Connected Corridors
Face-to-Face Meeting

Tuesday, Feb 27th , 2018 – 1:30 – 3:30 pm
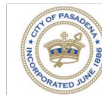Monrovia

Feb 27th, 2018

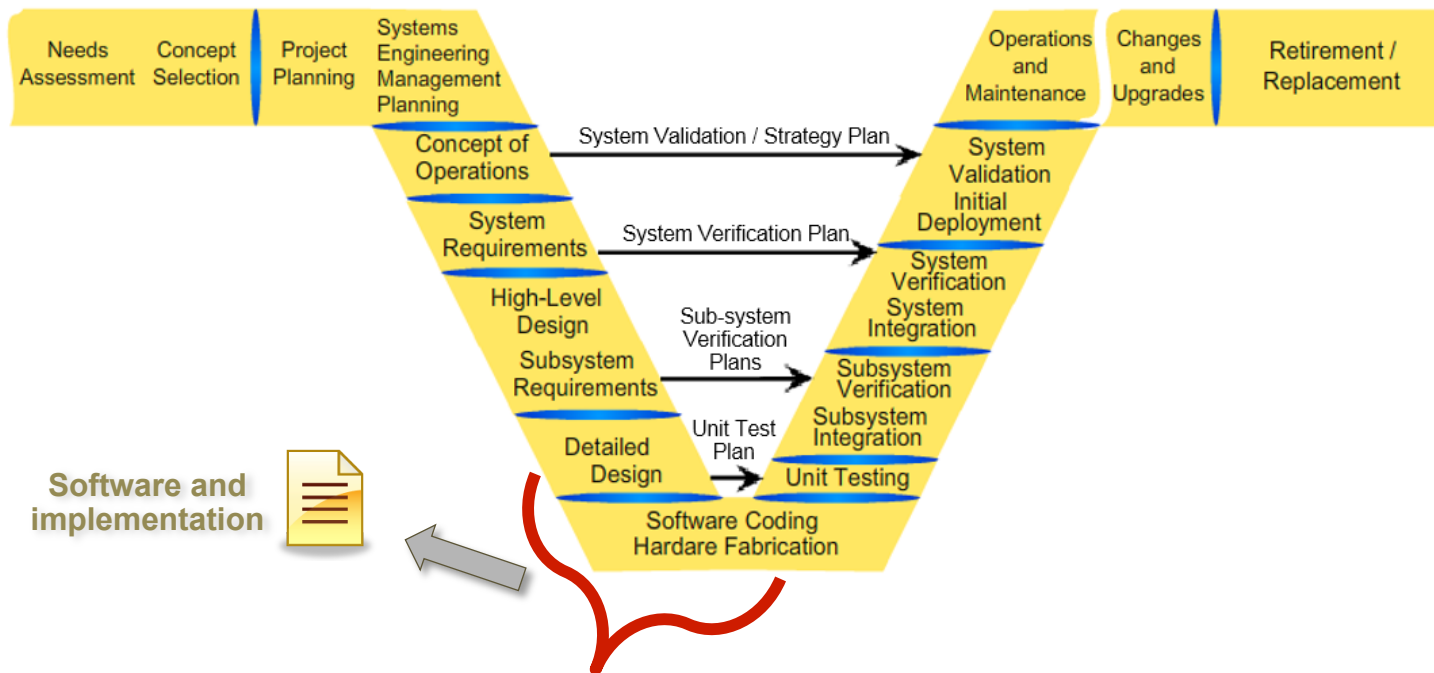# Agenda

- 1:30-2:00 – Summary of program

- 2:00-2:20 – MOU - Mort

- 2:20-2:40 – Update on communications – Kali

- 2:40-3:00 – Design Document Update – Brian Peterson (PATH)

- 3:00-3:20 – Arterial Sign Update - Joe

- 3:20-3:30 – Closing: Next meeting location in Pasadena?

Systems Engineering Next Steps

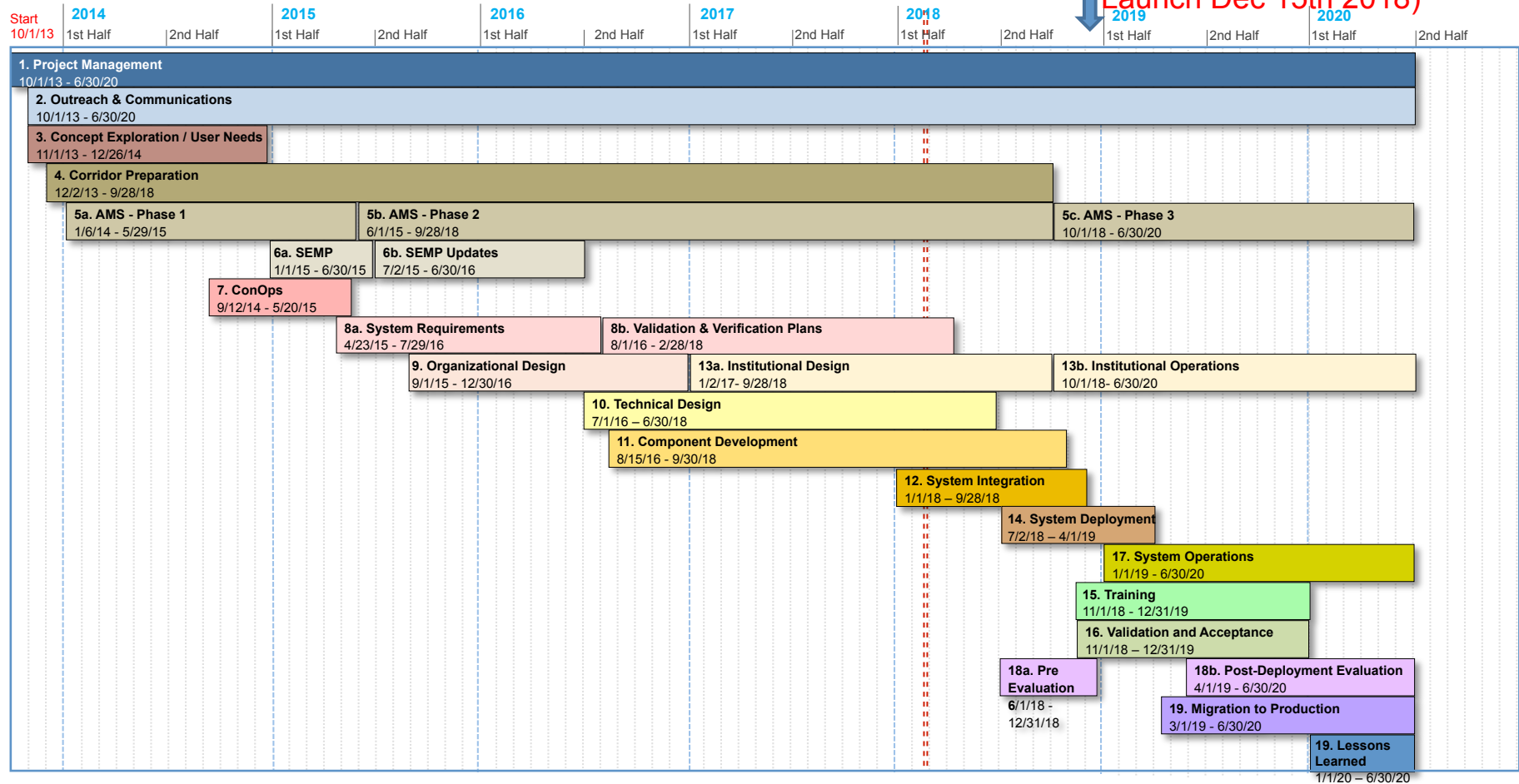- **Design Documents – How will the requirements be met**

- **Hardware and Software – Building the system**

Schedule

Launch Dec 15th 2018)

	2014		2015		2016		2017		2018		2019		2020	
Start 10/1/13	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half

1. Project Management
10/1/13 - 6/30/20

2. Outreach & Communications
10/1/13 - 6/30/20

3. Concept Exploration / User Needs
11/1/13 - 12/26/14

4. Corridor Preparation
12/2/13 - 9/28/18

5a. AMS - Phase 1
1/6/14 - 5/29/15

5b. AMS - Phase 2
6/1/15 - 9/28/18

5c. AMS - Phase 3
10/1/18 - 6/30/20

6a. SEMP
1/1/15 - 6/30/15

6b. SEMP Updates
7/2/15 - 6/30/16

7. ConOps
9/12/14 - 5/20/15

8a. System Requirements
4/23/15 - 7/29/16

8b. Validation & Verification Plans
8/1/16 - 2/28/18

9. Organizational Design
9/1/15 - 12/30/16

13a. Institutional Design
1/2/17- 9/28/18

13b. Institutional Operations
10/1/18- 6/30/20

10. Technical Design
7/1/16 – 6/30/18

11. Component Development
8/15/16 - 9/30/18

12. System Integration
1/1/18 – 9/28/18

14. System Deployment
7/2/18 – 4/1/19

17. System Operations
1/1/19 - 6/30/20

15. Training
11/1/18 - 12/31/19

16. Validation and Acceptance
11/1/18 – 12/31/19

18a. Pre Evaluation
6/1/18 - 12/31/18

18b. Post-Deployment Evaluation
4/1/19 - 6/30/20

19. Migration to Production
3/1/19 - 6/30/20

19. Lessons Learned
1/1/20 – 6/30/20

Risks and remediation

- **Lack of Time for Integration and Testing**
  - Likely to launch end of year with functional DSS **but** not actively setting ITS control elements (traffic signals, etc)
  - We will start setting ITS control elements in 2nd Quarter of 2019

- **Dynamic Message Sign RFP**
  - Hopefully come to agreement by end of week

- **Other Call for Projects ITS Purchasing Process**
  - In processing at Caltrans – Still working out schedule

- **Completion of Traffic Control System Interfaces**
  - One RFP has come out for Bid (Yes!), the next should be following

6 Summary

Human and Organizational Design

- **Tarek Hatata from SMG presented interview results:**
  - Caltrans D11
  - SANDAG
  - Caltrans D4

- **They were asked to comment on a subset of our human requirements.**

- **They validated the need for all of them.**

- **Caltrans HQ to work on process for allocation of funds to assist with meeting these requirements.**

Review of Caltrans Workflows during ICM

- ☐ **Meeting with 20 Caltrans personnel from the TMC, TMT, Maintenance, ITS, IT, etc**
- ☐ **Reviewed workflows of how TMC operations, TMT operations, first responder operations will work together during an incident response**
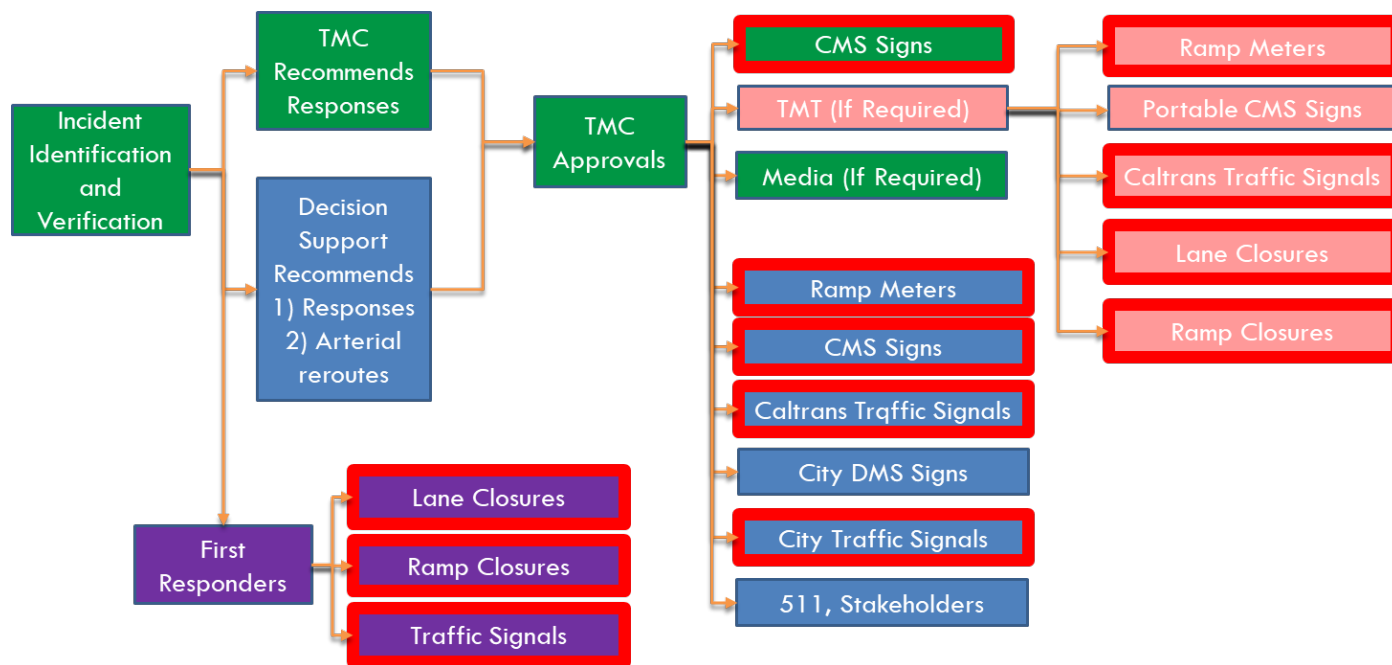
Response Planning Meetings

- **Productive meetings on January 30-31 with many of you to discuss strategies/constraints for the design of response timing plans**
  - January 30: Caltrans
  - January 31: Caltrans/County/Local Cities/Metro

- **Started the development of response timing plans based on results**
  - Current focus is on developing flush plans to be used in response to moderate/major incidents

- **Are using stakeholder timing plan sheets**

- **Need to discuss how sheets are input into system/controllers**

Cloud to Caltrans

□ **Amahayes and Greg working on implementation of Cloud to Caltrans communication**

- ◻ D7 and AWS sides are both prepared and ready

- ◻ AT&T has one additional configuration to make on equipment they manage at the edge of D7; expected by March 1

- ◻ Once this is ready, we will hold a conference call and "flip the switch" to make NetBond go live

- ◻ This isolated connection will allow the creation, on demand, of ICM virtual computing resources on the D7 private network

- ◻ Initial test plan in place

TMDD Interfaces to Data Hub

- **Traffic Control Systems**
  - Kimley Horn
    - RFP released
  - TransCore
    - Provided test server
    - Delivery scheduled for April
    - Delivery schedule to be provided this week
  - McCain
    - Caltrans working on contract

- **ATMS – Caltrans (CMS Signs, Ramps)**
  - Reviewing UI design document
  - On track for a May/June delivery

COTS (Purple Box) - ICMS

- **Companies who are participating:**
  - Kapsch
  - Parsons
  - Telegra

- **Update**
  - We are in the final stages of document review (licenses, confidentiality, scope of work, etc)
  - They wanted these documents to support the 1 million dollars they are investing in this
  - Released an RFI to request recommendations on amount of funding to allocate for the purchase

Design and Construction

- **210 TMS Upgrade - Allen**

- **Call for Projects (ITS Elements) – Allen**

- **Network Communication**
  - To be discussed in detail later by Kali

- **Call for Projects – Signs and Sign Software**
  - To be discussed in detail later by Joe

Data Quality

- **Freeway - Data Quality Meeting**
  - I-210 PM 22.6 – 25
    - EB   28.6%
    - WB   09.7%
  - I-210 PM 25 - 43.2
    - EB   59.6%
    - WB   58.5%
- **Pasadena Data**
  - 56% - Received one month of Pasadena data
  - The next month is overdue – Joaquin could you perchance ping McCain?
- **Arcadia**
  - 83% - Climbing toward the 90% goal!
- **Monrovia**
  - 65.7%
- **Durate**
  - 62.9%
- **County**
  - 28.2% for LACO

Data Hub and DSS Software

- Response Plan Management development in progress

- Verification Plan released

- Test Automation

- DSS Interface

- System Interface Design released

- Conversations regarding PeMS data repository/reporting

- Intersection signal pipelines

- AWS engineering and automation design progress
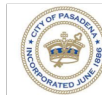
AWS Implementation

- **Questions**

  - How are applications deployed?

  - How are EC2s (Amazon Elastic Compute Clouds) created?

  - Backups?

- **Goals and Principles**

  - Development uses continuous integration

  - Infrastructure as code

  - Everything is automated – Networking, VPC, Security, Databases, Deployment, Instance Creation, …

  - Something dies, suspect – just kill or quarantine and start another one

  - Managed services whenever possible – service backups (S3, Glacier)

Data Hub and DSS Detail Design (Draft)

PEMS as part of performance improvement
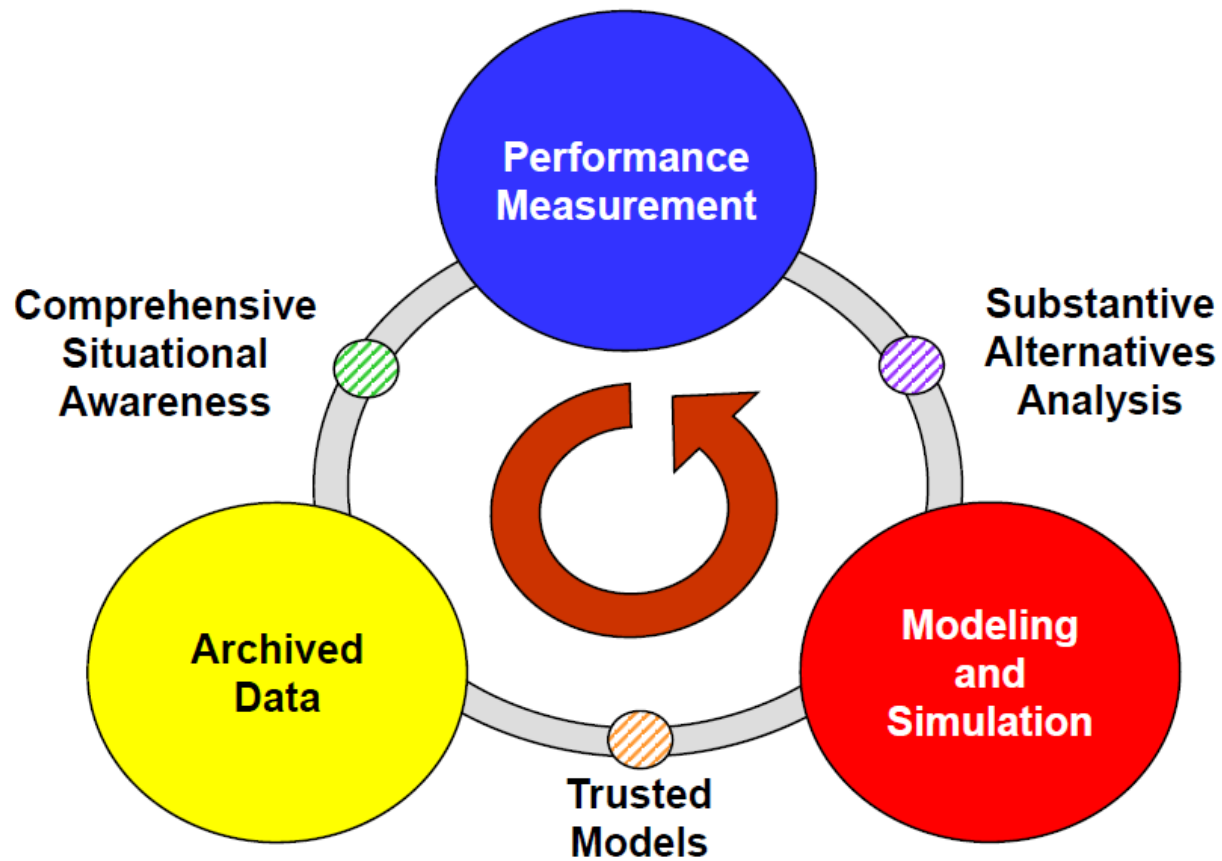
PEMS Usage Scenario Meeting

- **PEMS is the performance measurement and comparison subsystem of Connected Corridors**

- **Would like to meet with interested stakeholders to ensure the product does what is needed**
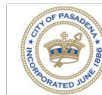
- **Will be setting up a meeting in March**

MOU
Mort

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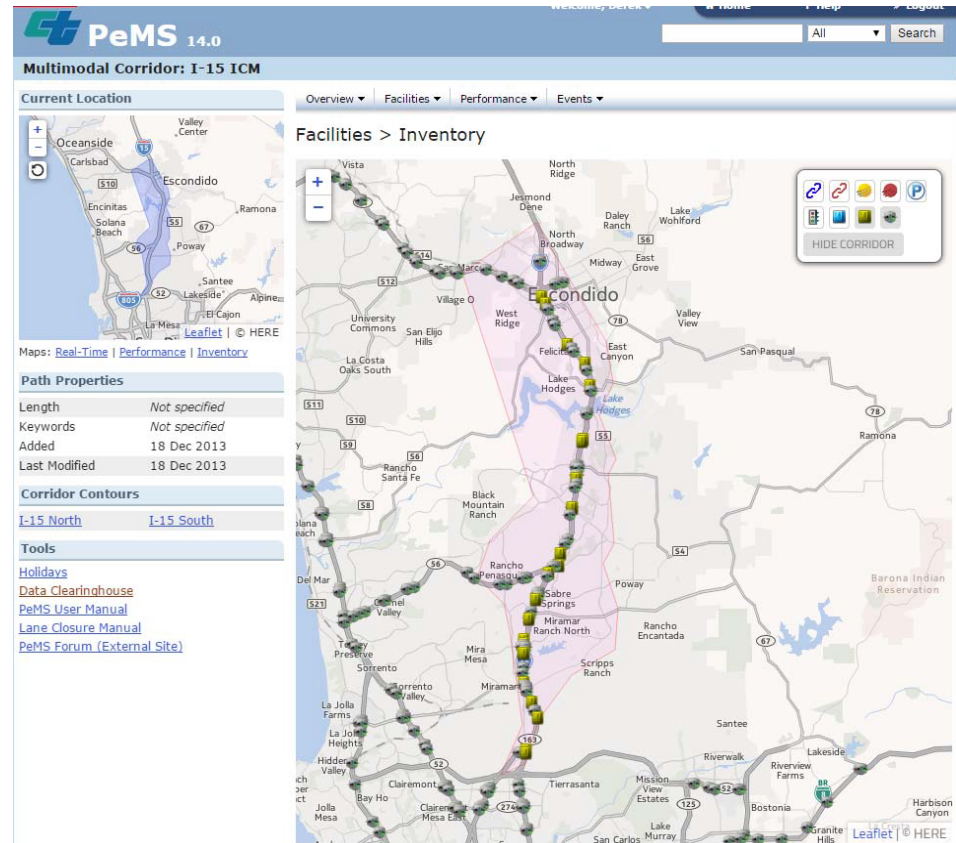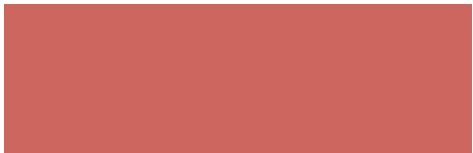
☐ A preliminary draft copy has been mailed to each of you in Mid January

☐ There have only been a few comments – which we are working on answering

☐ We are looking for final comments on MOU by Friday 3/9/2018.

Communication Kali

Status Update

- **Issued VPN request for Arcadia**
  - Connect traffic control system
  - Implement IP connection to Caltrans

Brian Peterson

High Level Design

- High Level Design v1.0 Release

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

**Connected Corridors: I-210 Pilot
Integrated Corridor Management System**

Core System High-Level Design

January 30, 2018
v 1.0

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.

High Level vs. Detailed Design

□ High Level Design

- System Architecture
- Primary Components
- Data Flows
- Processes
- Databases
- Primary Interfaces

□ Detailed Design

- Component Architecture
- Interface Details/ Design
- DB Schemas
- AWS Design
  - EC2
  - Security
  - Services

Key Sections

□ **High Level Design Objectives, Constraints, and Principles**

□ **Core System High Level Design**

□ **Data Hub Design**

□ **Decision Support System Design**

□ **Security Design**

□ **System Interface And Message System Design**

□ **Not Included:**

  ◻ Corridor Management System Design - COTS
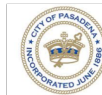
Objectives, Constraints, and Principles

- Real time operation

- Speed to decision

- Flexibility for Future with Incremental Improvements

- Security

- Maintainable, Operable by Caltrans

- Scalable

- Resilient, Reliable

Core System High Level Design

□ **Data Hub**

□ **Decision Support System (DSS)**

□ **Corridor Management System**

□ **Why?**

- ▪ Interchangeability
- ▪ Operate at different scales
- ▪ Futureproofing
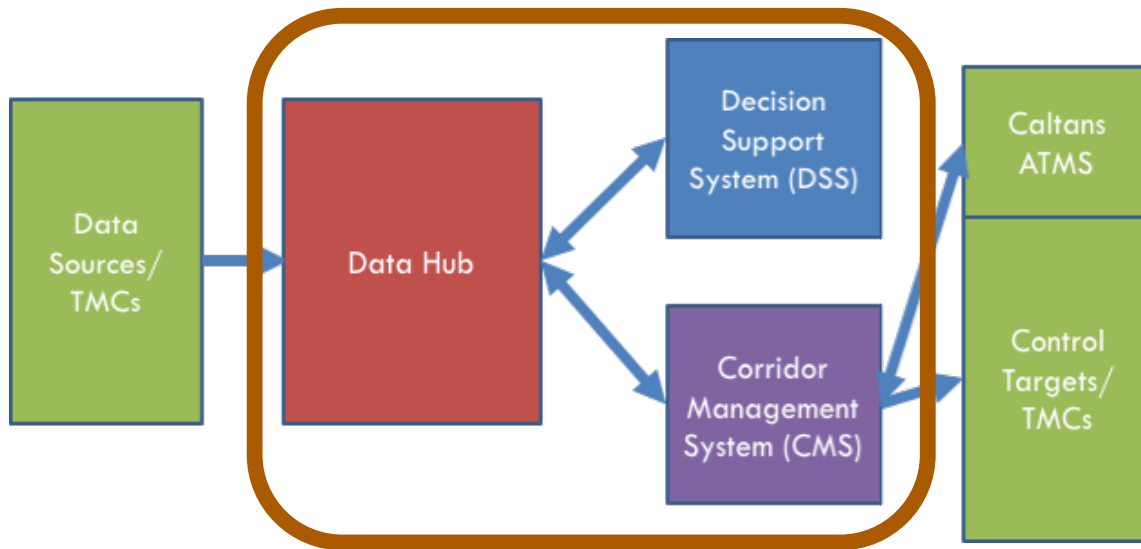
□ **Enabling Elements**

- ▪ Standards based communications - TMDD
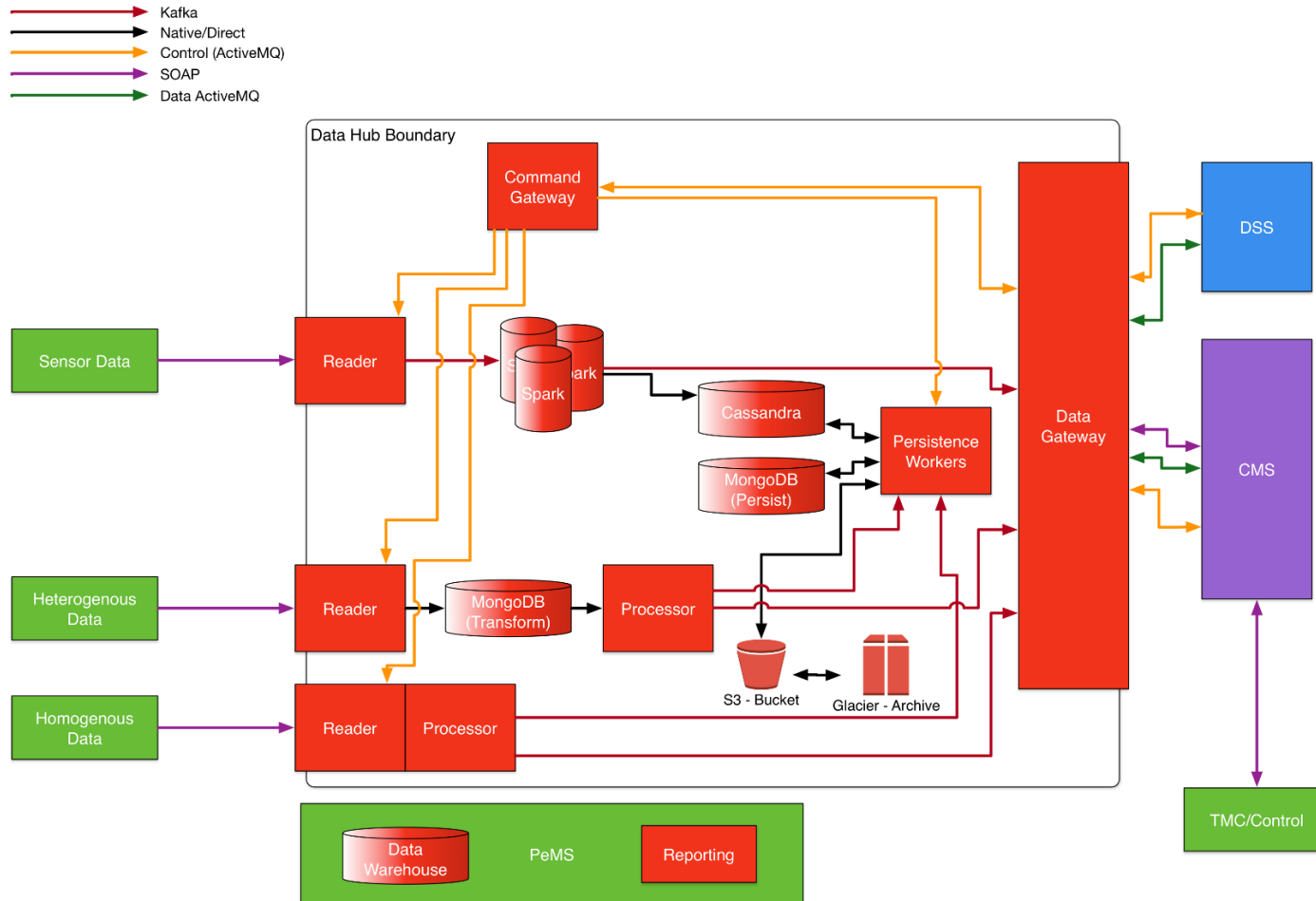- ▪ Clean separation of responsibilities

Data Hub Functions

- **Receive information**

- **Process information**
  - Data Quality
  - Common Metrics/Analysis
  - Predictive Analytics
  - Standardized formatting/content

- **Persist information**

- **Secure information**

- **Provide data communications bus**

- **Orchestration of services between the DSS and CMS**

Data Hub High Level Design

Data Hub Design

- **Types of Components**

- **Data Sources (TMCs – Intersections, Ramps, …)**

- **Data Pipelines – types and application to specific sources, control (Sensors, Timing Plan Inventories, …)**

- **Communications - DSS/DH/CMS**

- **Primary System Interface (Data Gateway)**

- **Core System Command and Control – Orchestration (Command Gateway)**
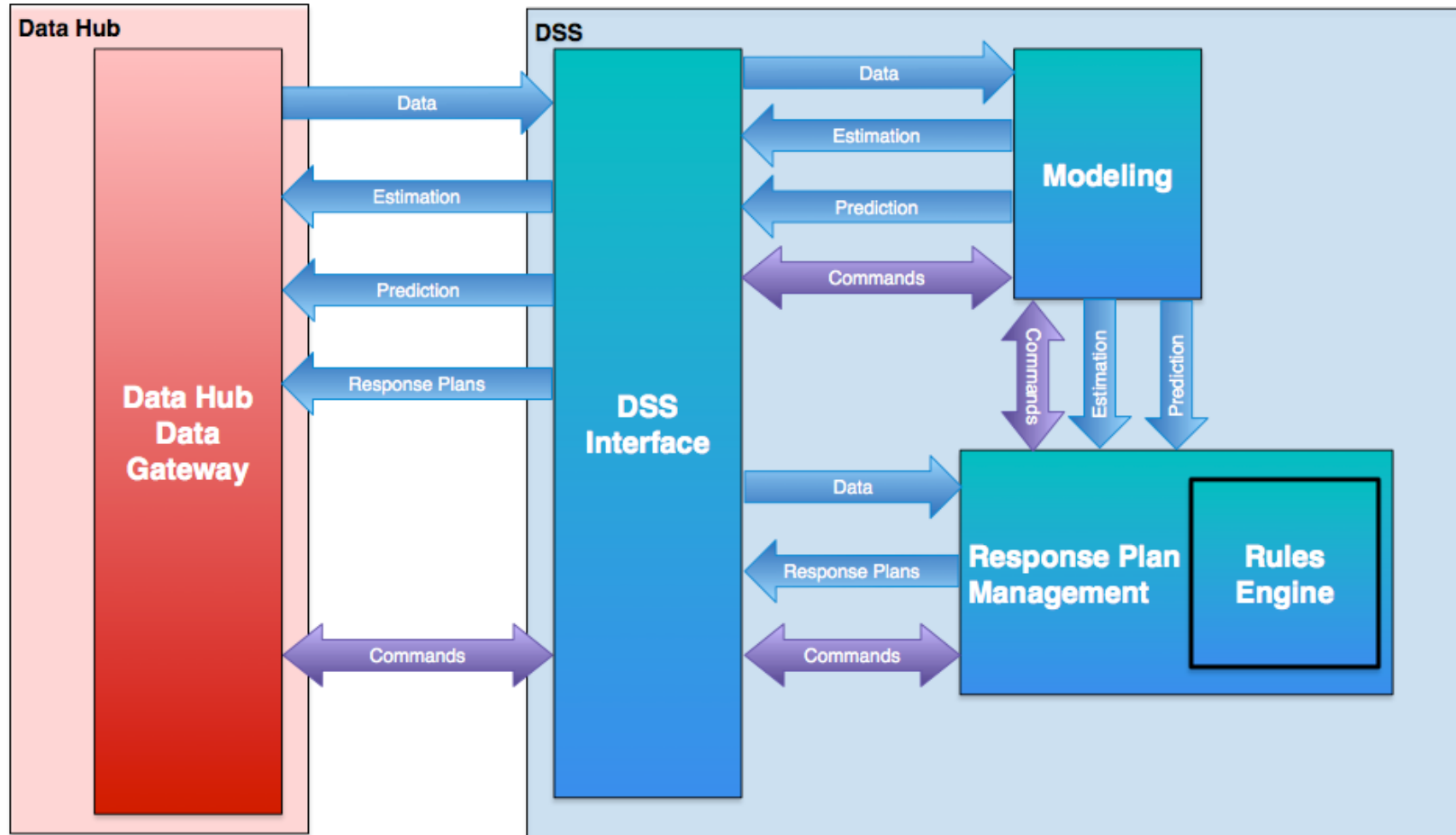
DSS Functions

- Provide response plans

- Evaluate response plans

- Provide one or more recommendations to corridor operators

- Provide response plan evaluation results to the Corridor Management System

- Recommend response plan updates when appropriate
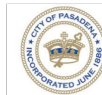
Decision Support System Design

Security

- **Principles**
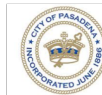   - Minimize attack surface
    - Authentication
    - Encryption
    - Isolation of processing
    - Automation and monitoring
    - Control of system launch
    - Data validation

System Interfaces and Messaging

- **External interfaces – Data Hub**

- **Data Hub – DSS**

- **Data Hub – CMS**

- **CMS – external interfaces**

- **Messaging Technology**
  - ActiveMQ
  - Kafka

Takeaways

- **High Speed**

- **High Resiliency**

- **Very Scalable**

- **With AWS – Highly Automatable**

- **High Security Capable Design**

- **Reliable**

- **High Data Throughput**

- **Built for the Future of Transportation**

Release for Review and Comment

- **Currently in internal review**

- **Draft on website**

- **Release v1 by March 15**

- **We can setup a review session here in LA if desired**

- **Contact brian.peterson@berkeley.edu for assistance in reviewing, questions, or comments**
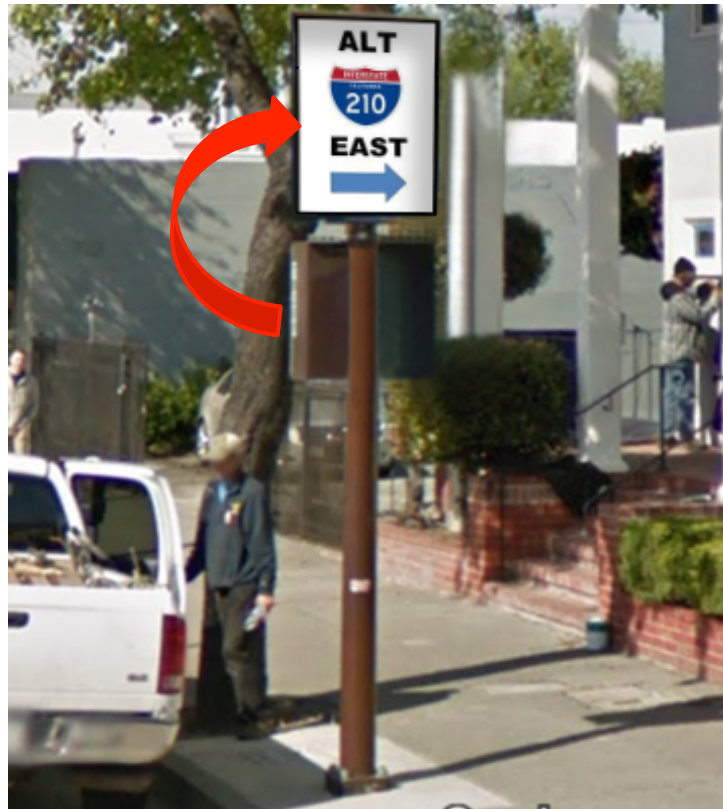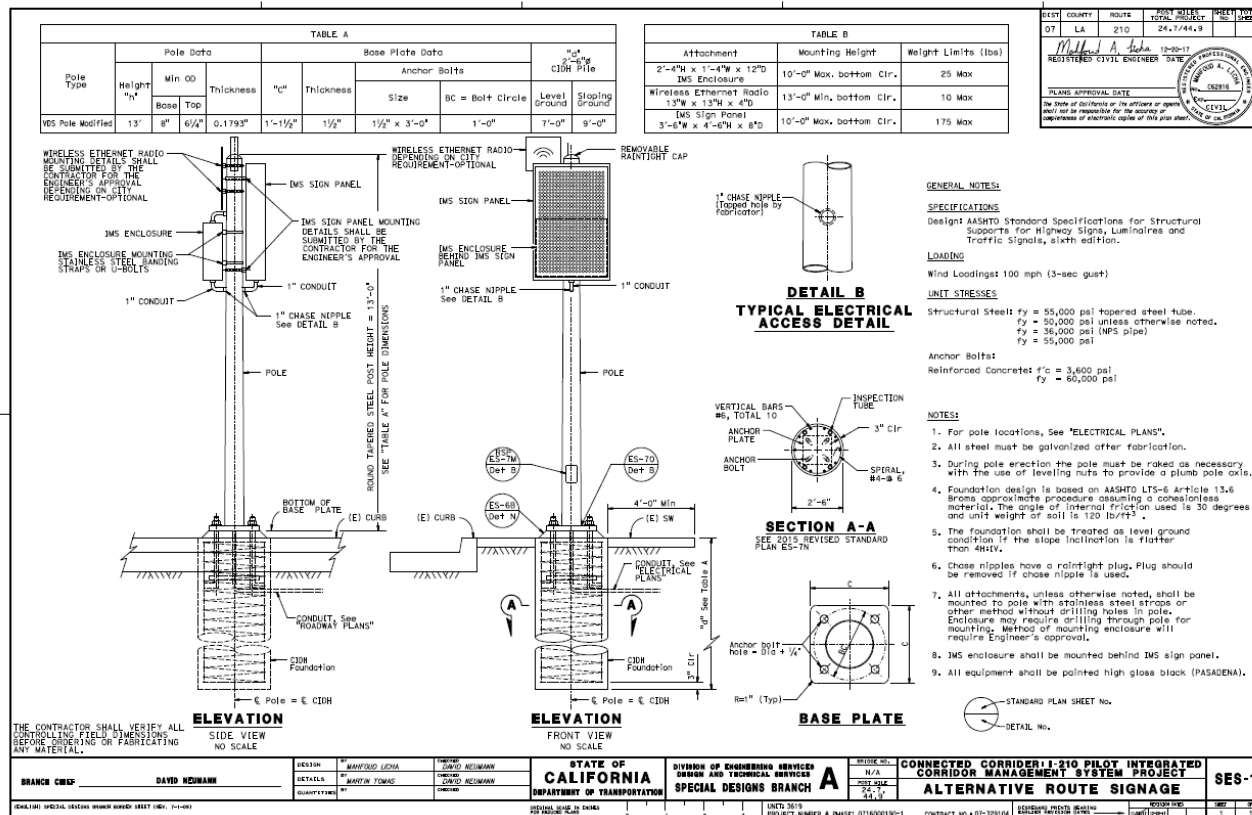
Arterial Message Signs

Equipment Update (CMS)

Sign: Full Matrix LED (3.5' x 4.5')

Equipment Update (Pole)

☐ **Pole: County requested modified connectors (under review)**
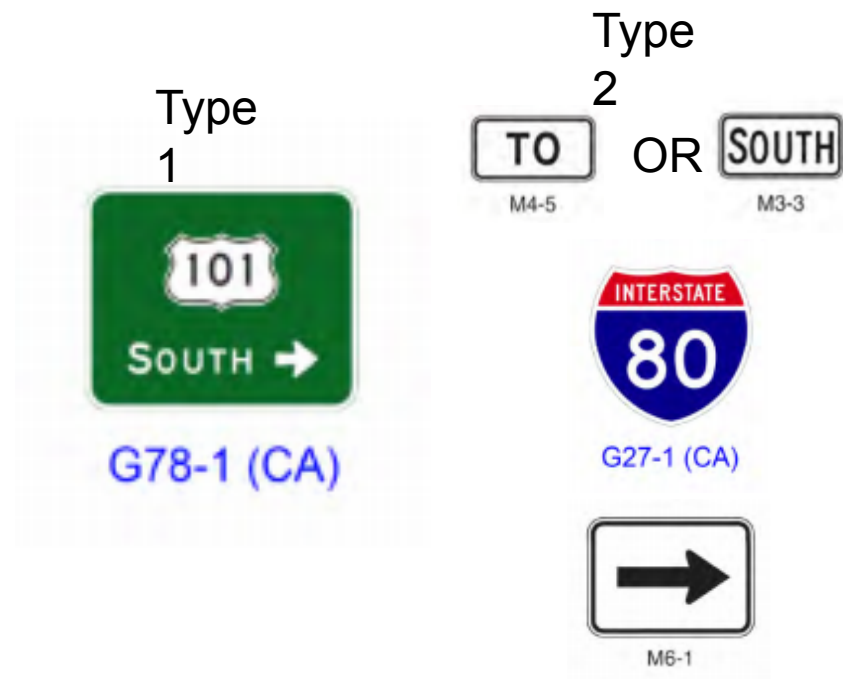
DMS Sign Location Update

- **16 Locations, 18 Signs in Pasadena**
  - 5 locations are at Caltrans-owned signals

- **7 Locations, 9 Signs in Arcadia**
  - 3 locations are at Caltrans-owned signals

- **2 Locations, 3 Signs in Monrovia**
  - 1 location is at a Caltrans-owned signal

- **2 Locations, 2 Signs in Unincorporated County Land**
  - 2 locations on Rosemead owned by LACO

- **1 Location, 2 Signs Shared Monrovia & Duarte**

- **2 Locations, 2 Signs in Duarte**

- *TOTAL = 36 signs*

Static Sign Location Update

- **Nine locations will have static painted signs of two types**
  - Three in Caltrans ROW
  - One in Pasadena
  - Two in Arcadia
  - One in Monrovia
  - One in Duarte
  - One in LACO

Type 1

Type 2

TO OR SOUTH

M4-5   M3-3

101 SOUTH →

G78-1 (CA)

INTERSTATE 80

G27-1 (CA)

→

M6-1

Next Steps – Obtain Final Approvals

- **Pasadena**
  - Checking on whether they can provide 15 feet of conduit (5 and 10) at Maple at Fair Oaks, Maple at Allen
  - Awaiting DMS control software server specification (to be used by all stakeholders)

- **Arcadia**
  - Checking conduit for one sign at Foothill at Baldwin North

- **Monrovia**
  - Awaiting approval of Power
  - Location at: Huntington at Myrtle

- **Duarte – Completed**

- **Awaiting final approval from Caltrans for adding radios and power to mast arm at two locations**
  - Central at Myrtle, Central at Mountain

- **PATH in internal review of final RFP – Details worked out with D7**

Thank You
and
Next Meeting
(Suggest April 10th
in Pasadena)