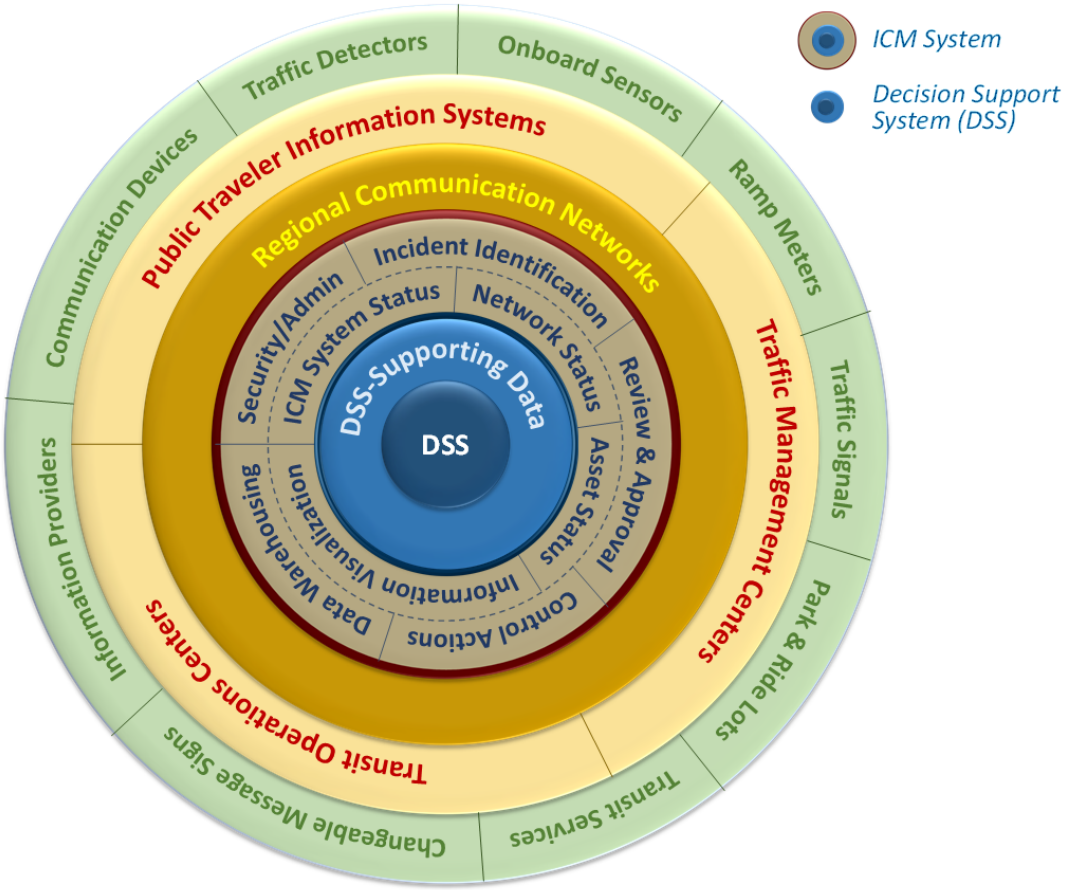
ICM (Joe Butler, PATH) Integrated Corridor Management (ICM) - Continuing growth and adoption – Tuesday 9:00 AM – September 22nd

- From Integrated Corridor Management to Integrated Regional Management - Dallas Experience Dr. Ahmad Sadegh, Schneider Electric/ Todd Plesko, Dallas Area Rapid Transit
- California Connected Corridors Program - a strategic approach to statewide Integrated Corridor Management (ICM) Joan Sollenberger/Dr. Nick Compin – Caltrans
- Using Real-Time Data to Automate Variable Speeds and Traveler Information – Jim Peters, DKS
- The Future of Integrated Corridor Management - Enhanced decision support utilizing new data, new metrics and the internet of things and people – Dr. Jane MacFarlane - Here/Nokia

Definition and Architecture Phase

High-level Architecture

System Components



System Interfaces Review

- **Existing system interfaces in D7**
  - Information Exchange Network (IEN) – LA County DPW
    - Access to traffic control systems (TCS) for remote plan change support
    - Supplies real-time traffic data collected from the TCS
  - Regional Integration of ITS (RIITS) – Metro
    - Provides interface to multiple Advanced Traveler Information Systems (ATIS) including go511
- **Considerations**
  - Interfacing with these systems would maintain consistency with the LA County Regional ITS Architecture
  - Final interface determination dependent upon the requirements

Arterial System Planning

- **Caltrans:**
  - (Ramp) intersections currently on Pasadena Series 2000 to be transitioned to Caltrans TSMSS
  - Other Corridor (ramp) intersections to be connected to Caltrans TSMSS
- **LA County:**
  - Has started the process to replace the current IEN to bring the technologies used up-to-date
- **Pasadena :**
  - Intersections currently on i2 system to be transitioned to a (new?) TCS due to termination of support by Siemens
  - Move intersections on end-of-life Series 2000 to the QuicNet system

Arterial System Schedule

Duarte and Monrovia on KITS	Completed
County to bring KITS onto IEN	Fall 2015
IEN Contractor Selection	Spring 2016
go511 upgraded system installed	November 2016
Pasadena i2 intersection change-over	December 2016
Caltrans TSMSS Operational	June 2017
I-210 ICM Operational	July 2017
IEN Replacement System operational	October 2017

Important: Reusable Components

- **Organizational structures being piloted in District 7 are to be used state-wide**
- **We wish to determine which CC software and hardware components will be considered state-wide reusable assets**
  - TSMSS – This is a state wide standard that will be used for CC
  - PEMS – We don't know yet - We believe that the most economical and by far the least risky method for implementing our performance analysis requirements is through utilization of PEMS, Arterial PEMS and Corridor PEMS
  - Data Hub – We don't know yet
  - Decision Support System – We believe this to be a reusable component but care must be taken in its design and in the integration of CC and DCCM
- **Guidance is needed in the near future from Caltrans HQ on these topics**
- **This is important and one of the largest risks to the timing and funding of the program.**

Requirements Gathering

Requirements Gathering

- **Our "system"**
  - Composed of people, organizations, software and hardware
  - All must work together to accomplish our goals
  - Requirements must specify expectations for each component
- **Requirements gathering**
  - Both an educational and a definitional process
  - Requirements are emergent from interactions among users
  - How to gather emergent requirements?

Actors and Stories

- **First we define the Actors in our system**
  - Any person, organization, software or hardware that either comprise the system or interact with the system
  - These actors perform one or more roles in the operation of the system
- **Next we tell each other Stories**
  - A story describes in a step by step process what each person expects both themselves and other system components to do

Actors

- Managers
- Technical Staff
- Operators
- Public Relations
- Data Managers
- Drivers and Passengers
- Organizations
- Public Safety
- Systems
- System Managers
- 3rd Party

Stories

- Incident Management Planning - Generic
- Incident Management Execution - Generic
- Daily Activities
- Maintenance – Planned changes to people, organizations, software and hardware
- Unplanned problems - Errors/Malfunctions/Unplanned changes to people, organizations, software and hardware
- Reporting and Performance Evaluation
- Program Management

Requirements

- **Requirements emerge from combining the stories and resolving differences of opinion between the different participants in the story telling process**
- **Two types of Requirements**
  - Purely Functional
  - Design Constraints
- **Deliverables**
  - Requirements that can be tested
  - Clear view of how users will judge success
  - Design guidelines in certain areas
  - Outline for an operational manual

Current Status

- **Start with actors and story themes brainstormed by the requirements gathering team**
  - Initial actors /stories listing completed
  - Forms basis for first round of "small team" meetings
  - Stories to be used as catalyst for discussion to expose requirements in our meetings
- **Build the matrix of actors and organizations**
  - Used to identify meetings
  - Iteris to present to and review with Corridor Stakeholderrs in August
- **Meet with small user teams to educate, validate and update**

Caltrans HQ

- **Held requirements gathering introductory meeting**
  - Well attended
  - No shortage of input
  - Probably future focus on design constraints as functional requirements to be provided by Corridor stakeholders
- **Looking forward to follow on meetings:**

Khan Vu	Brian Simi	Alan Benson	Joe Butler
Martha Styer	Tim Hart	Nick Compin	Francois Dion
Mike Jenkinson	Gomez Gonzalo	Raj Porandla	
Larry Wooster	Stan Slavin	Ted Lombardi	

Have we missed anyone?

210 Corridor Stakeholders

- **Initial Meetings Begun**
  - Consulted with Pasadena and County during preparation
- **Complete Initial Meetings with remaining stakeholders**
  - Early August
- **Carry out Requirements Meetings**
  - August/September/Early October

I-210 Connected Corridors

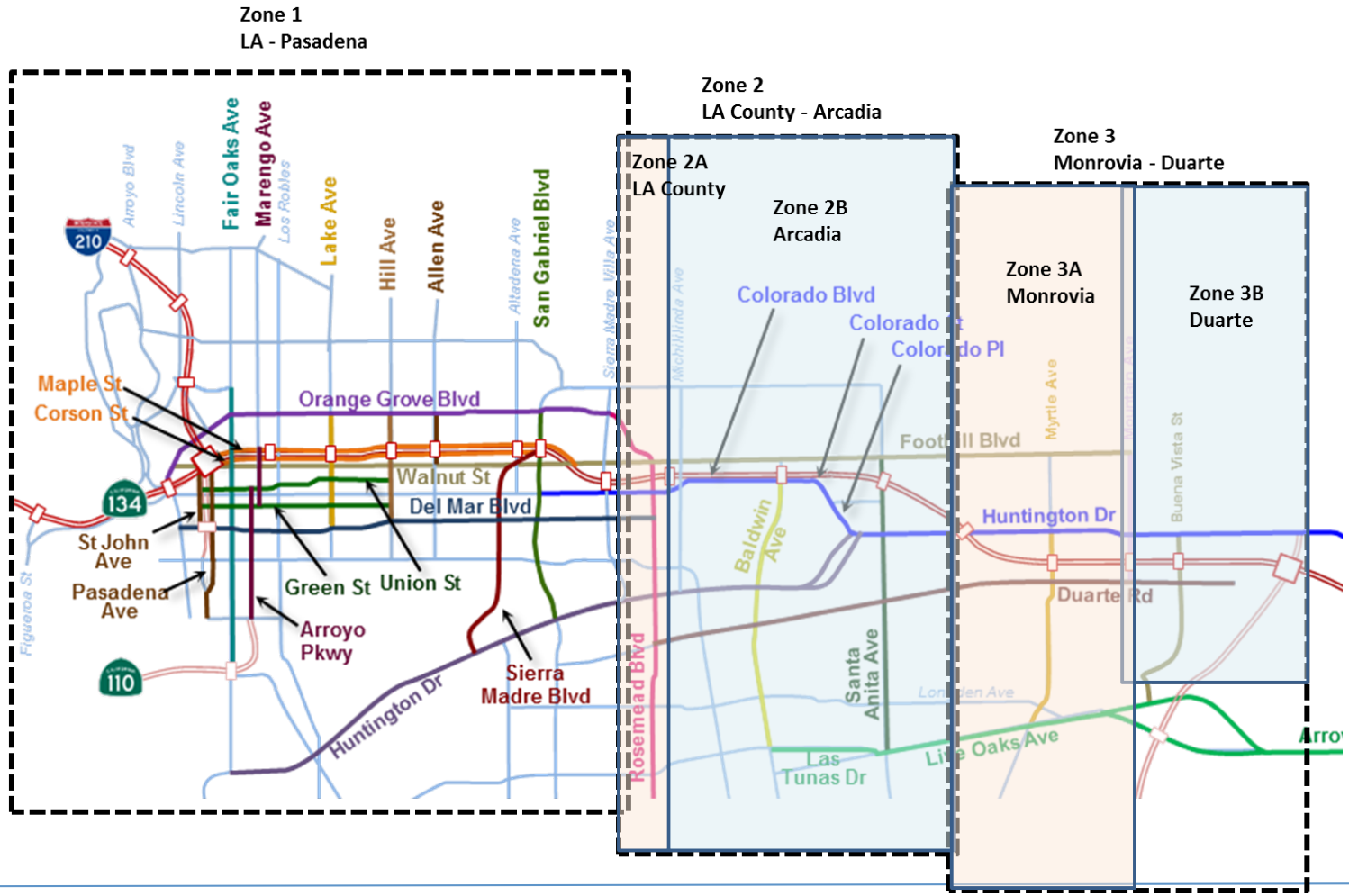
Incident Management Response Plans - Examples

August 4, 2015

I-210 CC Incident Response Plans

- **Approach**
  - Minor – Moderate – Major Incident Scenarios
  - Automated Response Plans for Scenarios
    - Freeway ramp metering & ramp signal operations
    - Local arterial signal operations (designated routes only)
  - Develop Rules Based Response Plans
    - Preliminary concepts
    - Alternative local arterial corridor routes
    - Factors to consider (for restrictive days/hours on select corridors)
      - Major events and activity centers
      - Schools and other high pedestrian activity areas (senior centers, rec centers, etc)
      - Businesses and residents
      - Bikes, peds, and transit (LRT grade crossing)

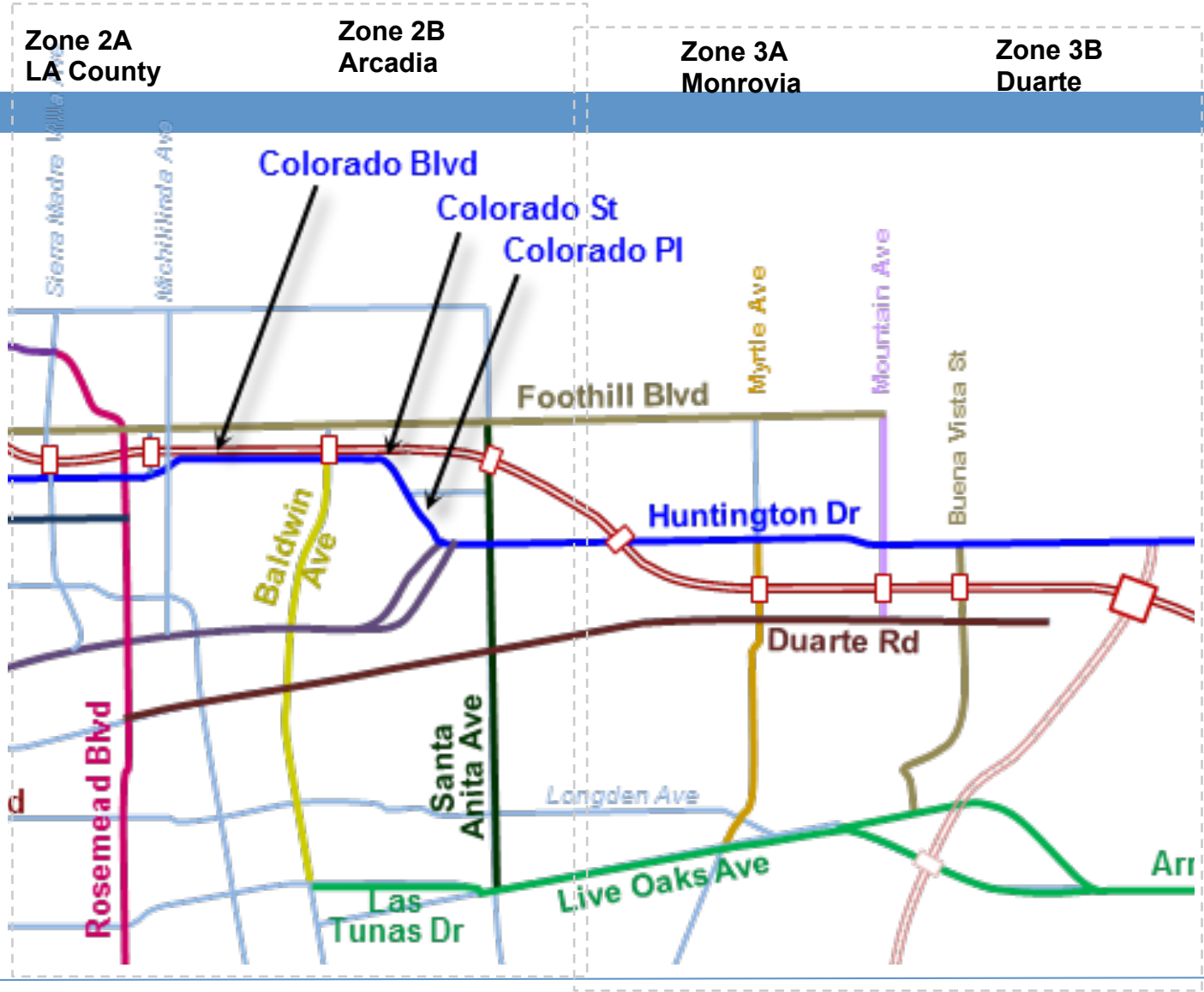
Influence Zones



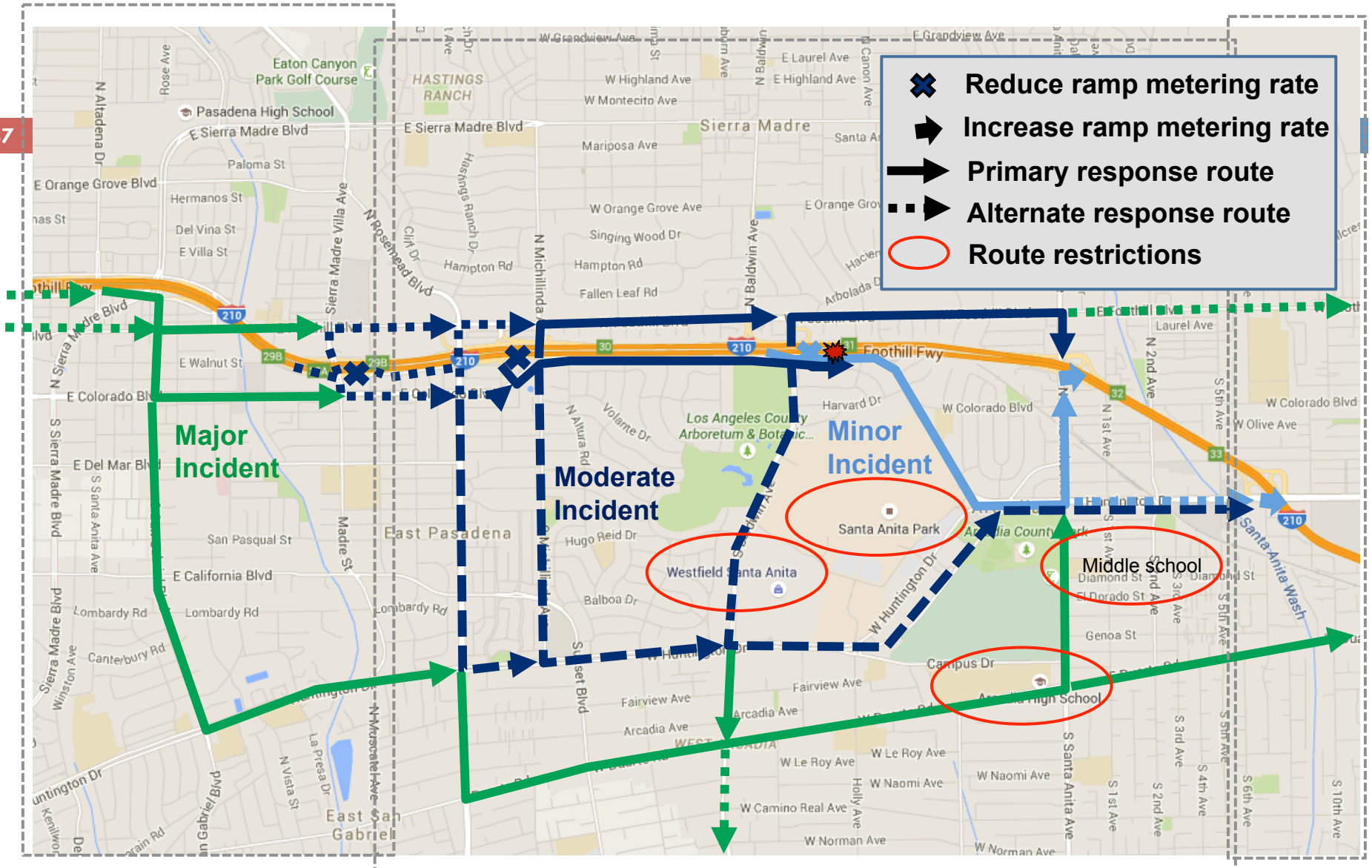
ZONES 2 and 3

Zone 2
LA County - Arcadia

Zone 3
Monrovia - Duarte



ZONE 1, 2, and 3 Impact



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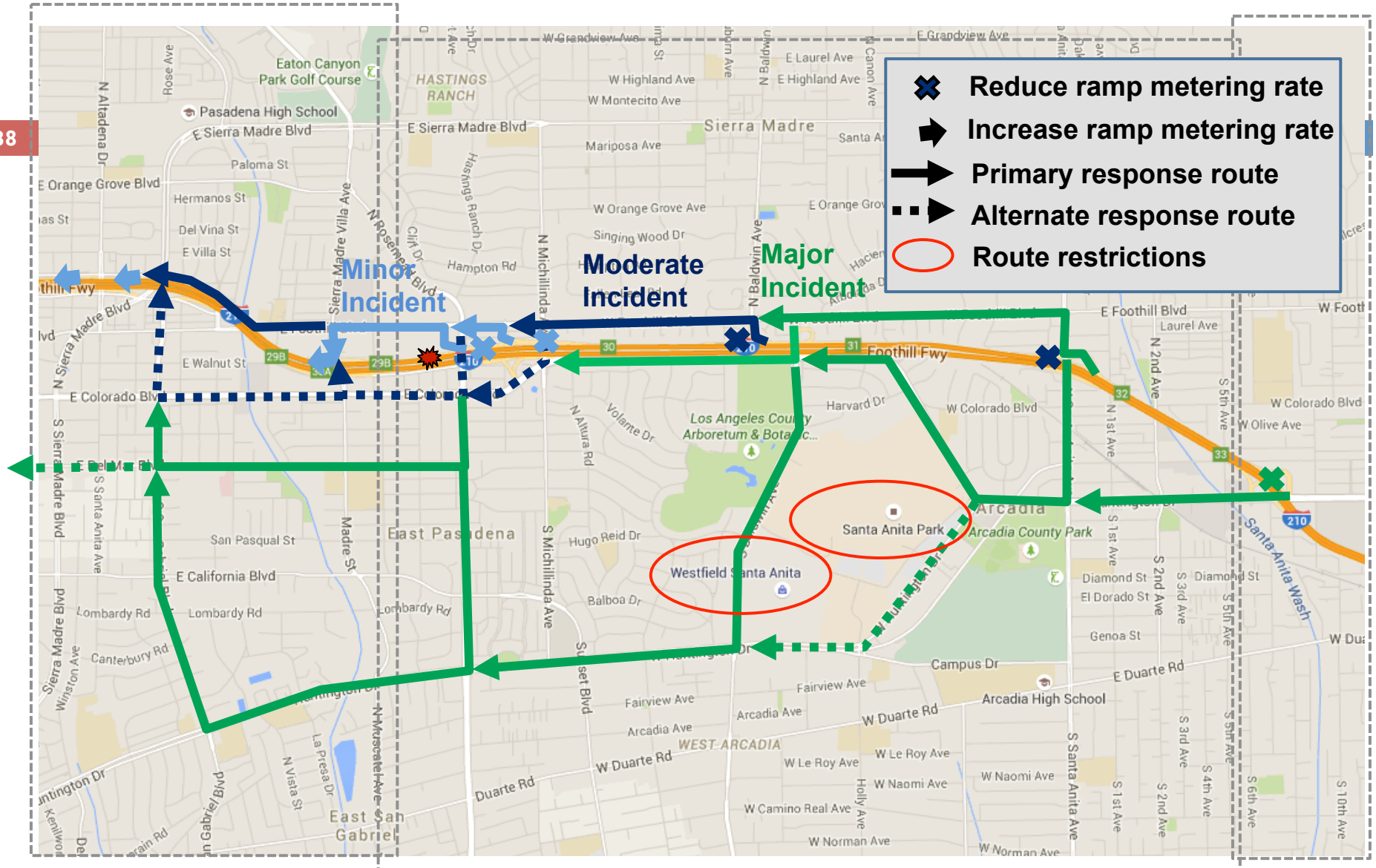

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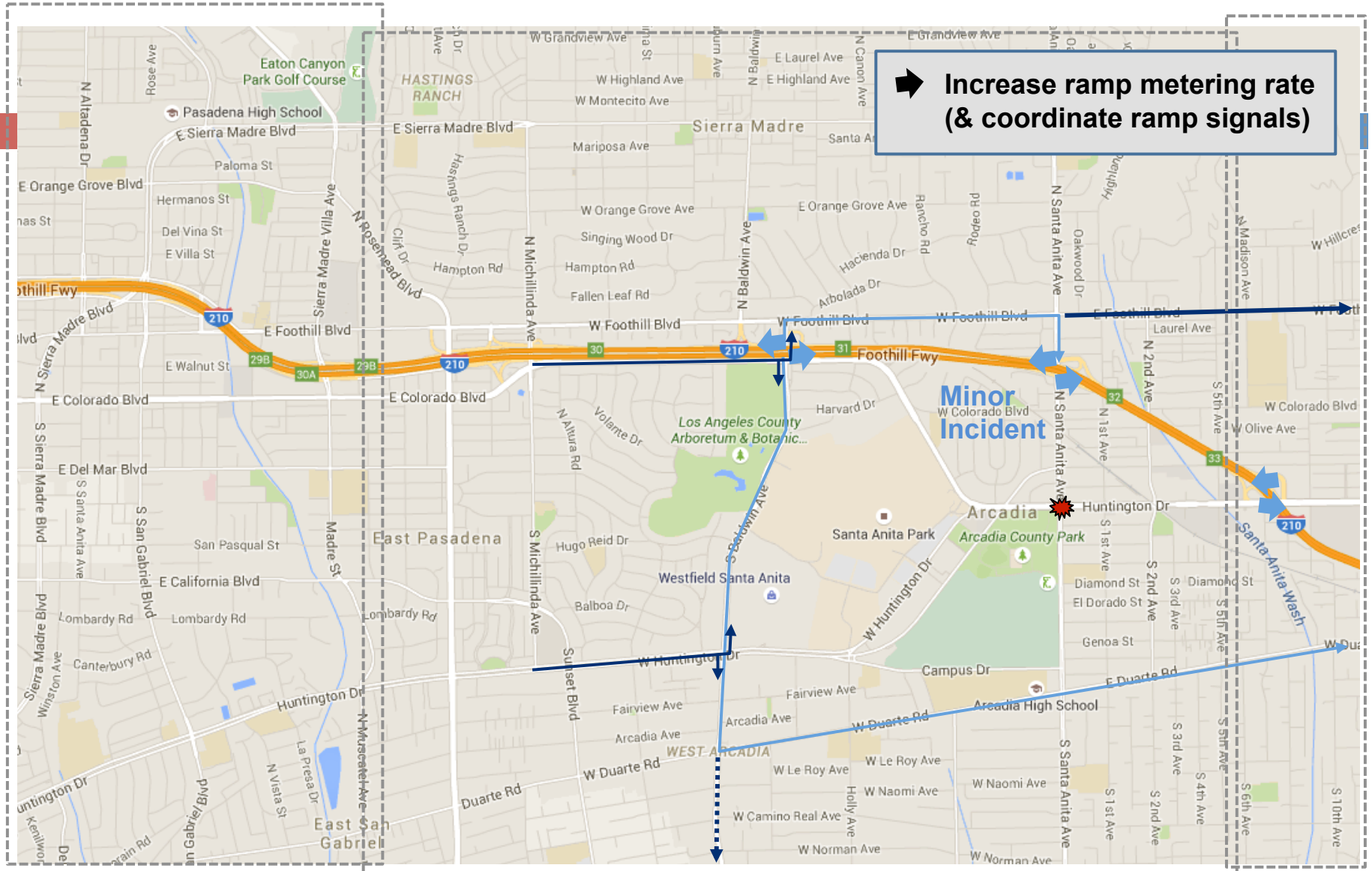
ZONE 2 and 3 Impact



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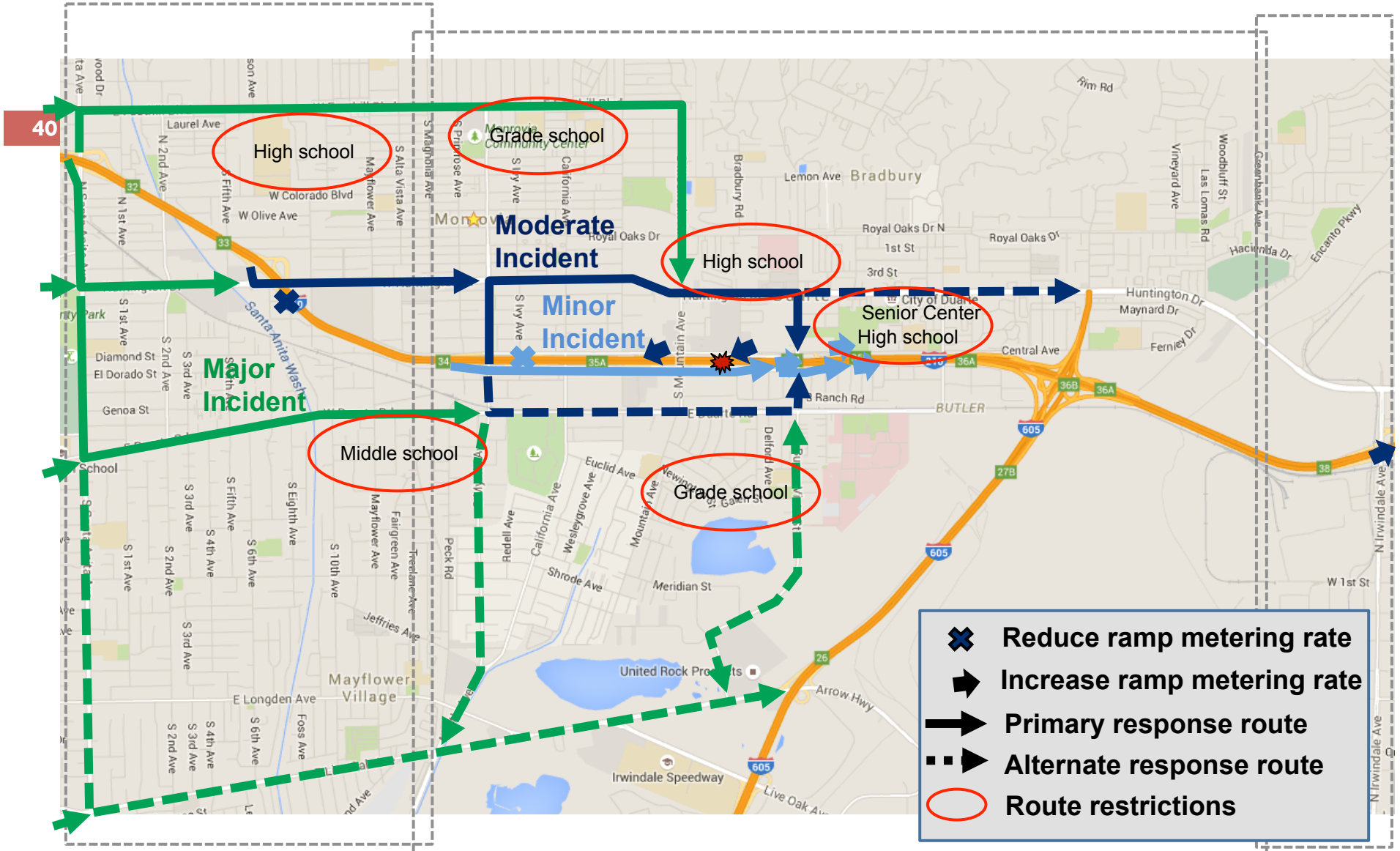

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I-210 CC Incident Response Plans

- **Develop Rules Based Response Plans**
  - Freeway Minor Incident Response (initial script)
    - Reduce ramp metering (RM) rate at ramps within 2 miles upstream (RU1, RU2)
      - 50% reduction to start (adjust as needed)
      - Reduce green time to ramp intersection signal movements to on-ramps
    - Increase RM rate at ramps within 2 miles downstream (RD1, RD2)
      - 50% increase to start (adjust as needed)
      - More green time to ramp I/S signal movements to access on-ramps (RID1, RID2)
    - Increase RM rate at opposite direction ramps within1 mile (RO1, RO2)
      - 25% increase to start (adjust as needed)
    - Alternative local arterial corridor routes (A1, A2)
      - More green time for arterial I/S signals (AID1, AID2) thru movements to RID1/RID2
      - Factors to consider (for restrictive days/hours on select corridors)

Current Status

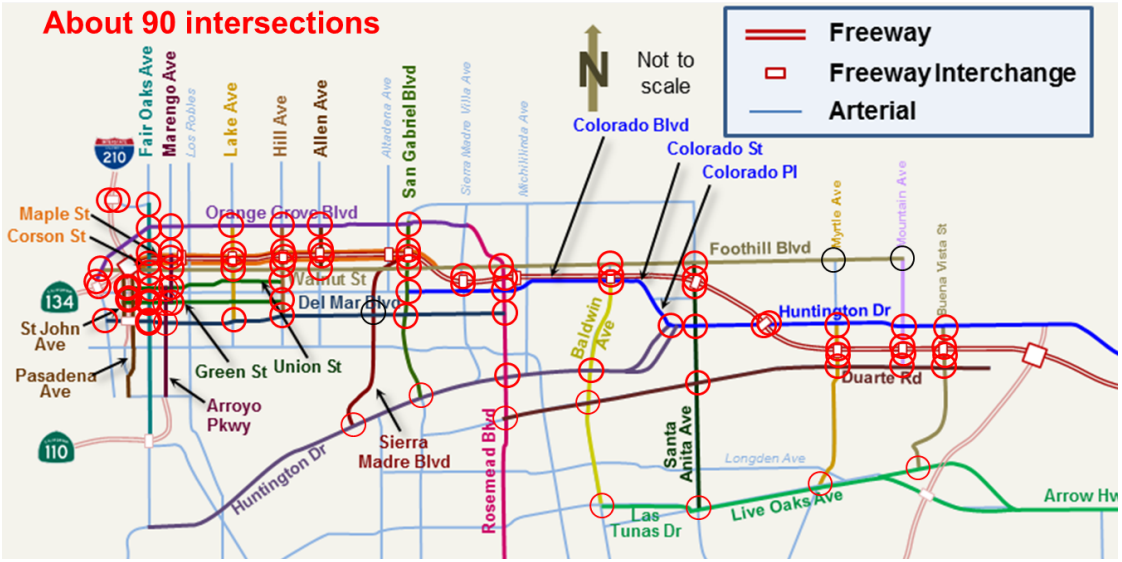
- **Have met with several cities**
- **Have begun raising detailed questions in re areas of activity, signal plans, rerouting mechanisms, etc.**
- **Recent 4 lane closure provided an excellent focus for some of the challenges and opportunities**

I-210 Connected Corridors
Project Evaluation Framework

June 9, 2015

Facilities

- **I-210 corridor facilities to evaluate include:**
  - I-210 freeway and ramps (by city boundary segments)
  - Key parallel arterials & connecting arterials (by city segments)
  - Key intersections (at least 90 locations)



Strategies

- **Key strategies include:**
  - Non-Recurrent Congestion (focus of the project)
    - Incident Response Planning
    - Advisory Diversion Management and Rerouting
  - Recurrent Congestion & Off-Peak Period (measure residual benefits of project elements)
    - Freeway Adaptive Ramp Metering
    - Arterial Coordinated Signal Operations

Incident Management Operational Scenarios

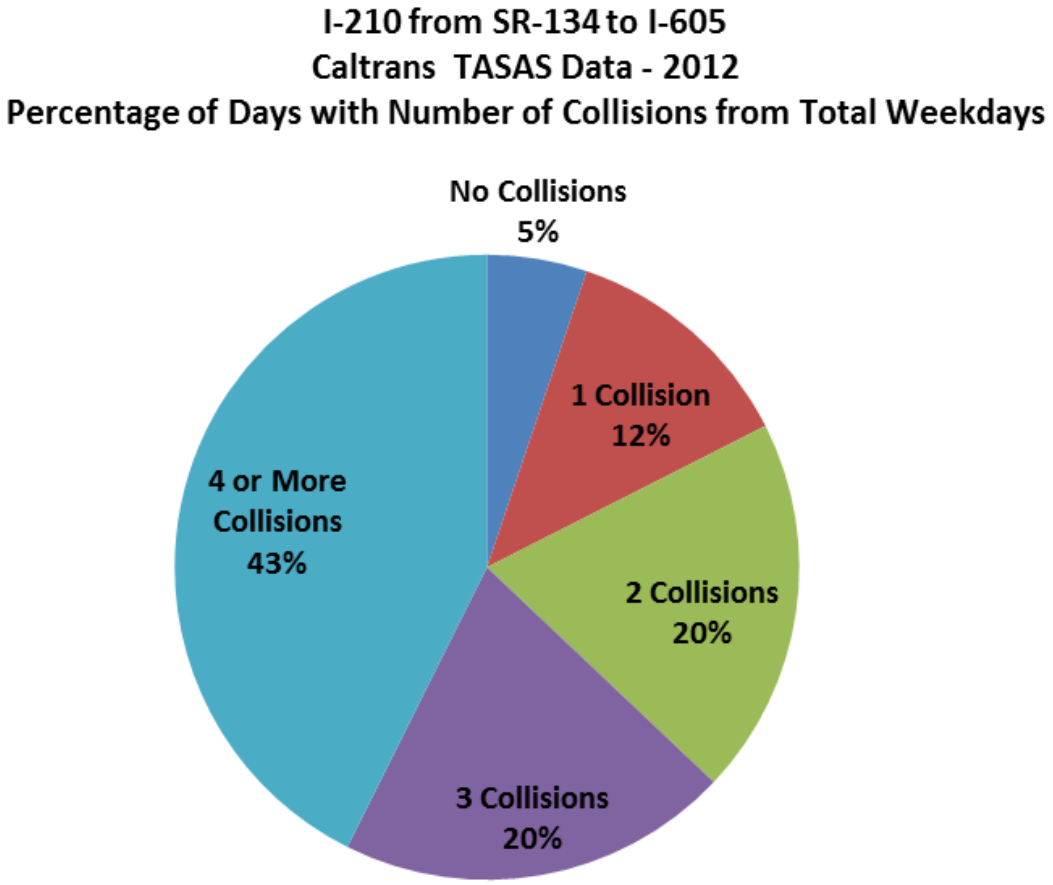
- **Possible incident scenarios include:**
  - Scenario 1: Major Incident on Freeway (All Lanes Blocked)
  - Scenario 2: Moderate Incident on Freeway (Partial Lane Closure)
  - Scenario 3: Major Incident on Arterial (All Lanes Blocked)
  - Scenario 4: Moderate Incident on Arterial (Partial Lane Closure)
  - Scenario 5: Major Incident on Arterial Intersection (I/S Blocked)
  - Scenario 6: Moderate Incident on Arterial I/S (Partial I/S Closure)
  - Scenario 7: Incident on Freeway On-Ramp
  - Scenario 8: Incident on Freeway Off-Ramp

Challenges

- **Non-recurrent congestion:**
  - How do we compare conditions before/after incidents?
    - We cannot time accidents
    - Every accident is different and resulting traffic is different
    - Accidents do not occur at same time or like days
    - Incidents are unpredictable
    - ✓ Requires robust detection data
    - ✓ Requires expert analysis
  - Timing of implementation
    - Implementation is not done at one time - it is done in phases
    - When is it truly "after"? (measure in between phases?)
    - When and what is "before"?

Why "Significant" Non-Recurrent Congestion

Not many collision-free days



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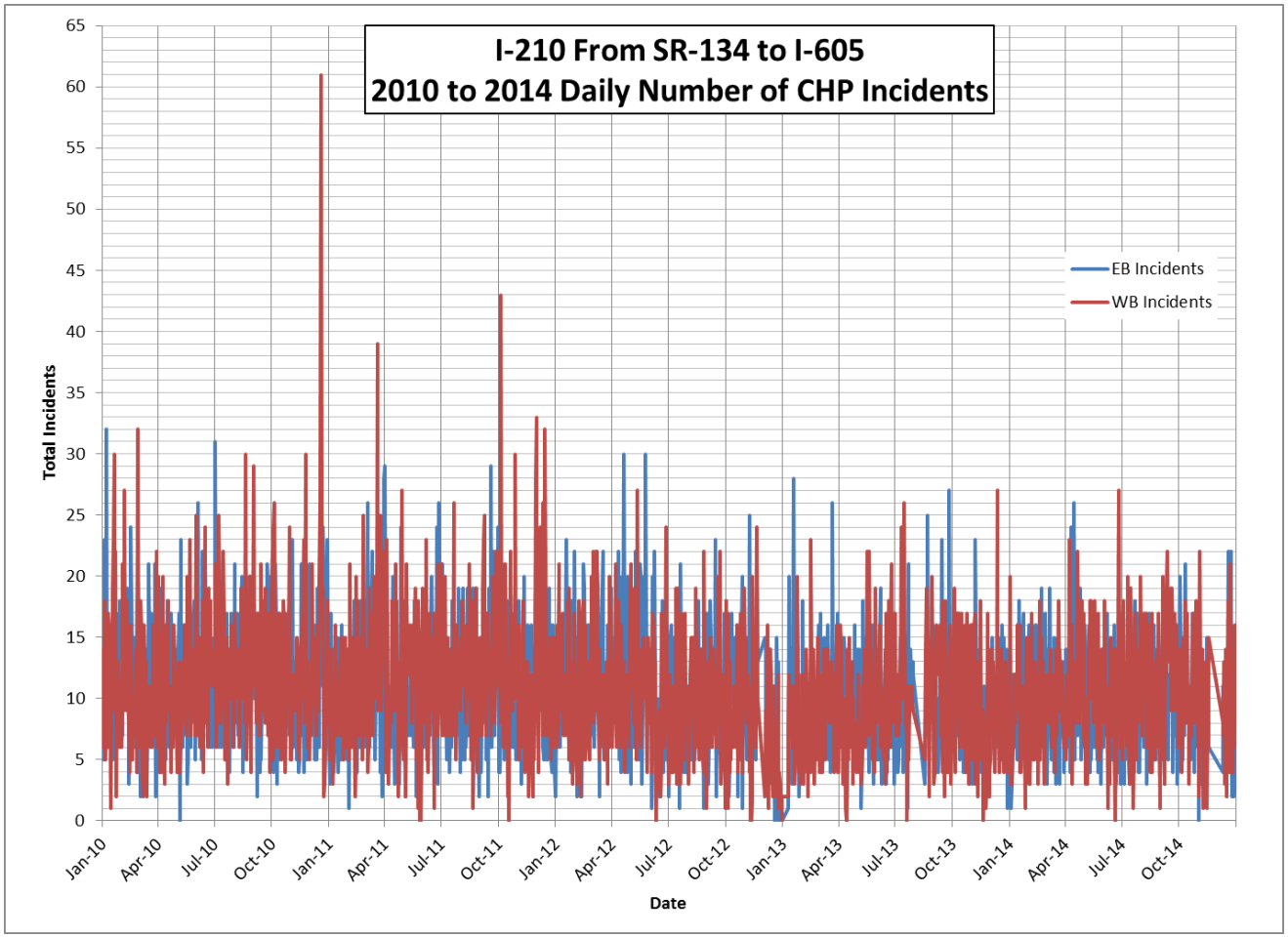

Suitable Performance Measures

- **Estimated performance measures on other projects:**

PERFORMANCE MEASURE AREAS	San Diego	Dallas	Minneapolis
Annual Travel Time Savings (Person-Hours)	246,000	740,000	132,000
Improvement in Travel-Time Reliability (Reduction in Travel-Time Variance)	10.6%	3%	4.4%
Fuel Saved Annually (in Gallons)	323,000	981,000	17,600
Tons of Mobile Emissions Saved Annually (in Tons) (GHG Emissions)	3,100	9,400	175

Requires use of modeling (e.g., Caltrans Cal-B/C economic model)

Suitable Performance Measures

- **Potential suitable performance measures:**
  - Demand
    - Vehicle Miles Traveled (VMT)
  - Mobility
    - Speeds and Travel Times
    - Delay (vehicle and/or person) and Vehicle Hours Traveled (VHT)
    - Congestion Period (peak period hours)
  - Productivity
    - Traffic Flow (volumes - vehicles an/or persons)
    - Level of Service (intersections)
  - Reliability
    - Travel Time Variability (Buffer Index)
    - Planning Time Index
  - Safety (SWTRS/TASAS data available year or more later)

Suitable Performance Measures

- **Transit (?)**
  - Transit on-time performance *(if transit agency provides data)*
  - Average travel times *(if transit agency provides data)*
  - Transit ridership *(if transit agency provides data)*

- *Need to investigate available Gold Line data*
  - *Time of day*
  - *Accuracy*
  - *Access*
- *Ridership on specific incident days*

Data Sources

- **Data sources:**
  - Available sources (before & after)
    - Caltrans Freeway PeMS (or ATMS) – freeway & all ramps
    - Arterial intersection signal detection
    - Arterial segment speed/occupancy detection
    - Arterial blue tooth readers
    - Caltrans TASAS, CHP SWTRS, CHP CAD; Metro FSP data
    - Local agency collision database (Pasadena Traffic Records System)
    - INRIX or HERE crowd sourcing (Metro/SCAG in process of acquiring INRIX)
  - Potential manual needed (before & after)
    - Arterial link tube and I/S turning movement counts (before & after)
      - select locations where detection is not available
    - Probe vehicle runs to validate INRIX, HERE, PeMS, blue tooth

For Any Manual Data Collection

- **Before** (before implementation) – Fall 2015 or Spring 2016
- **After** (after implementation) – at least 3-6 months after implementation

LOCAL RISKS

	Duarte	Arcadia	Monrovia	Pasadena	LA County
Overall Project Risks					
Funding		What, if anything, needs to be cut from the Pilot project due to funding constraints or shortfalls?			
Staffing/Personnel		Overtime required?			
Systems		• Communications needs to be reliable (100% on-line?) • Fiber connections to CT through the current project LA 210 EA 30640			
Organizational		Do all parties continue to work together?			
Agency Risk					
Funding	No local funds available.	• No or limited local funds. • Prioritization of limited funds (balancing city needs versus needs of the CC). • Duse of Traffic Impact fees (are other funds available)? • Unsuccessful Metro grant. • Requires more funding than anticipated.			
Staffing/Personnel	Project requires additional staffing (consultants).	• Project requires additional staffing (consultants). • Management won't pay for staff/personnel required (esp. after hours). • All hands on deck (ca we drop everything when an incident occurs?). • Not enough people or time.			
Systems	Requires accurate infrastructure inventory.	• Requires accurate fiber/wireless infrastructure. • Keeping local systems supported and up and running (M&O). • No redundancy in the system. • Reliability of the local agency traffic signal network (no or faulty detection or BBS). • Supporting local systems (i.e. CCTV/video).			
Organizational	N/A	• City Attorney, Council and/or management no longer supportive (change in stance or leave office). • Negative publicity (the smallest apposing voice may be the loudest). • Agreements not signed. • Insufficient outreach.			

Action Items and Next Meeting Time

Thank You