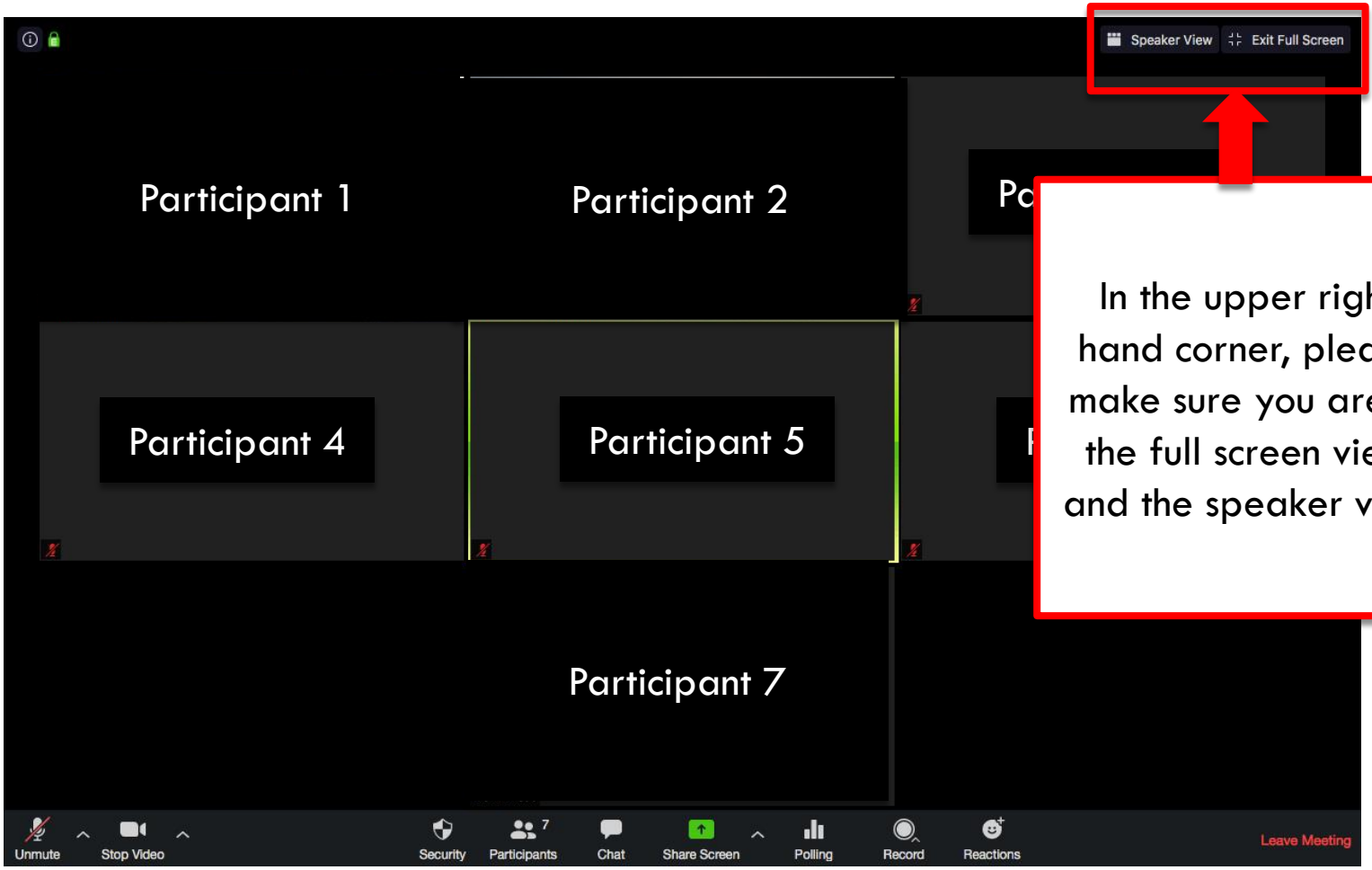
Connected Corridors
(Virtual) Face-to-Face Meeting

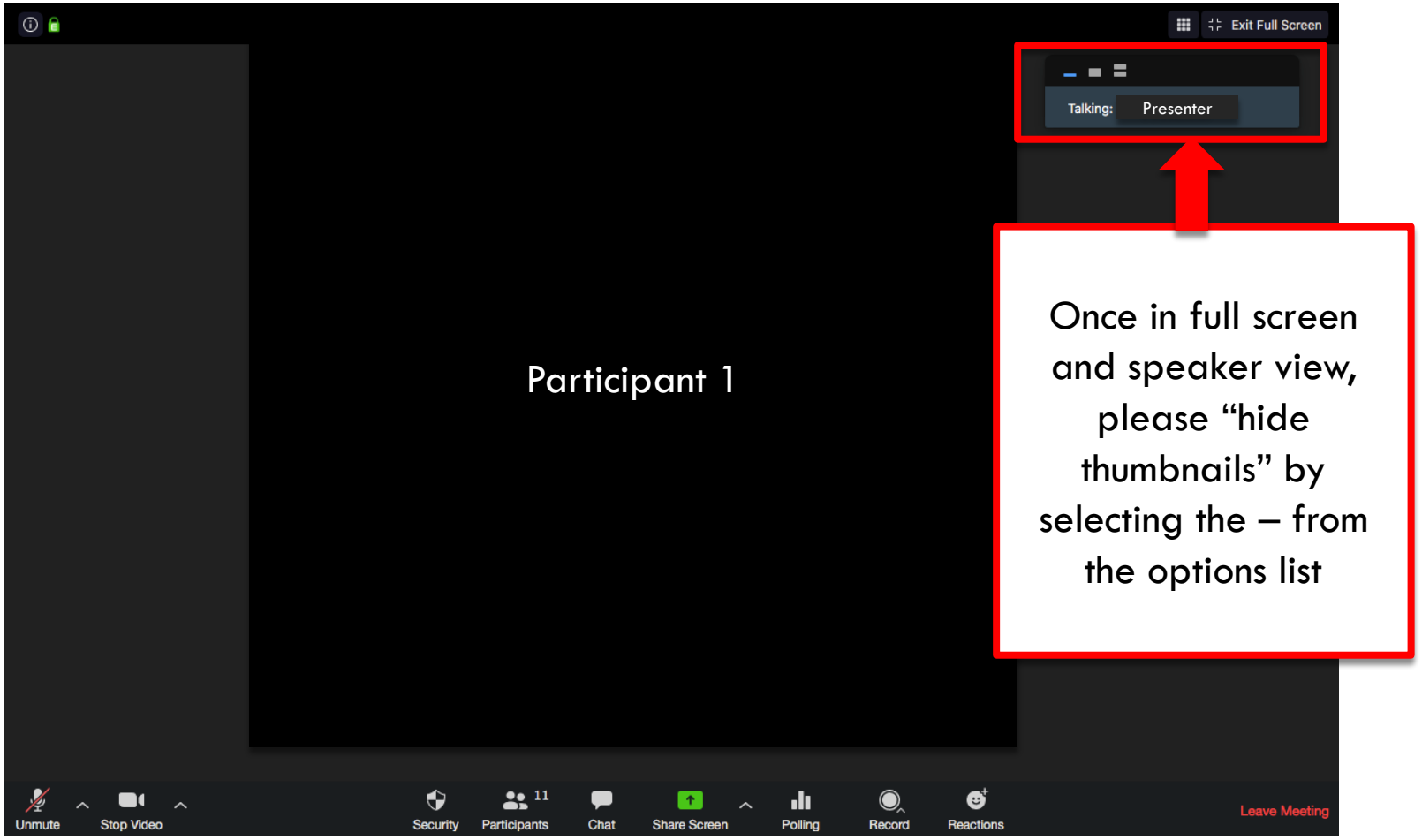
Tuesday, December 8th, 2020
1:30 – 3:30 pm
via Zoom Video Conferencing

Zoom Tips



In the upper right hand corner, please make sure you are in the full screen view and the speaker view

Zoom Tips


Exit Full Screen
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Presenter
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Unmute
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Chat
Share Screen
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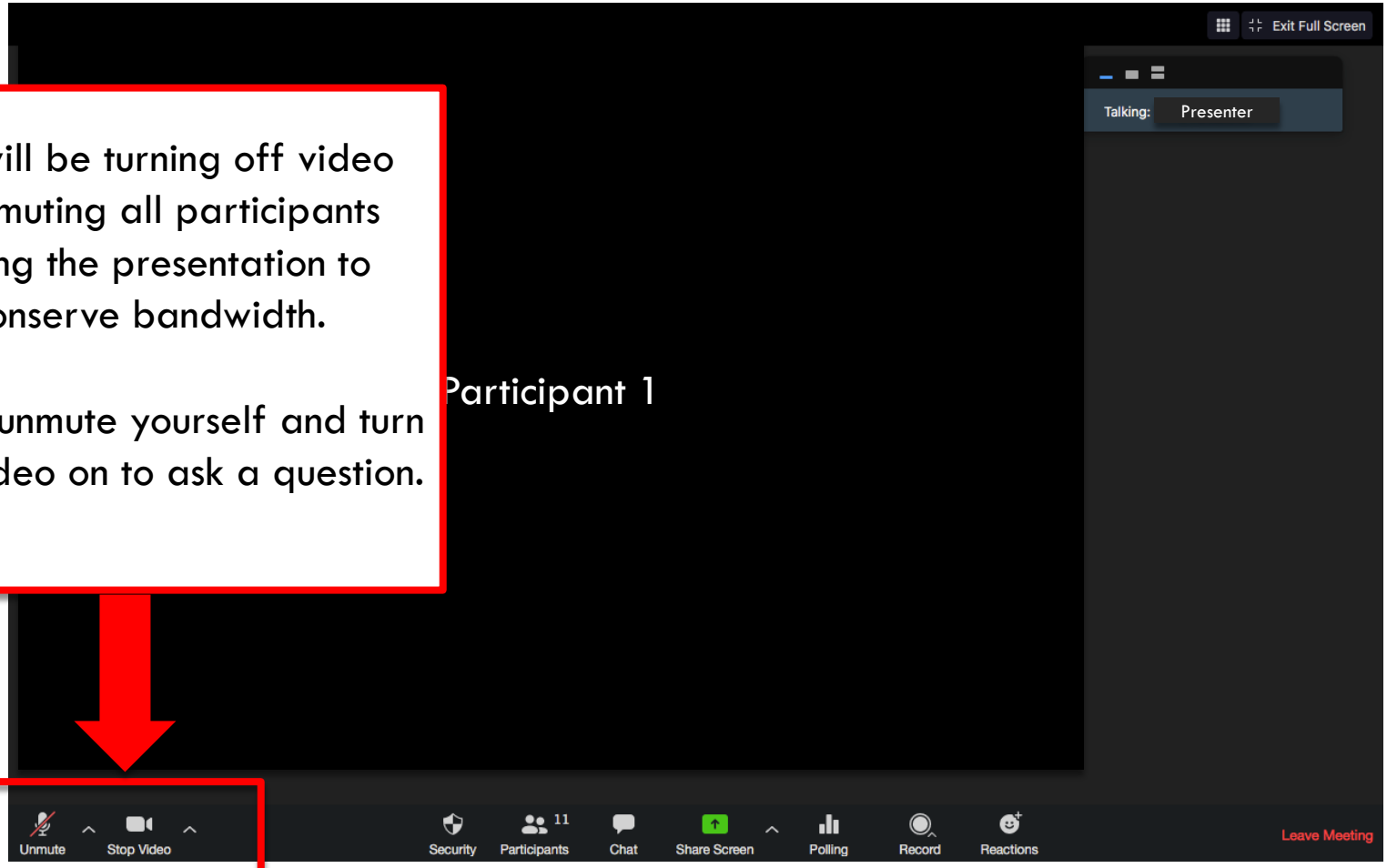
Once in full screen and speaker view, please "hide thumbnails" by selecting the – from the options list

Zoom Tips

We will be turning off video and muting all participants during the presentation to conserve bandwidth.

Please unmute yourself and turn your video on to ask a question.



Agenda

- **1:30 - 1:50 PM – Greetings, Introduction and Progress Summary**
- **1:55 – 2:10 PM – Incident Life Cycle Overview**
- **2:10 – 2:20 PM - AMS Update**
- **2:25 – 2:40 PM - Kapsch Status Update**
- **2:45 – 3:00 PM – I-210 CC Environmental Station Data Preliminary Study**
- **3:05 - 3:20 – Parsons Call for Projects Update**
- **3:20 – 3:30 – Round Table and Closing**

Next Meeting - Tuesday, February 2nd, 2021

Note: Meeting location sequence Monrovia, Duarte, LA Metro, Caltrans TMC, County, Arcadia, Pasadena

I-210 Pilot Implementation Project Progress Summary

Schedule – Till Launch (Page 1 of 2)

- **Complete Call for Projects Procurement** – **Jan 2020**
- **ATMS with CC modifications deployed to Production** – **March 2020**
- **Major functions of the Test DSS work with production ATMS incident data** (demonstrated) – **May 2020**
- **Data Hub configuration and deployment management functions (deployment/release hardening)** – **May 2020**
  (conducted incremental releases with containers, further hardening as we go through the pilot)
- **Estimation running in the cloud** – **August <- ~~December~~ 2020**
  (In the cloud with limited functionality. Not fully tested yet. Work sch. switched with Prediction.)
- **Complete ATMS Modifications** – **~~October 2020~~ -> January 2021**
  (Received Parsons updates for the Design doc. in resp. to comments. Date to be confirmed after the spec agreement.)
- **Complete McCain Transparity C2C interface** (Pasadena) – **~~October 2020~~ -> January 2021**
  (Code is ready to deploy to Prod. CT app deployed. City signals to follow; waiting for the network and SSL certs to be deployed.)
- **Prediction (Aimsun) running in the cloud** – **November 2020**
  (In the cloud with limited functionality. Working on scalability, update and deployment automation and performance.)
- **Rules Engine (Drools) running in the cloud** – **August <- ~~October~~ 2020**
  (Technology is running in the cloud with initial RP generation;
  Remains: workflow enhancements and hardening throughout the Pilot).
- **All ITS Elements Installed in Field** – **~~Q3-Q4 2020~~ -> Dec-Jan 2021**
  (See slides for Parsons DMS package #8-1,2,3 below).

Schedule – Till Launch (Page 2 of 2)

- **Integrate CT Lane Closure System*** – ~~*September 2020*~~ -> **February 2021**
- **Integrate Local Lane Closure System*** – **April 2021** (to confirm)
  (Rules engine has to know the info. May require LCS software modification.)
- **All data (except new arterial DMS signs) being received** – ~~*November 2020*~~ -> **January 2021** (to confirm)
  (i.e. all ITS elements are installed and sending data through their C2C interfaces.
  Per latest, P3 and P5 moved from Q4 2020 to April 2021)
- **Performance Management System Available** – ~~*December 2020*~~ -> (to confirm)
  (Data Hub is sending data out waiting for the connection.)
- **Complete C2C DMS Sign Interfaces** – ~~*February*~~ -> **March 2021**
  (See Call for Projects slides below;
  testing completion moved Feb->Mar 2021. Just started testing some dialogs with ATMS)
- **Version 1.0 System Production Deployment/Release** – **February -> 2021**
  (Estimation, Prediction, Rules, CMS, etc. could be less than in May.)
- **System Operational Test and Validation, TMC/CT&Locals Operator Acceptance Testing** – **March-May 2021**
- **Before Study** – **March to May 2021**
  (Could be based on historic data due to Covid impact.)
- **CT and Local Agencies Operator Training** – **April to May 2021**
- **Launch Pilot** – **May 2021**

Note:
* Caltrans HQ IT involvement required. Both the Arterials (built for rail system) and state-wide Freeway LCSs exist and maintained by CT IT. Just recently received the info and started reviewing.

Schedule – Pilot Launch to Pilot Completion

- **Pilot Launch – May 2021**
- Kapsch – May 2021 – September 2021
- Parsons – September 2021 – January 2022
- Interim Benefits Analysis – January 2022
- Telegra – January 2022 – May 2022
- After Study – March to April 2022
- Kapsch – June 2022 – September 2022
- Documentation Completed – September 2022
- Procurement of CMS system – August 2022
- Procurement of Aimsun – August 2022
- **Pilot complete - September 2022**

Planned Accomplishments for December 2020-January 2021

- **Software Development**
  - Expand capabilities of prediction in cloud DSS. Begin efforts to optimize prediction run times. Begin automation of model update build processes.
  - Continue effort to capture state and local lane closure system data in Data Hub.
  - Support networking and deployment of SSL and McCain Transparity update in Pasadena.
  - Continue integration efforts for DMS signs, testing both ATMS and LedStar interfaces. Retest current freeway sign interfaces updated to add LedStar signs.
  - Continue efforts with Parsons and D7 to update ATMS workflows and user interface.
  - Complete command testing for Pasadena signals (McCain).
- **Analysis Modeling and Simulation (AMS)**
  - Complete testing of estimation components to handle more complicated intersection topologies in the CC network
  - Add rules to handle queue information for response plan selection
  - Integrate and test Response Plan Generator (RPG) working with queue estimation information

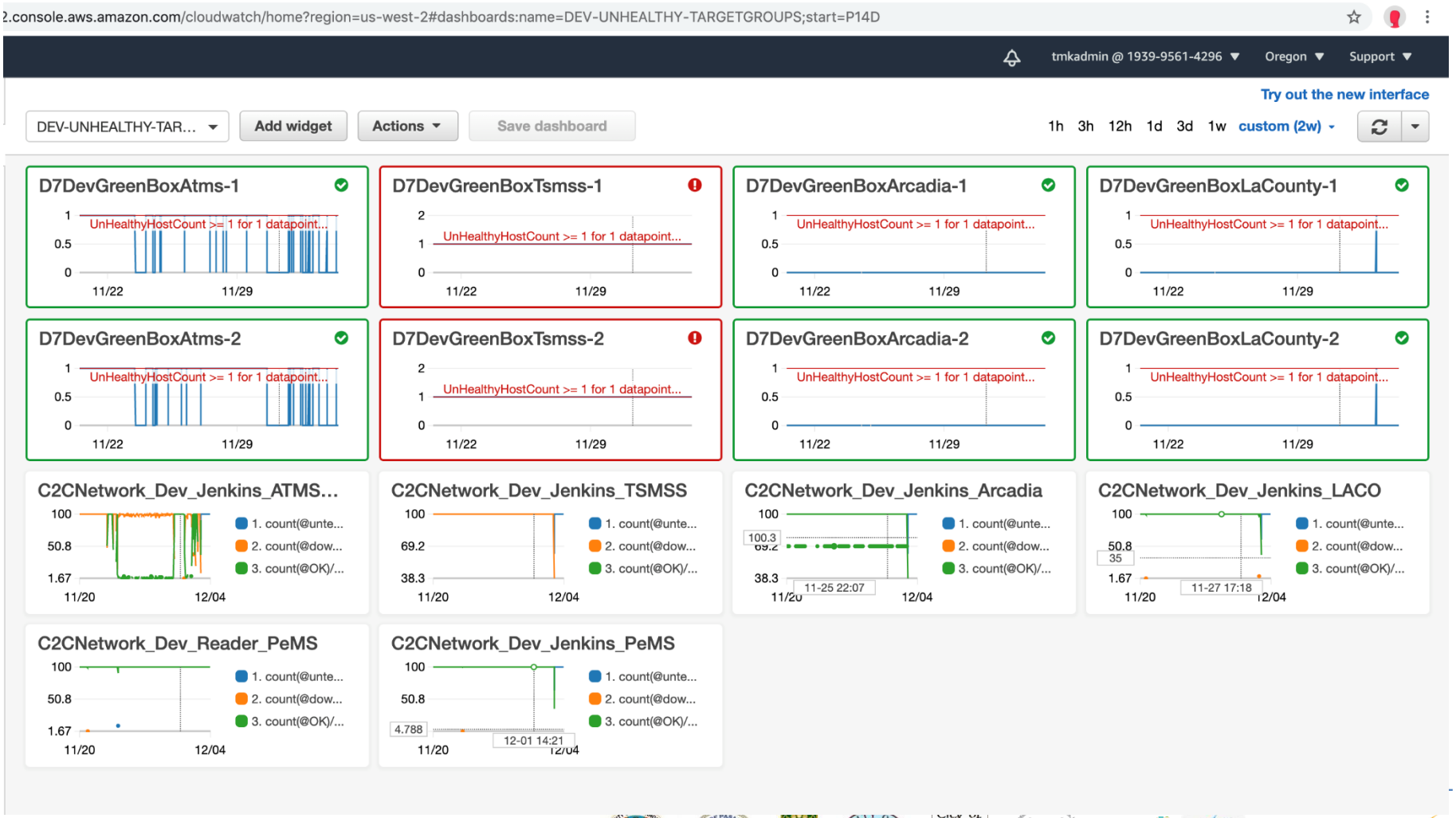
I-210 CC Pilot: **Project Risks to Watch**

1. PATH contract is being reevaluated by CT HQ.
2. The project needs to secure funding through the Pilot completion.
3. Timely completion of Kapsch CMS Integration.
(Estimate to complete expected this week).
4. Timely completion of ATMS modifications.
5. Timely completion of DMS integration.
6. Timely completion of the Local and Freeway LCSs integration.
(As we just recently were able to obtain the information and started reviewing it.)
7. Full readiness of the DSS.
(Rules, estimation, prediction; including the initial RP, updates and termination.)
8. Data availability and quality.
9. Performance Management System availability.

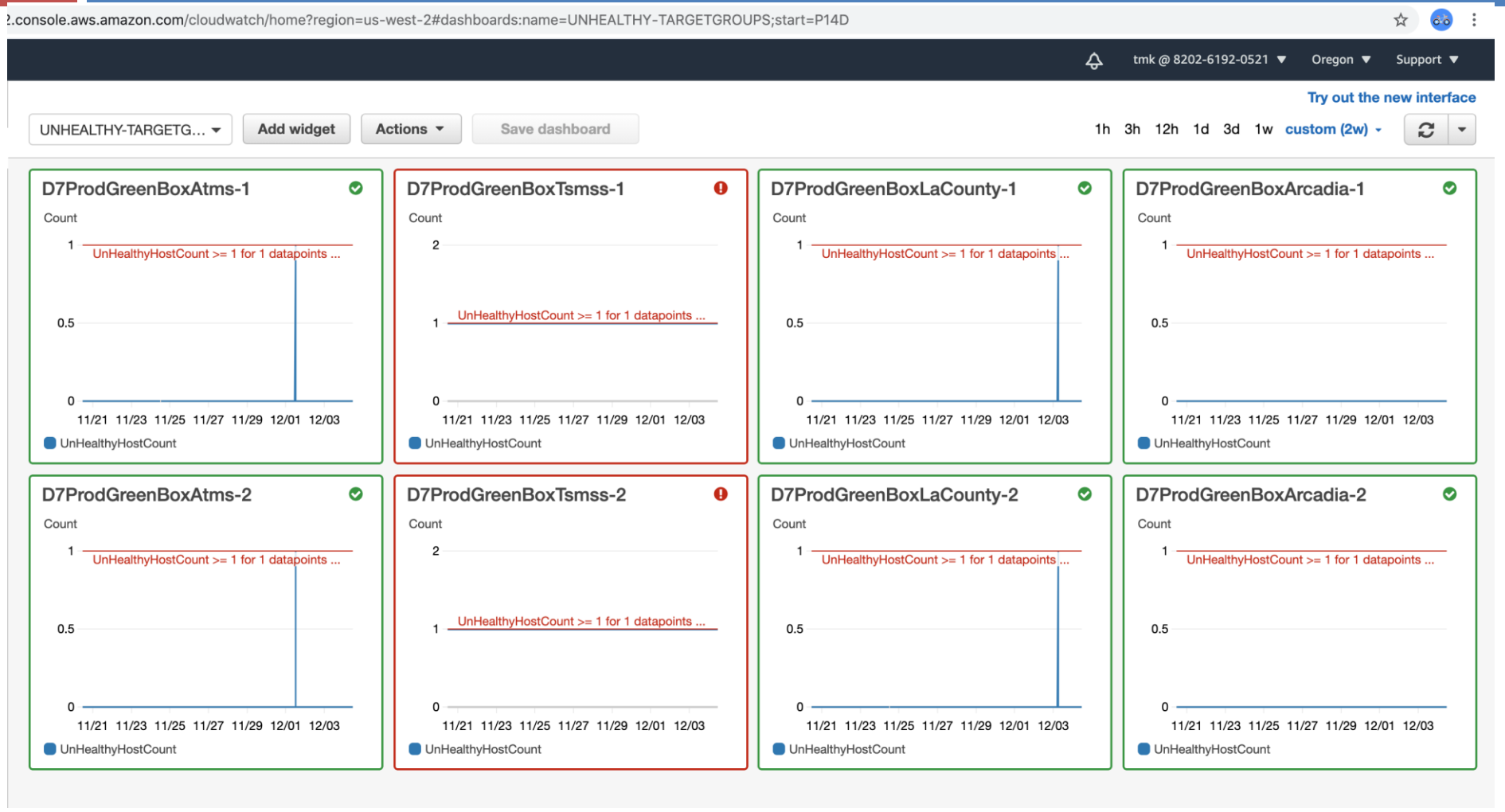
Networking and Center to Center Connectivity

- **C2C network connectivity issues**
  - Lost connectivity to TSMSS due its upgrade. Working with CT to reestablish connectivity so testing can resume.
  - Pasadena intersection signal connectivity not yet established (2 installations). Waiting for connectivity to verify installation for Caltrans signals. Verification of Pasadena signal interface to follow.
  - Test ATMS frequent down time is problematic. Often there is no notification.
- **New connectivity to be established**
  - Need test-only connectivity for DMS C2C dialog testing via LedStar interface
  - Pasadena and LACO dynamic message signs
  - Local LCS (needs a deployment target where the software will be hosted)
  - State LCS

Dev System C2C Connectivity Nov 19 – Dec 4



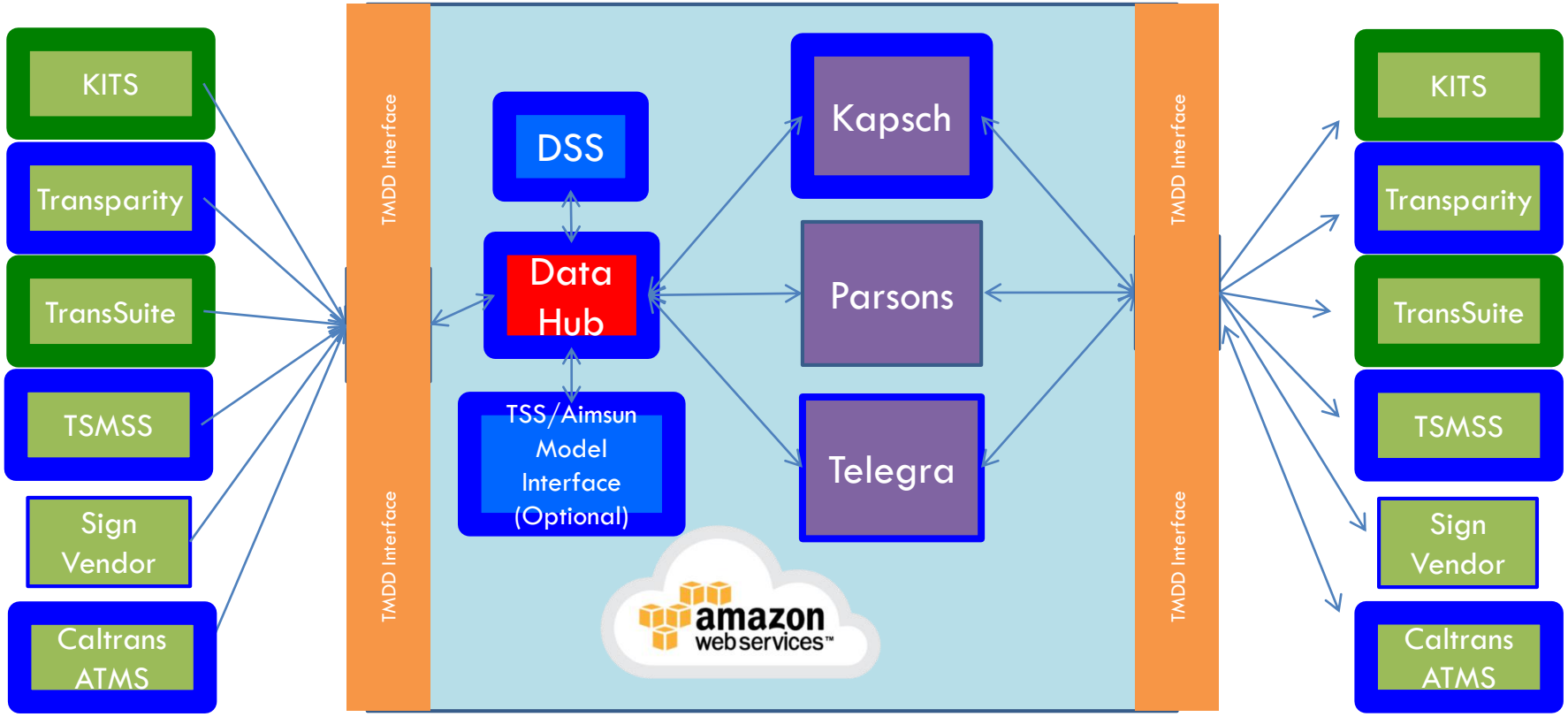
Production System C2C Connectivity Nov 19 – Dec 4



C2C Connectivity Challenges

- **TSMSS System has been offline in all environments since upgrade on November 10th**
- **Test ATMS system has been very unstable for somewhat longer**

C2C Interface Implementations - Status



Legend:
Green border – Done; Blue border – In Progress (thickness commensurate with progress)

Systems Integration

- **Pasadena**
  - McCain/Transparity C2C interface – Dialog testing complete. Command execution testing in progress – issues reported, in retest. Deployment delayed – networking and SSL taking longer than expected.
- **Dynamic Message Signs – Pasadena, LACO, Caltrans**
  - Beginning interface testing of first dialogs with the CT ATMS. Other dialogs still in development. Awaiting networking to test Ledstar (Pasadena/LACO) C2C dialogs.
- **Caltrans**
  - Received updates of Parsons design for ATMS updates. Will review this week.
- **TSMSS**
  - Resolving connectivity to test fixes following last round of testing

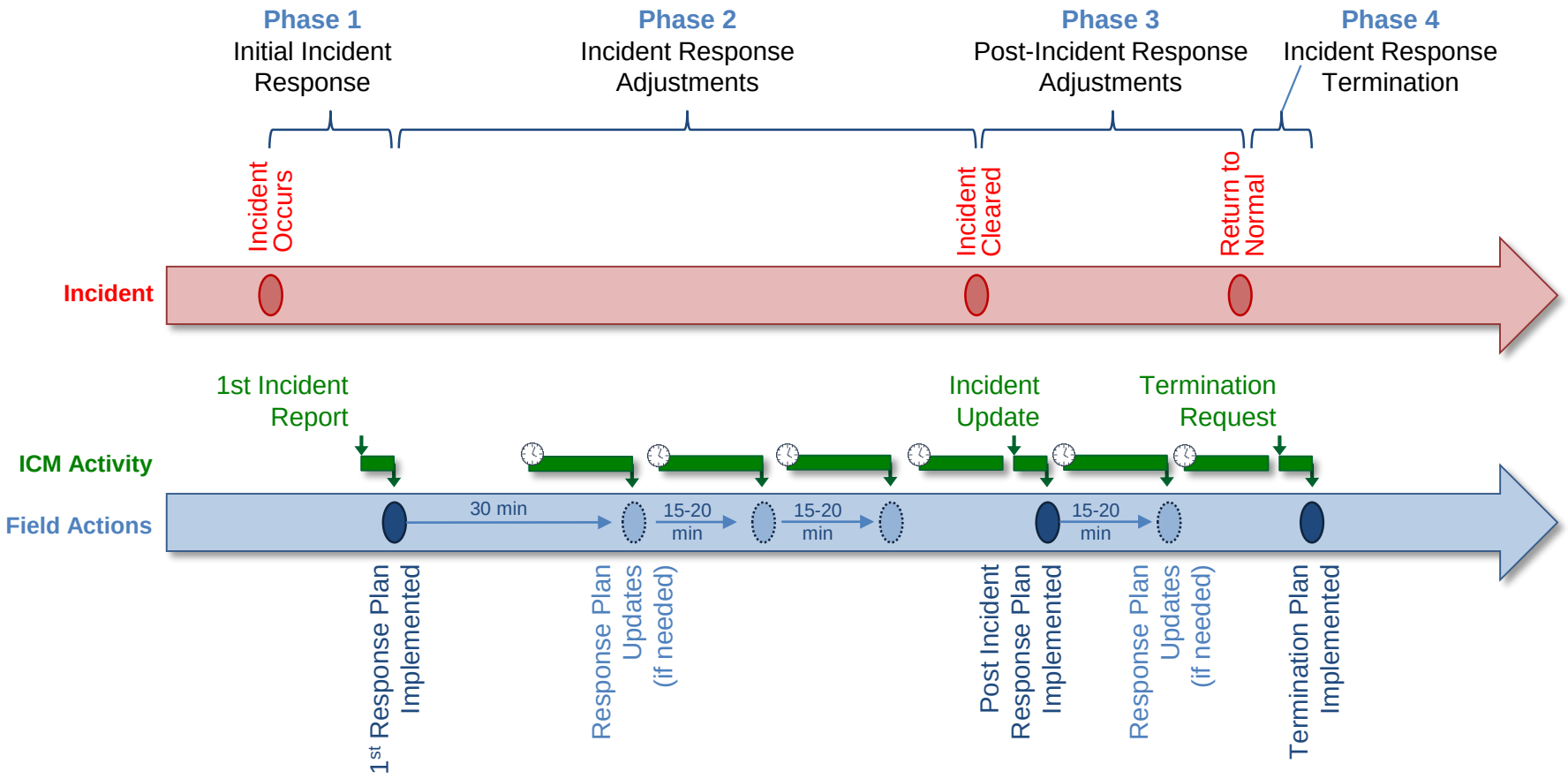
Systems Development

- **Updates**
  - First cloud prediction capabilities developed. Working to add ability to scale beyond n=1. Have experienced a full integration of prediction, estimation, and rules within cloud DSS. Working to ensure local deployment support for AMS team simultaneously with cloud deployment.
  - Completed first rules and estimation deployments to cloud. Currently working to improve rules and adding queue estimation to rules route/response plan creation.
  - Fixed data pipeline bugs affecting reliability of pipelines.
  - Implemented AWS security enhancements and implemented cost reduction activities for AWS expenses
  - Reviewed data from state LCS system. Developing custom interface in the Data Hub. *
  - Local LCS system custom interface in development. Data received may have issues for system use. *
  - Developed automated tests for incident workflow.

* Both LCS interfaces convert source LCS data to TMDD format for downstream standardized consumption

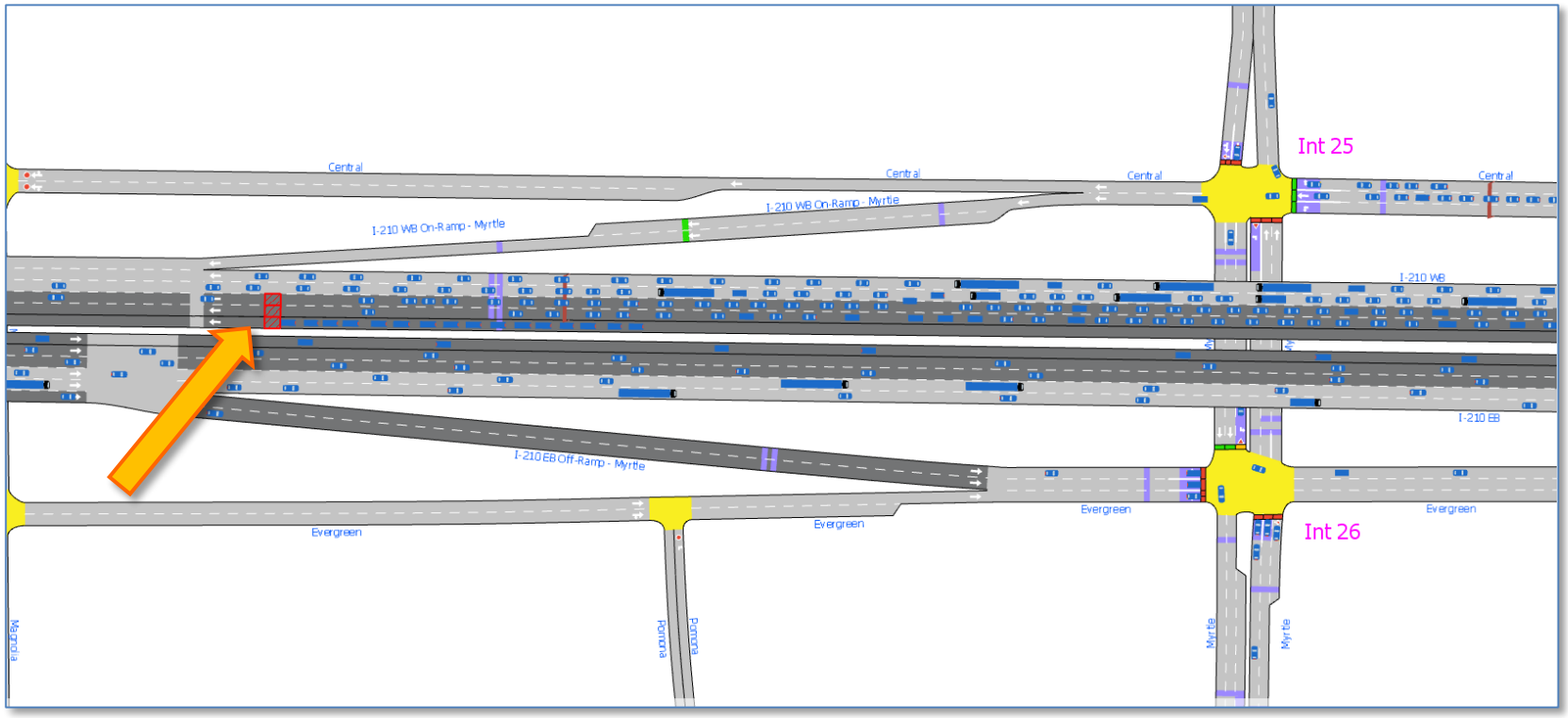
Incident Life Cycle Overview

Incident and RP Life Cycle



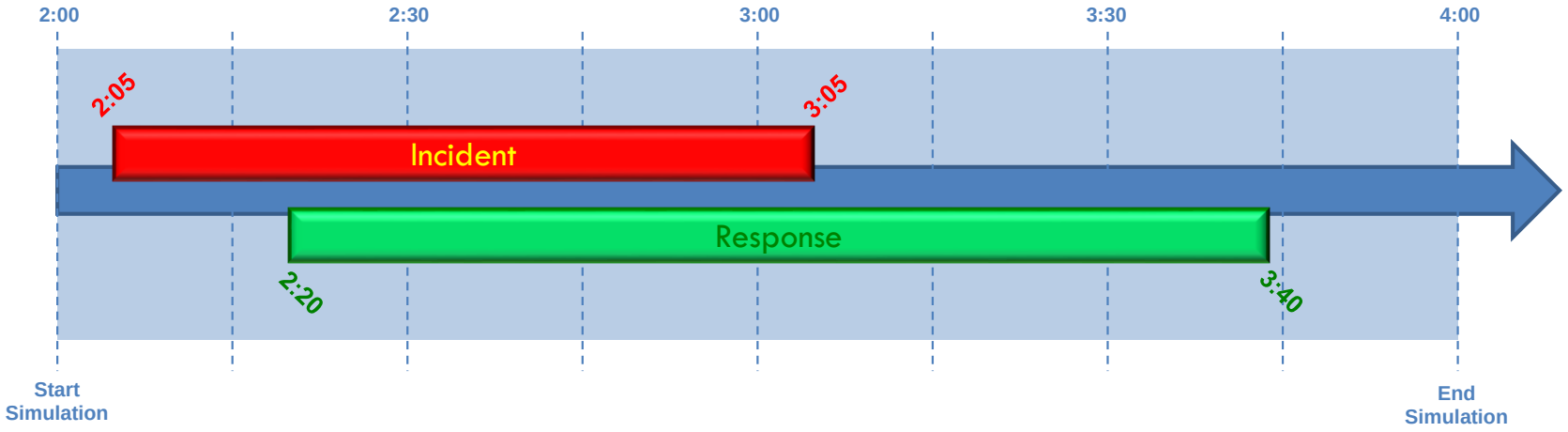
Incident

- **HOV + 2 left lane blocked at Myrtle on I-210 WB**



Simulated Incident and RP Life Cycle

- **To clear excess traffic on arterial streets, RP extends beyond end of freeway incident**

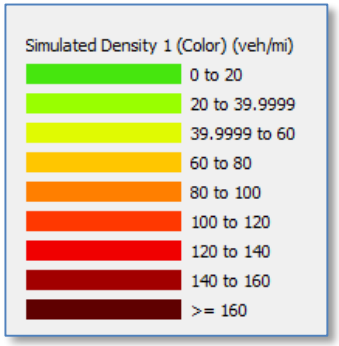


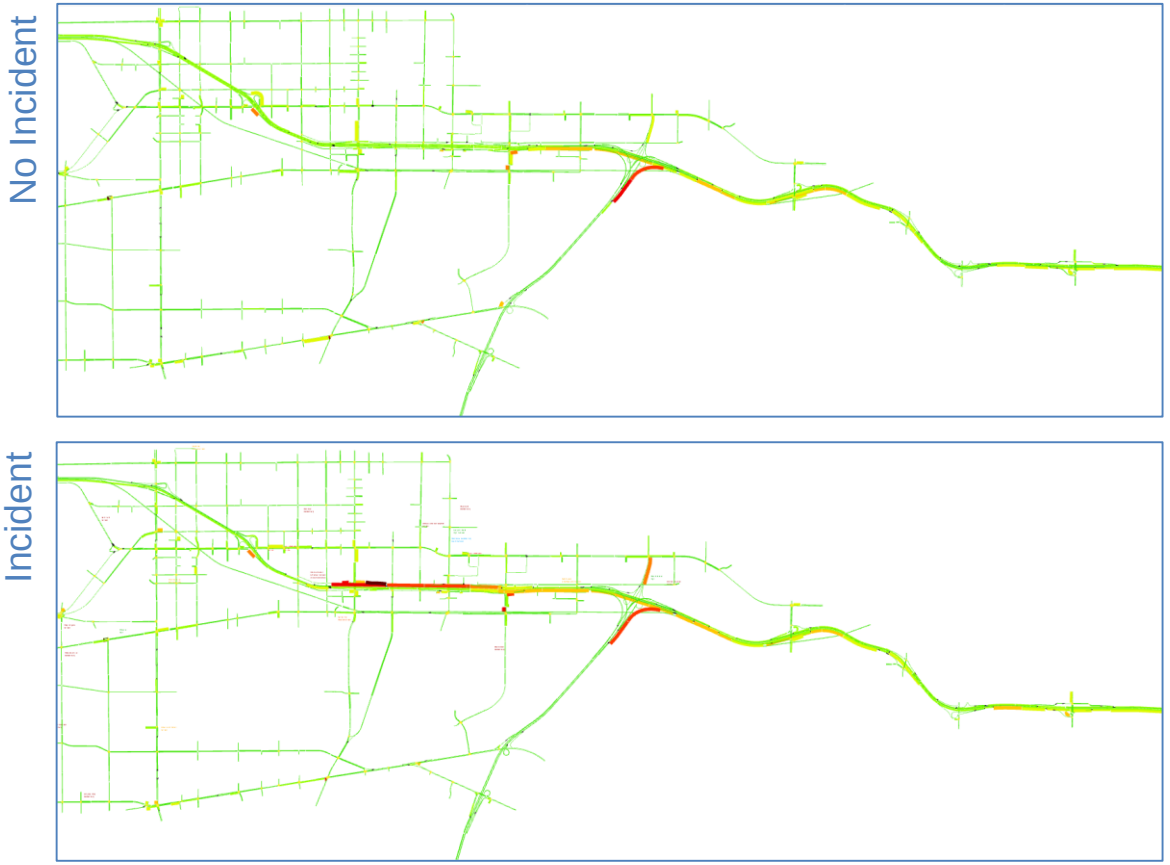
First Incident Report

Phase 1

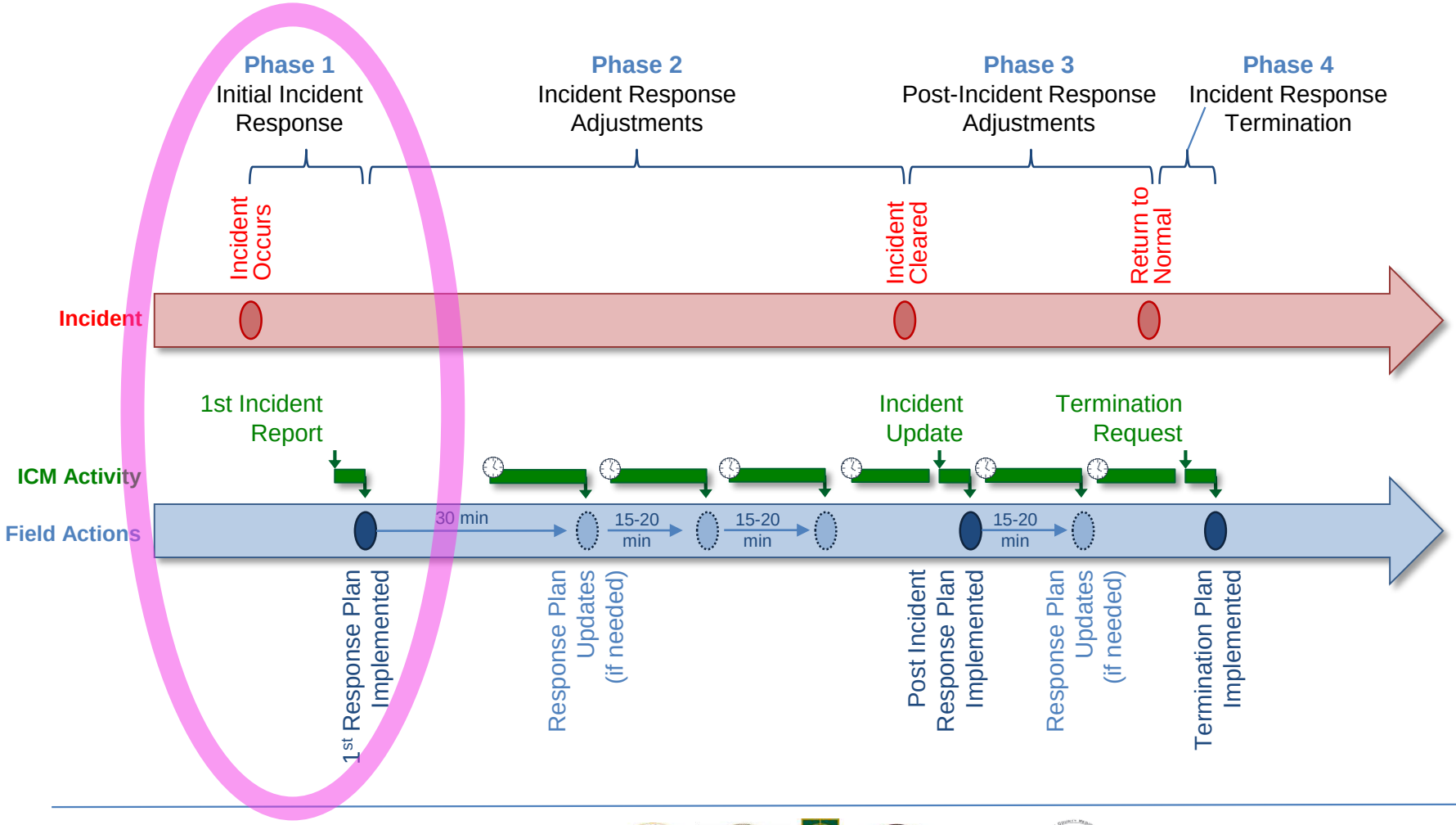
Before Response

- **2:15 PM – 10 min into incident**



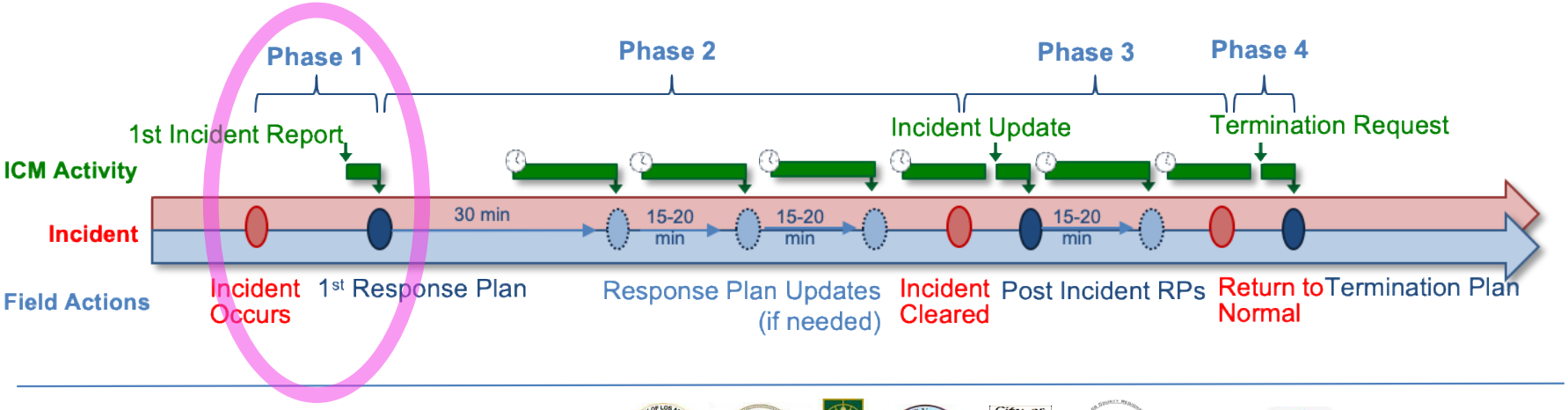


Phase 1: Initial Response



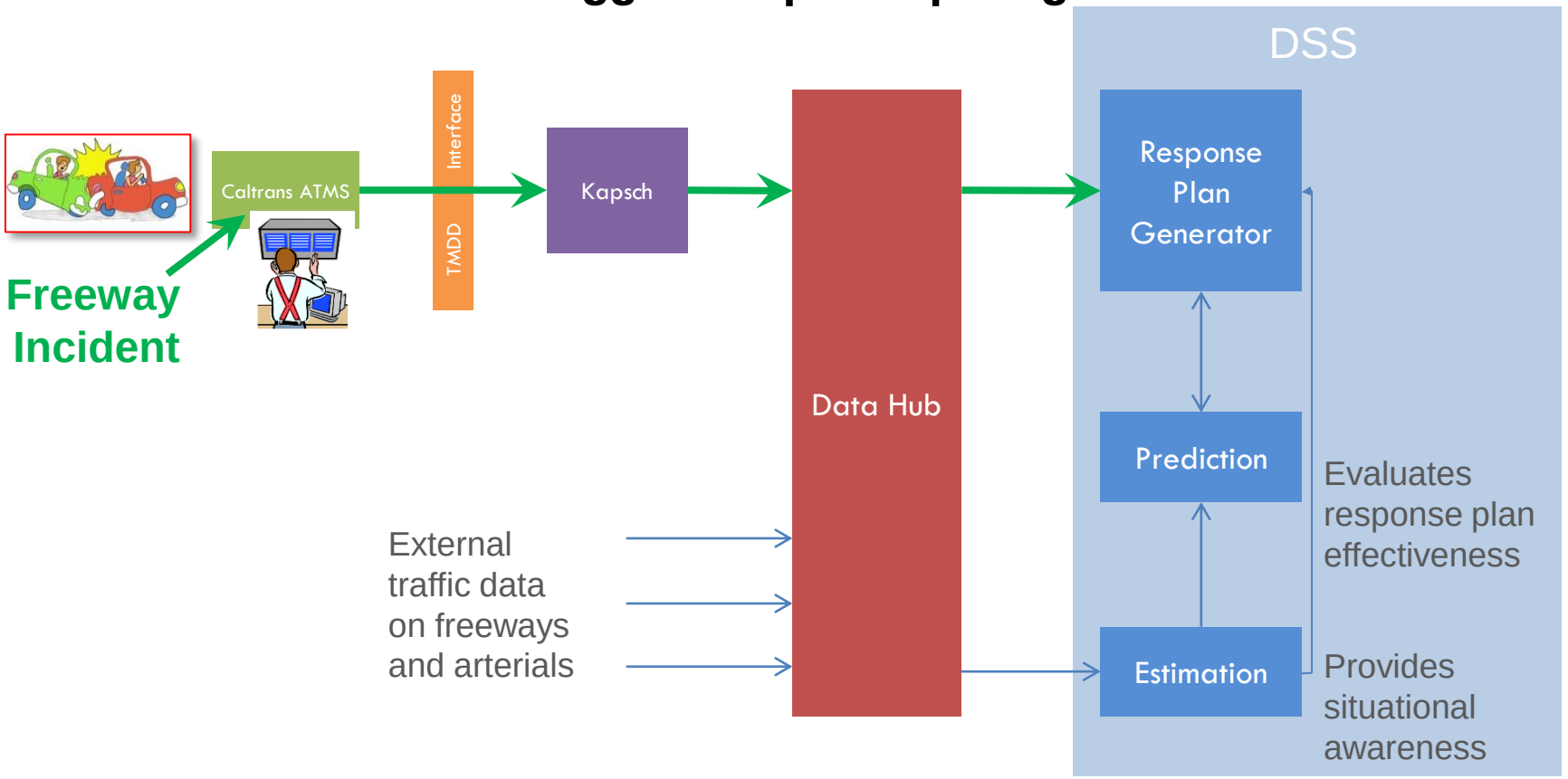
First Incident Report

- **Operator actions**
  - Enter incident information into ATMS
  - Request I-210 Connected Corridors Response Plan



First Incident Report Data Flow

- **An ATMS incident triggers response plan generation**

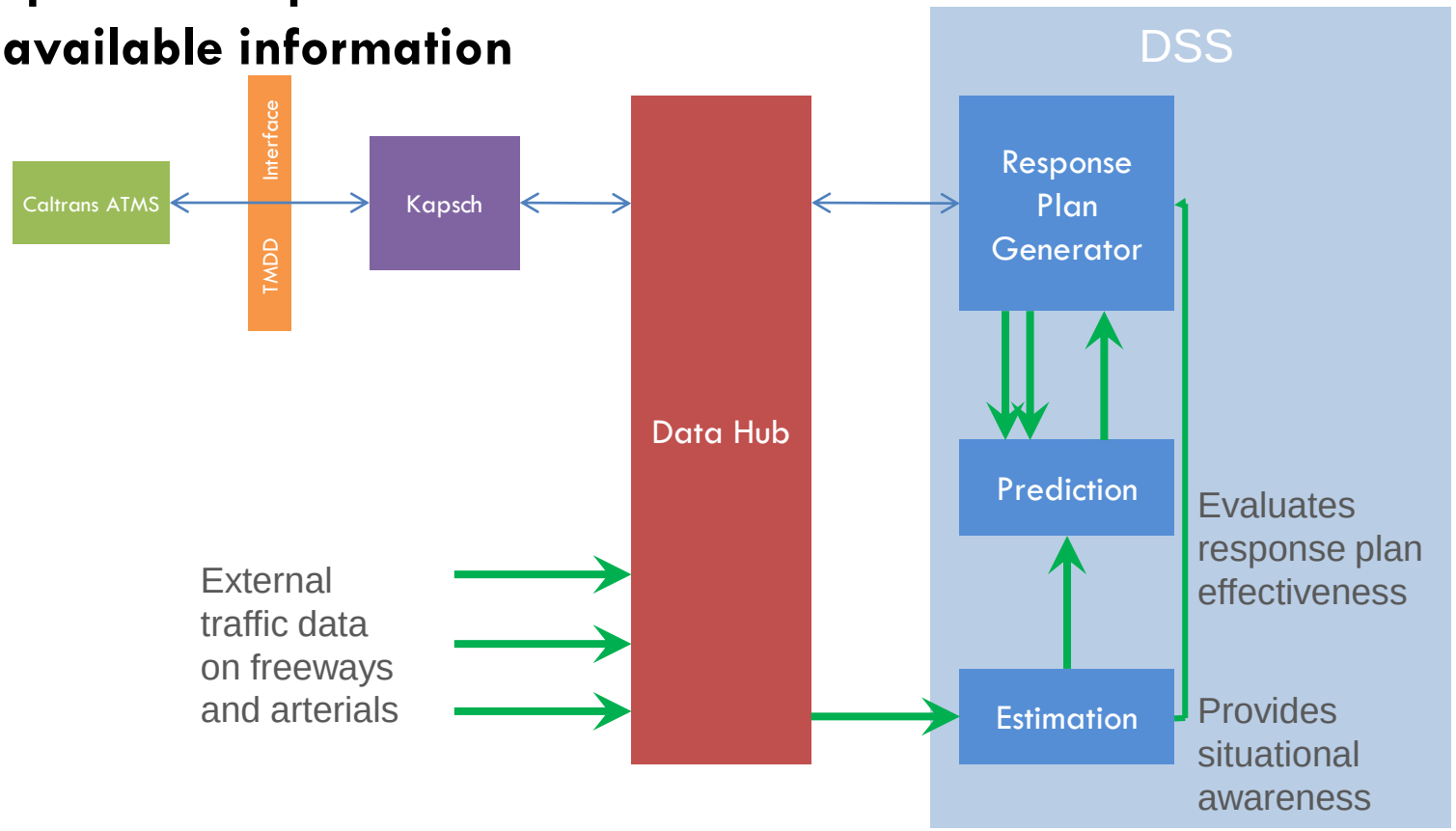


Initial Response Plan

Still in Phase 1

Evaluation of best response plan

- **Top pre-scored plans are evaluated based on available information**

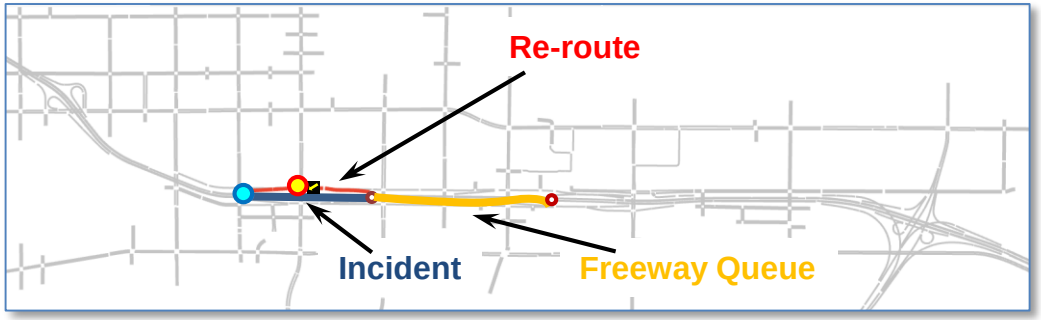


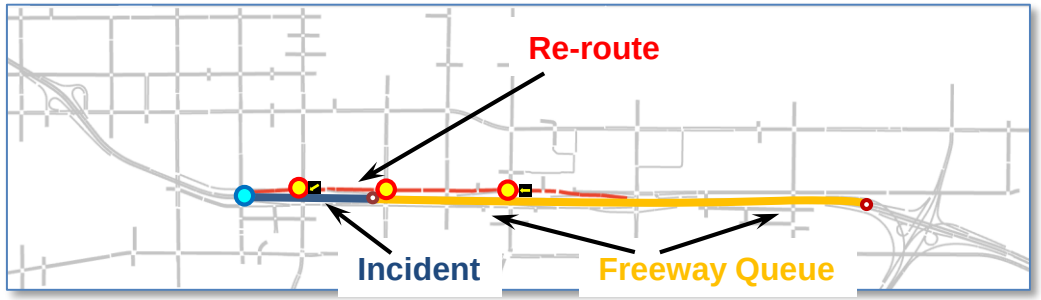
Decision making process

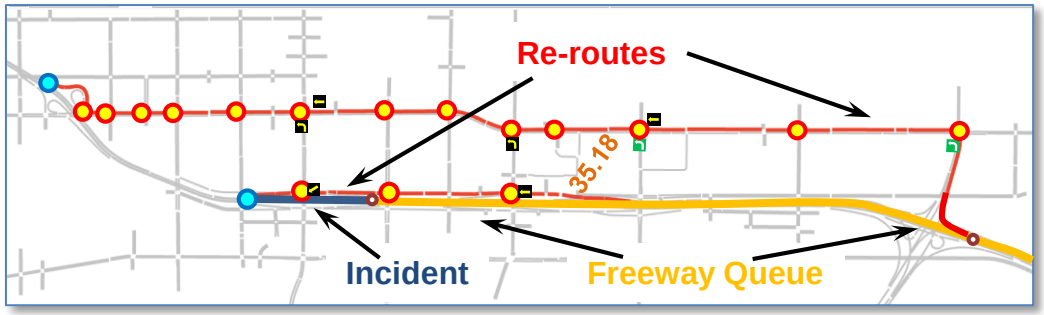
- **Plans are pre-scored based on traffic engineering judgement, results of simulation studies, and stakeholder preferences**
- **In addition, the rules take into consideration**
  - Incident attributes (e.g., location, time of day, lanes blocked)
  - Historical demand and queue forecast
  - Asset availability
  - Estimation results for queue length and initial state
  - Prediction scorecard
- **If experiencing a data outage, estimation and prediction become impossible**
- **If experiencing a communications outage, a response cannot be deployed**

Possible Responses

- **Single detour**
  - Central, Myrtle off-ramp → Myrtle on-ramp
- **Single detour**
  - Central, Mountain off-ramp → Myrtle on-ramp
- **Dual detours**
  - Central, Mountain off-ramp → Myrtle on-ramp
  - Huntington, Mount Olive → Huntington on-ramp

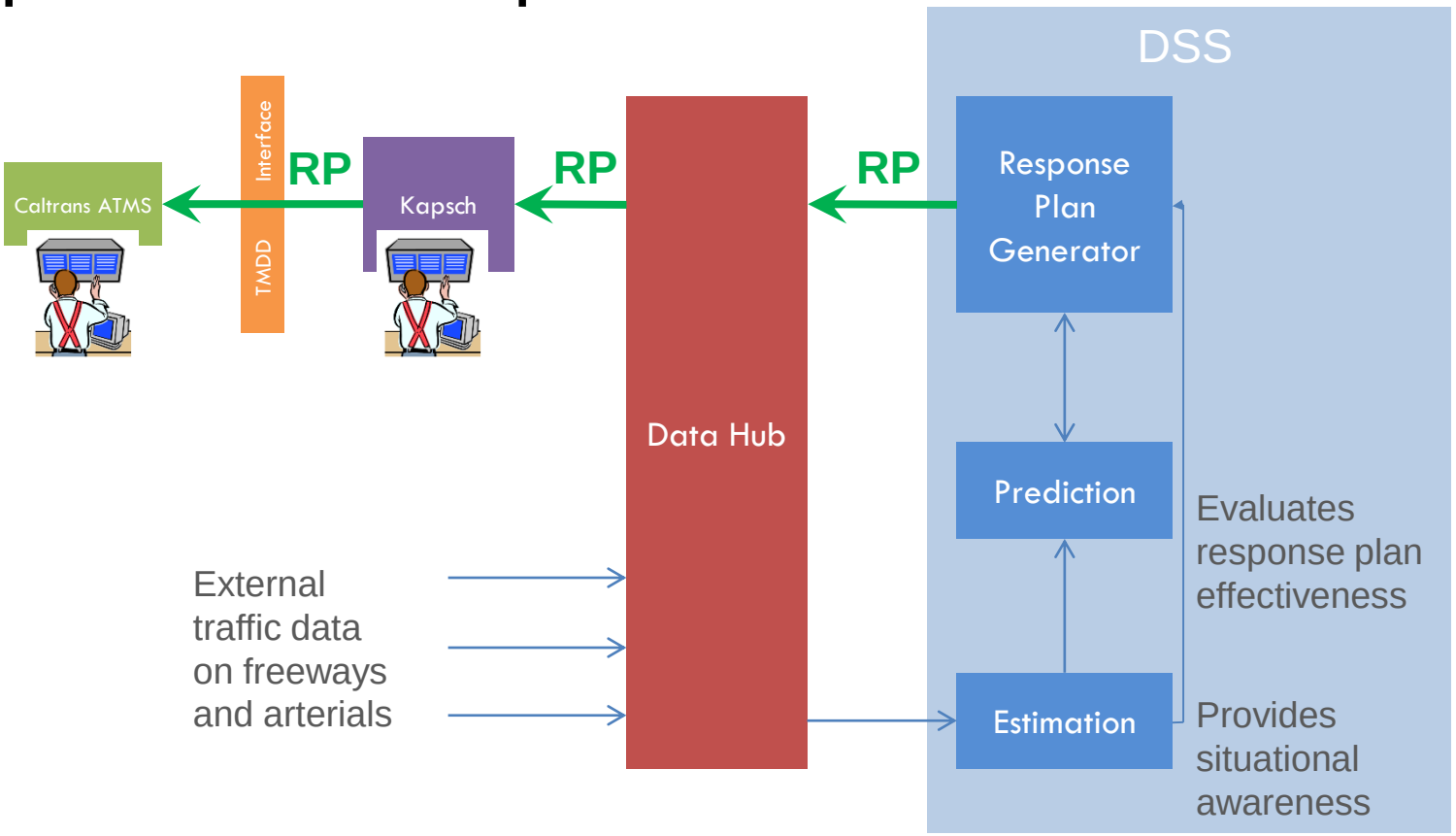






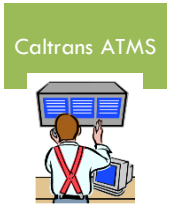
Approval of Response Plan

- **Response Plan sent to Kapsch CMS and ATMS**



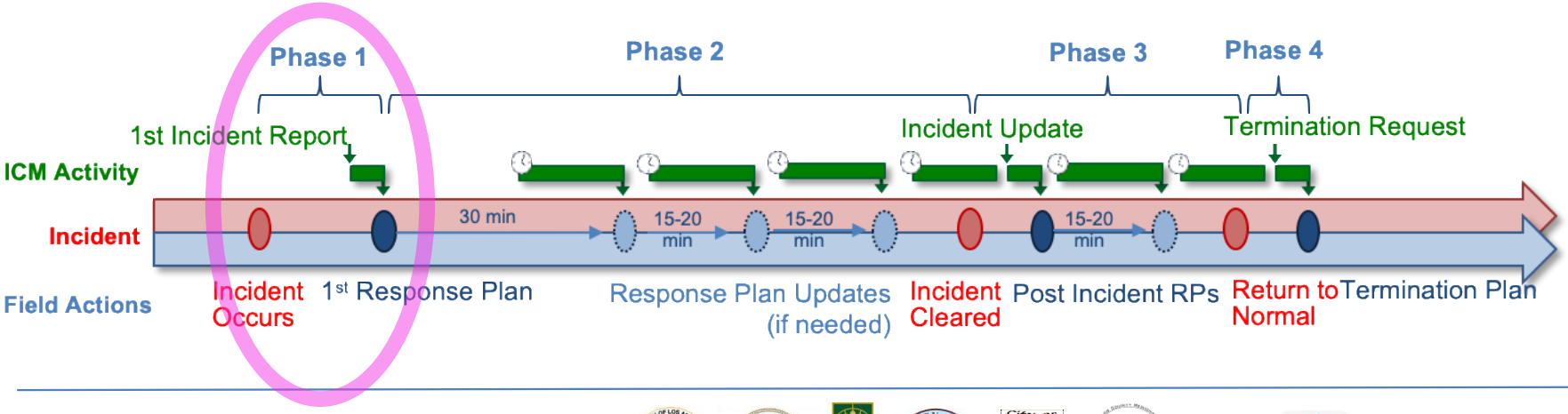
First Response Plan Deployment

- **Operator actions**
  - Approve or disapprove plan in ATMS
  - Approve or disapprove plan in Kapsch CMS



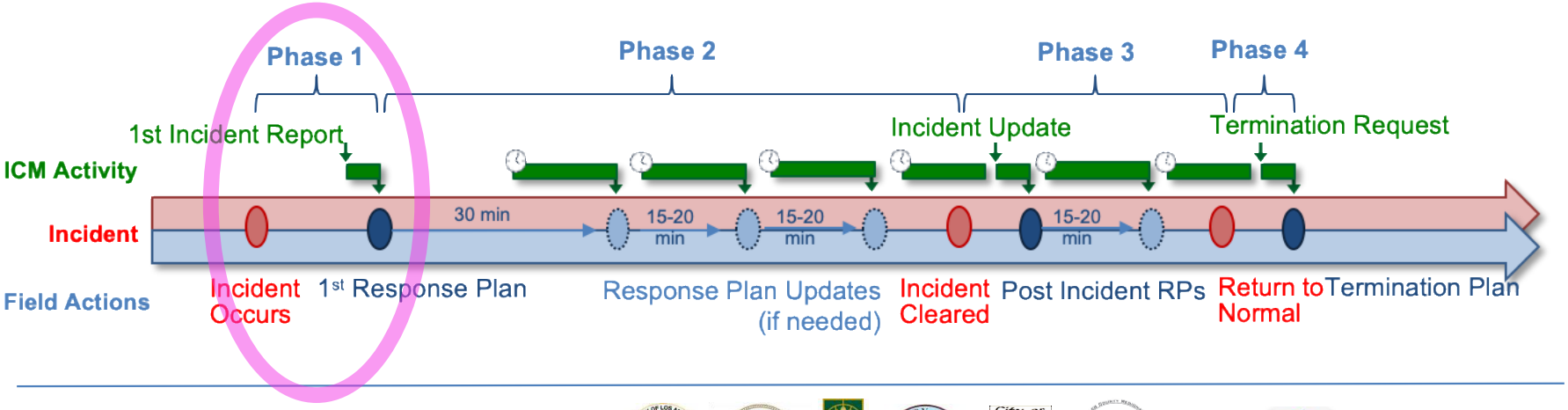
- **If a plan is disapproved, the next ranked, available plan will be offered**

- **After time-out window, the plan is automatically approved**



What happens next?

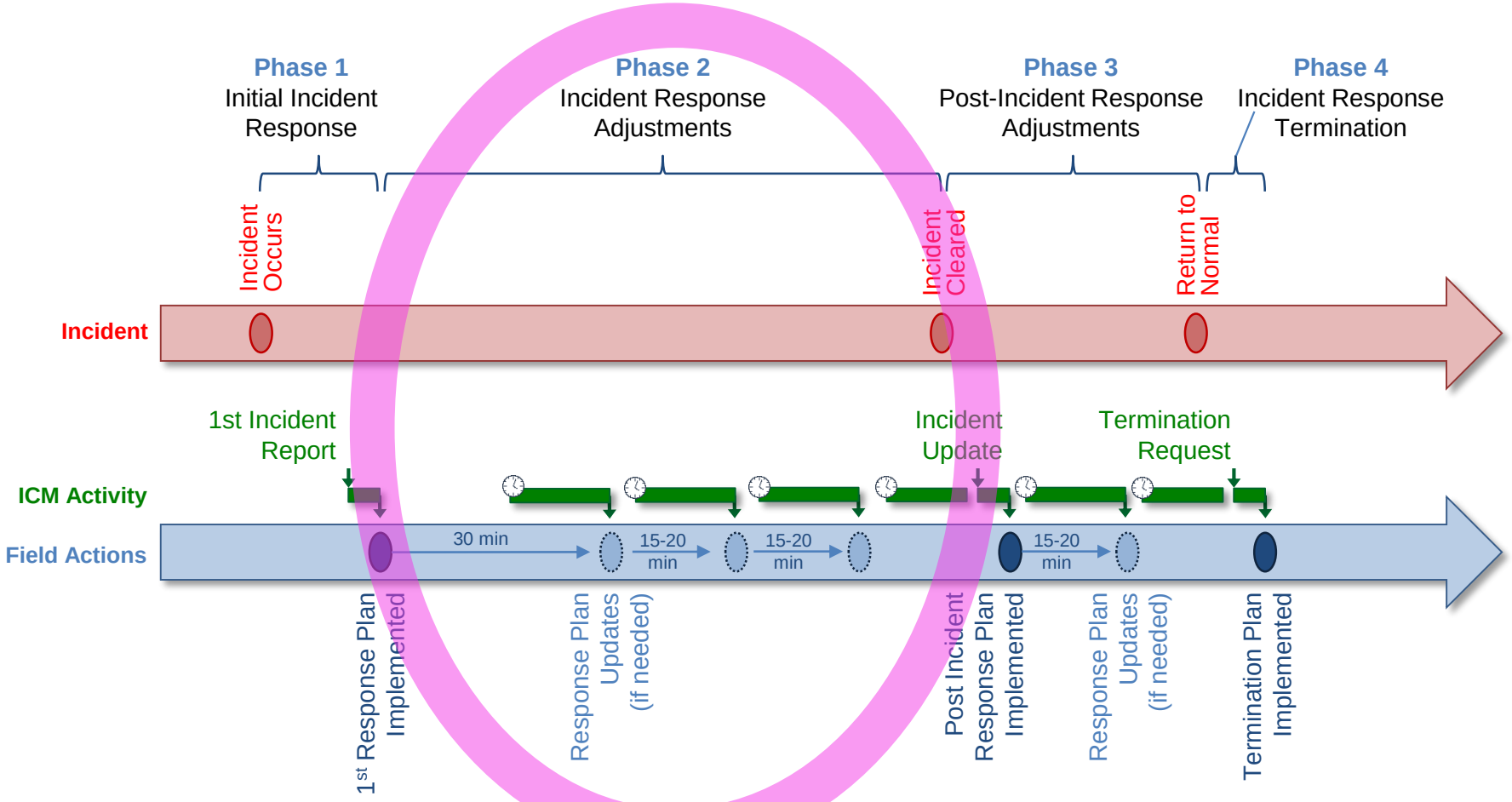
- **Proceed to Phase 2**
- **System will maintain TOD operations if:**
  - No available response plan (no assets available)
  - All response plans rejected
  - TOD is the best plan (1 lane blocked at 2 am)



Response Plan Updates

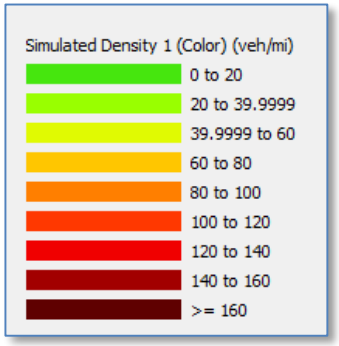
Phase 2

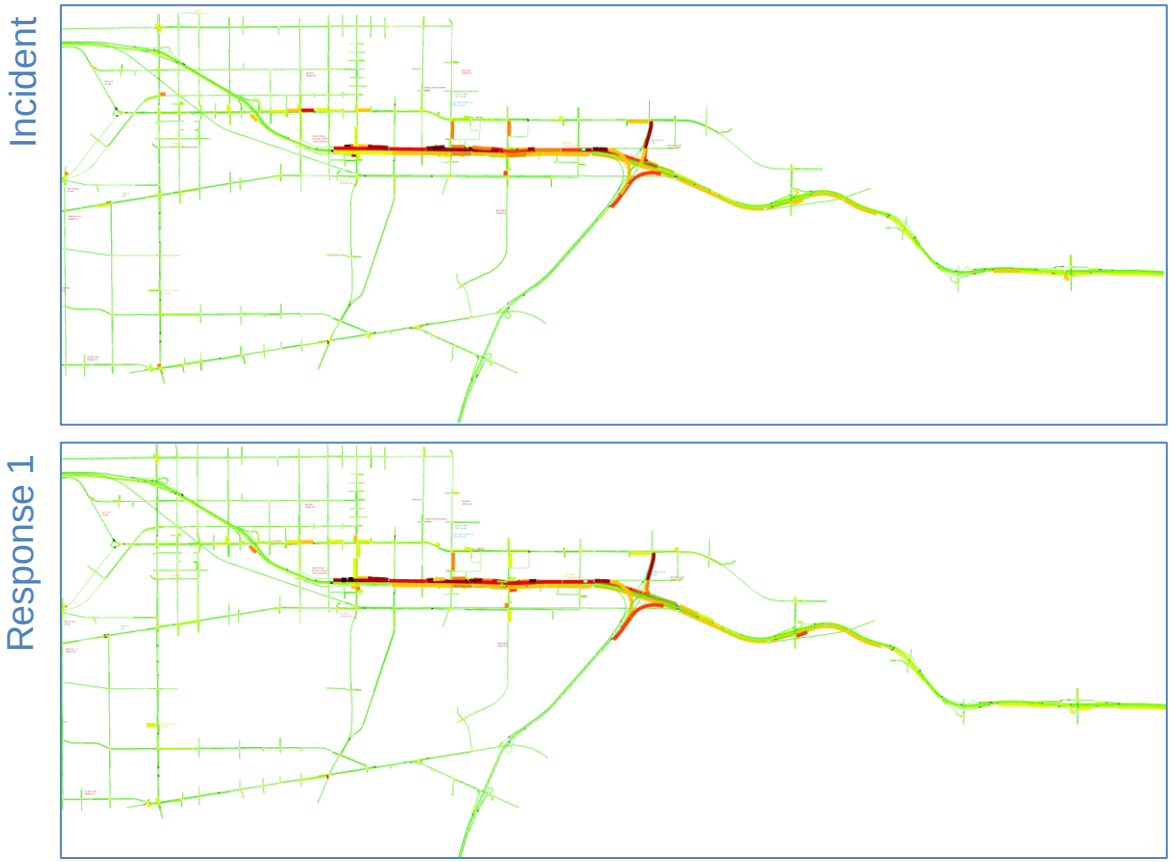
Phase 2: Periodic Evaluation



Response 1

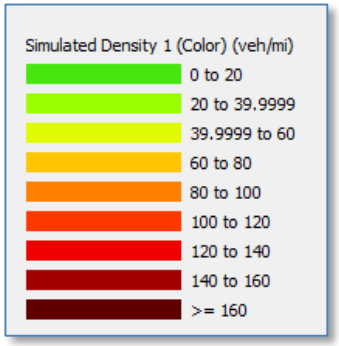
- **2:30 – 25 min into incident / 10 minutes into response**

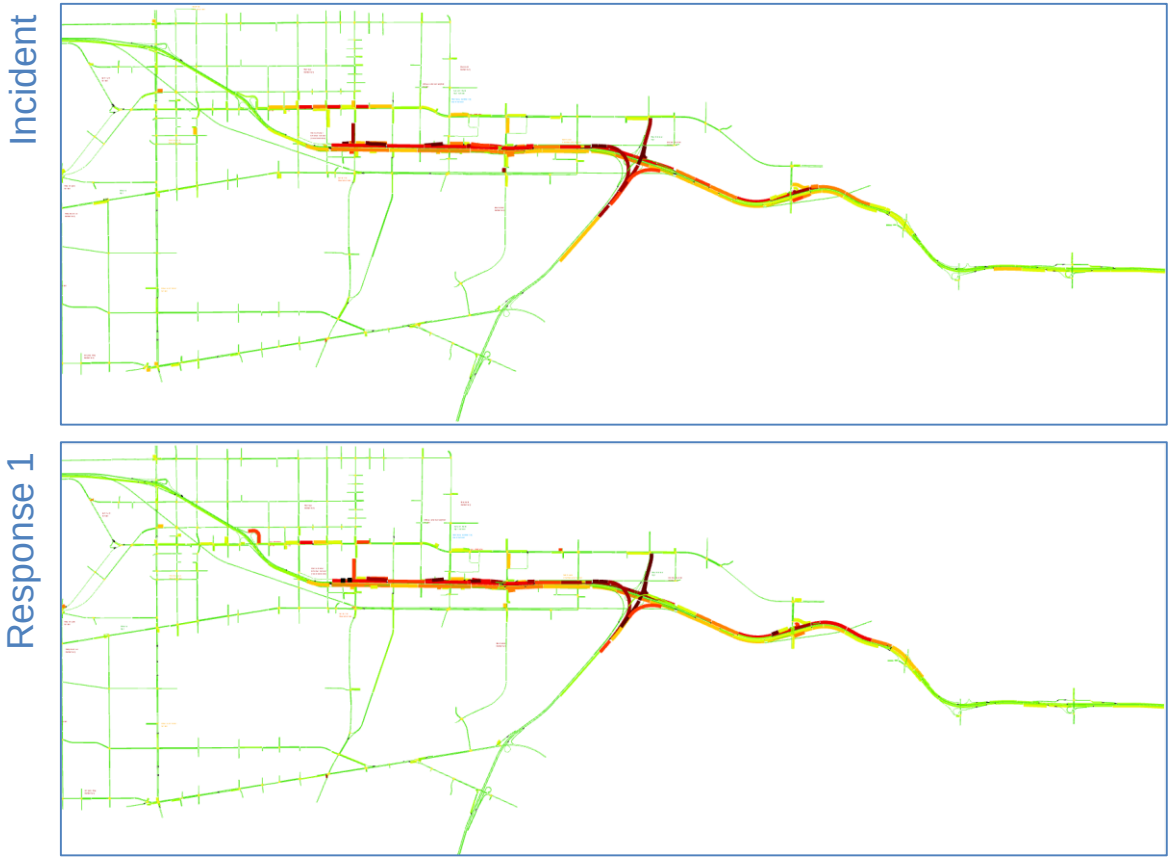




Response 1

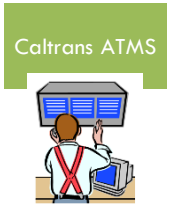
- **2:45 PM – 40 min into incident / 25 min into response**

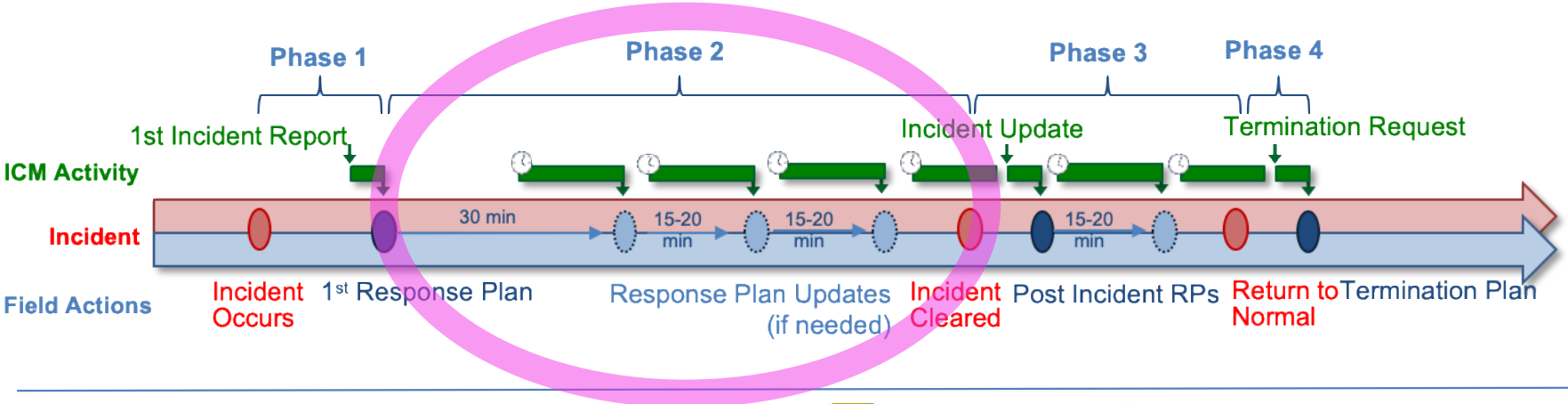




Phase 2 Updates

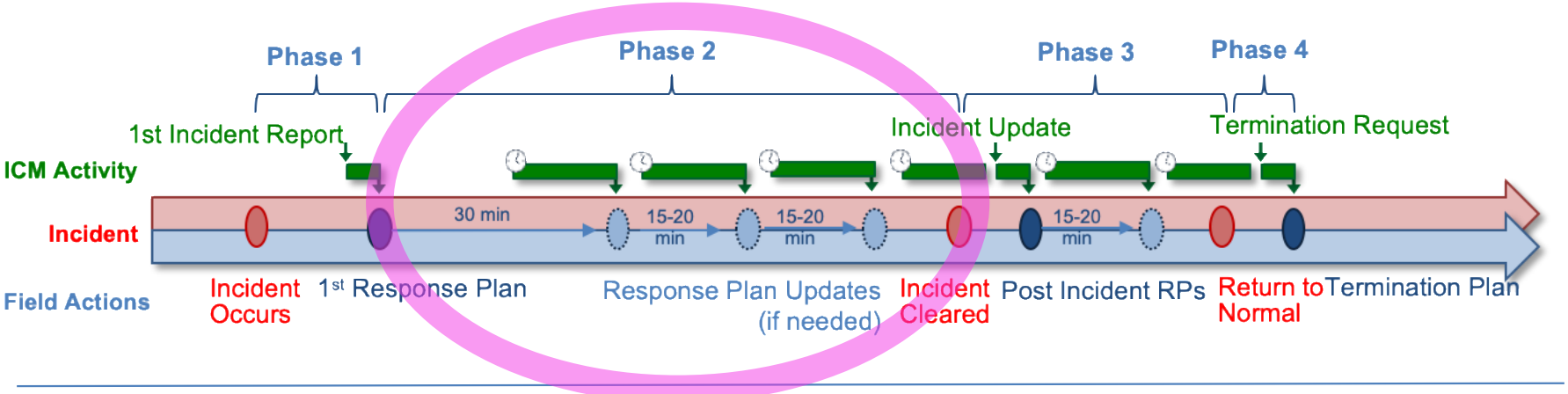
- **ICM Actions**
  - Periodically offer better response plan(s) if available
- **Operator actions**
  - Update incident with new information (modify lanes blocked)
  - Approve or disapprove response plans
  - Request termination
- **If a plan is disapproved, the next ranked, available plan will be offered**
- **After time-out window, the plan is automatically approved**





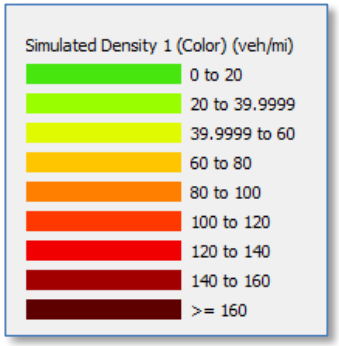
What happens next?

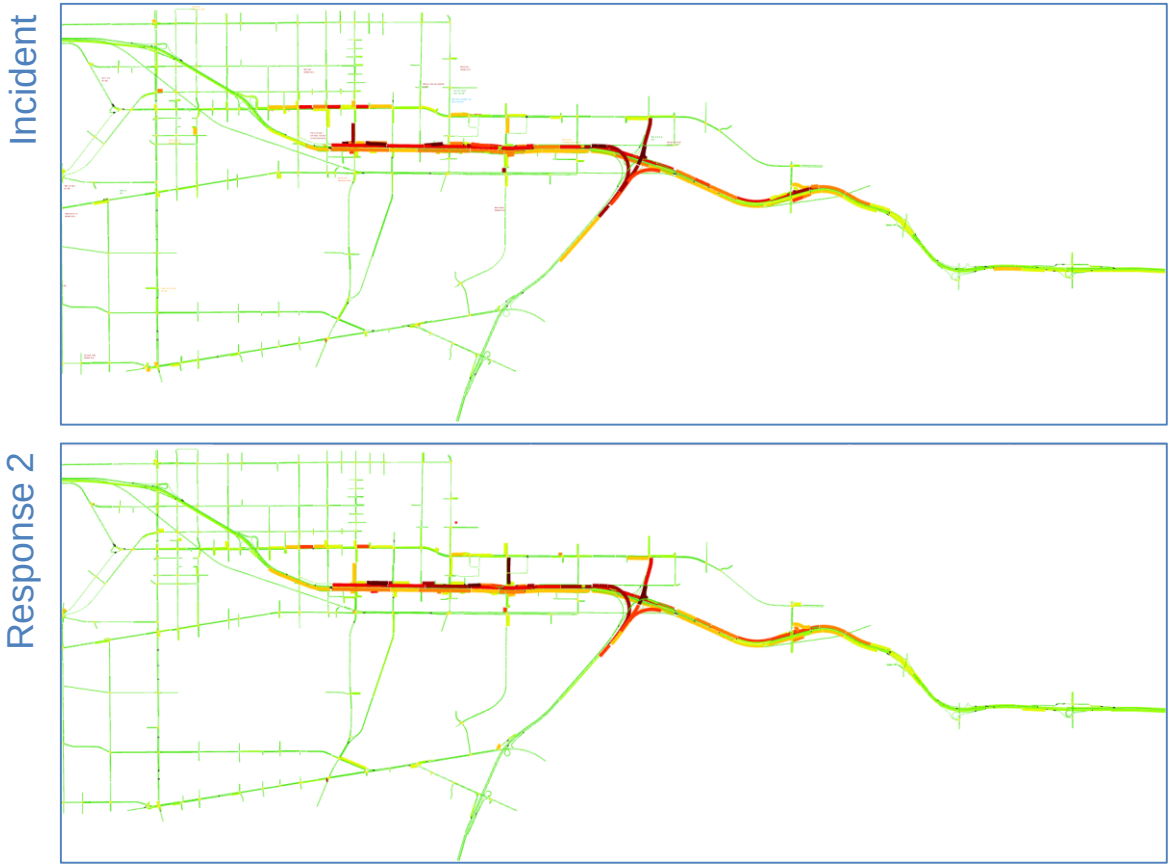
- **If freeway lanes become clear**
  - Operator updates the incident → Phase 3
- **If something else changes**
  - Operator updates the incident → Phase 2
- **If plan cancellation is desired**
  - Operator requests termination → Phase 4



Response 2

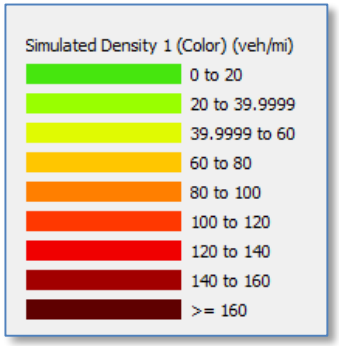
- **2:45 PM – 40 min into incident / 25 min into response**

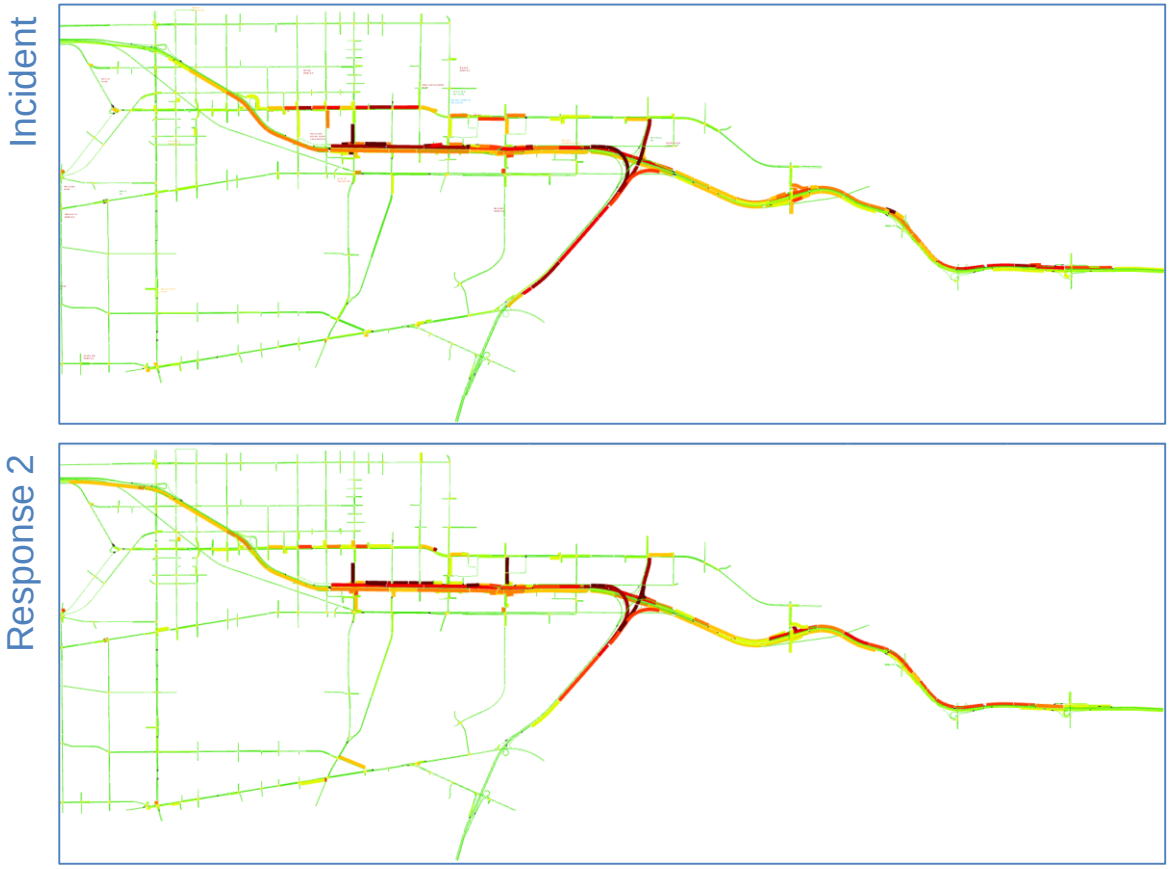




Response 2

- **3:00 PM – 55 min into incident / 40 min into response**

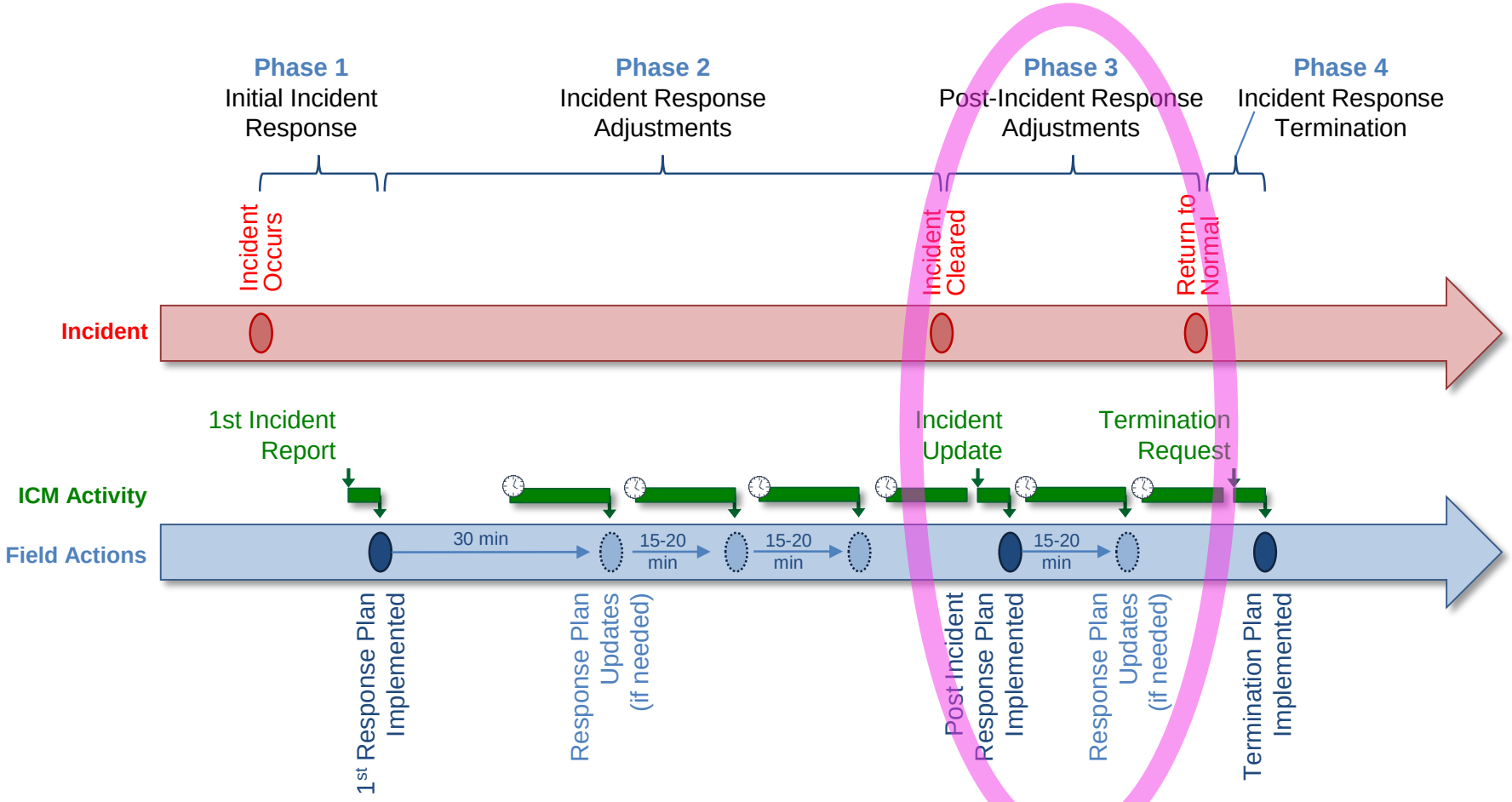




Freeway Lanes Cleared

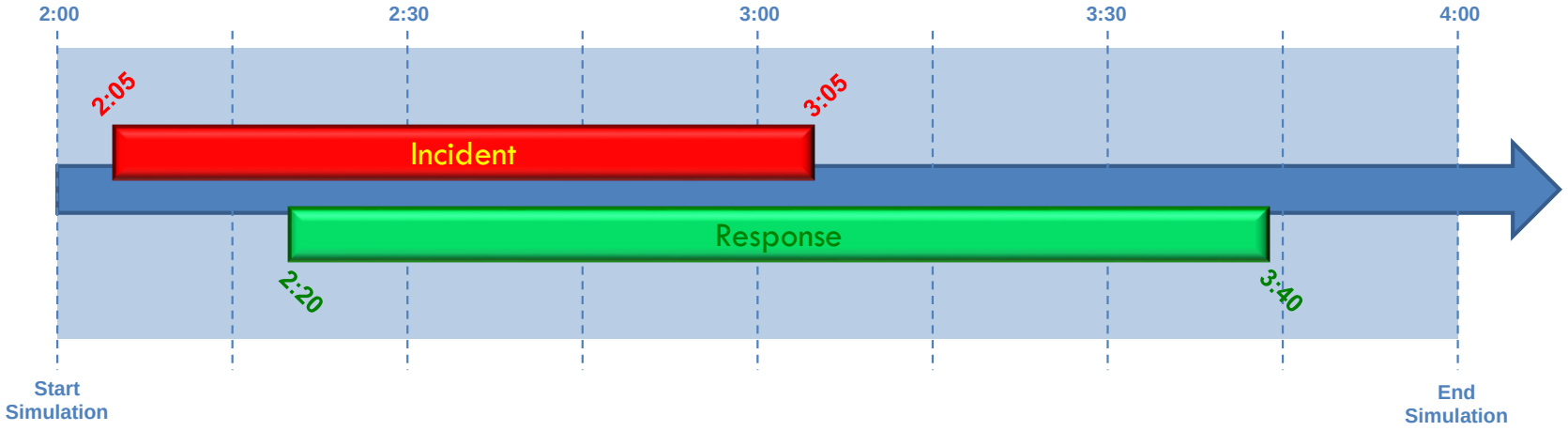
Phase 3

Phase 3: Post-Incident Plan

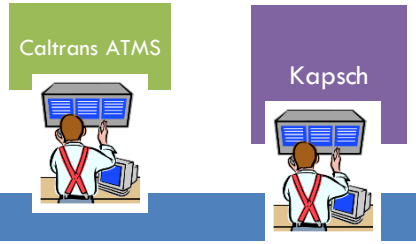


Simulated Incident and RP Life Cycle

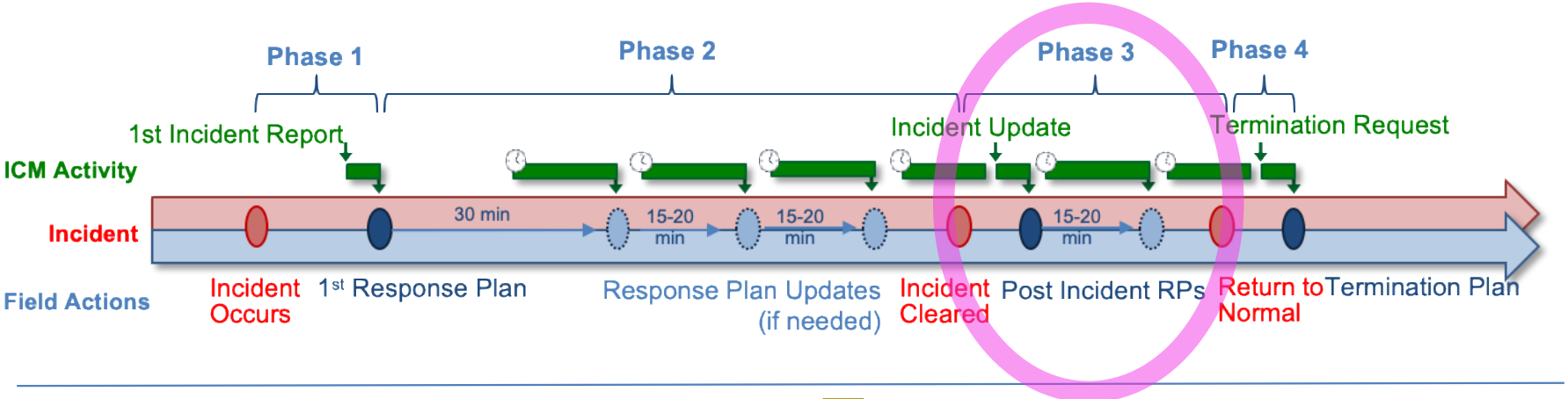
- **To clear excess traffic on arterial streets, RP extends beyond end of freeway incident**



Entering Phase 3

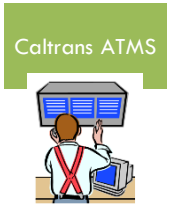


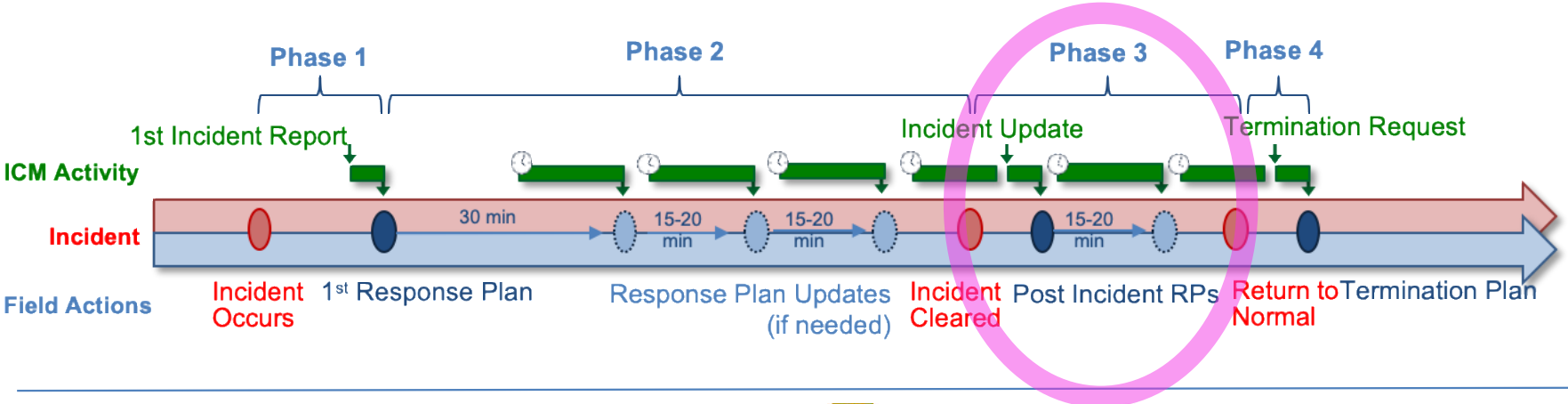
- Operator updates incident to inform ICM system that freeway lanes are no longer blocked
- ICM offers a new response plan deleting CMS alternate route
- If a plan is disapproved, the next ranked, available plan will be offered
- After time-out window, the plan is automatically approved



Phase 3 Updates: Same as Phase 2

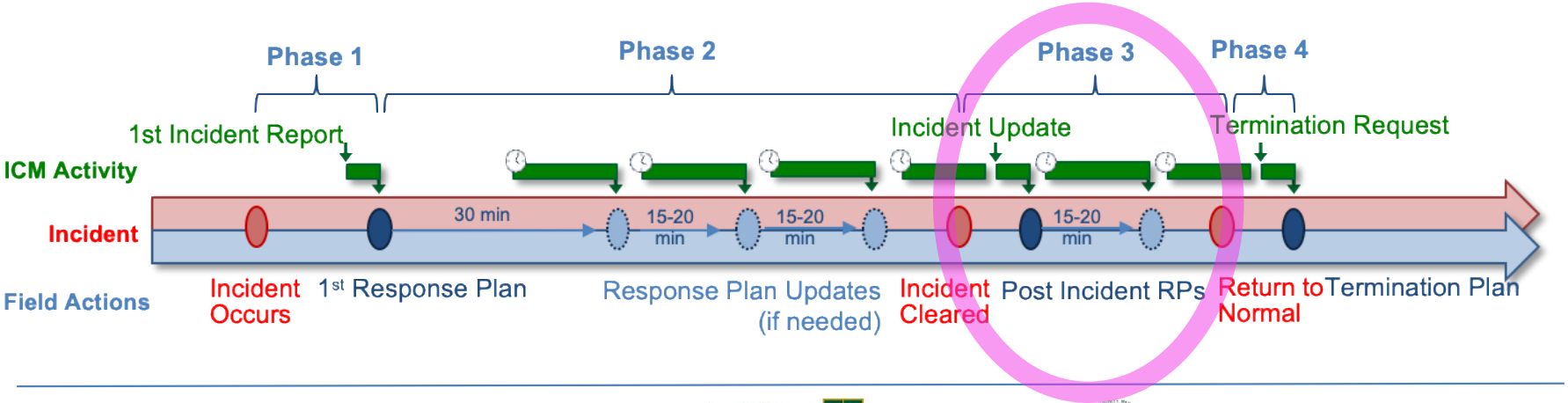
- **ICM Actions**
  - Periodically offer better response plan if available
- **Operator actions**
  - Update incident with new information (modify lanes blocked)
  - Approve or disapprove response plans
  - Request termination
- **If a plan is disapproved, the next ranked, available plan will be offered**
- **After time-out window, the plan is automatically approved**





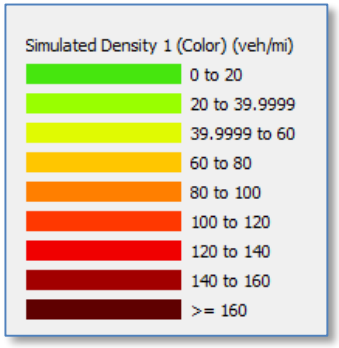
What happens next?

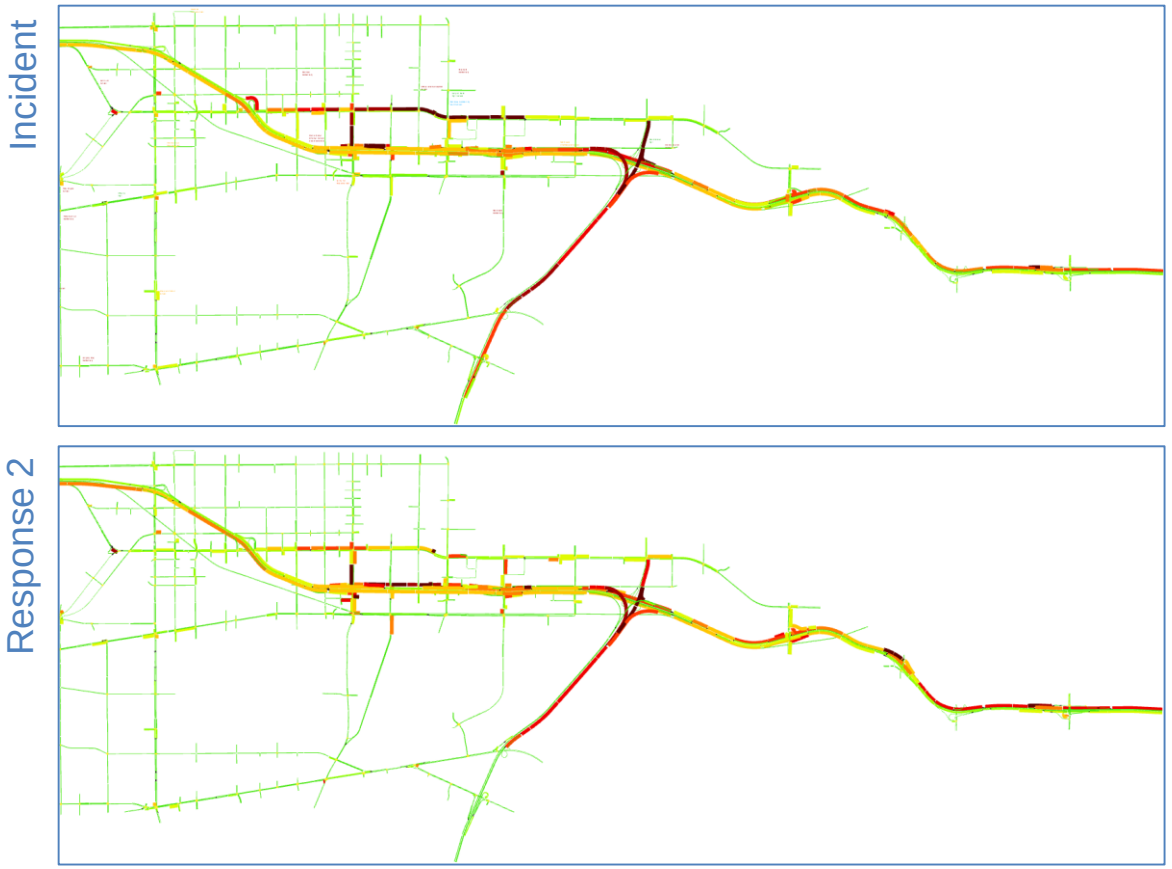
- **If freeway lanes become blocked again**
  - Operator updates the incident → Phase 2
- **If something else changes**
  - Operator updates the incident → Phase 3
- **If plan cancellation is desired**
  - Operator requests termination → Phase 4



Response 2

- **3:15 PM – 10 min after incident end / 55 min into response**

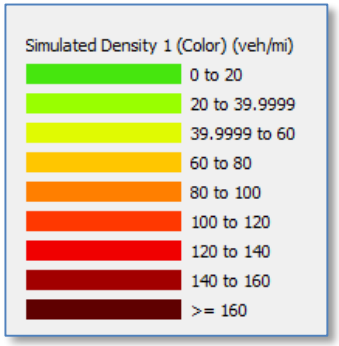


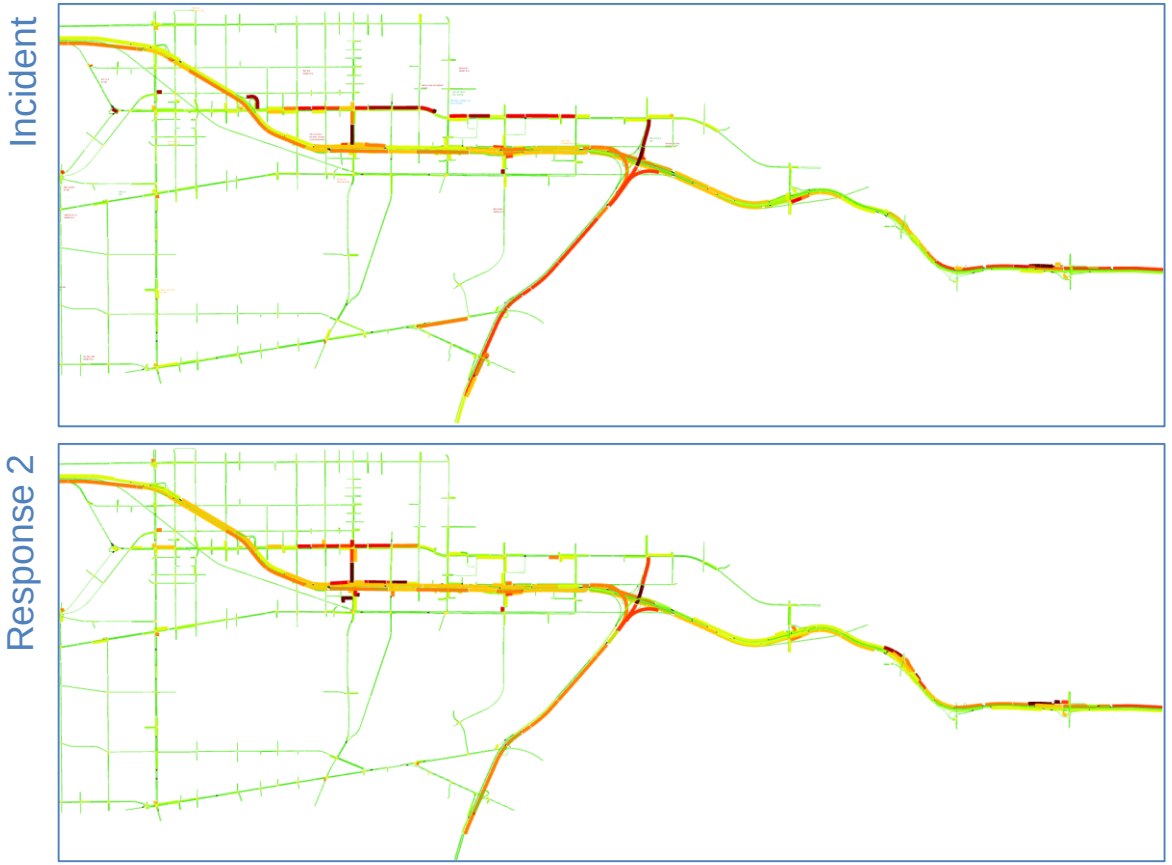


Typical to observe significant arterial congestion after the freeway lanes are cleared

Response 2

- **3:30 PM – 25 min after incident end**

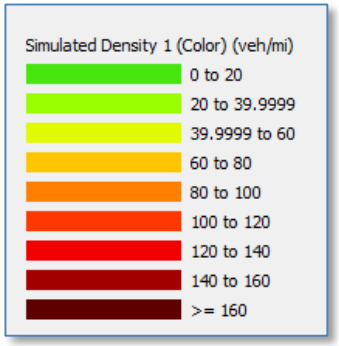




Typical to observe significant arterial congestion after the freeway lanes are cleared

Response 2

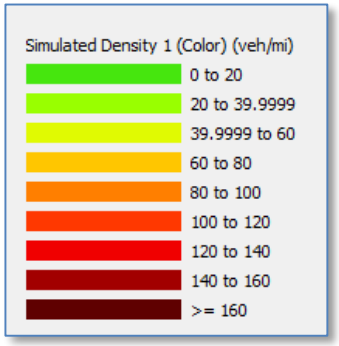
- **3:45 PM – 40 min after incident end**

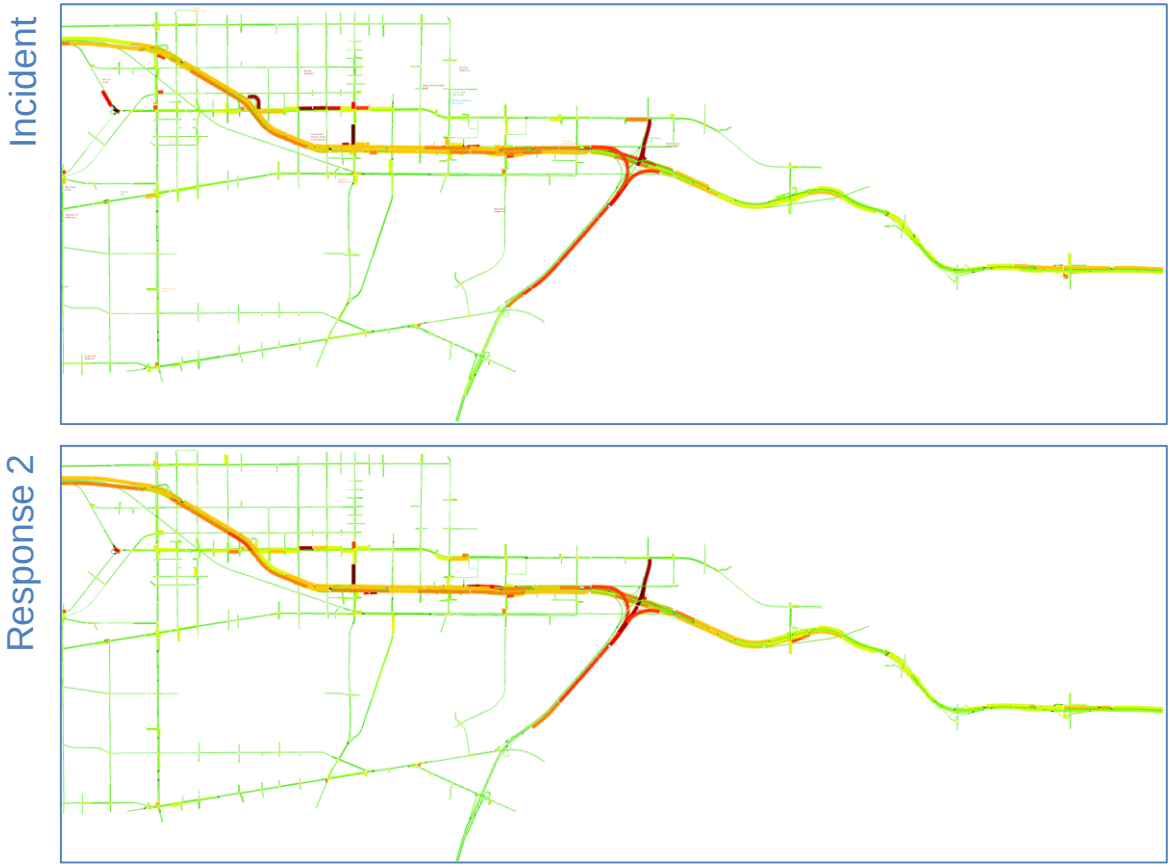


Typical to observe significant arterial congestion after the freeway lanes are cleared

Response 2

- **4:00 PM – 55 min after incident end**

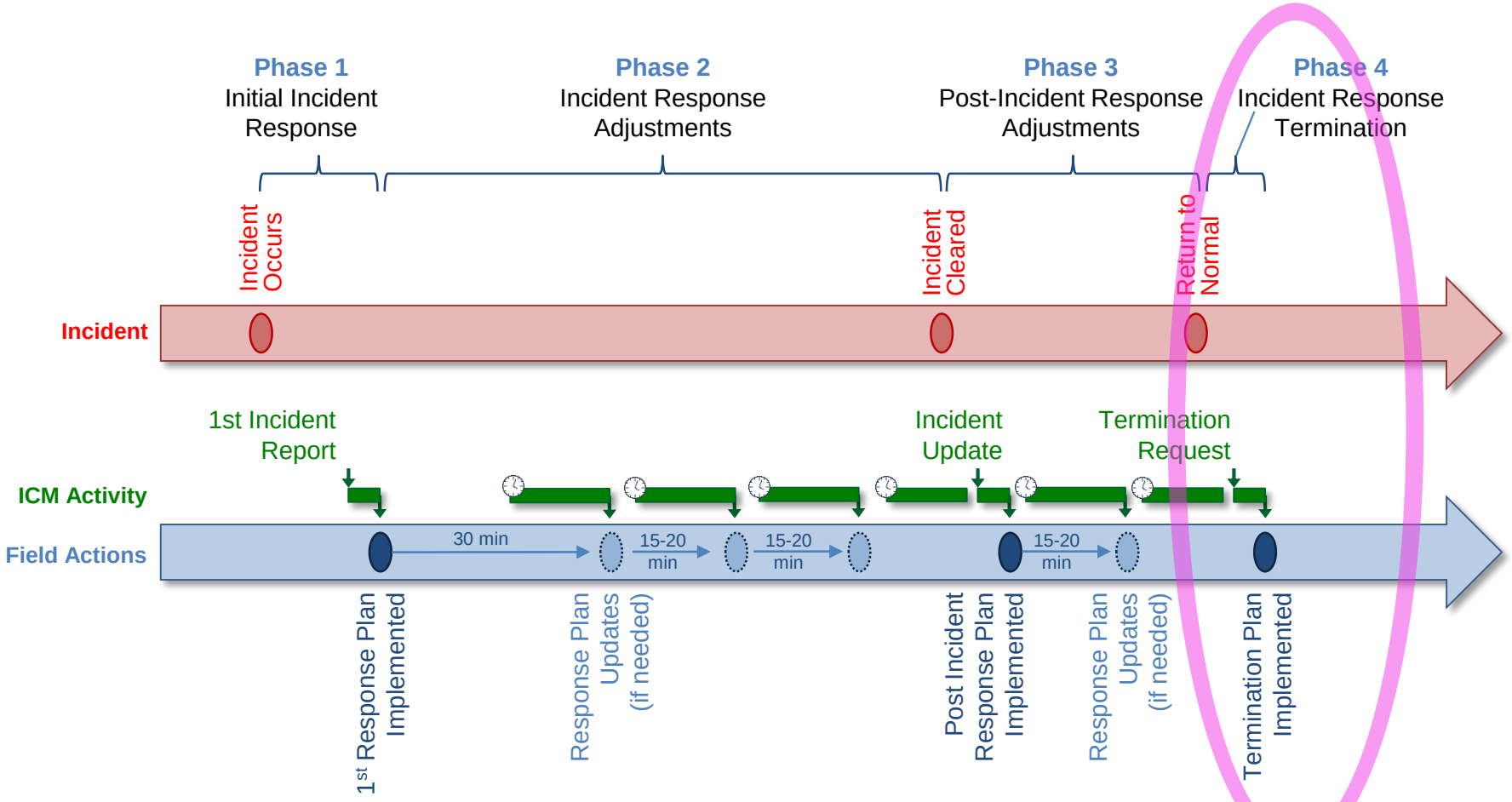




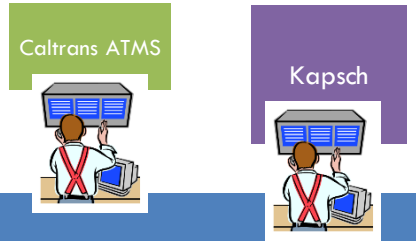
Excess Congestion Cleared

Phase 4

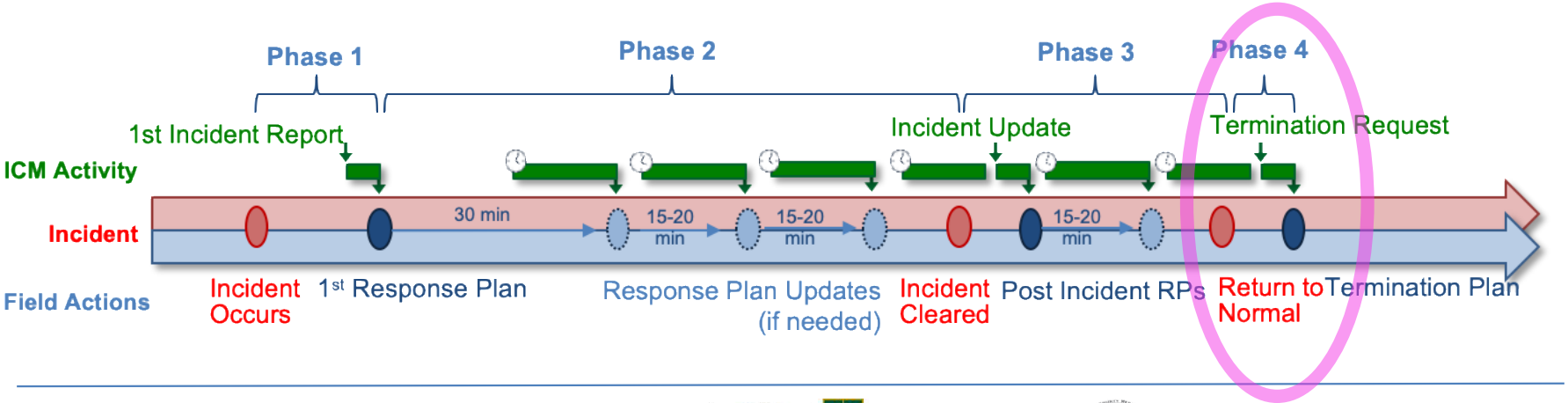
Phase 4: Termination Request



Entering Phase 4

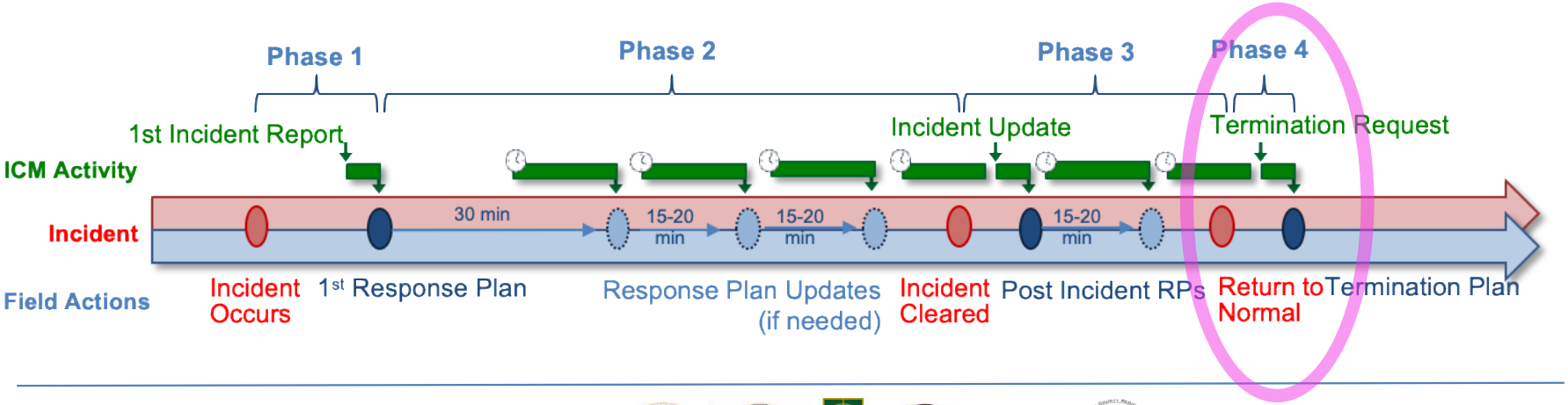


- Operator requests termination
- ICM offers a new response plan that releases resources
- If the termination is disapproved, the current plan will remain in place and termination will not occur
- After time-out window, the termination is automatically approved



What happens next?

- **If termination plan is approved**
  - Resources are released and operations return to TOD
- **If termination plan is disapproved**
  - System returns to Phase 2 or Phase 3 as appropriate



Incident Closed

AMS Accomplishments

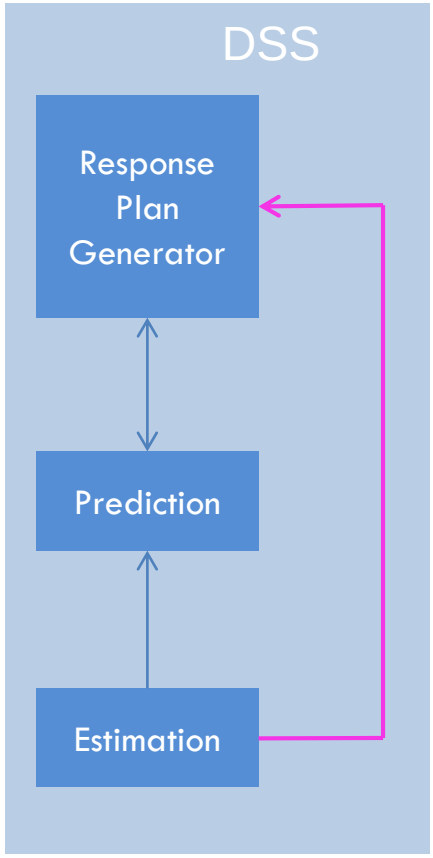
AMS Accomplishments

- **Prediction**
  - New snapshot of the simulation model in Aimsun 20 was completed
  - Aimsun prediction is running in the cloud (with cloud license)
- **Response Plan Generator (RPG)**
  - Updated to consume asset inventories and states from the data feeds. This is important to disqualify response plans that require unavailable assets
  - Methods to rectify changes in inventory IDs are implemented. This is important so that response plans in all parts of the DSS, model, and system can be maintained, and synchronized

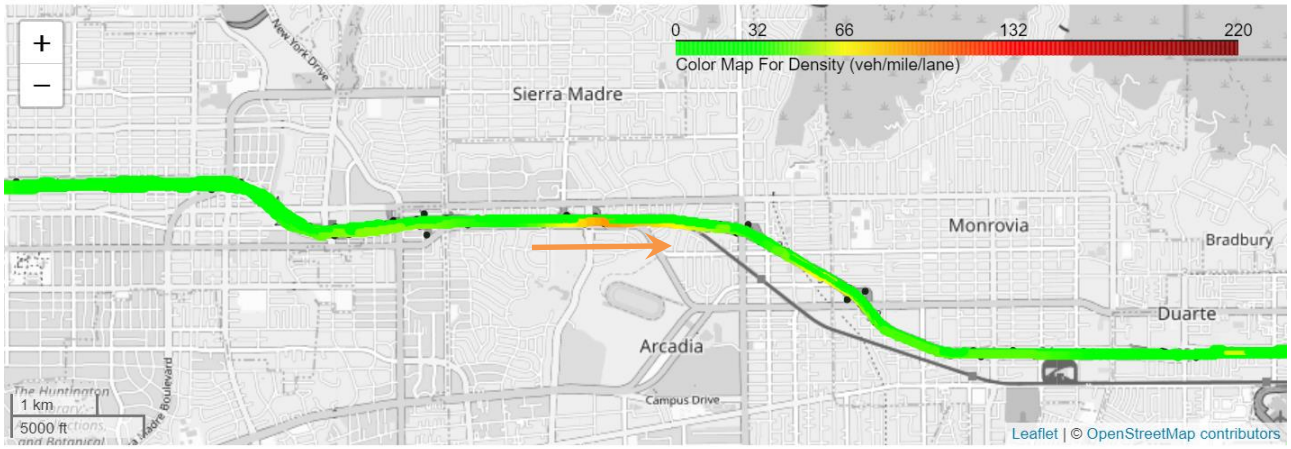
AMS Accomplishments

- **Estimation**
  - Completed testing of real-time queue estimation
  - Arterial estimation is being upgraded to handle intersections with more complicated topology. Coding has been completed and testing is on schedule
- **Integration**
  - Integrating queue estimation results with rules, so that the RPG can use the freeway back of queue conditions to select the response plans
- **Lane closure systems (LCS)**
  - Began initial tasks to review data structures and the mapping of fields

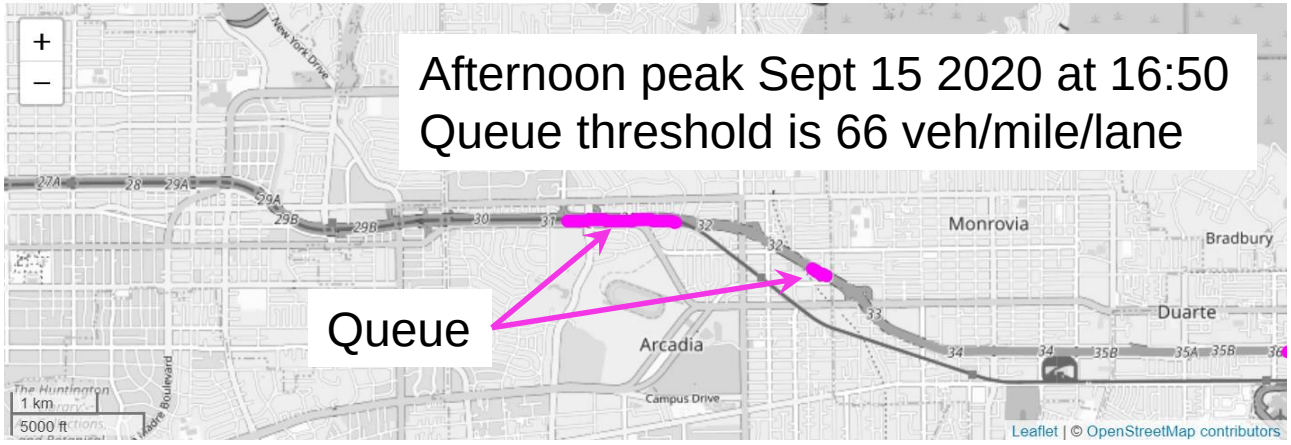
Freeway Queue Estimation Tested



Traffic State Estimation Visualization



Queue Estimation Visualization



AMS Next steps

- Focus on Response Plan Generator (Rules)
- Add rules to handle queue information for plan selection
- Integrate and test RPG working with queue estimation information
- Complete testing of estimation components to handle more complicated intersection topologies in the CC network

Data Quality

I-210 – Freeway Data Quality

- Excellent overall data availability on core I-210
- SR-134 and I-605 have had some construction
- Real-time feeds are mostly stable, despite sporadic, short-lived outages
- PeMS outages in September and October were quickly resolved

Caltrans (freeways) | Arcadia | Pasadena | Summary

Weekly Average Sensor Availability
Hover over cells to view units in detector-days.

I-210 | Eastbound PM 25 - PM 43.25

		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
	21 22 23 24 25 26 27			100.0%	86.9%	95.1%	90.9%	96.0%	93.6%
	28 29 30 1 2 3 4			100.0%	89.0%	94.6%	90.9%	96.0%	93.6%
July	5 6 7 8 9 10 11			85.7%	76.7%	81.5%	77.9%	82.3%	80.6%
	12 13 14 15 16 17 18			85.7%	75.9%	81.4%	77.9%	82.3%	80.4%
	19 20 21 22 23 24 25			85.7%	75.5%	81.5%	77.9%	82.3%	80.4%
	26 27 28 29 30 31 1			100.0%	84.1%	93.5%	90.9%	93.7%	92.0%
August	2 3 4 5 6 7 8			100.0%	87.8%	95.5%	90.9%	96.0%	94.0%
	9 10 11 12 13 14 15			100.0%	87.3%	94.7%	90.9%	96.0%	93.4%
	16 17 18 19 20 21 22			100.0%	88.6%	93.0%	90.9%	96.0%	92.6%
	23 24 25 26 27 28 29			100.0%	86.5%	93.8%	90.9%	96.0%	92.8%
	30 31 1 2 3 4 5			100.0%	88.6%	93.6%	90.9%	96.0%	92.9%
September	6 7 8 9 10 11 12			100.0%	86.5%	92.6%	89.6%	92.0%	91.5%
	13 14 15 16 17 18 19			85.7%	73.1%	79.2%	77.9%	78.9%	78.3%
	20 21 22 23 24 25 26			57.1%	49.0%	53.4%	53.2%	54.3%	53.0%
	27 28 29 30 1 2 3			100.0%	83.7%	92.3%	93.9%	96.0%	91.9%
October	4 5 6 7 8 9 10			100.0%	81.6%	89.1%	96.5%	96.0%	90.0%
	11 12 13 14 15 16 17			85.7%	69.4%	76.3%	83.1%	82.3%	77.1%
	18 19 20 21 22 23 24			100.0%	83.7%	90.9%	97.0%	96.0%	91.4%
	25 26 27 28 29 30 31			100.0%	83.7%	90.5%	96.1%	96.0%	91.0%
November	1 2 3 4 5 6 7			100.0%	87.8%	93.8%	93.9%	95.4%	93.3%
	8 9 10 11 12 13 14			100.0%	89.0%	95.3%	93.9%	96.0%	94.4%
	15 16 17 18 19 20 21			100.0%	87.8%	94.9%	93.9%	96.0%	94.0%
	22 23 24 25 26 27 28			100.0%	89.0%	95.2%	93.9%	98.9%	94.7%

Data Readiness Grid

Asset Data and Status Weekly Report (12/07/2020)					
Agency	**System**	**Asset Type**	**Critical for Launch?**	**Ready for Launch?**	**Comment**
Caltrans	PeMS	PeMS Data	Yes (as a workaround for ATMS)	Yes	Minor sporadic outages
	ATMS	Freeway Detector Messages	No (workaround available)	NA	
		Ramp Meter Messages	Yes	Almost	
		DMS Messages	Yes	Almost	
	TSMSS/TransSuite	Intersection Detector	Yes	Not yet	Fix in process to enable software update
		Intersection Signal	Workaround available	NA	Will likely use same workaround as Arcadia
Arcadia	TransSuite	Intersection Detector	Yes	Almost	
		Intersection Signal	Workaround available	NA	Workaround available
LACO	KITS	Intersection Detector	Yes	Almost	
		Intersection Signal	Requires workarounds	No	Workarounds not yet implemented
Duarte	KITS	Intersection Detector	Yes	Almost	
		Intersection Signal	Requires workarounds	No	Workarounds not yet implemented
Monrovia	KITS	Intersection Detector	Yes	Almost	
		Intersection Signal	Requires workarounds	No	Workarounds not yet implemented
Pasadena	McCain	Intersection Detector	Yes	No	
		Intersection Signal	Workaround possibility depends on intersection data	No	

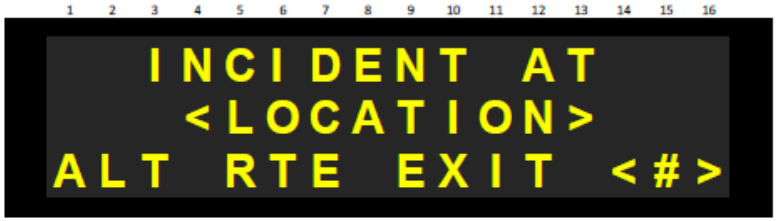
Stakeholder Progress

DMS Signage Discussions (Trailblazer)

- **Discussions held to discuss sign messages and style**

CMS Signage Discussions (Freeway)

- **Constraints**
  - 1 phase: 3 lines
  - 2 phase: 2 lines
  - 16 characters per line



Freeway Messaging - Detour 1			
CMS 1		CMS 2	
CMS 82 - Foothill	INCIDENT **ALLEN** ALT RTE EXITS **26 27**	None	None
CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXIT **27**	None	None
CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26 27**	None	None
CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26 27**	None	None
CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26 27**	None	None
CMS 137 - W/O Altadena	INCIDENT **ALTADENA** ALT RTE EXIT **28**	None	None
CMS 137 - W/O Altadena	INCIDENT **ALTADENA** ALT RTE EXIT **28**	CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26-28**
CMS 137 - W/O Altadena	INCIDENT **ALTADENA** ALT RTE EXIT **28**	CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26-28**
CMS 137 - W/O Altadena	INCIDENT **ALTADENA** ALT RTE EXIT **28**	CMS 82 - Foothill	INCIDENT **ALTADENA** ALT RTE EXITS **26-28**
CMS 137 - W/O Altadena	INCIDENT **SIERRA MADRE VILLA** ALT RTE EXIT **29A**	None	None
CMS 137 - W/O Altadena	INCIDENT **SIERRA MADRE VILLA** ALT RTE EXIT **29A**	CMS 82 - Foothill	INCIDENT SIERRA MADRE VILLA XX LANES CLOSED
CMS 137 - W/O Altadena	INCIDENT **SIERRA MADRE VILLA** ALT RTE EXIT **29B**	None	None
CMS 137 - W/O Altadena	INCIDENT **SIERRA MADRE VILLA** ALT RTE EXITS **29A 29B**	CMS 82 - Foothill	INCIDENT SIERRA MADRE VILLA XX LANES CLOSED

Response Plans – Stakeholder Progress

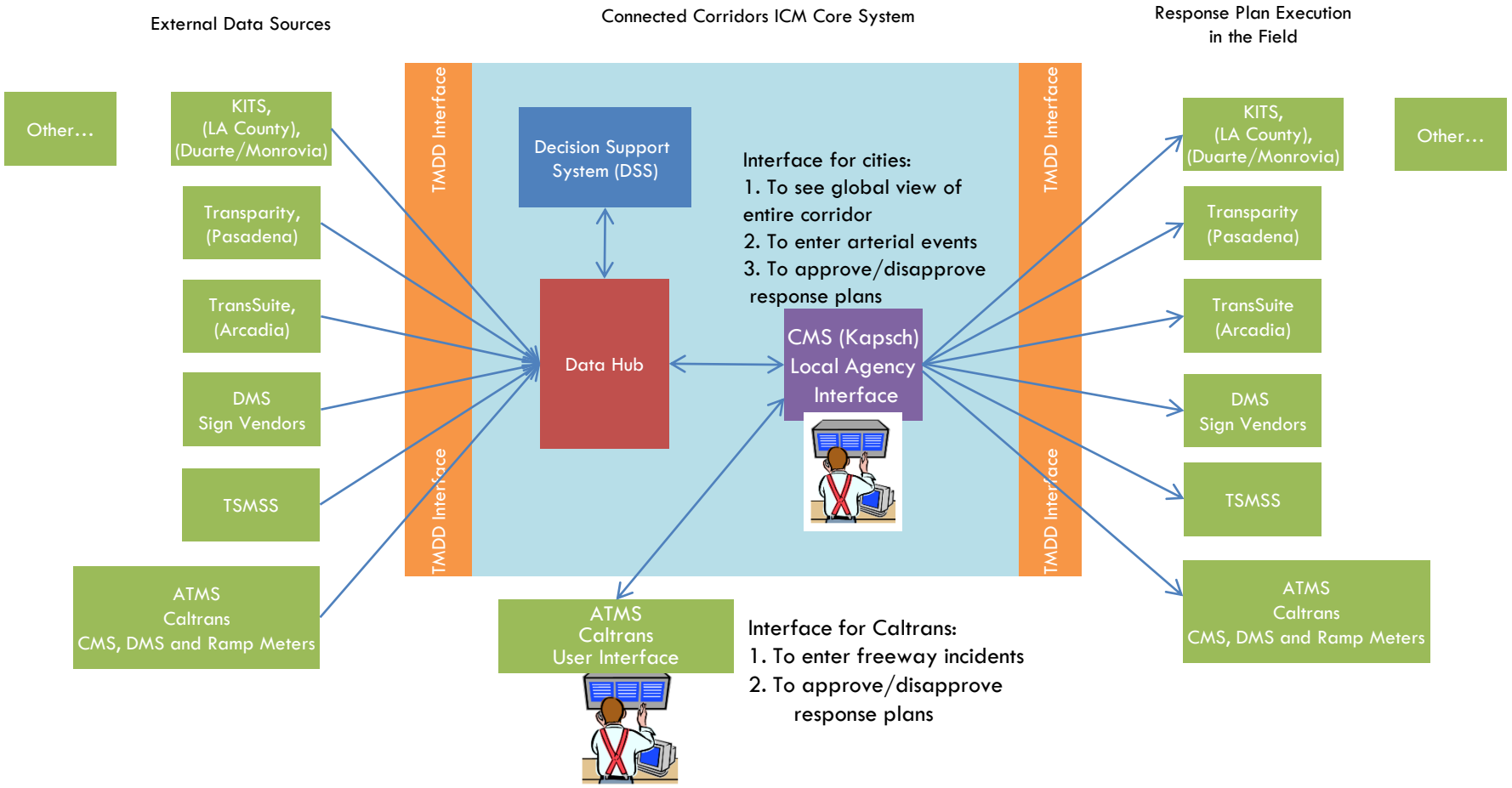
- **Pasadena**
  - Consensus achieved on operations and maintenance of intersections within the City of Pasadena, but owned by Caltrans
  - All signal timing plans have been deployed
- **LA County**
  - Discussion of response plan library and proposed DMS messages in trailblazer signs
- **Monrovia**
  - Equipment replaced at Huntington & Shamrock
- **Duarte**
  - No update

Response Plans – Stakeholder Progress

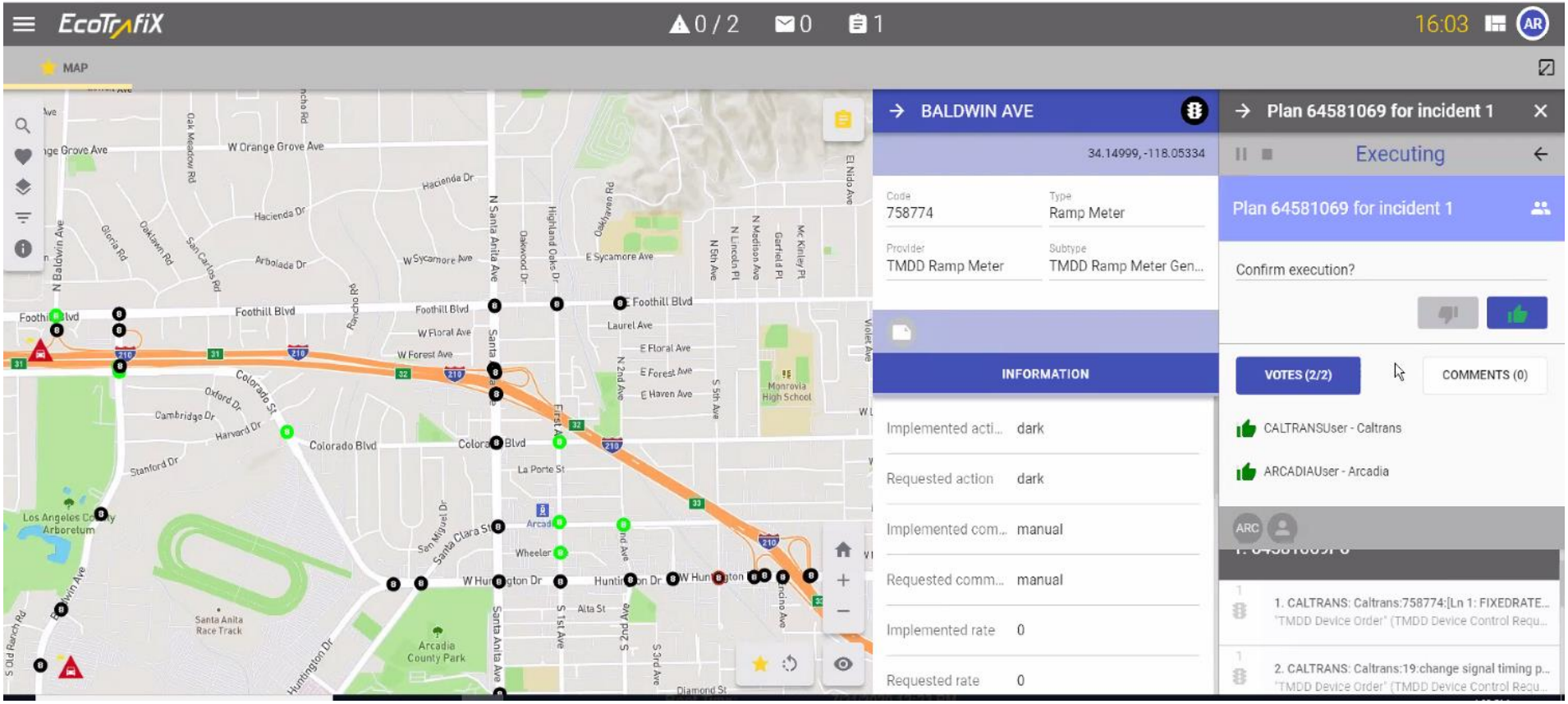
- **Arcadia**
  - No update
- **Caltrans**
  - Discussion of response plan library
  - Initial bench testing reveals that updates to TSMSS server and software are both critical for continued progress
  - TSMSS server has been updated but networking challenges remain

Kapsch Update

CC ICM System Overview



I-210 Integrated Corridor Management
Kapsch Update

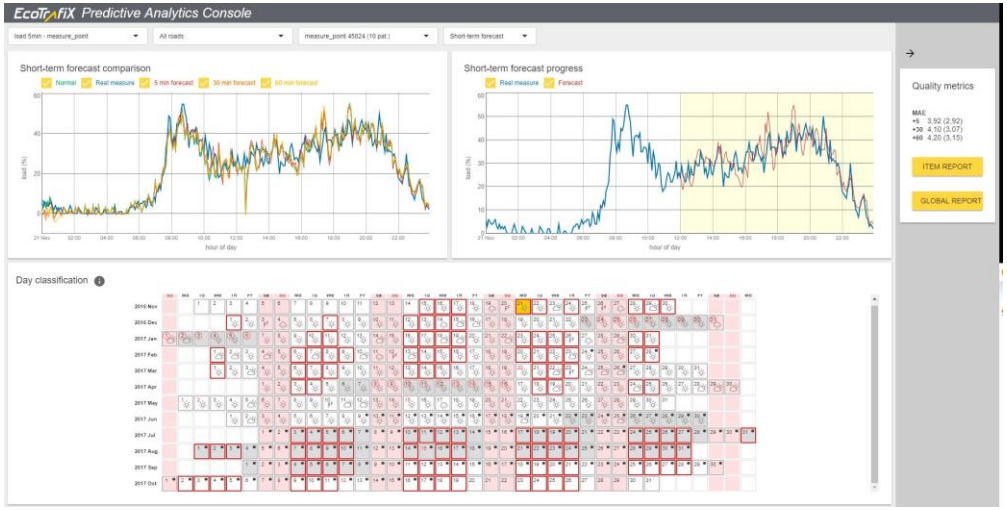


Tim O'Leary
December 8, 2020

EcoTrafiX Product Status

- EcoTrafiX V3.2 was released and operating well.

- Key Features:
  - Improve roadway link incident creation
  - Waze integration
  - Regional Map device filters
  - Regional Map transparent layers



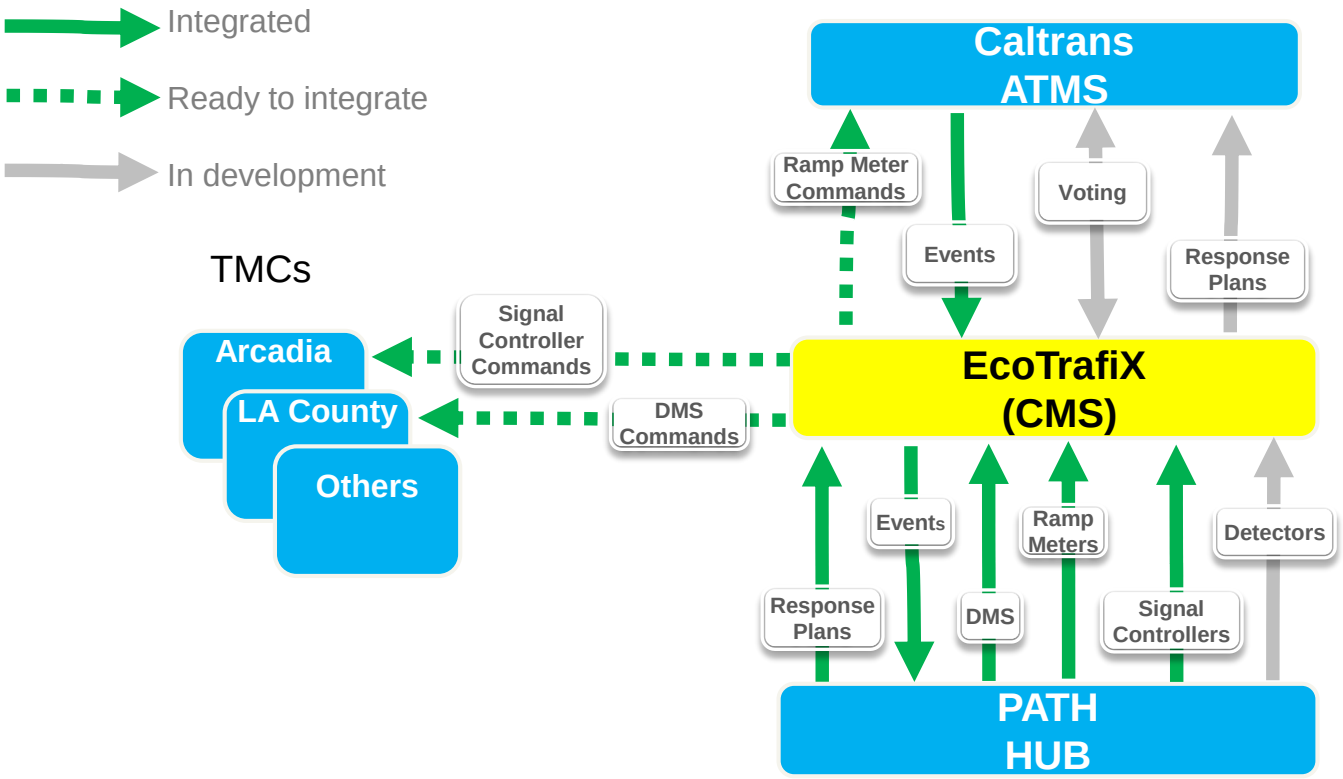
EcoTrafiX Interface Status

Good progress:

- EcoTrafiX continuing to integrate the reception of Response Plans from DSS
- EcoTrafiX receiving events from ATMS
- EcoTrafiX forwarding ATMS and ETX events to PATH's Hub
- EcoTrafiX deployed and running in production

EcoTrafiX Interface Status

Interface



Next Steps

- Continue EcoTrafiX Development
- Develop Cost Analysis for Project Completion
- Continue to support I-210 Pilot with available Resources

Thank You!

Kapsch TrafficCom

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Air Quality Evaluation Before-N-After the COVID-19 Safer@Home Order on I-210

Xinkai Wu, Ph.D.; Xudong Jia, Ph.D., PE; Cal Poly Pomona
Lianyu Chu, Ph.D.; CLR Analytics Inc.
Allen Chen, PE; Leila Sy; Giovanni Magana, Caltrans District 7

Oct.20, 2020

CalPolyPomona

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

CLRAnalytics
Smart Infrastructure for Informed Decision

Background – Task 9

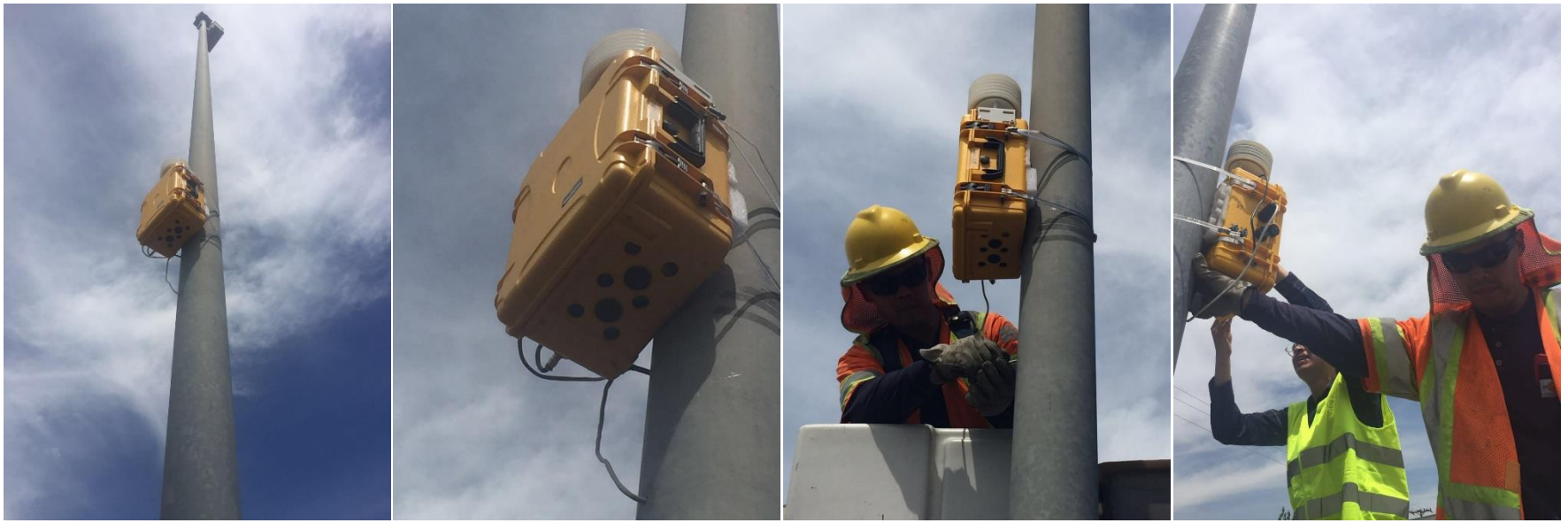
- Task 9: Evaluate the air quality before-N-after the deployment of the CC project

- Covid-19 Safer@Home order provides a unique opportunity to observe the impact of the significantly reduced traffic on air quality.

Background: iAQBox

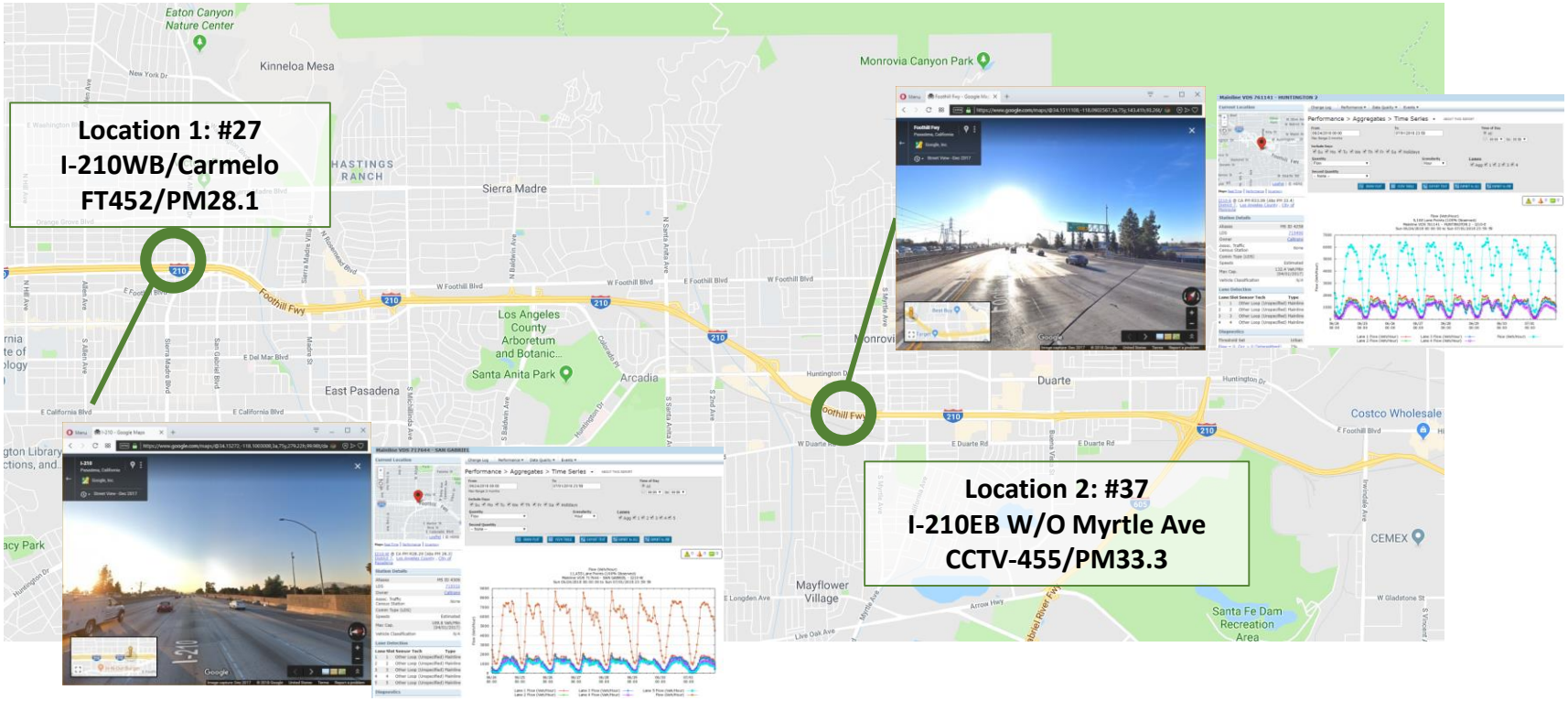
- iAQBox (Intelligent Air Quality Box)
- A Roadside Air Quality Measurement Device, customized from CLR Analytics Inc.
- Collect air quality data:
  - Emissions (CO, NO, NO2, O3, CO2)
  - Particulates (PM2.5, PM10)
  - Meteorological data (temp. and RH)
- Portable
- Low-cost

Field Installation - Mount iAQBox on CCTV Poles

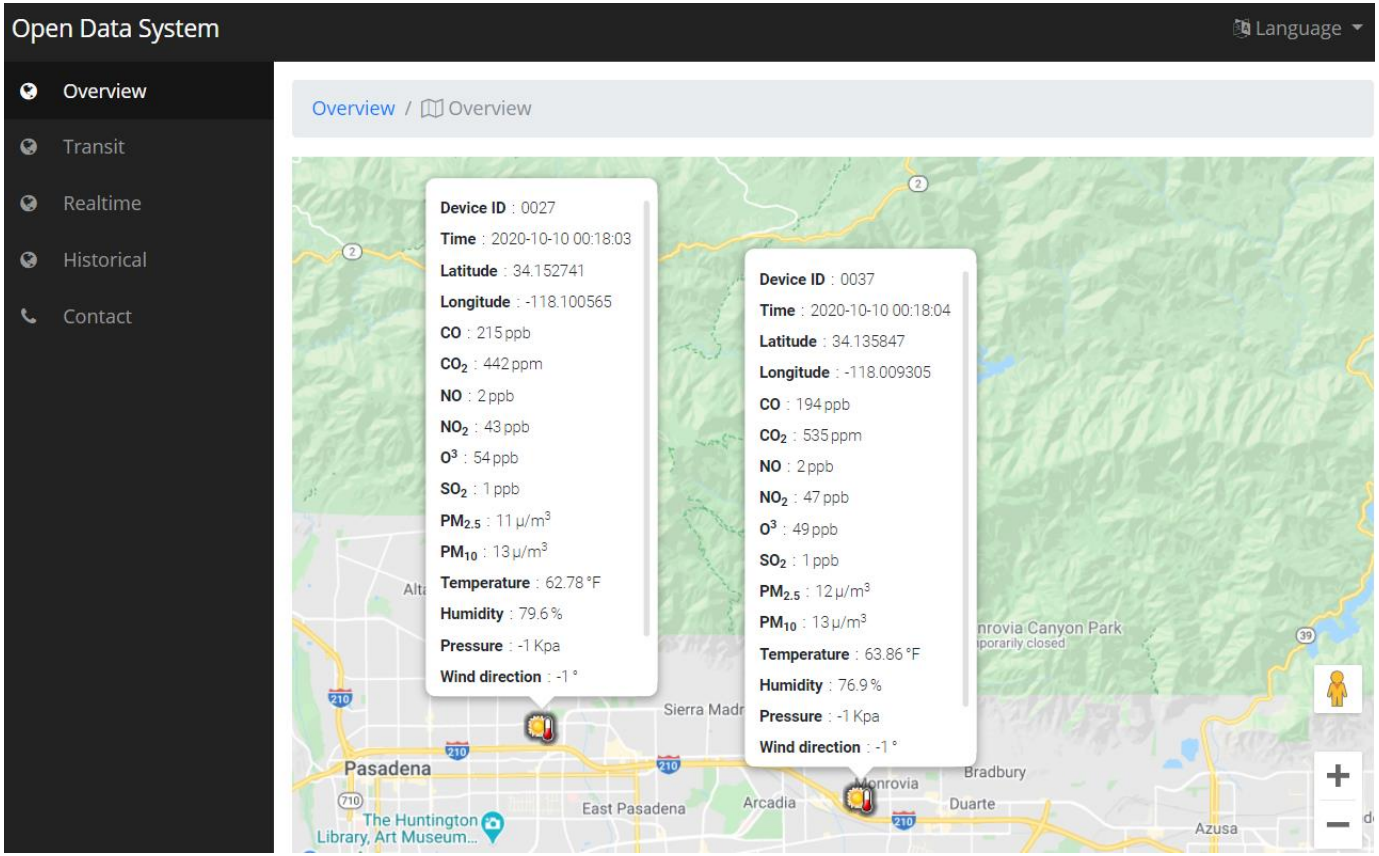


- ✓**Electricity Power Support**
- ✓**Networking Support**

Two Field Installations



Online Data: http://opendatasym.com



Real-Time

10 Weekdays Comparison

Before-N-after the Safer@Home order

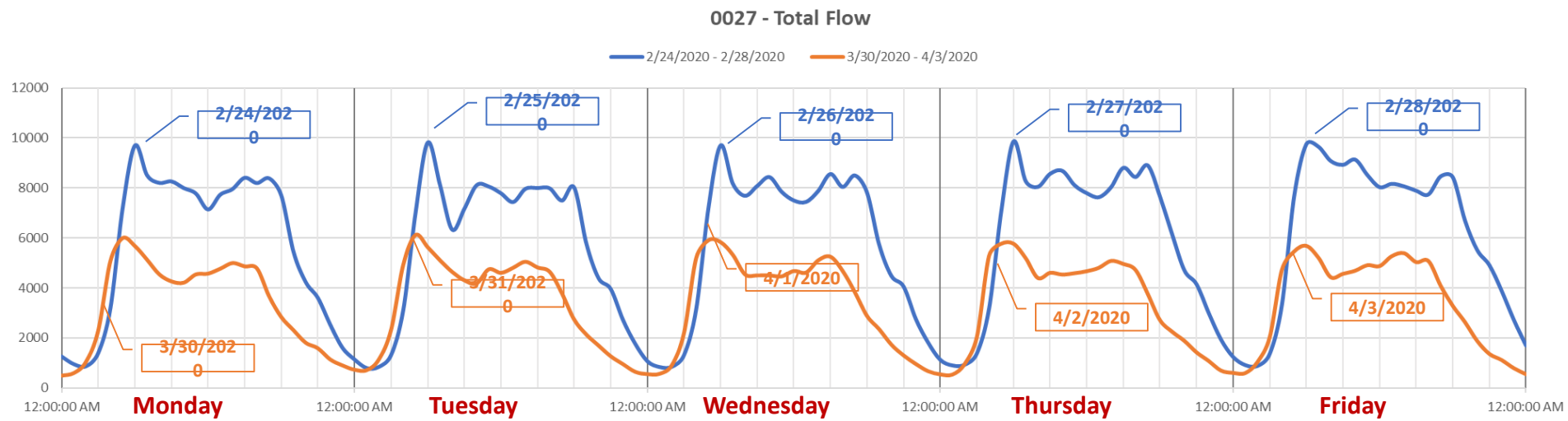
Warnings：

- We are presenting LOTS of Data (Could be very boring ☺).
- We might be the first to present vehicle emission data in such high resolution.
- We only present preliminary results (purely observations).

Traffic Data from PeMS

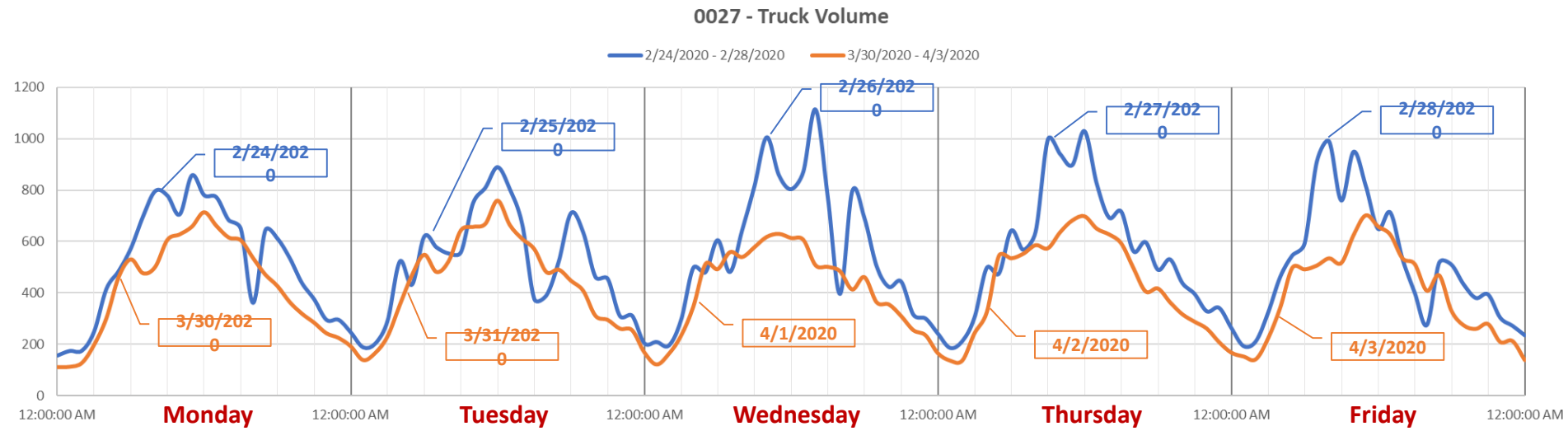
Before-N-after the Safer@Home order

Total Traffic Volume B-N-A Safer@Home Order



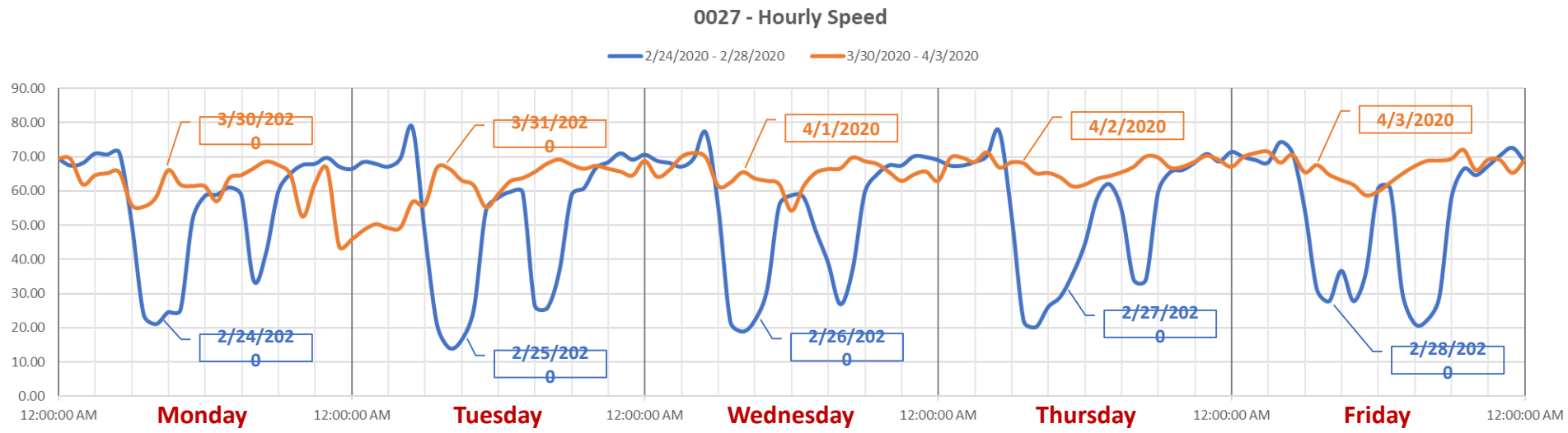
Before: Blue lines; After: Orange lines

Total Truck Volume B-N-A Safer@Home Order



Before: Blue lines; After: Orange lines

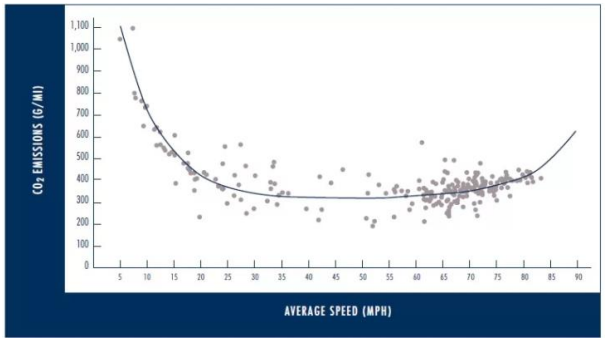
Hourly Speed B-N-A Safer@Home Order



Before: Blue lines; After: Orange lines

Observations: Air Quality Before-N-After Safer@Home Order

Observation 1: **More flow / VMT leads to more CO2.**



- **More CO2 emission at low speed**
- **Factors, such as sunshine, lead to the decrease of CO2.**

- **Background:**
  - Vehicles are now America's biggest CO2 source [1].
  - Vehicles emit higher CO2 during traffic congestion [2].
  - Roughly a third of America’s carbon dioxide (CO2) emissions come from moving people or goods, and 80 percent of these emissions are from cars and trucks [3].

References:

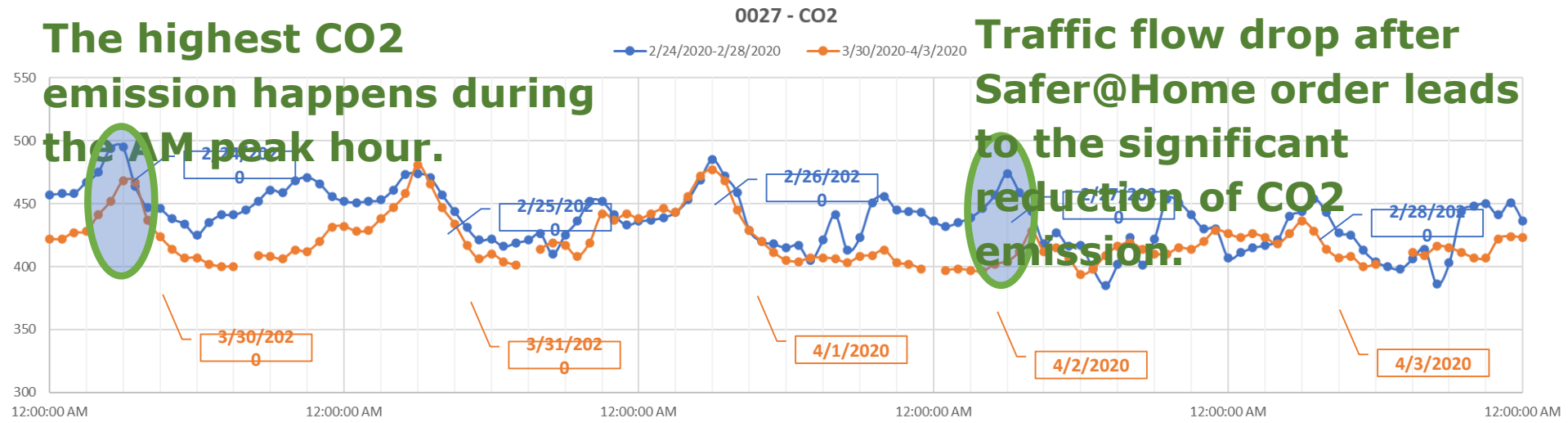
[1] https://www.theguardian.com/environment/2018/jan/01/vehicles-climate-change-emissions-trump-administration

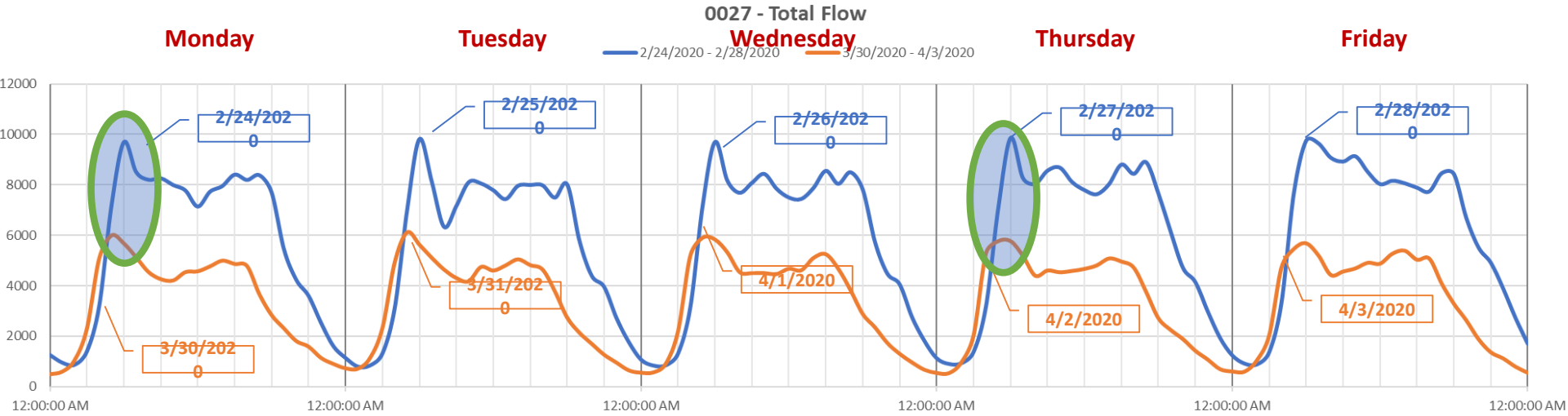
[2] https://www.accessmagazine.org/fall-2009/traffic-congestion-greenhouse-gases/#:~:text=If%20congestion%20reduces%20the%20average,will%20directly%20reduce%20CO2%20emissions.

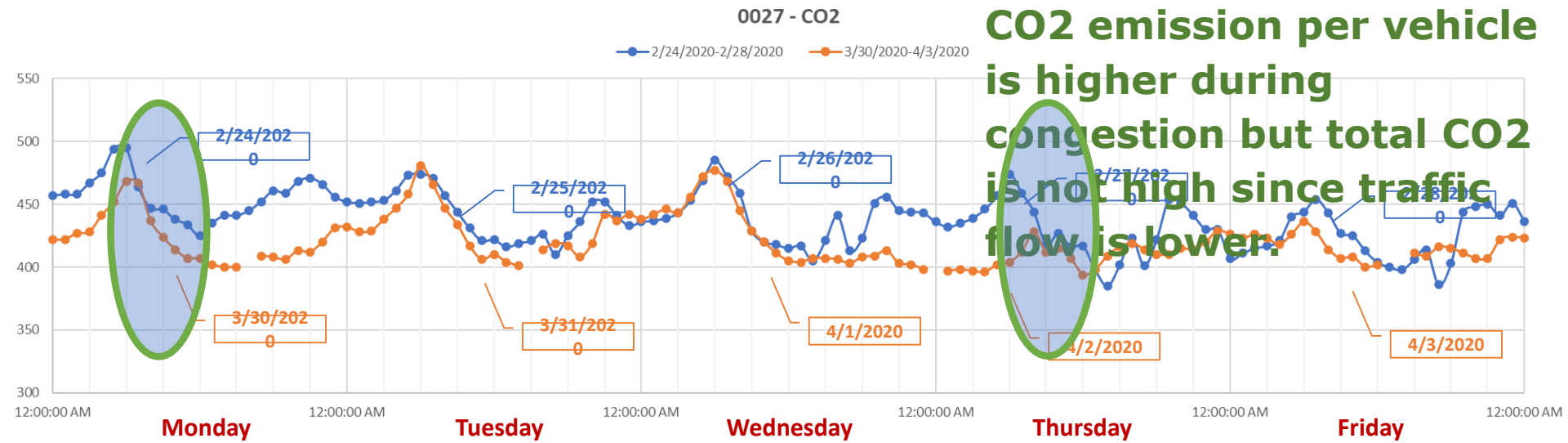
[3] https://www.accessmagazine.org/fall-2009/traffic-congestion-greenhouse-gases/

The highest CO2 emission happens during the AM peak hour.

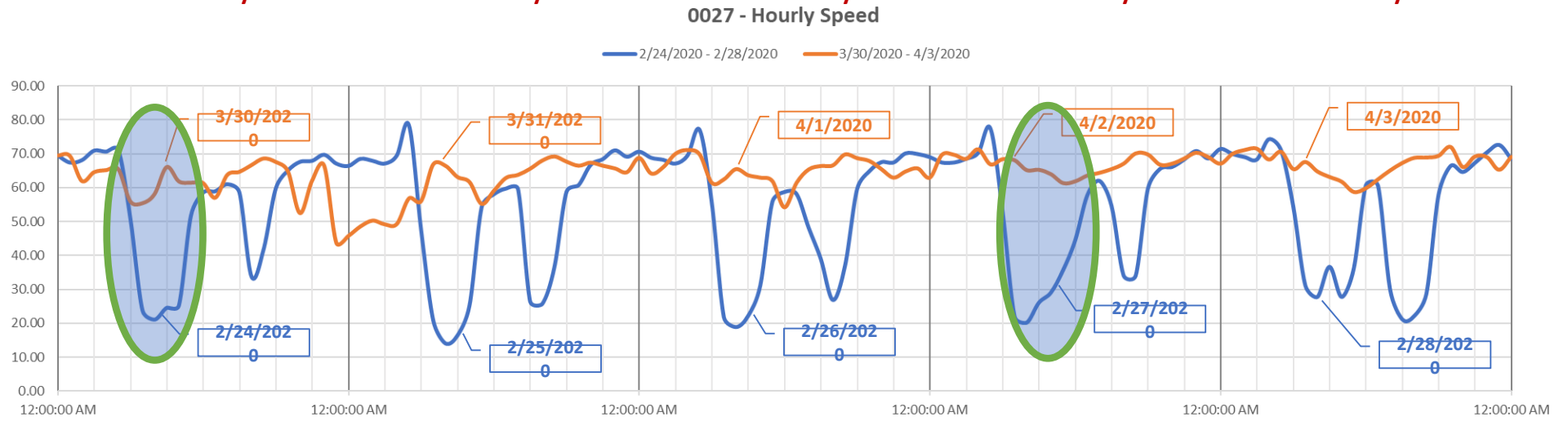
Traffic flow drop after Safer@Home order leads to the significant reduction of CO2 emission.







CO2 emission per vehicle is higher during congestion but total CO2 is not high since traffic flow is lower.



Observation 2: **Traffic is not the major PM source**

- **Many factors contribute to PM2.5 other than traffic (refer to mountain fire case).**

Background

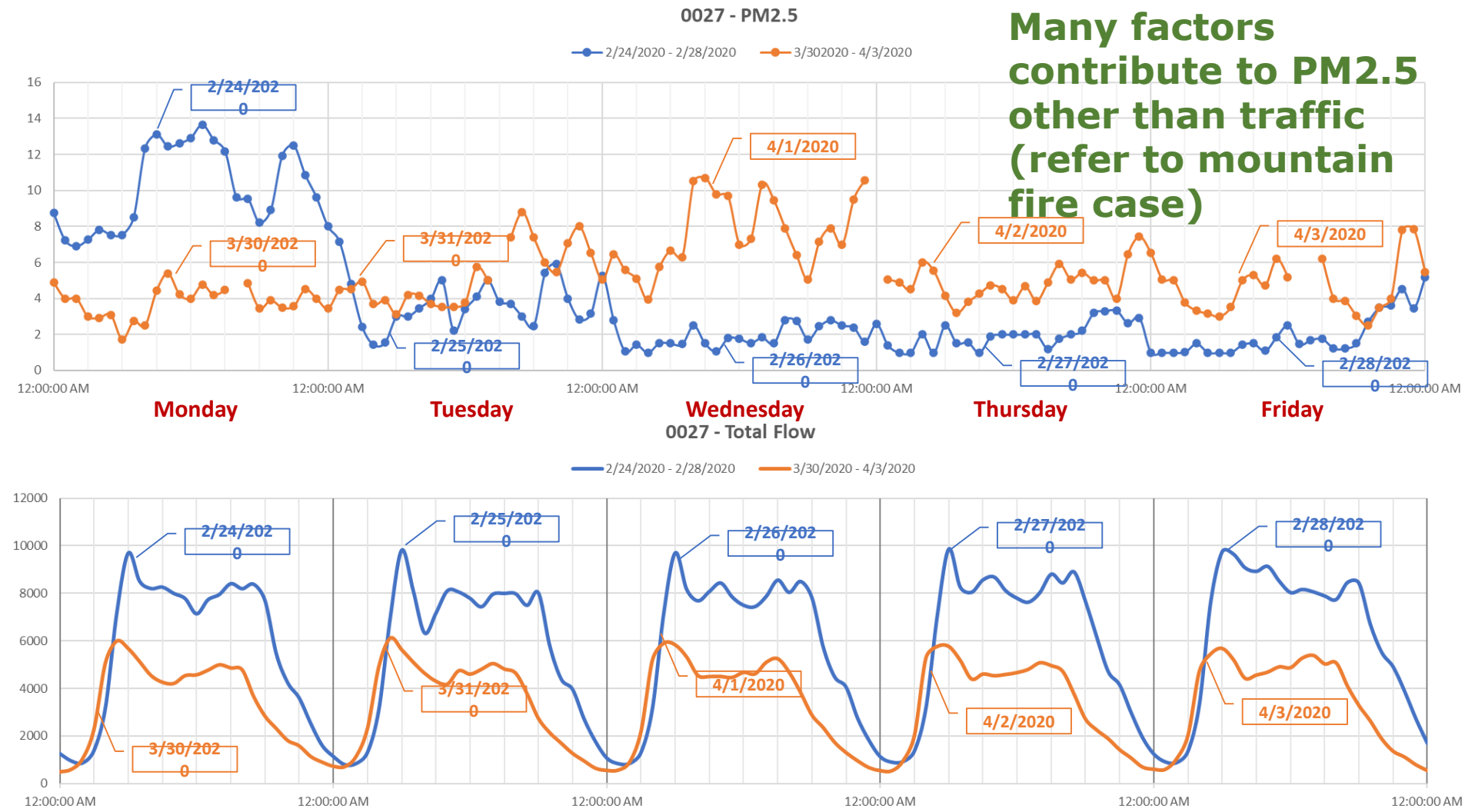
- Traffic-related PM2.5 exposure varies greatly depending upon city [1].
- The highest PM concentrations occur in congested traffic or when driving behind a heavy diesel-driven vehicle [1].
- Heavy-duty trucks may generate a lot of PM2.5 [2][3].

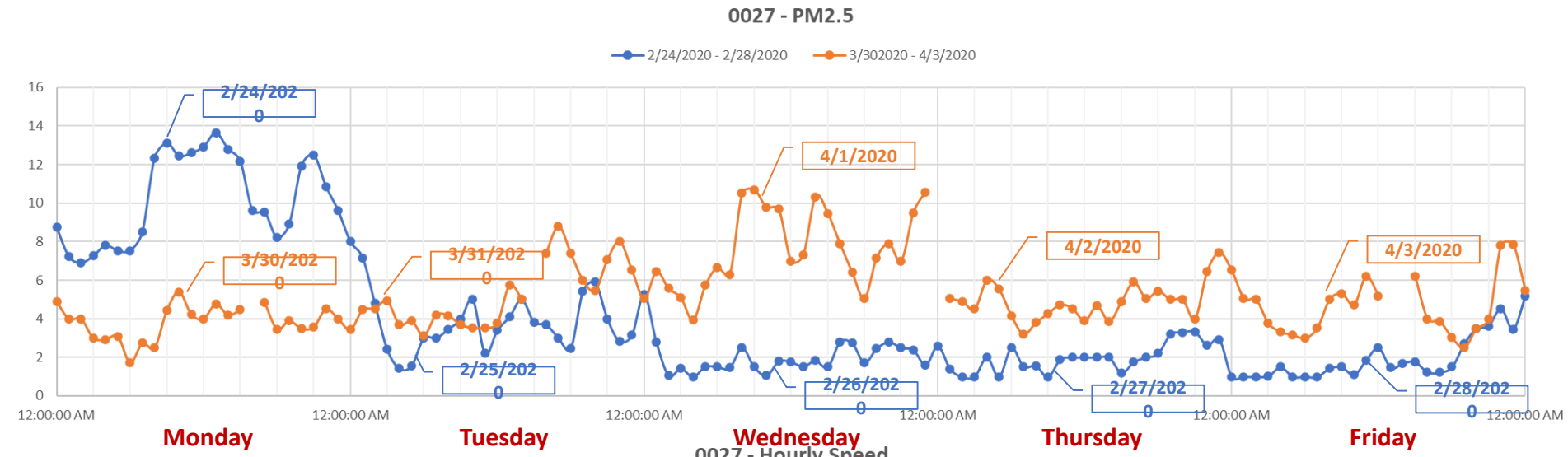
References:

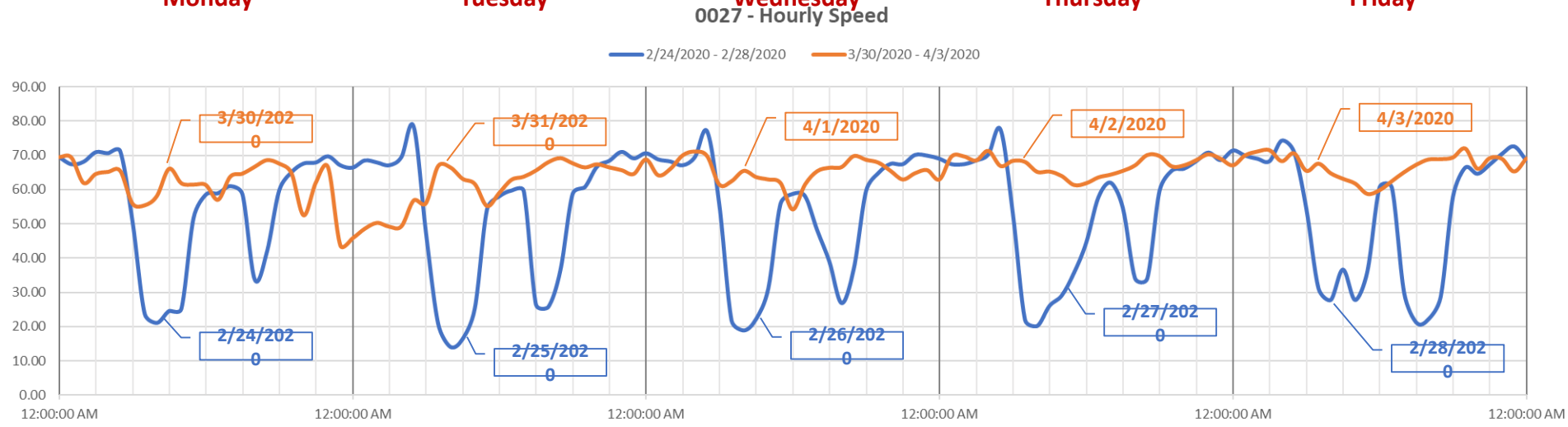
[1] https://www.wunderground.com/cat6/air-pollution-cars-affects-everyone-why-we-should-care

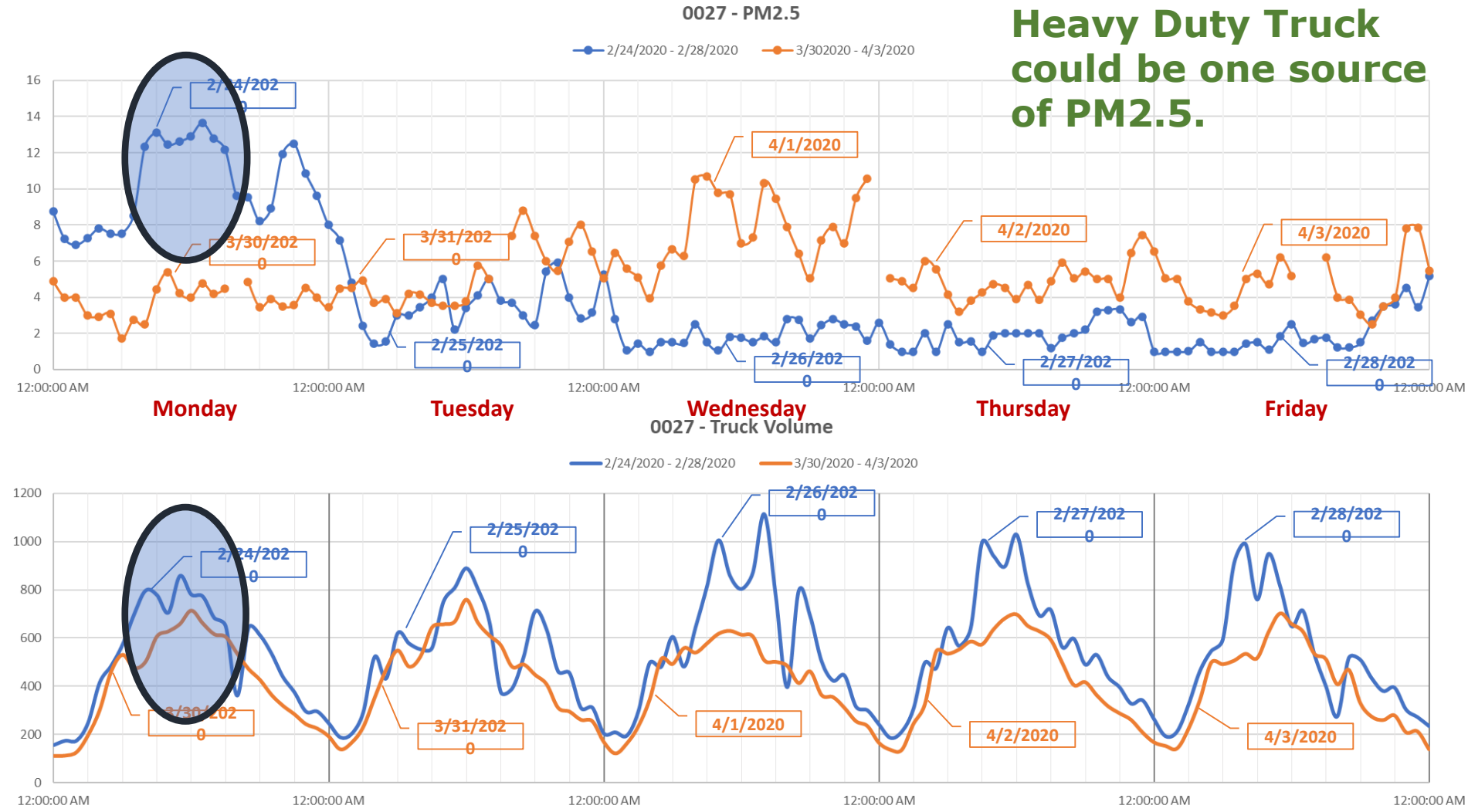
[2] https://pubmed.ncbi.nlm.nih.gov/28293828/

[3] https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0172-6


0027 - PM2.5
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
Many factors contribute to PM2.5 other than traffic (refer to mountain fire case)
2/24/2020
3/30/2020
3/31/2020
2/25/2020
4/1/2020
2/26/2020
4/2/2020
2/27/2020
4/3/2020
2/28/2020
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Total Flow
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
2/24/2020
2/25/2020
2/26/2020
2/27/2020
2/28/2020
3/30/2020
3/31/2020
4/1/2020
4/2/2020
4/3/2020


0027 - PM2.5
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
16
14
12
10
8
6
4
2
0
2/24/202
0
3/30/202
0
3/31/202
0
4/1/2020
4/2/2020
4/3/2020
2/25/202
0
2/26/202
0
2/27/202
0
2/28/202
0
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday


0027 - Hourly Speed
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
3/30/202
0
3/31/202
0
4/1/2020
4/2/2020
4/3/2020
2/24/202
0
2/25/202
0
2/26/202
0
2/27/202
0
2/28/202
0
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM


0027 - PM2.5
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
Heavy Duty Truck could be one source of PM2.5.
2/24/202
0
3/30/202
0
3/31/202
0
4/1/2020
2/25/202
0
2/26/202
0
4/2/2020
2/27/202
0
4/3/2020
2/28/202
0
16
14
12
10
8
6
4
2
0
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Truck Volume
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
1200
1000
800
600
400
200
0

Observation 3: **Heady Duty Truck is a source of CO.**

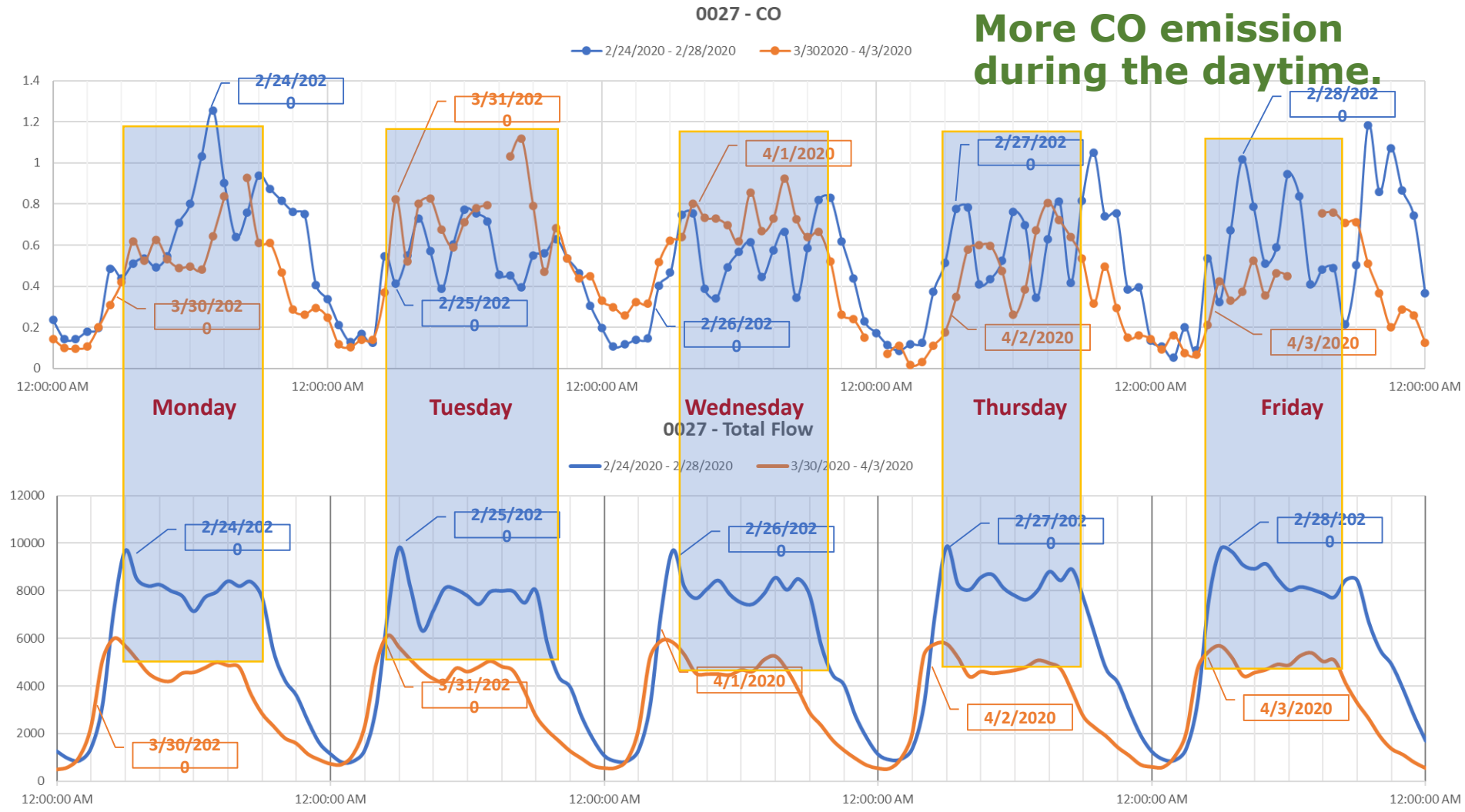
- **More CO when the flow is high, especially when truck flow is high.**
- **CO is low when speed is low.**

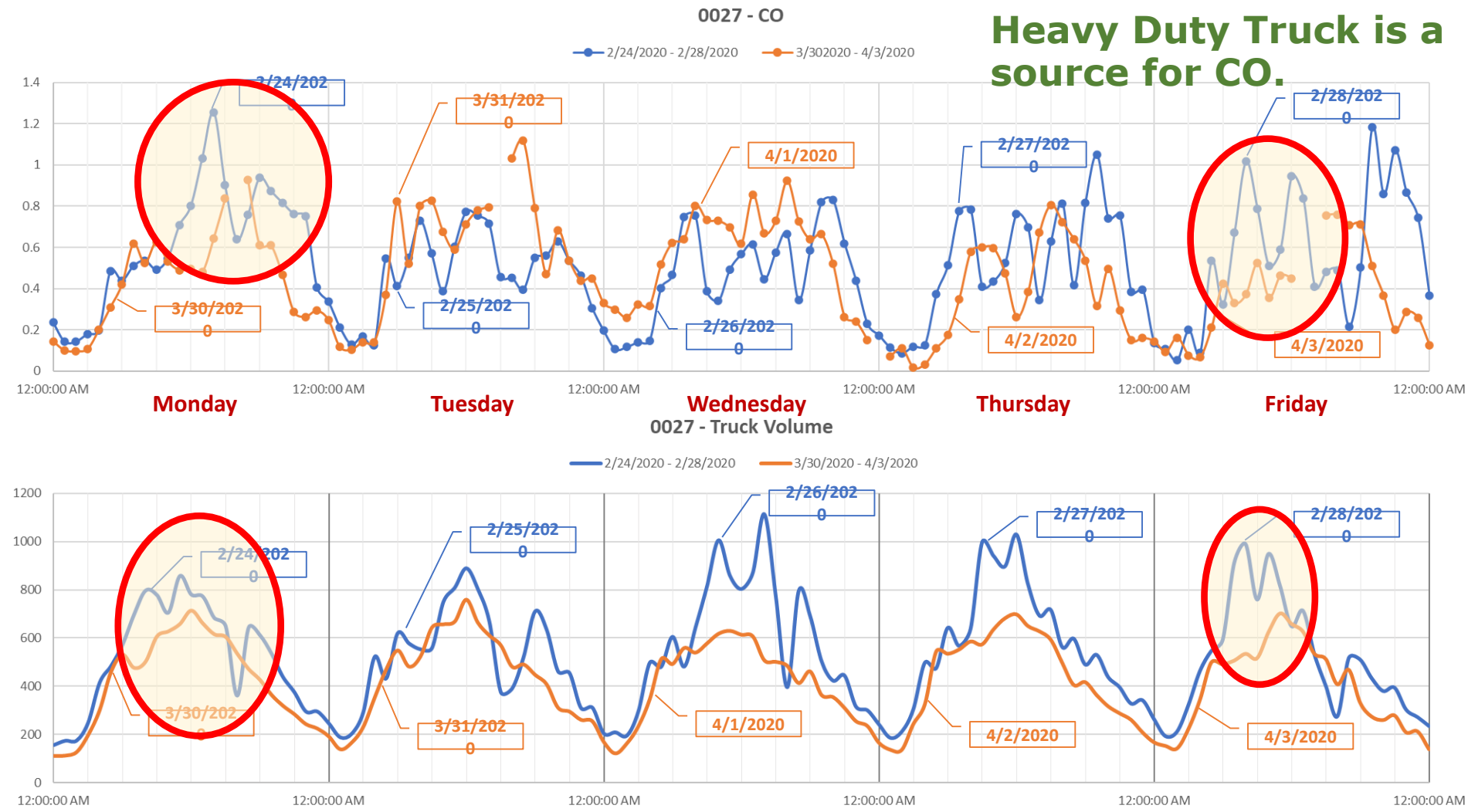
Background:

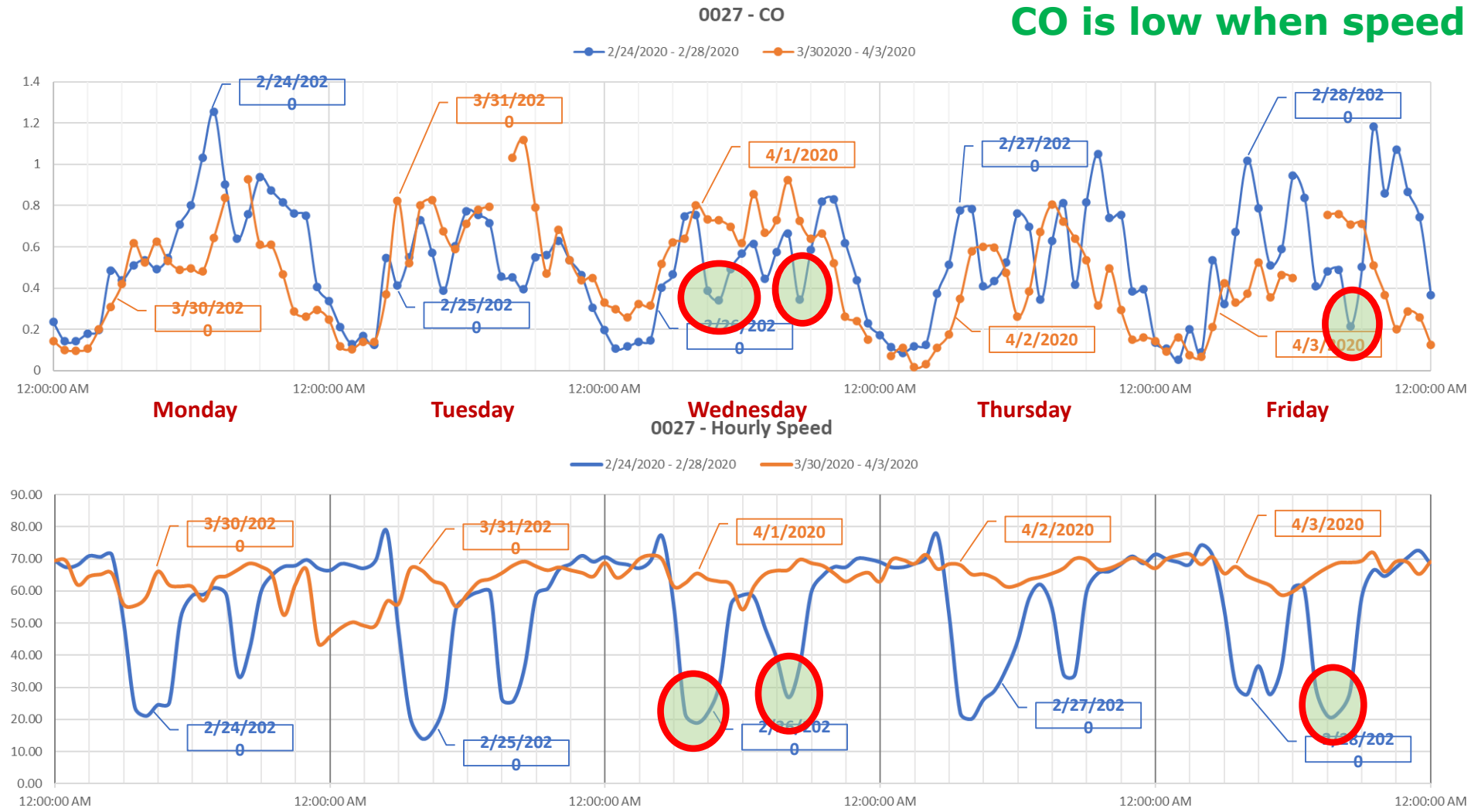
- Carbon monoxide (CO) is a highly toxic, colorless, and odorless gas that is produced through the incomplete burning of fuels. In fact, one of the most common sources of CO exposure is the internal combustion engine — a primary component of gasoline and diesel fueled trucks [1].
- While diesel fuel combustion engines typically produce lower CO concentrations than engines powered by gas, their emissions are enough to generate lethal concentrations, particularly if the engine is not tuned properly, and particularly in a closed cab of an idling vehicle suffering from exhaust issues and leaks.

References:

[1] https://sensorcon-sensing-products-by-molex.myshopify.com/pages/trucking-and-carbon-monoxide-awareness


0027 - CO
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
More CO emission during the daytime.
2/24/202 0
3/31/202 0
4/1/2020
2/27/202 0
2/28/202 0
3/30/202 0
2/25/202 0
2/26/202 0
4/2/2020
4/3/2020
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Total Flow
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
12000
10000
8000
6000
4000
2000
0


0027 - CO
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
Heavy Duty Truck is a source for CO.
2/24/202
0
3/31/202
0
4/1/2020
2/27/202
0
2/28/202
0
3/30/202
0
2/25/202
0
2/26/202
0
4/2/2020
4/3/2020
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Truck Volume
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
1200
1000
800
600
400
200
0


0027 - CO
CO is low when speed i
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
2/24/202
0
3/31/202
0
4/1/2020
2/27/202
0
2/28/202
0
3/30/202
0
2/25/202
0
4/2/2020
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Hourly Speed
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
3/30/202
0
3/31/202
0
4/1/2020
4/2/2020
4/3/2020
2/24/202
0
2/25/202
0
2/27/202
0

Observation 4: **Heavy Duty Truck is a major source of NO.**

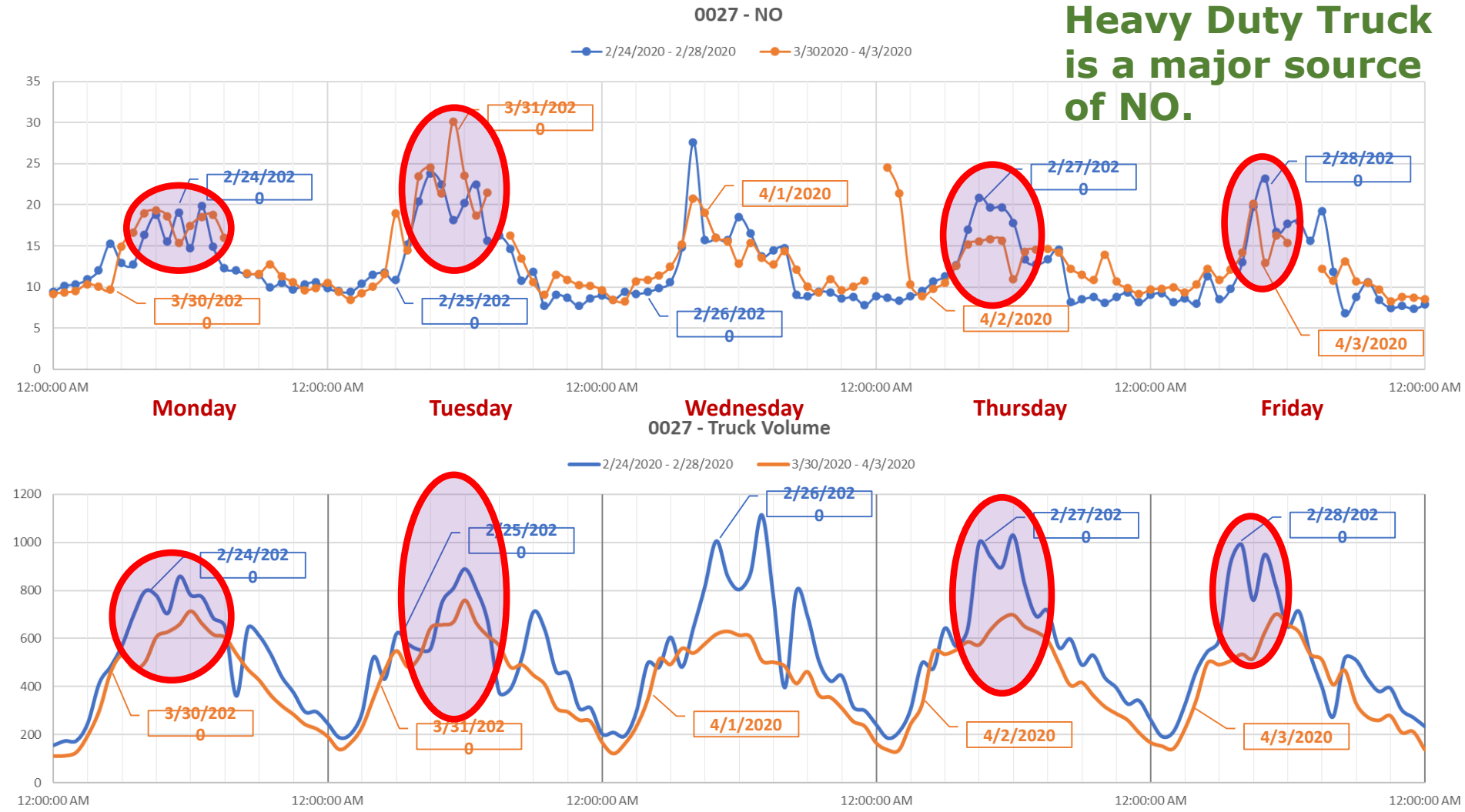
- **NO's peak and magnitude are similar before-N-after the Safer@Home Order.**
- **Heavy-duty truck volume may be similar before-N-after the Safer@Home Order.**
- **PeMS provides an estimate of truck flow but does not have ability to estimate Heavy duty truck flow.**

Background:

- Diesel engines are the largest source of nitrogen oxides (NOx) emissions nationally.
- NO are produced from fuel combustion in mobile and stationary sources. The combustion of gasoline in automobiles emit NO into the atmosphere (mobile source). Stationary emissions come from coal fired power plants, electric power plant boilers. [1]
- Excess NO may cause respiratory ailments, hematologic side effects, metabolic disorders, low blood pressure, nausea, vomiting and diarrhoea. [1]

References:

[1] https://www.aeroqual.com/meet-the-nitrogen-oxide-family


0027 - NO
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
Heavy Duty Truck is a major source of NO.
2/24/202
0
3/30/202
0
3/31/202
0
2/25/202
0
4/1/2020
2/26/202
0
2/27/202
0
4/2/2020
2/28/202
0
4/3/2020
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Truck Volume
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020

Observation 5: **NO2 is lower during the daytime, especially with Heavy Duty Trucks and sunlight.**

- **NO2 involves in the chemical reaction to produce O3 when there is sunlight.**
- **Background:**
  - Light-duty trucks emits 8 times more NOx than passenger cars [1].
  - Heavy-duty diesel trucks and buses as a major NOx source since NOx emissions from passenger cars and light-duty trucks have become increasingly controlled [2].
  - Breathing in high levels of NO2 can increase the likelihood of respiratory problems: wheezing, coughing, colds, flu and bronchitis. [3]
  - NO2 is a primary pollutant, it is also a contributing component for secondary pollutants formed from a chemical reaction, e.g., O3. [3]
  - Heavy-duty truck generates more NOx (NO + NO2) at higher speed [4].
  - NO2/NOx is lower when speed is higher [4].

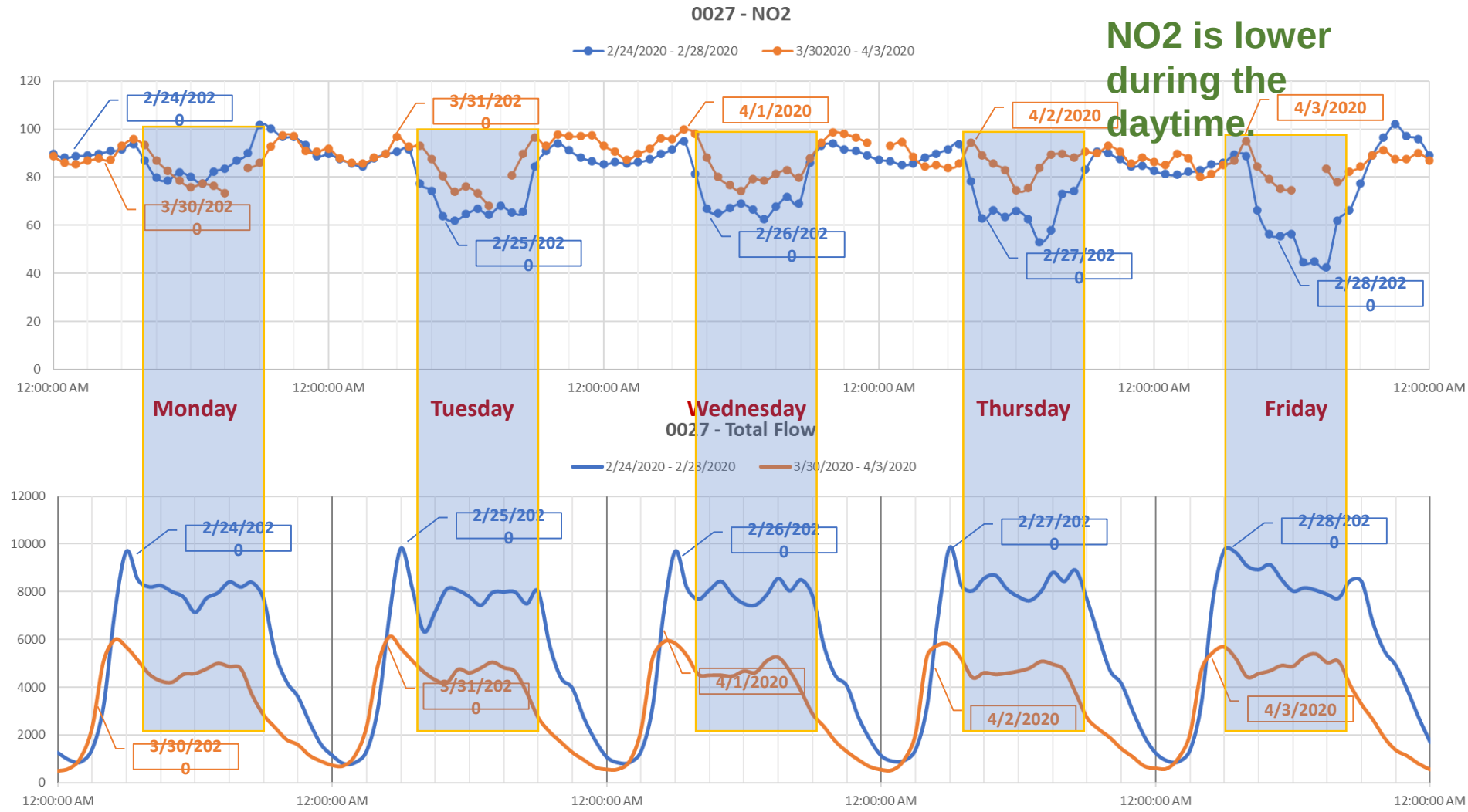
References:

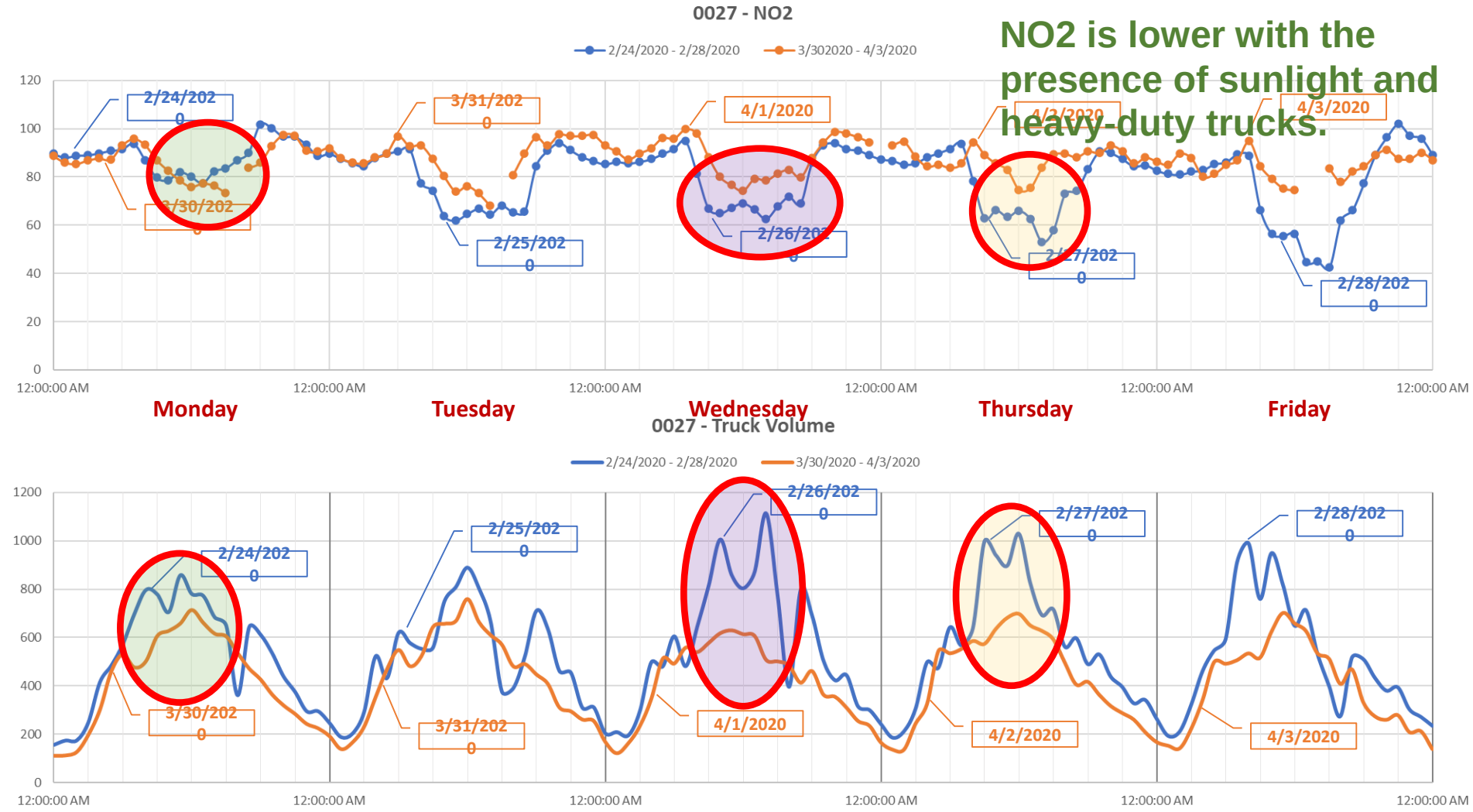
[1] https://www.sciencedirect.com/science/article/abs/pii/S1352231003007337

[2] https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/53/report/F

[3] https://www.aeroqual.com/meet-the-nitrogen-oxide-family

[4] https://www.dora.lib4ri.ch/empa/islandora/object/empa%3A8878/datastream/PDF/Thudium-2010-Speed_dependence_of_NO2-NOx_emission_ratio--%28published_version%29.pdf


0027 - NO2
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
NO2 is lower during the daytime.
2/24/202
0
3/30/202
0
3/31/202
0
2/25/202
0
4/1/2020
2/26/202
0
4/2/2020
2/27/202
0
4/3/2020
2/28/202
0
120
100
80
60
40
20
0
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Total Flow
2/24/2020 - 2/23/2020
3/30/2020 - 4/3/2020
12000
10000
8000
6000
4000
2000
0


0027 - NO2
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
NO2 is lower with the presence of sunlight and heavy-duty trucks.
2/24/202
0
3/30/202
0
3/31/202
0
2/25/202
0
4/1/2020
2/26/202
0
4/2/2020
2/27/202
0
4/3/2020
2/28/202
0
120
100
80
60
40
20
0
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Truck Volume
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
2/24/202
0
3/30/202
0
2/25/202
0
3/31/202
0
2/26/202
0
4/1/2020
2/27/202
0
4/2/2020
2/28/202
0
4/3/2020
1200
1000
800
600
400
200
0
12:00:00 AM

Observation 6: **More O3 was produced by reaction between NO2 and O2 with sunlight.**

•O3 is a secondary pollutant produced by reaction between nitrogen dioxide (NO2)

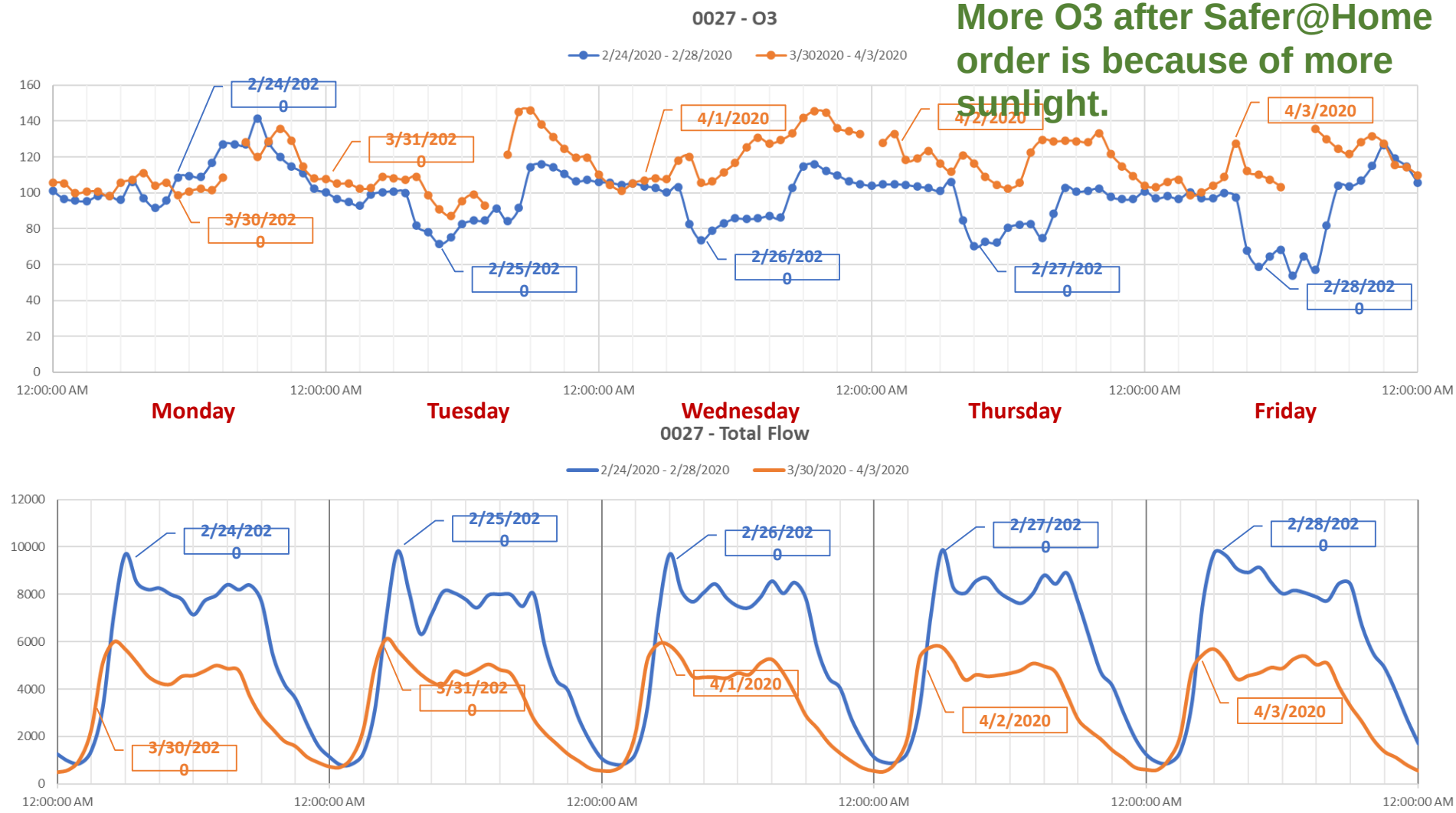
Background:

- When NOx reacts with other pollutants in the presence of sunlight, it forms ozone [1].
- More O3 after COVID-19 is because more NO2 was used to form O3.

References:

[1] https://www.aeroqual.com/meet-the-nitrogen-oxide-family

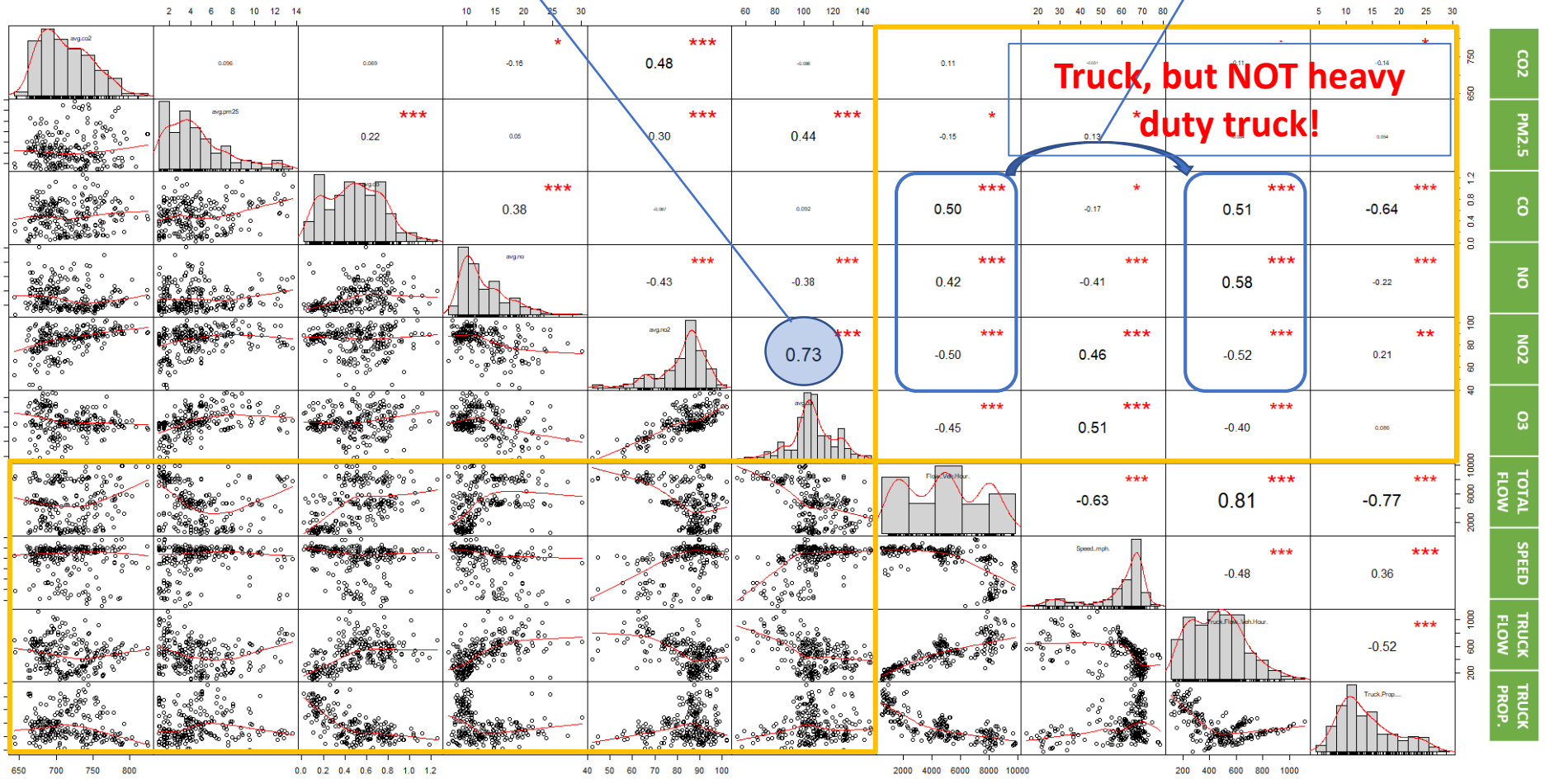
[2] https://www.tandfonline.com/doi/pdf/10.3155/1047-3289.60.8.977


0027 - O3
2/24/2020 - 2/28/2020
3/302020 - 4/3/2020
More O3 after Safer@Home order is because of more sunlight.
2/24/202
0
3/31/202
0
4/1/2020
4/2/2020
4/3/2020
3/30/202
0
2/25/202
0
2/26/202
0
2/27/202
0
2/28/202
0
160
140
120
100
80
60
40
20
0
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
Monday
Tuesday
Wednesday
Thursday
Friday
0027 - Total Flow
2/24/2020 - 2/28/2020
3/30/2020 - 4/3/2020
12000
10000
8000
6000
4000
2000
0
2/24/202
0
2/25/202
0
2/26/202
0
2/27/202
0
2/28/202
0
3/31/202
0
4/1/2020
4/2/2020
4/3/2020
3/30/202
0
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM
12:00:00 AM

Strong correlation between O3 and NO2.

The correlation values of CO, NO, and NO2 with truck volume increase compared to those with total flow.

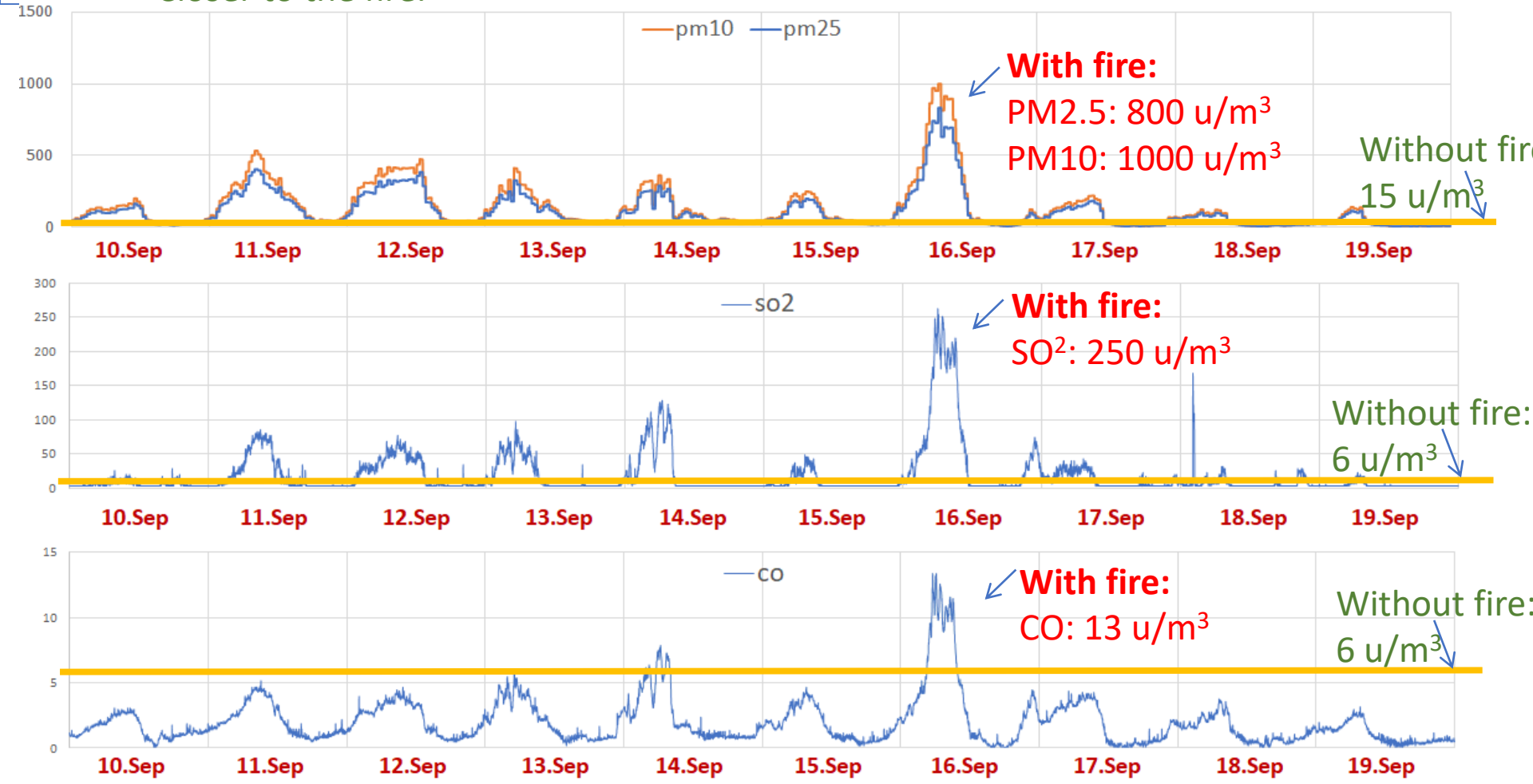
Truck, but NOT heavy duty truck!



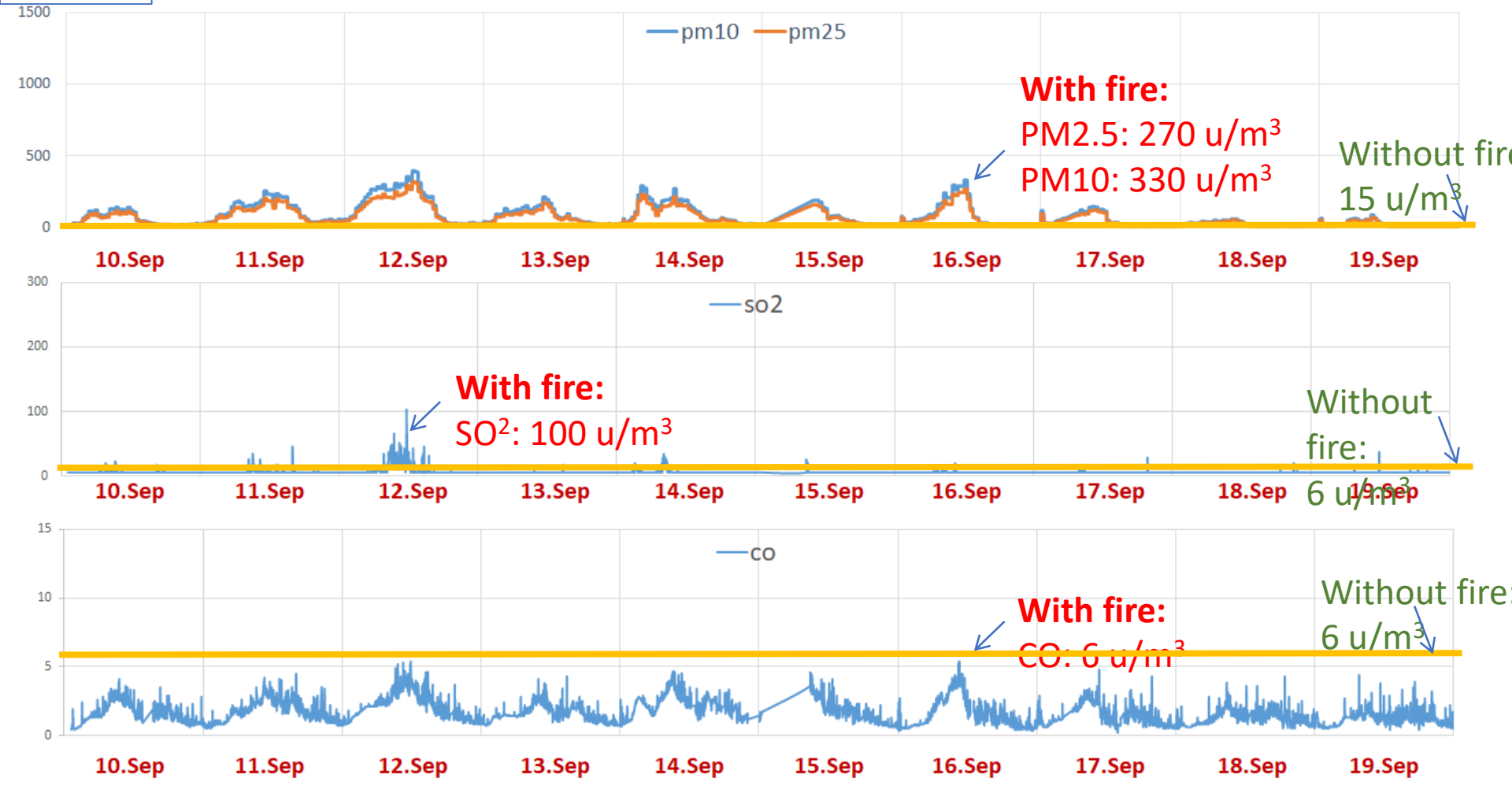
Mountain Fire

iAQBox:#37

Closer to the fire.



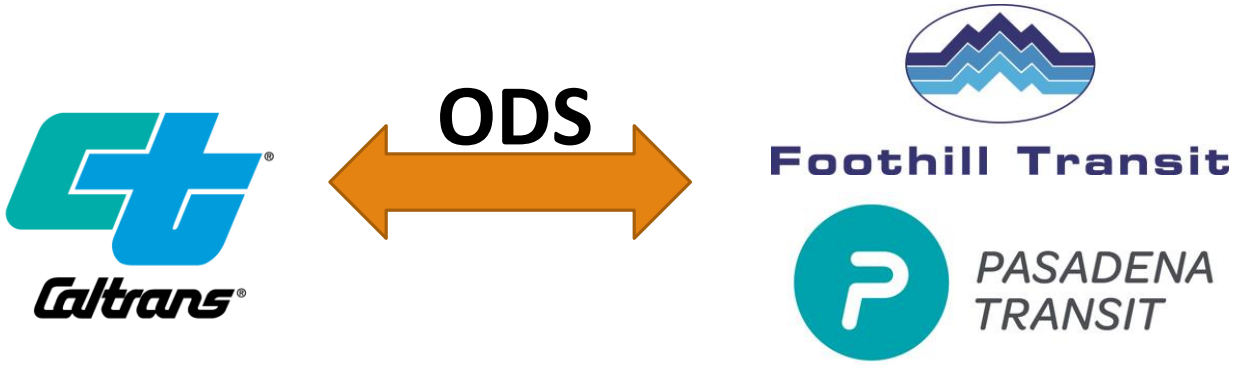
iAQBox:#27


pm10
pm25
With fire:
PM2.5: 270 u/m3
PM10: 330 u/m3
Without fire
15 u/m3
10.Sep
11.Sep
12.Sep
13.Sep
14.Sep
15.Sep
16.Sep
17.Sep
18.Sep
19.Sep
so2
With fire:
SO2: 100 u/m3
Without
fire:
6 u/m3
co
With fire:
CO: 6 u/m3
Without fire
6 u/m3

Conclusions

- Six observations that can be explained by existing literature
  - 1: More flow / VMT leads to more CO2.
  - 2: Many factors (e.g., mountain fire) contribute to PM2.5 other than traffic.
  - 3: Heady Duty Truck is a source of CO.
  - 4: Heavy Duty Truck is a major source of NO.
  - 5: NO2 involves in the chemical reaction to produce more O3 when there is sunlight.
  - 6: More O3 was produced by reaction between NO2 and O2 with sunlight.

- Only preliminary study
  - Need to analyze more data.
  - Need more data collection locations.
  - Need vehicle classification technologies (i.e. signature loop detector) to provide heavy-duty truck data.



Open Data System (ODS)

Xinkai Wu, Ph.D.; Xudong Jia, Ph.D., PE; Cal Poly Pomona
Lianyu Chu, Ph.D.; CLR Analytics Inc.
Allen Chen, PE; Leila Sy; Giovanni Magana, Caltrans District 7

Dec.03, 2020

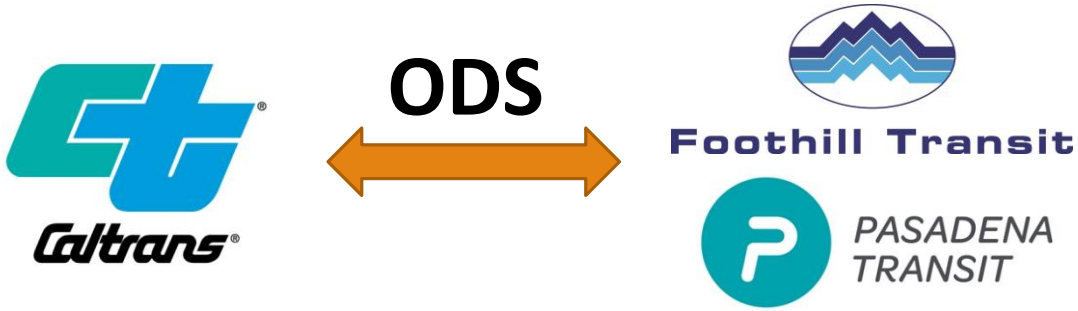
CalPolyPomona

Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

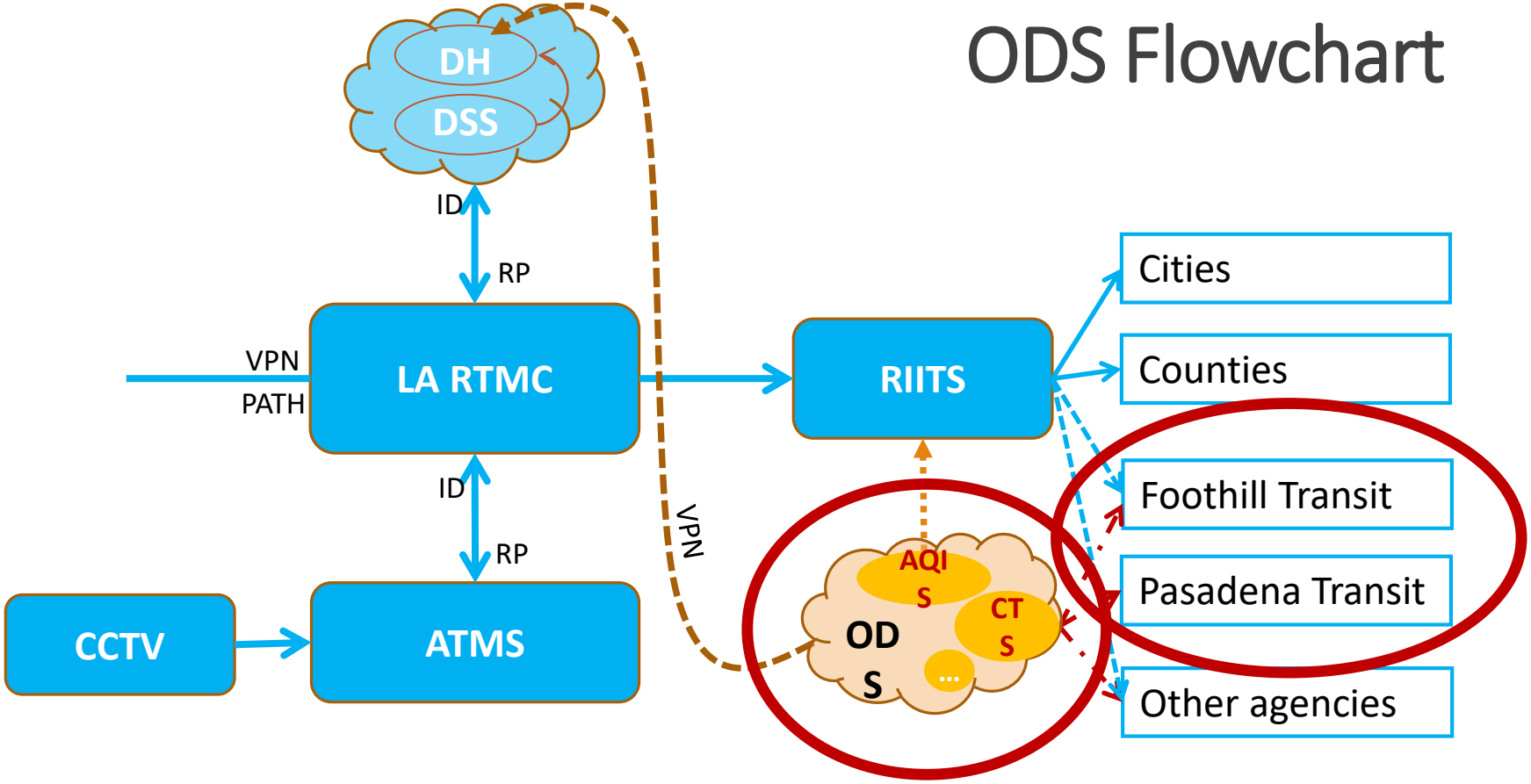
CLRAnalytics
Smart Infrastructure for Informed Decision

An Open Data System (ODS)

- Bridge Caltrans Decision Support System (DSS) with Foothill/Pasadena Transit Operation Center by providing real-time incidents/events/detour messages
- Provide a visualized platform to publish real-time information
- Support potential big data analysis

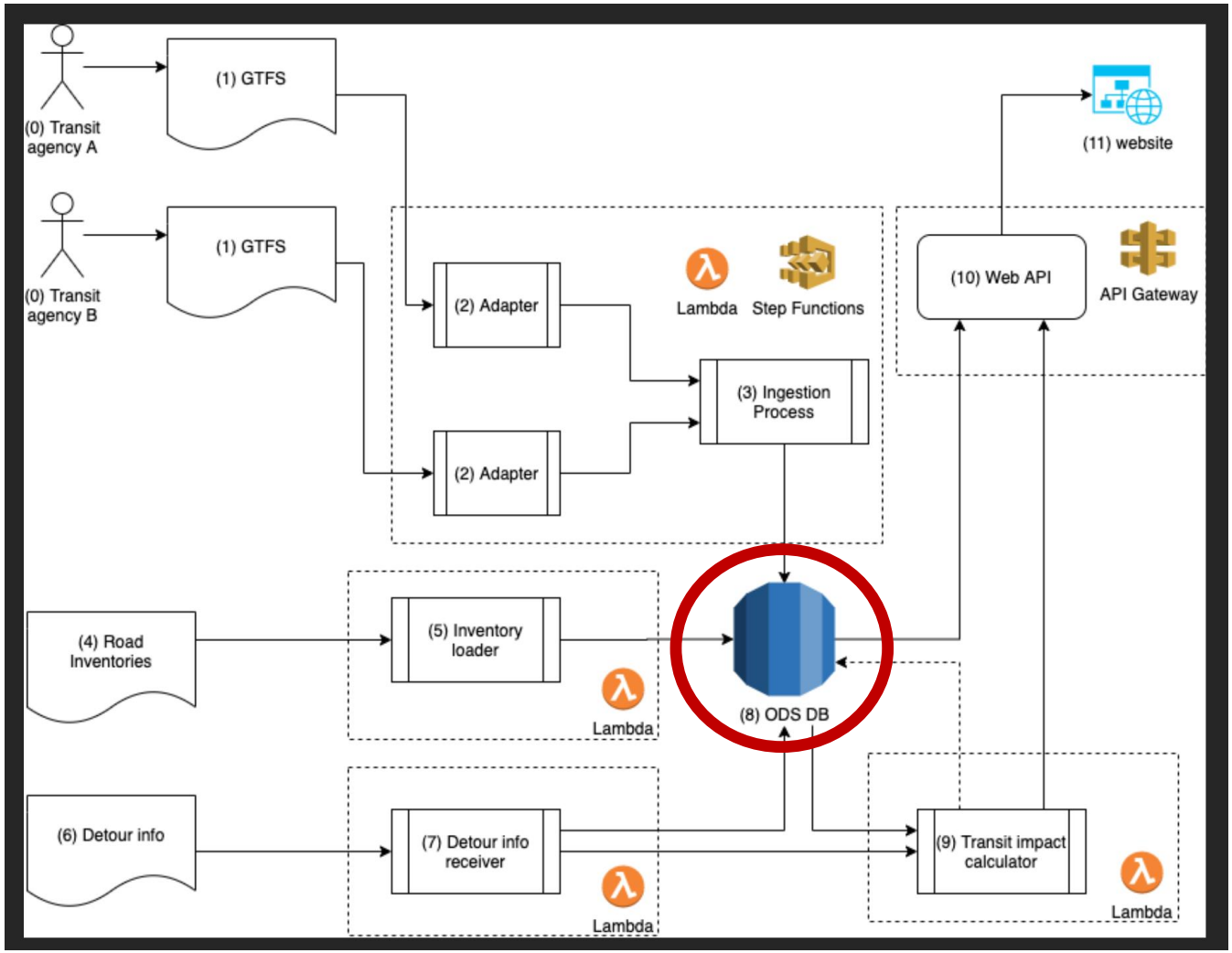


ODS Flowchart



AQIS: Air Quality Information System
CTS: Connected Transit System

ODS
Architecture

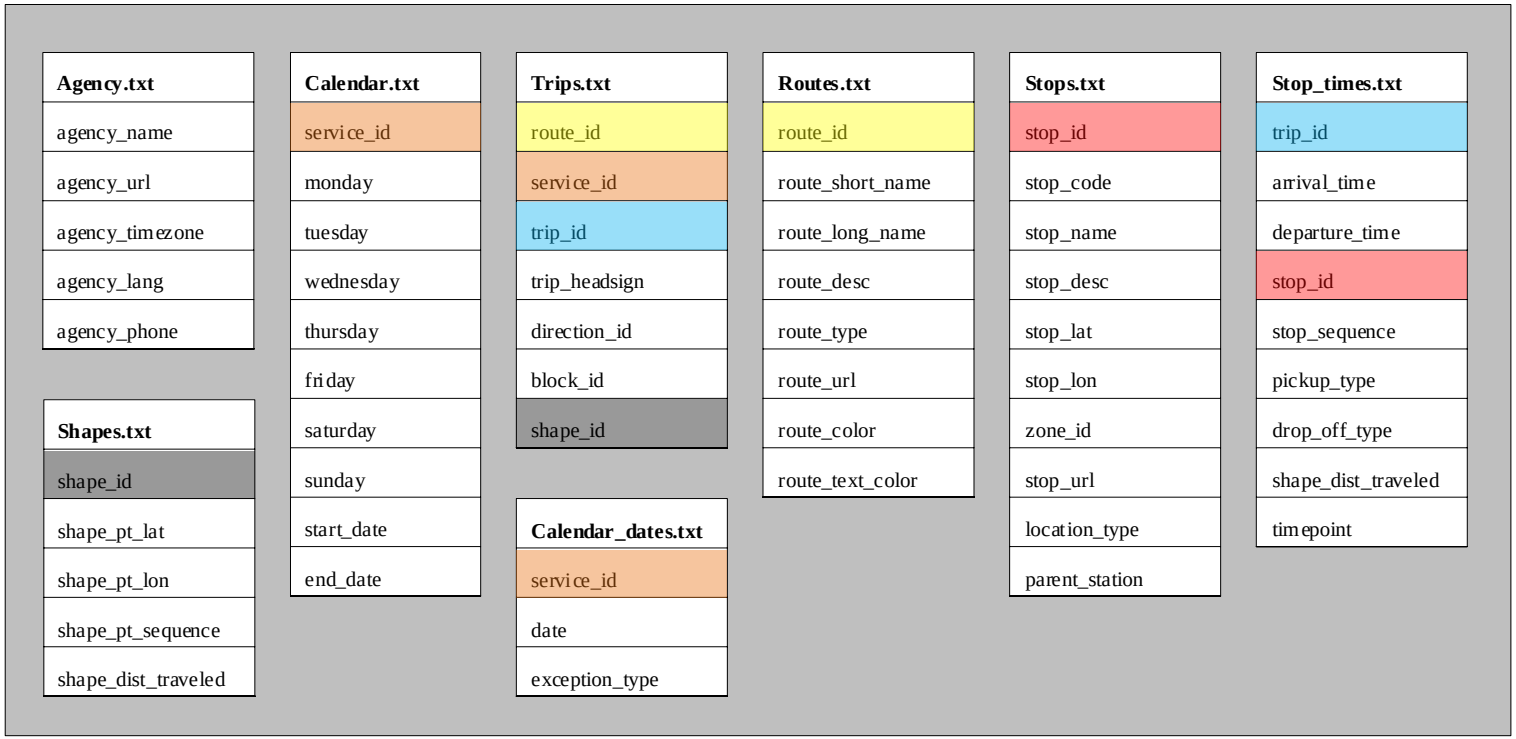


Universal Tools Developed for ODS

- GTFS data parser
  - Work with more transit agencies
- TMDD data parser
  - Roadway inventory from UC Berkeley
  - Response Plan

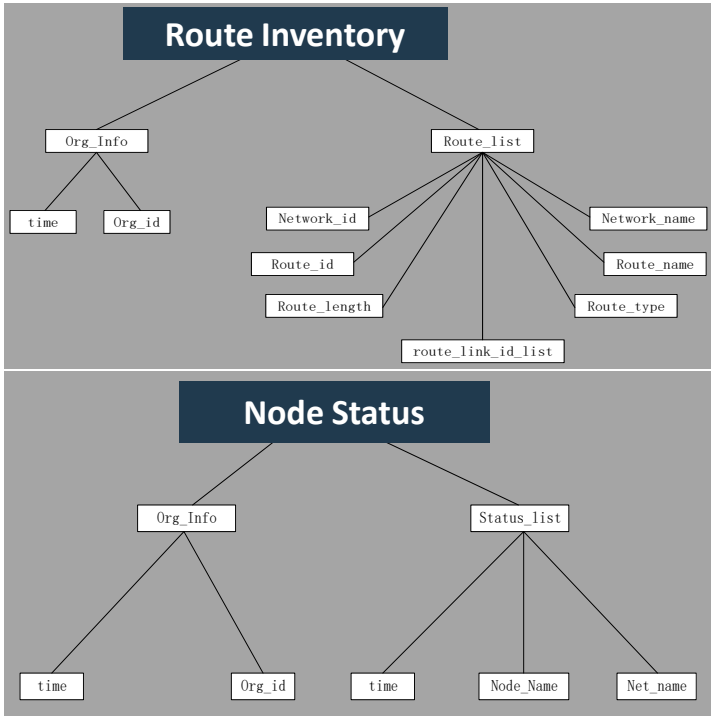
- Transit GTFS Data Parser (General Transit Feed Specification)

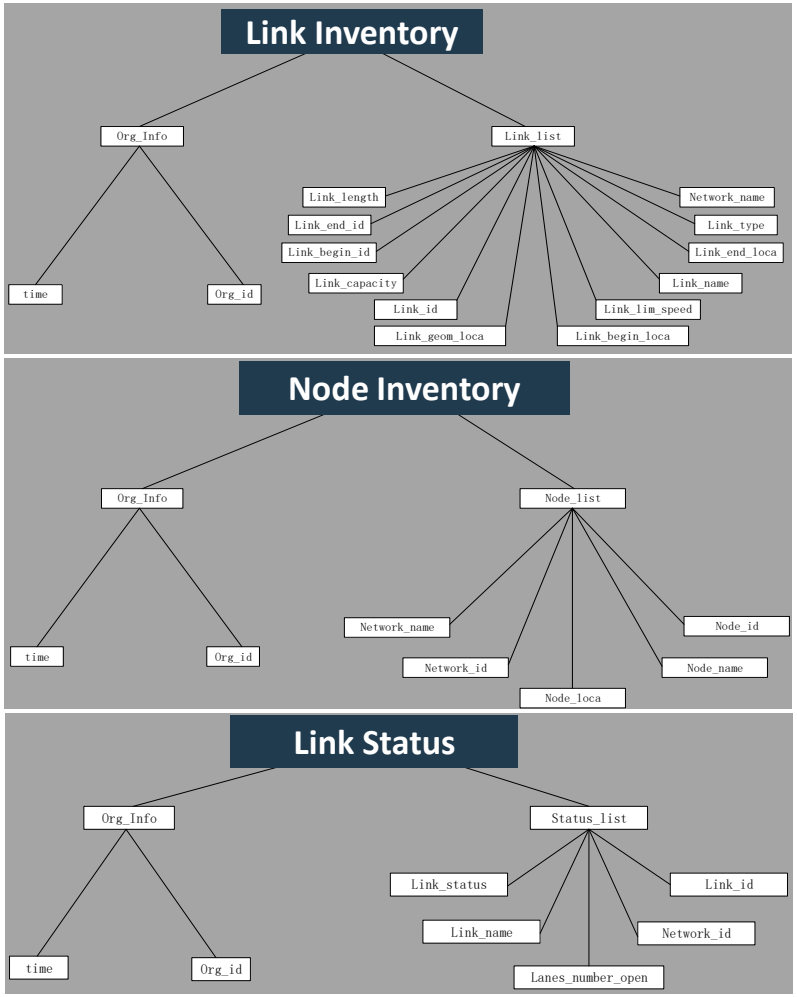
Transit GTFS Data (https://transitfeeds.com)



- TMDD Data (Response Plan, Network Inventory) Parser

Network Inventory Data (in TMDD format)





Response Plan Data (in TMDD format)

3.8.2.10. ResponsePlan Class

This is a new class to handle response plan objects.

3.8.2.10.1. ResponsePlanDetails

This is a new object representing each developed response plan and termination plan.

Attribute Name	Type/Element	Reference	Description	CC Required
Response-Plan-Request-Header	Type: ResponsePlanRequest Header	Custom type; see "Proposed Response Plans" layer		Yes
Response-Plan-Header	Type: ResponsePlanHeader	Custom type; see "Proposed Response Plans" layer		Yes
Activity-Start-Time	Type: DateTimeZone	TMDD 3.3.10.1 System Requirements spec 8.7.1.6	Time when response planning activities were initiated.	Yes-when applicable
		TMDD 3.3.10.1	Time when	

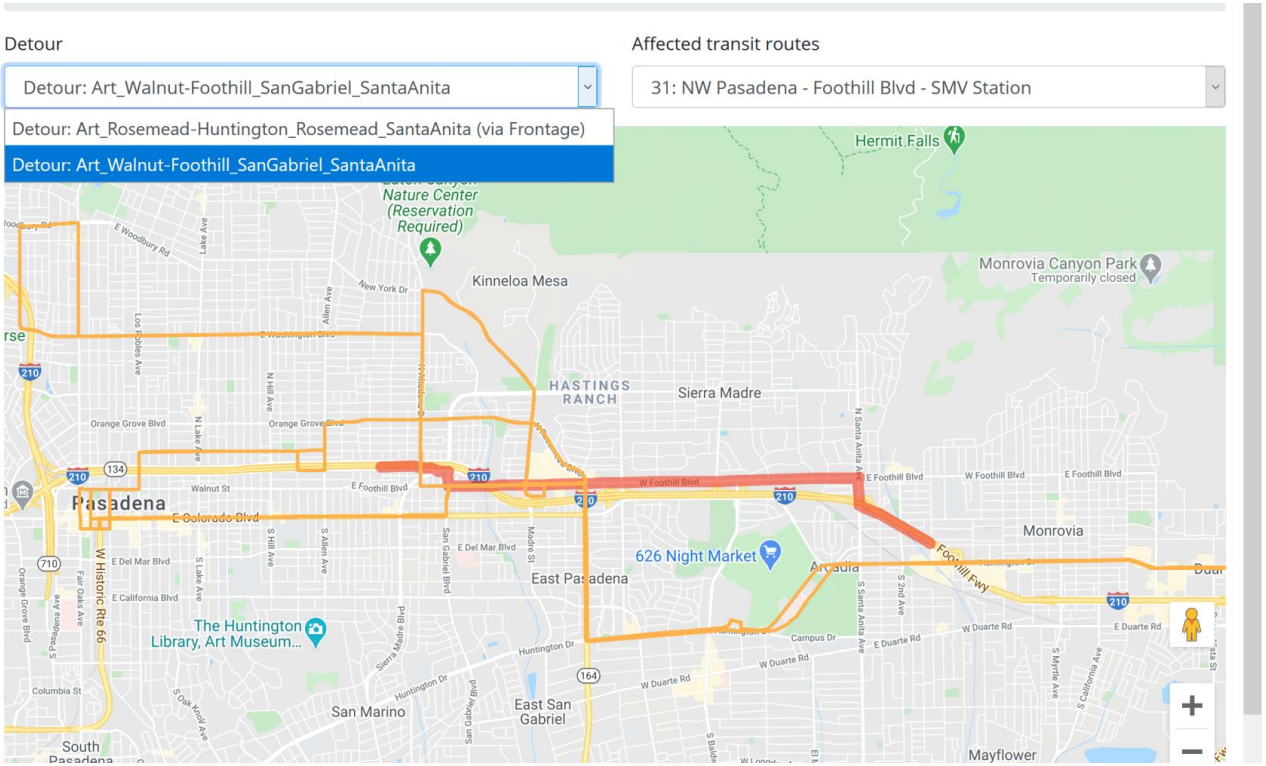
2020-03-02 responseplanmessage - Notepad

File Edit Format View Help

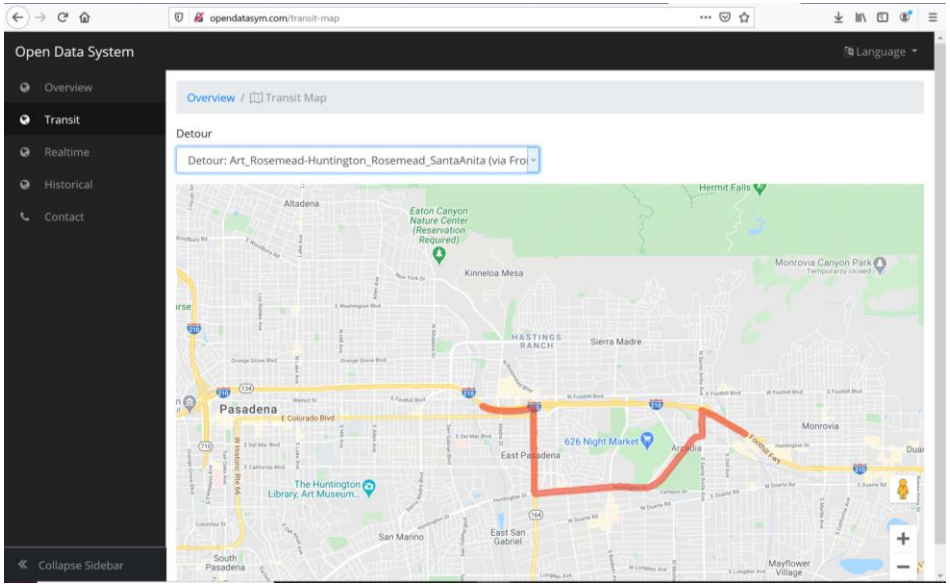

```
"response-plan-list" : {
  "response-plan-details" : [ {
    "response-plan-header" : {
      "event-id" : "1262245",
      "response-plan-id" : "5507078",
      "plan-type" : "",
      "evaluation-cycle" : 0,
      "response-plan-rank" : 0
    },
    "activity-start-time" : {
      "date" : "20200302",
      "time" : "1444488380",
      "offset" : "-0800"
    },
    "agency-list" : { },
    "detour-list" : {
      "detour" : [ {
        "network-name" : "I-210 Pilot Aimsun TMDD Network v04",
        "route-id" : "EB_Art_Colorado-Huntington_Huntington-Monrovia_MountOlive",
        "route-link-id-list" : {
          "link" : [ "00000" ]
        },
        "route-type" : "Art",
        "route-name" : "EB_Art_Colorado-Huntington_Huntington-Monrovia_MountOlive",
        "route-length" : 0
      }, {
        "network-name" : "I-210 Pilot Aimsun TMDD Network v04",
        "route-id" : "EB_Art_Evergreen_Myrtle_Myrtle",
        "route-link-id-list" : {
          "link" : [ "00000" ]
        },
        "route-type" : "Art",
        "route-name" : "EB_Art_Evergreen_Myrtle_Myrtle",
        "route-length" : 7049
      } ]
    },
```

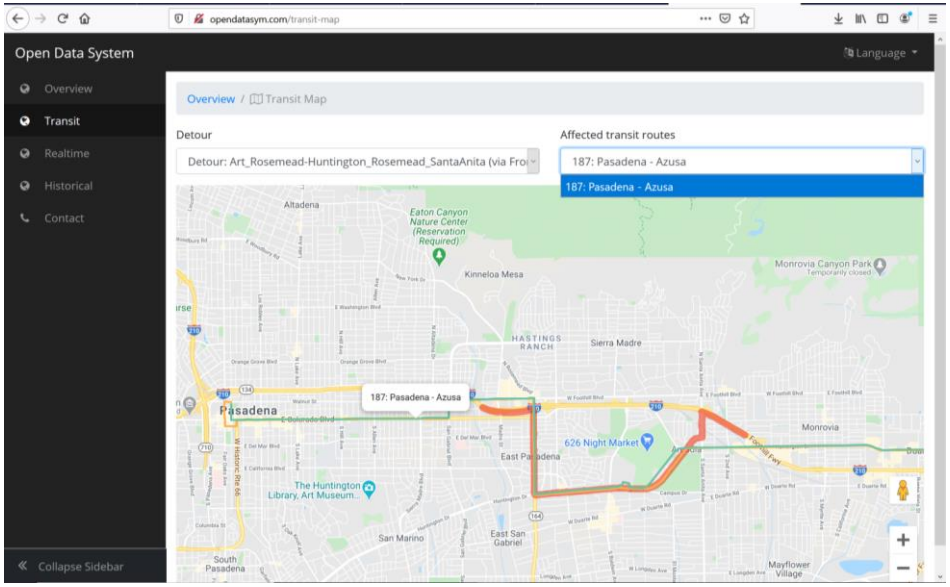
- Affected Transit Routes

User Interface: Affected Transit Routes by Response Plan Detour Routes



ODS Demo


opendatasym.com/transit-map
Open Data System
Language
Overview
Transit
Realtime
Historical
Contact
Collapse Sidebar
Overview / Transit Map
Detour
Detour: Art_Rosemead-Huntington_Rosemead_SantaAnita (via Fro
Altadena
Eaton Canyon Nature Center (Reservation Required)
Hermit Falls
Kinneloa Mesa
Monrovia Canyon Park
Temporarily closed
HASTINGS RANCH
Sierra Madre
Pasadena
E Colorado Blvd
626 Night Market
Arcadia
East Pasadena
Monrovia
The Huntington Library, Art Museum...
San Marino
East San Gabriel
South Pasadena
Mayflower Village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Open Data System
Language
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Contact
Collapse Sidebar
Overview / Transit Map
Detour
Detour: Art_Rosemead-Huntington_Rosemead_SantaAnita (via Fro
Affected transit routes
187: Pasadena - Azusa
187: Pasadena - Azusa
Altadena
Eaton Canyon Nature Center (Reservation Required)
Kinneloa Mesa
Monrovia Canyon Park
Temporarily closed
HASTINGS RANCH
Sierra Madre
Pasadena
E Colorado Blvd
626 Night Market
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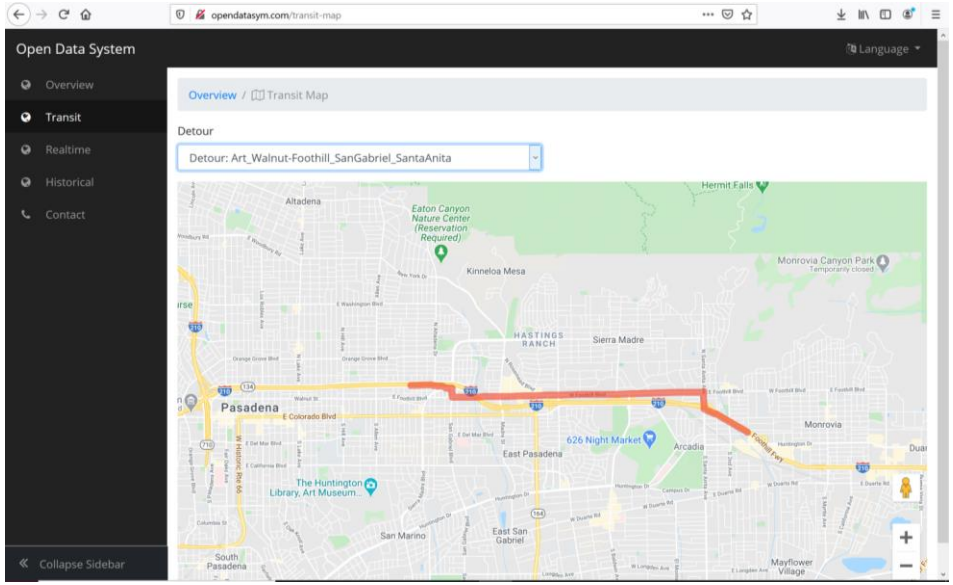
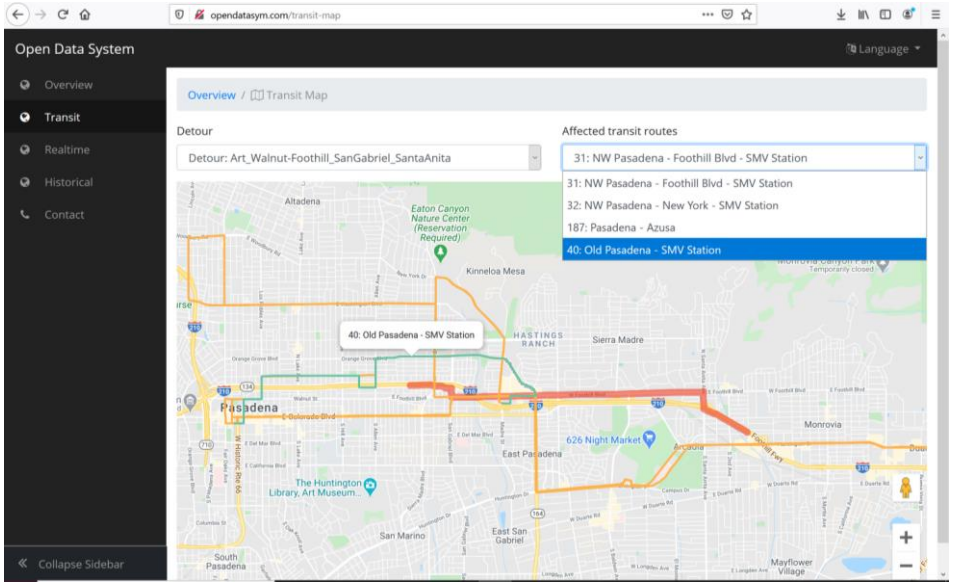
Monrovia
The Huntington Library, Art Museum...
San Marino
East San Gabriel
South Pasadena
Mayflower Village

ODS Demo


opendatasym.com/transit-map
Open Data System
Language
Overview
Transit
Realtime
Historical
Contact
Overview / Transit Map
Detour
Detour: Art_Walnut-Foothill_SanGabriel_SantaAnita
Collapse Sidebar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Open Data System
Language
Overview
Transit
Realtime
Historical
Contact
Overview / Transit Map
Detour
Detour: Art_Walnut-Foothill_SanGabriel_SantaAnita
Affected transit routes
31: NW Pasadena - Foothill Blvd - SMV Station
31: NW Pasadena - Foothill Blvd - SMV Station
32: NW Pasadena - New York - SMV Station
187: Pasadena - Azusa
40: Old Pasadena - SMV Station
40: Old Pasadena - SMV Station
Collapse Sidebar

Thank You!
Questions?

Dr. Xinkai Wu: xinkaiwu@cpp.edu
Dr. Lianyu Chu: lchu@clr-analytics.com

Parsons – Call for Projects Update

Update on Packages 1-9

Tuesday, December 8th, 2020

Project Objective

- Assist Caltrans D7 to manage the execution of the 9 arterial ITS improvement projects

#	Package Description	Contract #	Contract Status	Target
1	Bluetooth – Iteris Velocity	07A4470	Completed, Contract Closed	5/31/2019
2	Bluetooth – BlueToad	07A4477	Final System Testing Phase	10/31/2020
3	New Controller Cabinets	07A4761	Permit Application	Apr 2021
4	Communication Upgrades	07A4479	Completed, Contract Closed	6/30/2020
5	Firmware/Timing Plan Updates/Controller Upgrades	07A4480	Material Delivery/Testing	Apr 2021
6	Video Detection System	07A4481	Completed, Contract Closed	6/30/2020
7	Data Communication Module and Video Detection Software Upgrade	07A4755	Installation	Dec 2020 – Jan 2021
8-1	DMS Procurement	07A4792-3	Procuring one missing item	Jan 2021
8-2	DMS Integration	07A4794	Integration & Testing Phase	Mar 2021
8-3	DMS & Static Sign Installation	N/A	In progress	Dec 2020 – Jan 2021
9	Environmental Stations with Air Quality Sensors and Open Data Systems	07A4388	Development Phase	Q1,2021

Project Stakeholders

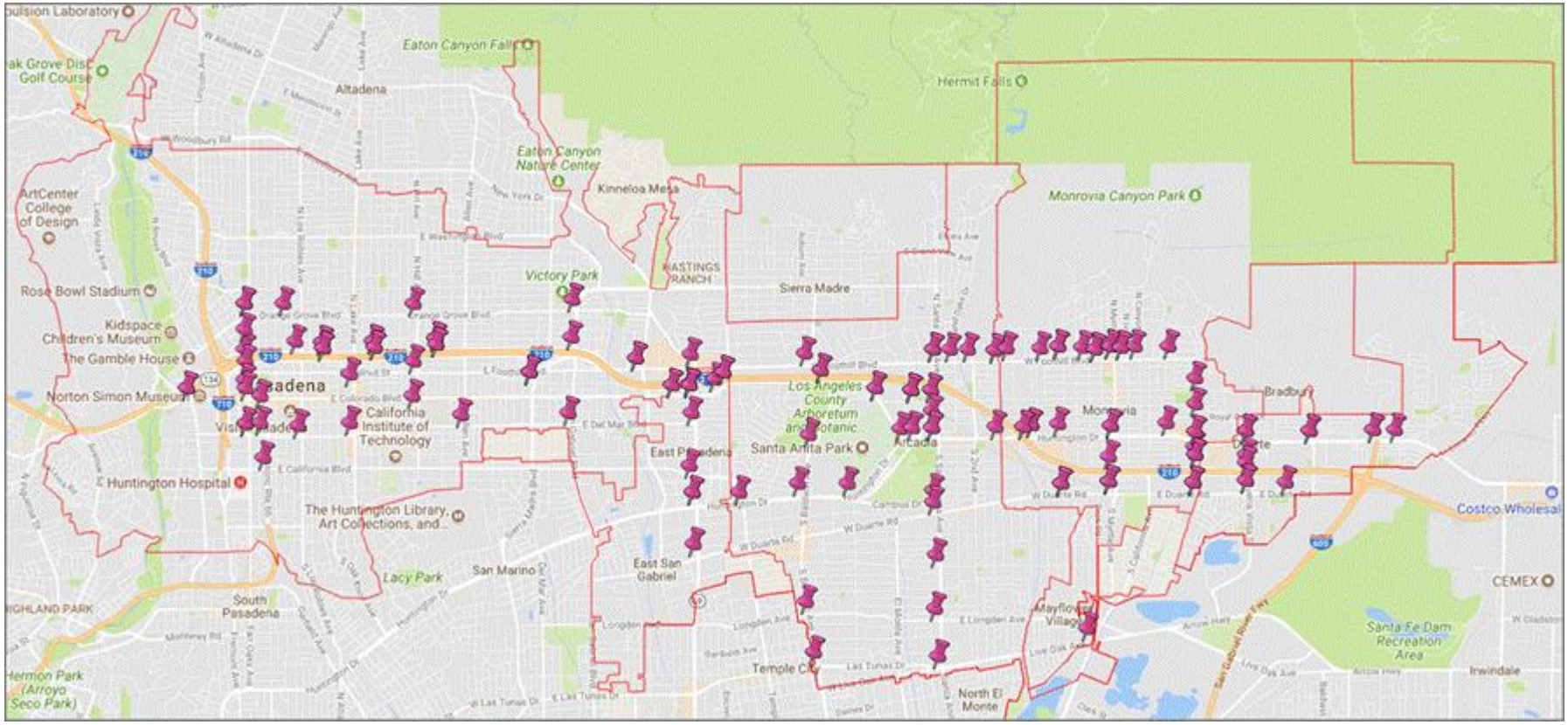
#	Package Description	Contract #	Metro & Caltrans	City of Pasadena	City of Arcadia	City of Monrovia	City of Duarte	LA County	Foothill Transit
1	Bluetooth – Iteris Velocity	07A4470	√		√				
2	Bluetooth – BlueToad	07A4477	√	√		√	√	√	
3	New Controller Cabinets	07A4761	√	√	√				
4	Communication Upgrades	07A4479	√		√	√	√	√	
5	Firmware/Timing Plan Updates/Controller Upgrades	07A4480	√	√	√	√		√	
6	Video Detection System	07A4481	√	√	√	√	√	√	
7	Data Communication Module and Video Detection Software Upgrade	07A4755	√	√	√	√	√	√	
8-1	DMS Procurement	07A4792-3	√	√				√	
8-2	DMS Integration	07A4794	√	√				√	
8-3	21 DMS Installation	Stakeholders	√	√				√	
	11 Static Sign Installation	Stakeholders	√	√	√		√	√	
9	Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)	07A4388	√	√					√

Project Stakeholders (cont.)

Additional Integration contracts – not part of the 9 Packages

#	Package Description	Contract #	Metro & Caltrans	City of Pasadena	City of Arcadia	City of Monrovia	City of Duarte	LA County	Foothill Transit
10	C2C between LA County KITS and I-210 CC's DSS	07A4486	√					√	
11	C2C between Pasadena and I-210 CC's DSS	07A4395	√	√					
12	I-210 CC System Consulting Contract	07A4340	√						

Project Area (cont.)



Package Status – Pkg # 1

Pkg. #	Pkg.	Contract #	Project Status
1	Bluetooth – Iteris Velocity	07A4470 PTM	• NTP: 7/10/2018 • Kick-off Meeting: 7/30/2018 • Submittal Approved: 8/16/2018 • Installation & Testing Completed on 5/29 & 5/30/2019 • Accepted by Arcadia, Documents Submitted • Completed

Package Status – Pkg # 2

Pkg. #	Pkg.	Contract #	Project Status

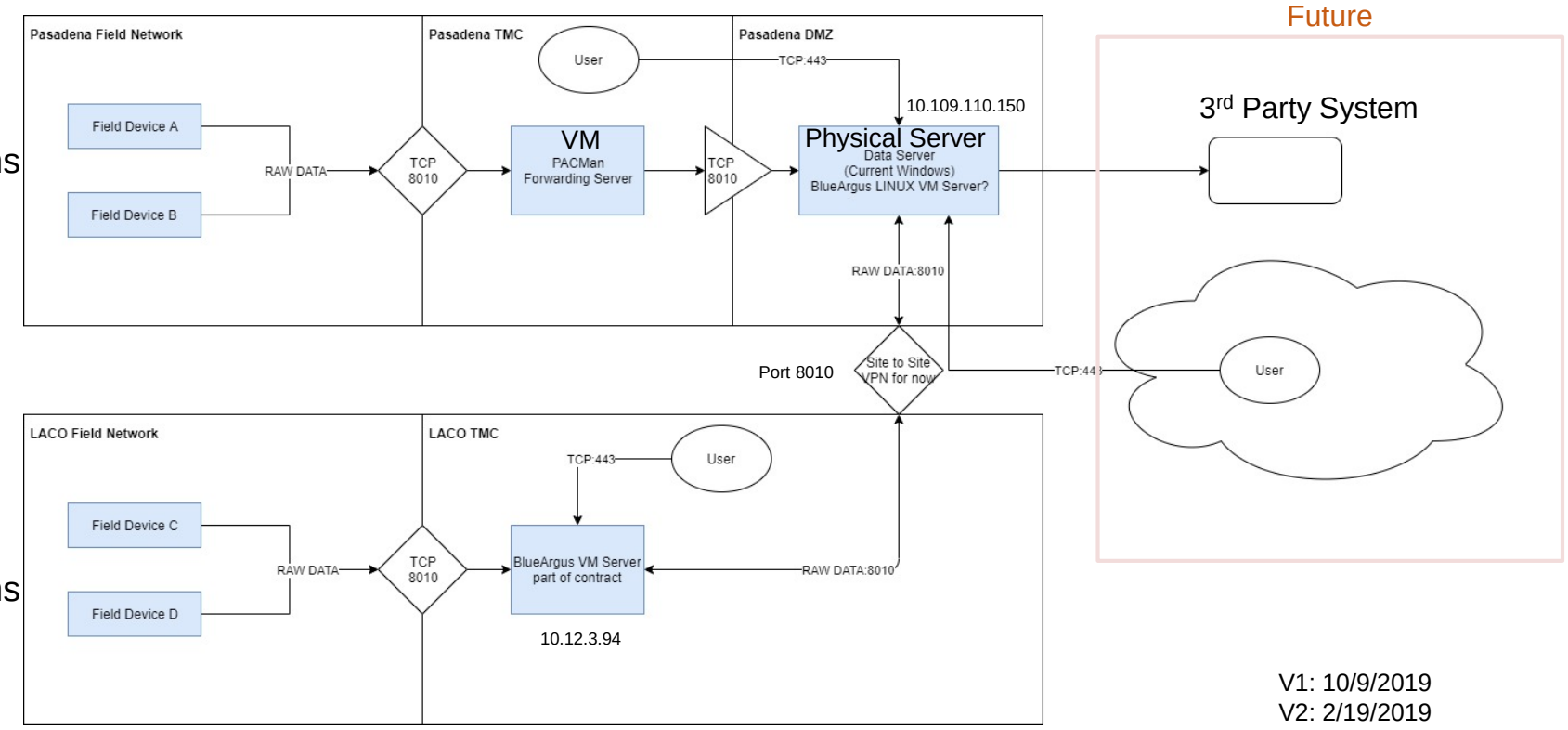
2	Bluetooth – BlueToad	07A4477 DBX	• NTP: 7/10/2018
			• Kick-off Meeting: 7/30/2018
			• Submittal Approved: 10/12/2018
			• Site Installation & Site Acceptance:
			  • LA County (4), Monrovia (4), Duarte (2): completed
			  • Caltrans (1 location without existing comms): Equipment delivered to LA County (confirmed)
			  • Pasadena (11): completed
			• TMC Server Installation & Configuration: Completed (5/2020)
			• LA Co <-> Pasadena Server Communications: configured & tested
			• **System Acceptance Testing & Training**
			  • Pasadena:
			  • All 11 locations online; final acceptance test & training completed on 11/13/2020
			  • LA County, Monrovia, Duarte:
			  • 9 locations online, final acceptance test & training completed on 12/14-17/2020
			  • Foothill@Mytle: radio communication issue – need support from LA Co & Monrovia
			• Expected to be completed: 12/31/2020 (95%)

Package Status – Pkg # 2

- **P2 - BlueToad Travel Time System – Comm. Architecture**

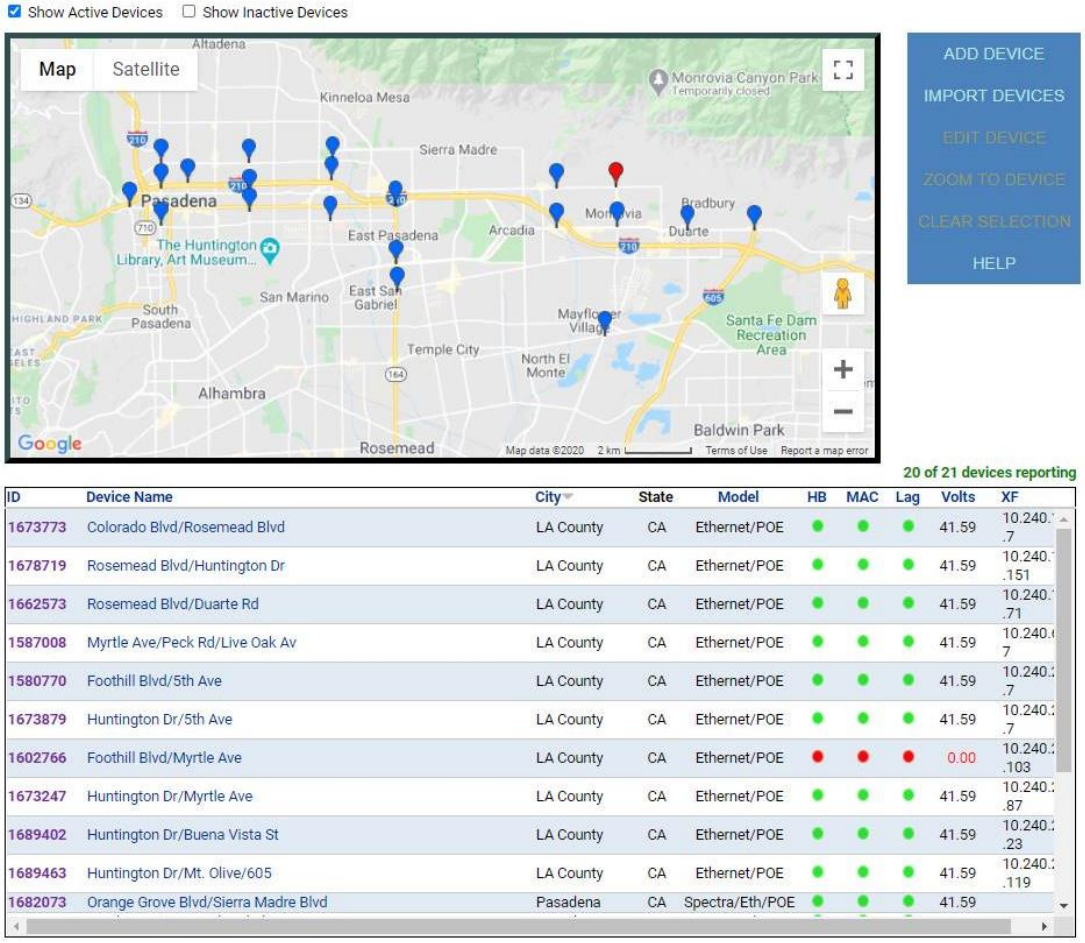
11 locations

10 locations



V1: 10/9/2019
V2: 2/19/2019
V3: 6/11/2020

Package Status – Pkg # 2



ID	Device Name	City	State	Model	HB	MAC	Lag	Volts	XF
1673773	Colorado Blvd/Rosemead Blvd	LA County	CA	Ethernet/POE				41.59	10.240.1 .7
1678719	Rosemead Blvd/Huntington Dr	LA County	CA	Ethernet/POE				41.59	10.240.1 .151
1662573	Rosemead Blvd/Duarte Rd	LA County	CA	Ethernet/POE				41.59	10.240.1 .71
1587008	Myrtle Ave/Peck Rd/Live Oak Av	LA County	CA	Ethernet/POE				41.59	10.240.(7
1580770	Foothill Blvd/5th Ave	LA County	CA	Ethernet/POE				41.59	10.240.1 .7
1673879	Huntington Dr/5th Ave	LA County	CA	Ethernet/POE				41.59	10.240.1 .7
1602766	Foothill Blvd/Myrtle Ave	LA County	CA	Ethernet/POE				0.00	10.240.1 .103
1673247	Huntington Dr/Myrtle Ave	LA County	CA	Ethernet/POE				41.59	10.240.1 .87
1689402	Huntington Dr/Buena Vista St	LA County	CA	Ethernet/POE				41.59	10.240.1 .23
1689463	Huntington Dr/Mt. Olive/605	LA County	CA	Ethernet/POE				41.59	10.240.1 .119
1682073	Orange Grove Blvd/Sierra Madre Blvd	Pasadena	CA	Spectra/Eth/POE				41.59	

For support, please send email to: bluetoad-help@trafficcast.com

Caltrans Metro RIITS SCAG SGVCOG Foothill Transit PATH

Package Status – Pkg # 3

Pkg. #	Package Name	Contract #	Project Status

3	New Controller Cabinets	07A4761 Crosstown	• Advertised: 9/26/19
			• Awarded: 2/11/2020
			• NTP: 2/19/2020
			• Kick-off Meeting: 2/25/2020
			• Material Submittal Review: Approved
			• Installation :
			  • Arcadia (1 site): completed & tested
			  • Used city-furnished controller, new equipment to be delivered to City
			  • Pasadena (7 sites): Additional underground work to be conducted by the City due to cabinet relocation at 6 locations.
			  • City and contractor conducted site investigation on 6/24/20, submitted the plans on 8/28/20; P3 & P5 contractors, the City & Caltrans agree on scope, sequence, and schedule; Layout sketches approved on 11/10/20;
			  • Permit Application to be approved but City Moratorium Period will be in effect from 12/15/20-1/5/21
			  • 1 location: Jan 2021; 6 locations: Apr 2021
			• Expected to be completed: Apr 2021

P3 & P5 Coordination – 6 Pasadena Locations

Year	2020				2021						
Month	9	10	11	12	1	2	3	4	5	6	7
0. Apply construction permit for 7 intersections											
1. Install 6 new cabinet at 6 new locations Install & turn on 1 new cabinet at 1 existing location											
2. Conduct underground work, provide comm. & power to the new cabinets											
3. Deliver & test new controllers to Pasadena											
4. Install new controllers in new cabinets, update timing plan											
5. Turn on 7 new controllers											
6. Turn on 6 new cabinets at 6 new locations											
7. Remove 6 existing cabinet & restore the sidewalk											

P3 Contractor – Install New Cabinet

P5 Contractor – Install New Controller

Pasadena City Resource – Provide Infrastructure to new Cabinet Location

Package Status – Pkg # 4

Pkg. #	Package Name	Contract #	Project Status
4	Communication Upgrades	07A4479 Kanaan Construction	• NTP: 7/13/2018 • Kick-off Meeting: 7/30/2018 • Submittal & RFI Approved: 5/6/2019 • Equipment procured • Installation of 35 locations: completed • Testing & Acceptance: completed (1/13/2020 & 4/14/2020) • Contract Closed: 6/30/2020

Package Status – Pkg # 5

Pkg. #	Package Name	Contract #	Project Status

5	Firmware/ Timing Plan Updates/C ontroller Upgrades	07A4480 CPE, Inc	• NTP: 7/17/2018
			• Kick-off Meeting: 7/30/2018
			• Changed hardware/firmware requirements per Stakeholder Comment; revised price estimate ($124,971) lower than original amount ($171,600) – reviewed & approved
			• Material - approved & ordered
			  • Pasadena: 7 controllers delivered (11/24/2020)
			  • Arcadia: 4 controllers delivered (11/4/2020)
			  • Monrovia: 3 D4 firmware delivered; 4 controllers expected Dec 2020
			• Installation
			  • 3 locations in Monrovia (related to Metro Gold Line project):
			  • spare 1C module (Arcadia) used to test firmware upgrade
			  • Timing: completed for 1 intersection, pending testing
			  • Installation: started in early Oct 2020; Est. Completion: Dec 2020
			  • 2 locations in Arcadia: Done
			  • 4 locations in Monrovia: Jan-Feb 2021
			  • 7 locations in Pasadena: Apr 2021
			• Expected to be completed: Apr 2021

Package Status – Pkg # 6

Pkg. #	Package Name	Contract #	Project Status

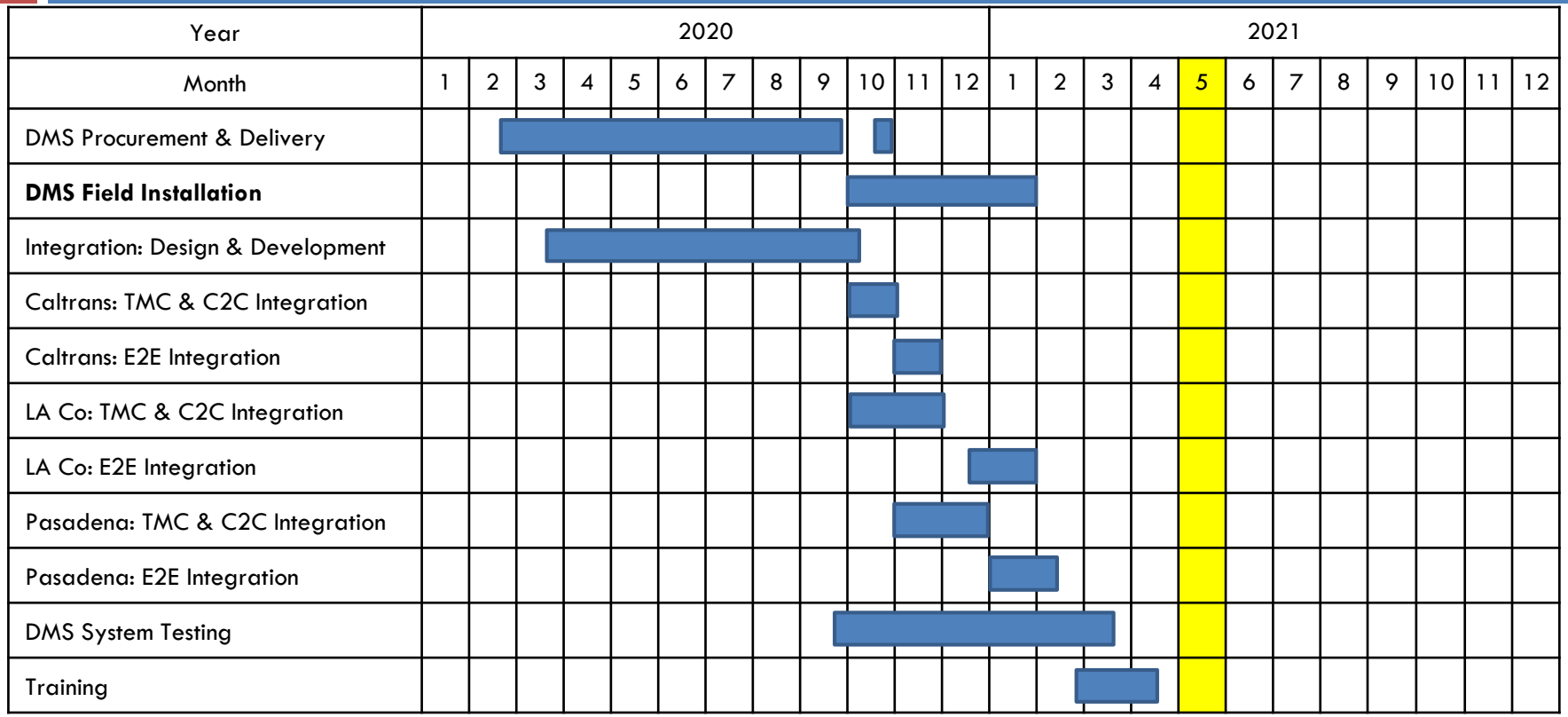
6	Video Detection System	07A4481 Traffic Loops Crackfilling, Inc	• NTP: 7/10/18
			• Kick-off Meeting: 7/30/18
			• 10/9/18: Conducted Site Survey
			• 10/18/18: Submittal approved
			• Installation: all 22 locations completed (Mar 2020)
			• Installation (22 locations):
			  • 22 locations: all completed
			  • Installation of conduit: completed
			• Acceptance Testing: Completed
			• As-built & Test Reports: Completed
			• Contract Closed: 6/30/2020

Package Status – Pkg # 7

Pkg. #	Package Name	Contract #	Project Status

7	Data Communication Module and Video Detection Software Upgrade	07A4755 Crosstown	• Advertised: 1/2/2020
			• Awarded: 2/11/2020
			• NTP: 2/19/2020
			• Kick-off Meeting: 2/25/2020
			• Materials
			  • LA County (4): approved
			  • Duarte (1): approved
			  • Monrovia (3): approved
			  • Arcadia (14): approved
			  • Pasadena (change from 8 to 6): approved
			• Procurement: Completed 7/10/2020
			• Installation:
			  • 25 out of 30 locations: completed
			  • Working on 5 locations in Pasadena (previously est. Dec 2020, could be adjusted to Jan 2021 due to Moratorium Period)
			• Expected to be completed: Dec 2020 – Jan 2021

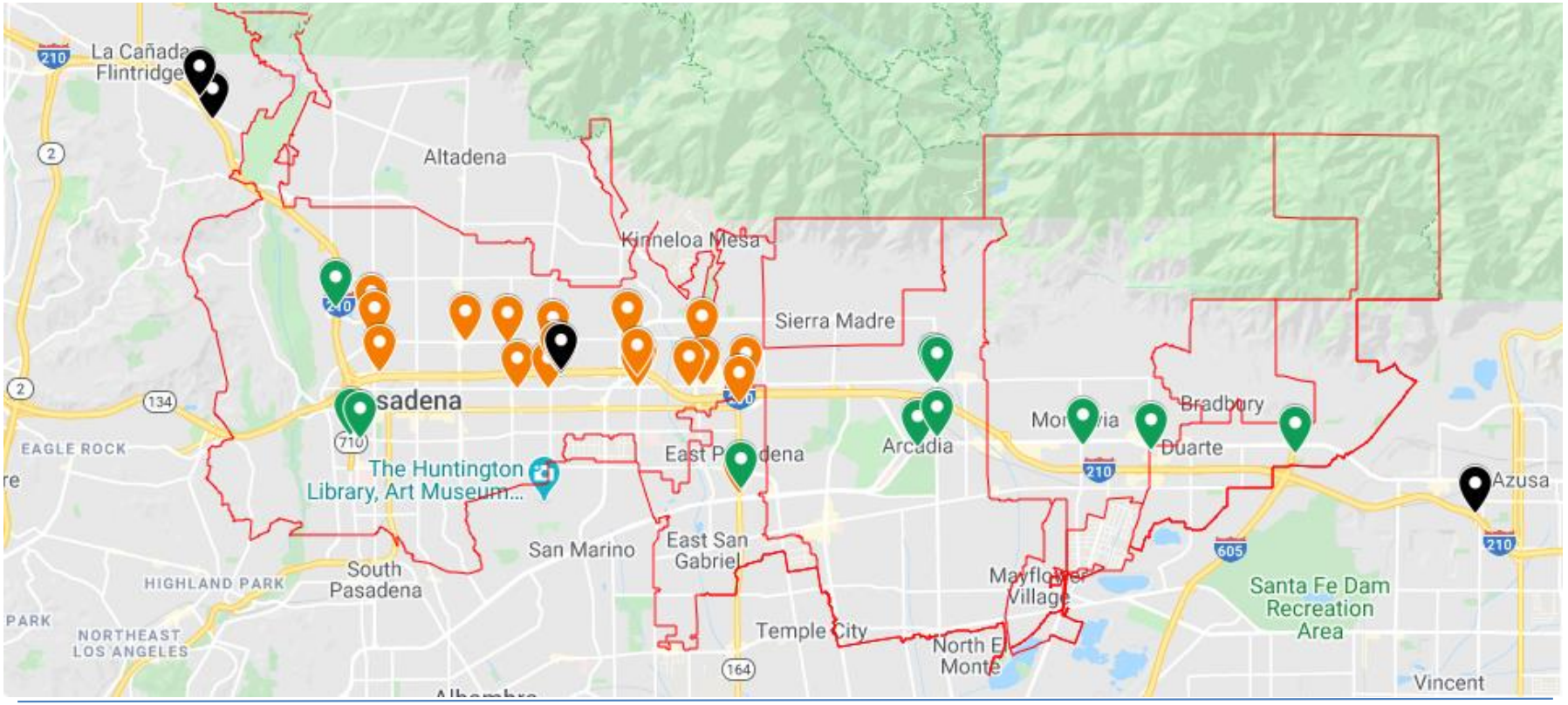
Package Status – Pkg # 8-1, 8-2, 8-3



Item	Total	Caltrans	Arcadia	Pasadena	Duarte	Monrovia	LA County
# of DMS	21	2		17			2
# of Static Signs	31	3	12	1	6	6	3

I-210 CC DMS, CMS, Static Signs

- Existing CMS: 6 along I-210 WB, 4 along I-210 EB
- New Static Detour Sign: 11 locations
- New Detour DMS: 19 locations



Package Status – Pkg # 8-1

Pkg. #	Package Name	Contract #	Project Status
8-1	Advanced Traveler Information Systems: DMS Procurement	07A4792-3 Elan Moyal	• Advertised: 10/25/19 • Awarded: 12/2/ 2019 • Kickoff meeting: 12/19/2019 • Material Submittals & procurement: in progress • Expected to be completed: Jan 2021

Package Status – Pkg # 8-1

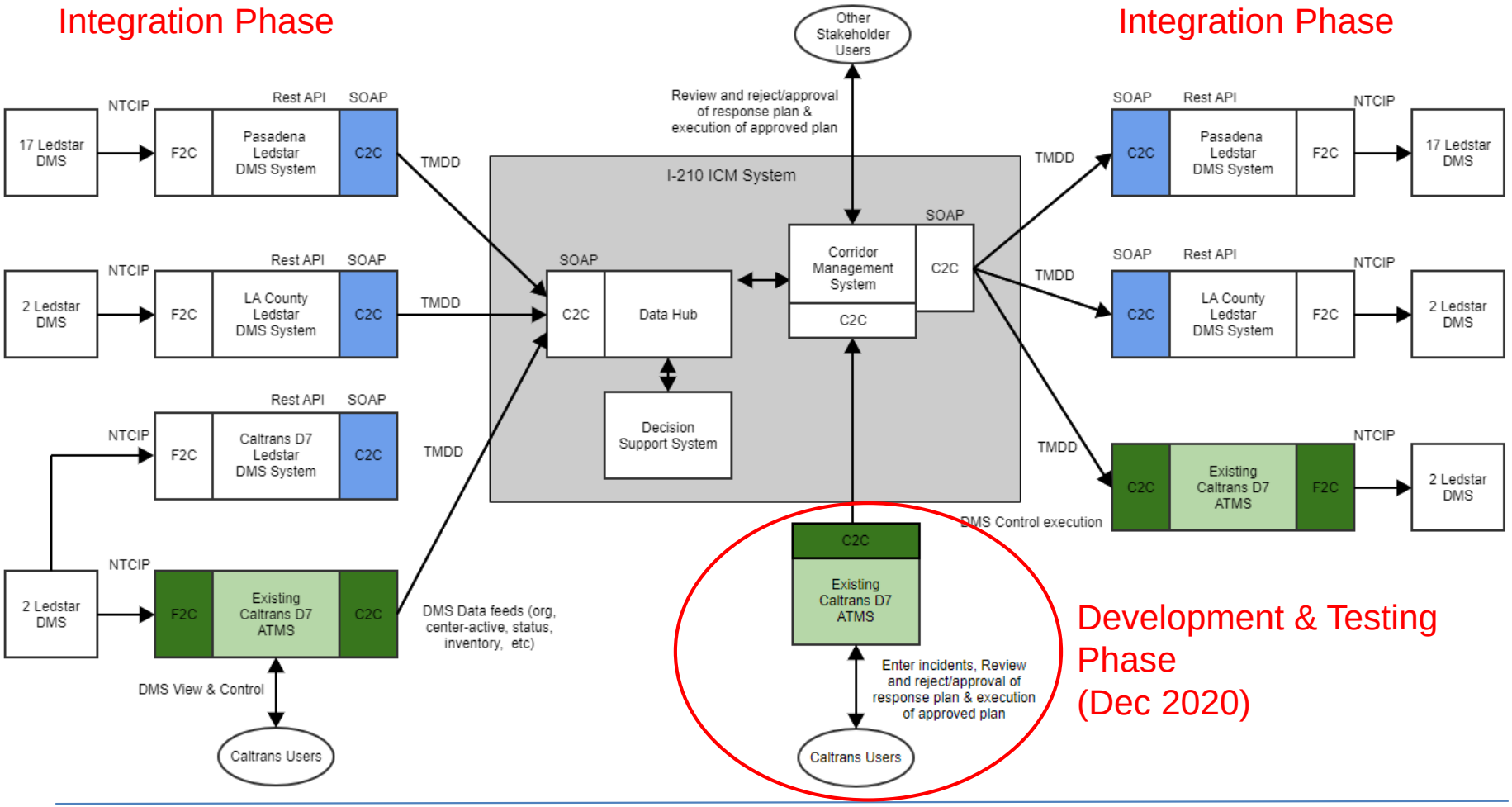
Item	Total	Caltrans	LACO	Pasadena	Ordered	Delivery
DMS & Mounting Hardware	21	2	2	17	3/27/20	17 delivered to Pasadena (confirmed) 2 delivered to LA County (confirmed) 2 delivered to Caltrans (confirmed) Mounting Hardware (submittal to be distributed for stakeholder review)
DMS Poles & Anchor Bolts	19	0	2	17	2/21/20	2 delivered to LACO: 6/15/2020 (confirmed) 17 delivered to Pasadena: 6/15/2020 (confirmed) 2 delivered to LACO: 8/18/2020 (confirmed) 17 delivered to Pasadena: 7/9/2020 (confirmed)
Pull boxes	19	0	2	17	4/30/20	2 delivered to LACO: 5/21/2020 (confirmed) 17 delivered to Pasadena: 6/1/2020 (confirmed)
Power & Comm Cables	11,000 ft	TBD	TBD	TBD	4/23/20	9 boxes delivered to Pasadena: 6/4/2020 (confirmed) 1 box delivered to LA County: 8/18/2020 (confirmed) 1 box delivered to Caltrans: 8/18/2020 (Parsons)
Radios	12	0	0	12	5/5/20	Delivered to Pasadena: 6/1/2020 (confirmed)
Sign Control System with API	3	1	1	1	3/27/20	Delivered to Caltrans: 9/29/2020
Servers	1	1	0	0	Lead time: 3 weeks	LACo: VM has been set up Pasadena: RAM cards received, VM to be set up Caltrans: Physical Server to be procured in separate PO (temporary VM has been set up)

Package Status – Pkg # 8-2

Pkg. #	Package Name	Contract #	Project Status

8-2	Advanced Traveler Information Systems: DMS Integration	07A4794 Parsons	• Advertised: 11/14/19
			• Awarded: 1/3/ 2020
			• Kickoff meeting: 1/14/2020
			• Construction Support
			  • Installation QC checklist v2 submitted
			• DMS System Development
			  • System Diagrams: completed
			  • Development Requirements: (v6) completed
			  • Design & Development: completed
			• DMS System TMC& C2C Integration & Testing
			  • LA CO TMC: setting up comms. to central system
			  • Caltrans LARTMC: Initial E2E testing ongoing
			  • Pasadena: Dec 2020- Jan 2021
			• DMS System E2E Integration & Testing
			  • Dec 2020 – Mar 2021
			• Training
			  • DMS workshop: 9/9/2020
			  • Device & Software training sessions: Jan - Mar 2021
			• Expected to be completed: Mar 2021

Package Status – Pkg # 8-2



Package Status – Pkg # 8-3

Pkg. #	Package Name	Contract #	Project Status

8-3	Advanced Traveler Information Systems: DMS & static sign Installation	N/A to be handled by Caltrans, LAPDW, & Pasadena	• DMS : delivered on 9/28/2020
			  • Installation QC Checklist & location infor distributed
			  • Installation
			  • LA County (2): Est. Oct-Dec 2020 (mounting brackets)
			  • Pasadena (17): Est. Oct-Nov 2020 (mounting brackets & Moratorium Period)
			  • Caltrans (2): will not be installed before May 2021; existing 2 DMS in close proximity can be used. (Discussion: Can statis signs be installed?)
			  • Installation support: information provided
			• Static Signs: delivered on 8/18/2020
			  • Installation QC Checklist & location info distributed
			  • Installation:
			  • LA County: starting from week of 10/19/2020
			  • Pasadena: done
			  • Arcadia: done
			  • Duarte: done
			  • Monrovia: target 12/30/2020
			• Expected to be completed: Dec 2020 – Jan 2021

Package Status – Pkg # 9

Pkg. #	Pkg.	Contract #	Project Status

9	Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)	07A4388 Cal Poly Pomona	• NTP: 6/29/18
			• Kick-off Meeting: 7/12/18
			• 3 Environmental stations
			  • Field installation done – 6/7/19
			  • Collect data and analyze data - ongoing
			• ODS Development
			  • Developed parser for transit data from Foothill Transit & Pasadena Transit
			  • Developed parser for sample response plan (ICD v1.2)
			  • Improving the program to match transit routes and diversion routes.
			• ODS Configuration and Testing
			  • Received Inventory of Road Network from PATH
			  • Need Inventory of Signal ID & Ramp Meter ID
			  • Coordinate with PATH to test automated data
			  • Coordinate with Transit agencies
			• Expected to be completed: Q1 2021 (85%)

Next Steps

- General: Need all stakeholders' prompt response on RFIs & submittal reviews to keep the project on schedule.
- Package 2: Final System Acceptance Testing & Training for LA County
- Package 3: Get construction permit and start stage 1 installation
  Package 5: Deliver remaining controllers, schedule installation
- Package 7: Complete installation
- Package 8-1: Deliver mounting brackets
- Package 8-2: System integration for LA Co TMC & Pasadena TMC; E2E testing for Caltrans LARTMC
- Package 8-3: Track installation status
- Package 9: Coordinate testing

Thank You
and
Next Meeting
(Suggest Tuesday
February 2nd, 2021 @
Zoom)