

Adaptive Ramp Metering on Beltline Highway

September 9, 2013

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TOM ADAMS

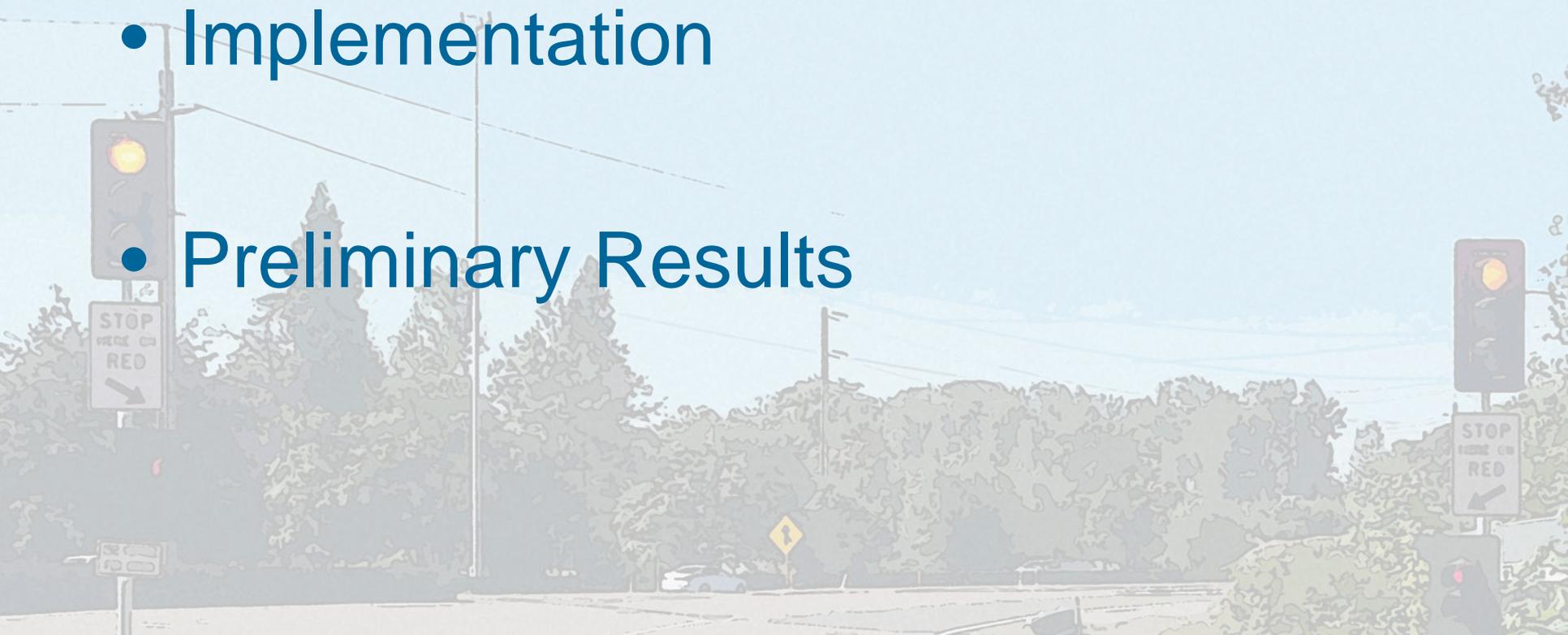
@TADAMSTHOMAS

KVAL 13

6:07 81°

#LiveOnKVAL

- History & Planning
- Implementation
- Preliminary Results

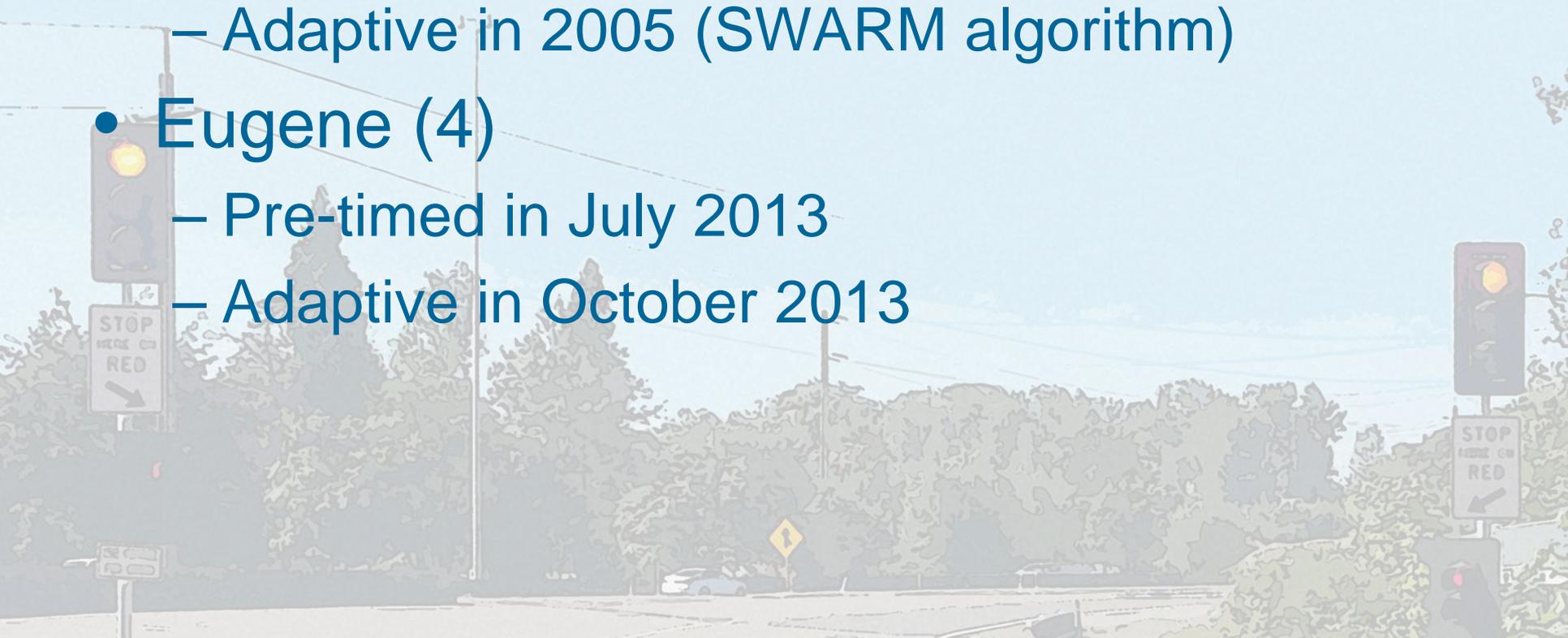


History & Planning



Ramp Metering History in State of Oregon

- Portland (about 150)
 - First Implemented in 1981 (Pre-timed)
 - Adaptive in 2005 (SWARM algorithm)
- Eugene (4)
 - Pre-timed in July 2013
 - Adaptive in October 2013

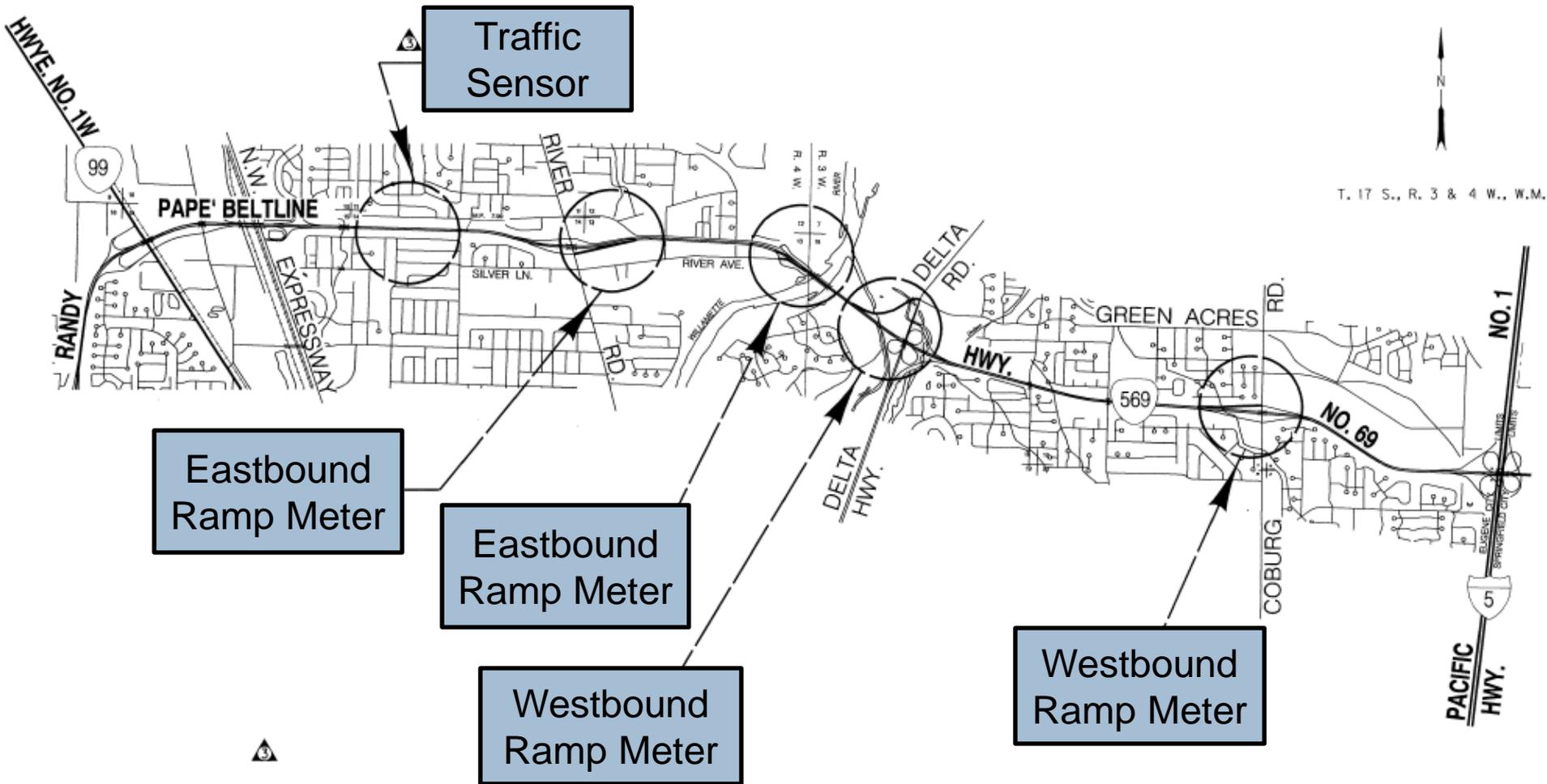


Why Beltline Highway?

- Purpose and Need
- ITS Analysis
- Geometric Constraints



Ramp Meter Locations



Eastbound: River Rd



Eastbound: River Rd



Eastbound: River Ave



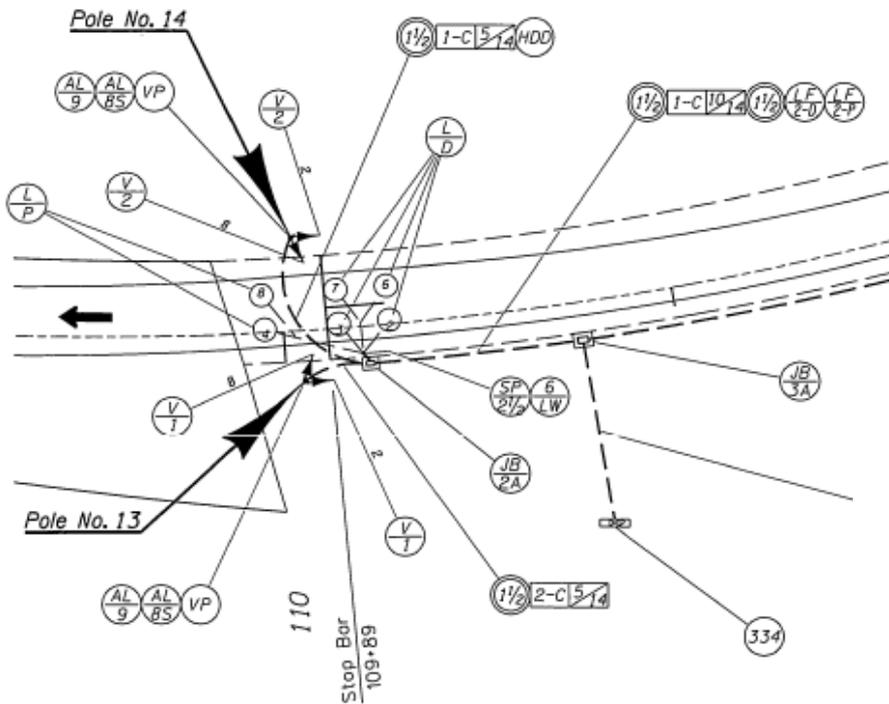
Eastbound: River Ave



Westbound: Green Acres



Westbound: Green Acres



Westbound: Coburg



What's New?

- New Hardware
- New Firmware
- New Software
- New Location for Ramp Metering

Hardware (ATC)



Firmware (Intellight)



[Home](#) [Print](#) [Manual](#) [Mobile](#)

- Front Panel Emulator
- Status
 - Status Summary
 - Metered Lanes
 - Mainline Lanes
 - Demand Detectors
 - Passage Detectors
 - Metered Queues
 - Sensor Data
 - Alarm Status
 - Channel Status
 - Input & Output Status
 - Cabinet Status
 - Peer Status
 - Manual Test
- Controller
 - General Config
 - Mainline Lanes
 - Metered Lanes
 - Metered Lane Control
 - Metering Plans
 - Dependency Groups
 - Demand Detectors
 - Passage Detectors
 - Metered Queues
 - Sensor Zones
 - Historical Data Reset
- Advanced IO
- Scheduler Configuration
 - Alarm Configuration
 - Peer Configuration
- User Programs Configuration
- Administration
 - Unit Information
 - Communication Settings
 - Date & Time Settings
 - Database Management

Meter Lanes Output Status

Lane	1								2							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Reds	●															
Yellows																
Greens	●															

Meter Lanes

Lane	1	2	3	4	5	6	7	8
Interval	Green	Red	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled
Active Cmd Source	Timebase Control	Timebase Control	Default	Default	Default	Default	Default	Default
Active Base Meter Rate	700	700	0	0	0	0	0	0
Active Meter Rate	700	700	0	0	0	0	0	0
Active Action	Fixed Rate	Fixed Rate	Dark	Dark	Dark	Dark	Dark	Dark
Requested Action	Fixed Rate	Fixed Rate	Dark	Dark	Dark	Dark	Dark	Dark
Active Queue Adjust	None	None	None	None	None	None	None	None

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Mainline Lanes Statistics

Average Flow Rate (vph)	675
Average Occupancy (%)	6.4
Average Speed (mph)	60
Num Flow Rate Lanes	4
Num Occupancy Lanes	4
Num Speed Lanes	4

Mainline Lanes

Lane	1	2	3	4	5	6	7	8
Status	Working	Working	Working	Working	Disabled	Disabled	Disabled	Disabled
Lead	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled
Trail	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled
Usage	Vol-Occ-Speed	Vol-Occ-Speed	Vol-Occ-Speed	Vol-Occ-Speed	Not Used	Not Used	Not Used	Not Used

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Detector Status

Det Group	1								2								3								4							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Status	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

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Wavetronix



Sensor Data

Zone	End Time	Volume	Occupancy	Speed (mph)	85 Percent Speed (mph)	Status
1	Thu Jul 25 01:23:20 2013	5	16.0	55.6	59.9	OK
2	Thu Jul 25 01:23:20 2013	5	6.9	61.0	62.9	OK
3	Thu Jul 25 01:23:20 2013	5	6.9	56.9	60.4	OK
4	Thu Jul 25 01:23:20 2013	2	3.3	47.8	49.9	OK
5	Unknown	N/A	N/A	N/A	N/A	Disabled

Central Ramp Metering System

Oregon Department of Transportation
Ramp Metering System

REGION 1 REGION 2 TEST

Ramp Metering Traffic & Archive Reports Configuration Global Parameters

User Comments Mode and Control SWARM Main Ramp SWARM Main Freeway SWARM Local Bottleneck Graphic Bottleneck Configuration

Metering Status for Ramp 10045: Delta Hwy (W)

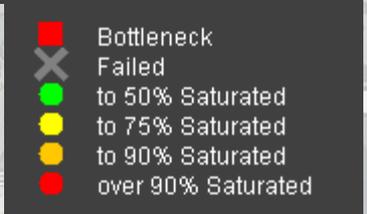
Freeze Last Update: Fri Sep 20 16:58:02 PDT 2013 Active Requested

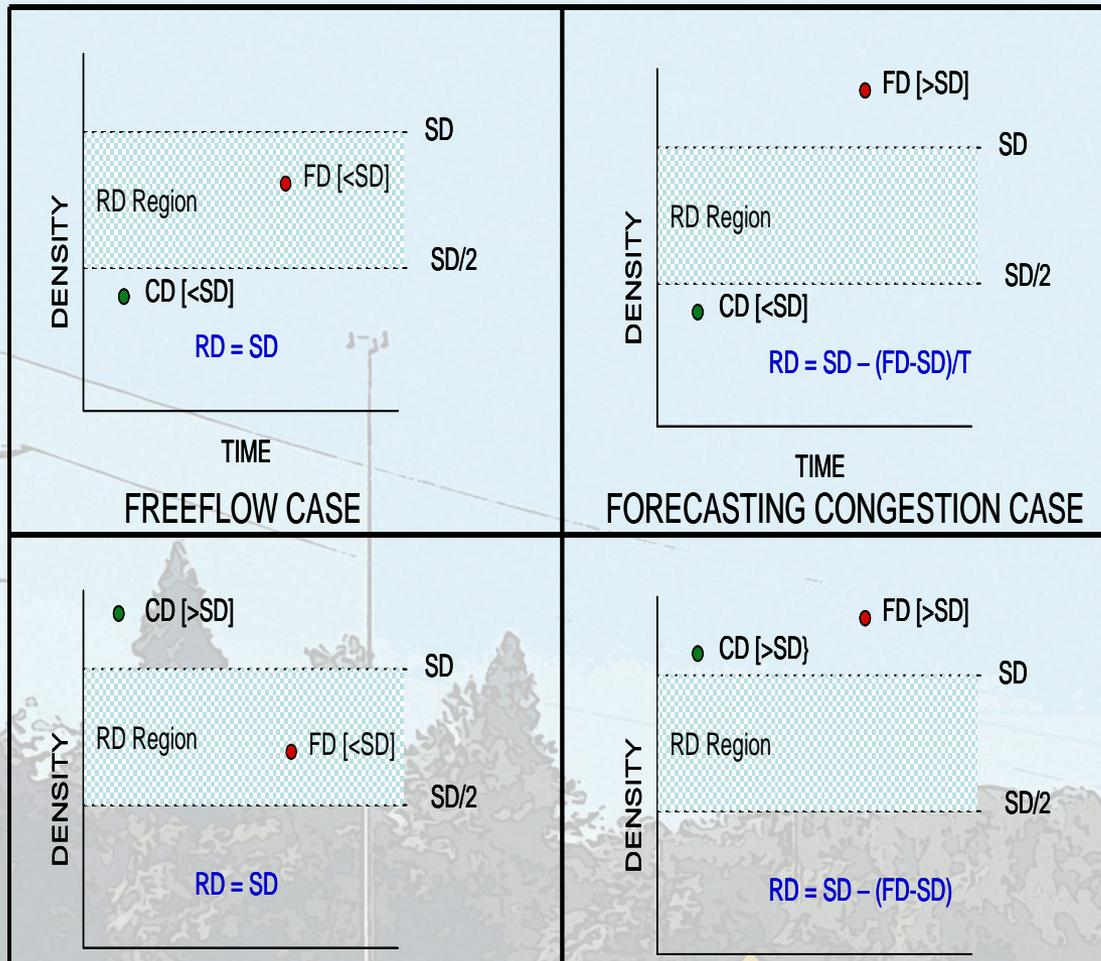
Ramp ID	10045	Highway	Beltline Hwy	Absolute Minimum Rate	300 veh//hr	Action	FIXED	FIXED
Location	Delta Hwy (W)	Absolute Maximum Rate	700 veh//hr	Metering Rate	450	450	veh//hr	
Milepost	10.05	No. Lanes	2	TOD Rate	n/a	veh//hr	Status	25.0%
Last Note				Dynamic Minimum Rate		240.00		veh//hr
				Ramp Volume		0		veh/poll

Local Mainline VDS	Downstream Mainline VDS
Station ID: 45	Station ID: 46
Location: Delta Hwy (W)	Location: Coburg Rd (W)
Milepost: 10.05	Milepost: 11.66
Speed: 55.00 mph	Speed: 62.93 mph
Density: 26.18 veh/mile/lane	Density: 20.02 veh/mile/lane

SWARM Local Computations

Current Average Density	23.10 veh/mile/lane	Raw Rate from Lookup Table	700.0 veh/hour/lane
		Previous Rate	760.00 veh/hour/lane
		SWARM LOCAL Rate	730.00 veh/hour/lane



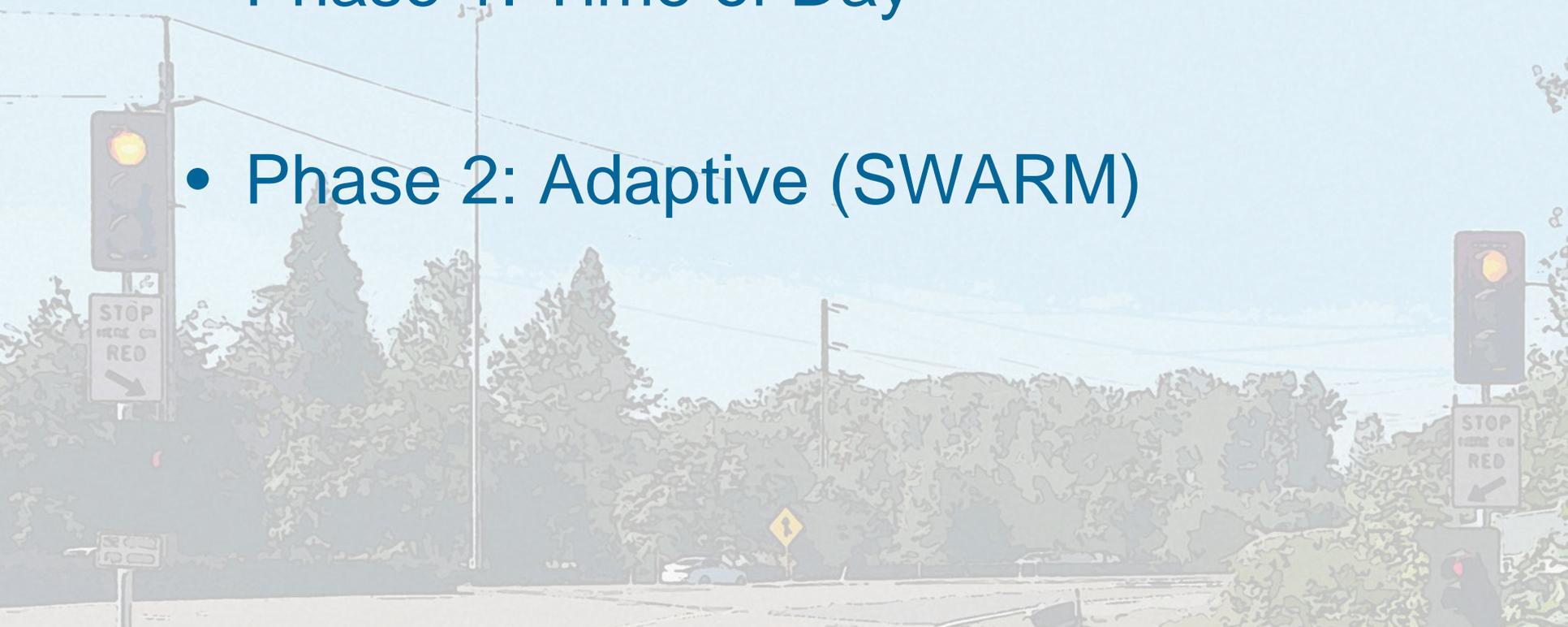


Implementation



Implementation Phases

- Phase 1: Time of Day
- Phase 2: Adaptive (SWARM)



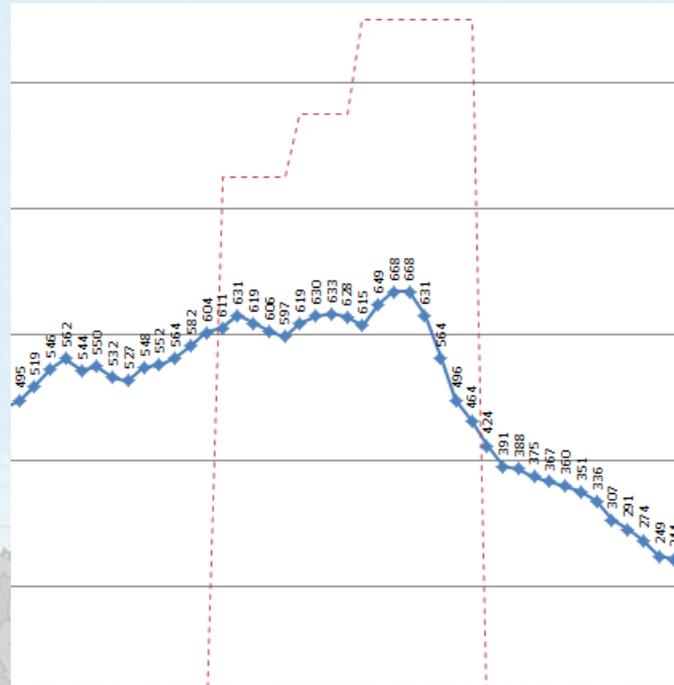
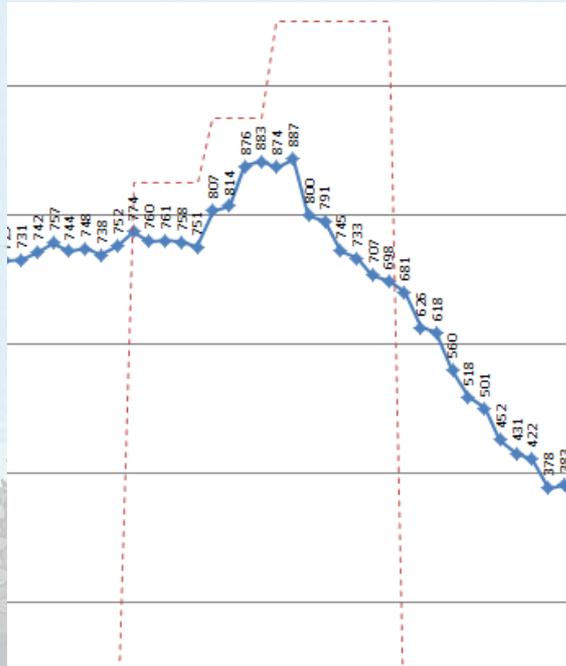
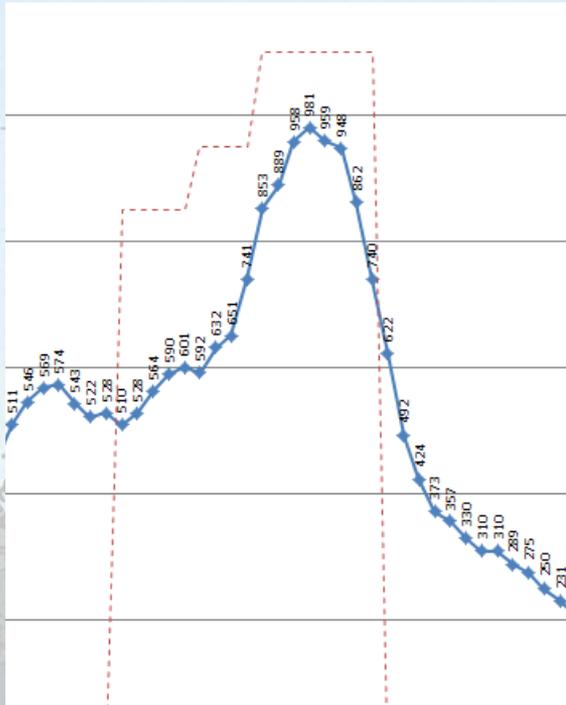
Phase 1: Time of Day

Aug 16-17, 2013

- Goals and Objectives
- Public Perception and the Media



Developing Metering Rates



Ramp Closure



Form Two Lines

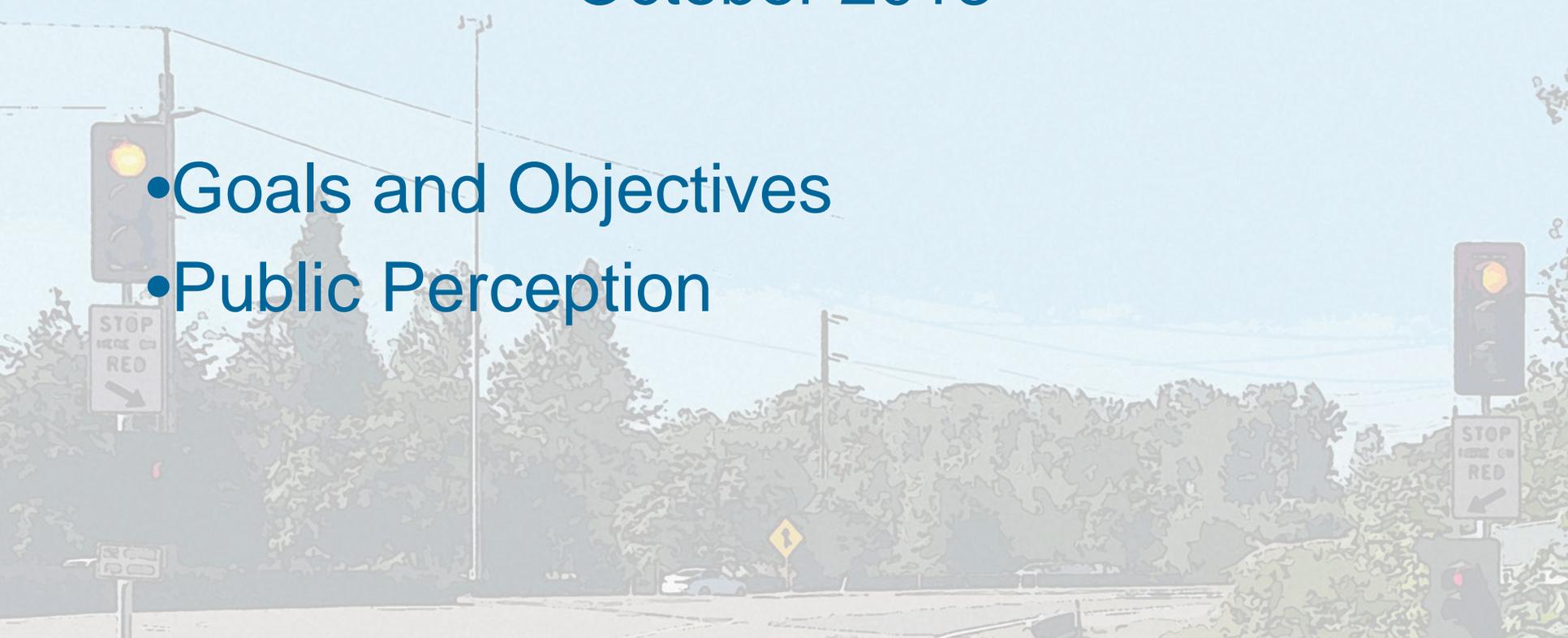




Phase 2: CRMS

October 2013

- Goals and Objectives
- Public Perception





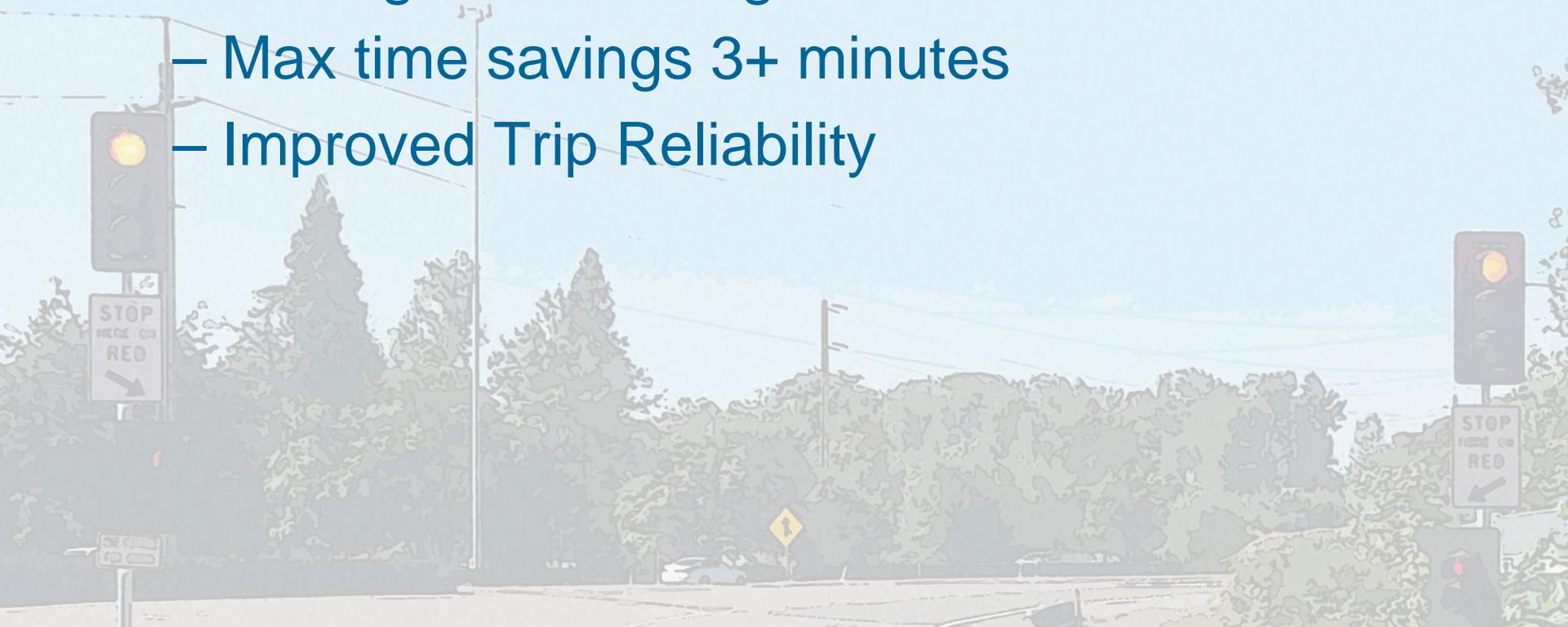


Preliminary Results



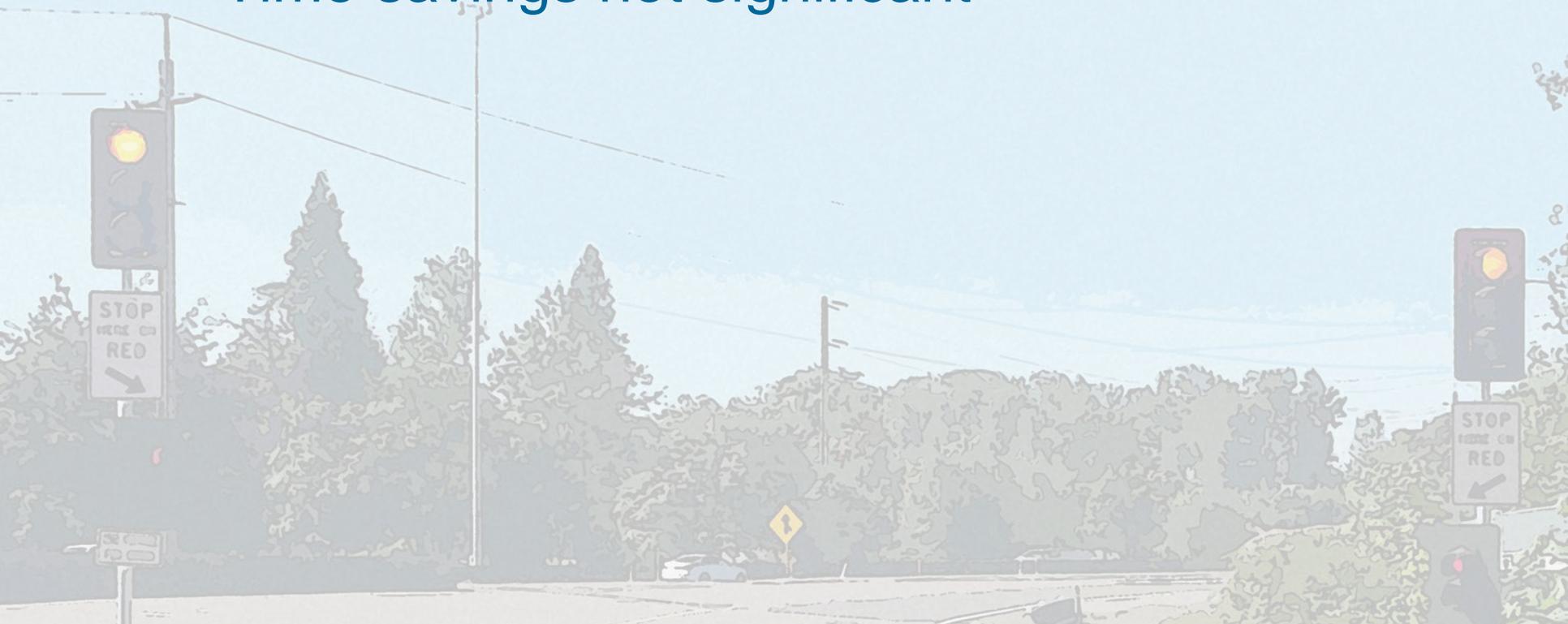
Westbound (Green Acres & Coburg Rd)

- Preliminary Data
 - Average time savings ~30 seconds
 - Max time savings 3+ minutes
 - Improved Trip Reliability



Eastbound (River Rd & River Ave)

- Preliminary Data
 - Time savings not significant



Safety Benefits

- Too early to quantify
- Expect reduction in merging-related crashes
 - Sideswipe
 - Rear-end

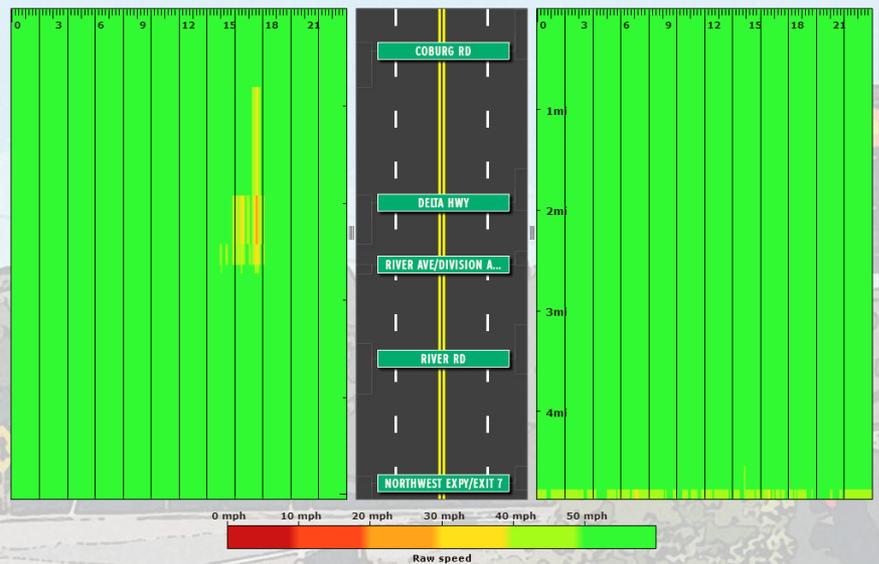
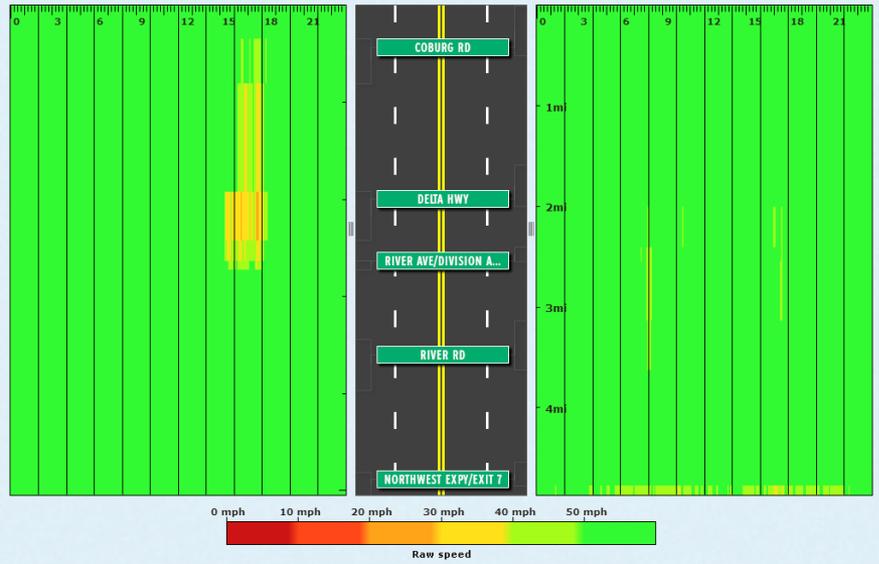


Preliminary Travel Time Benefits



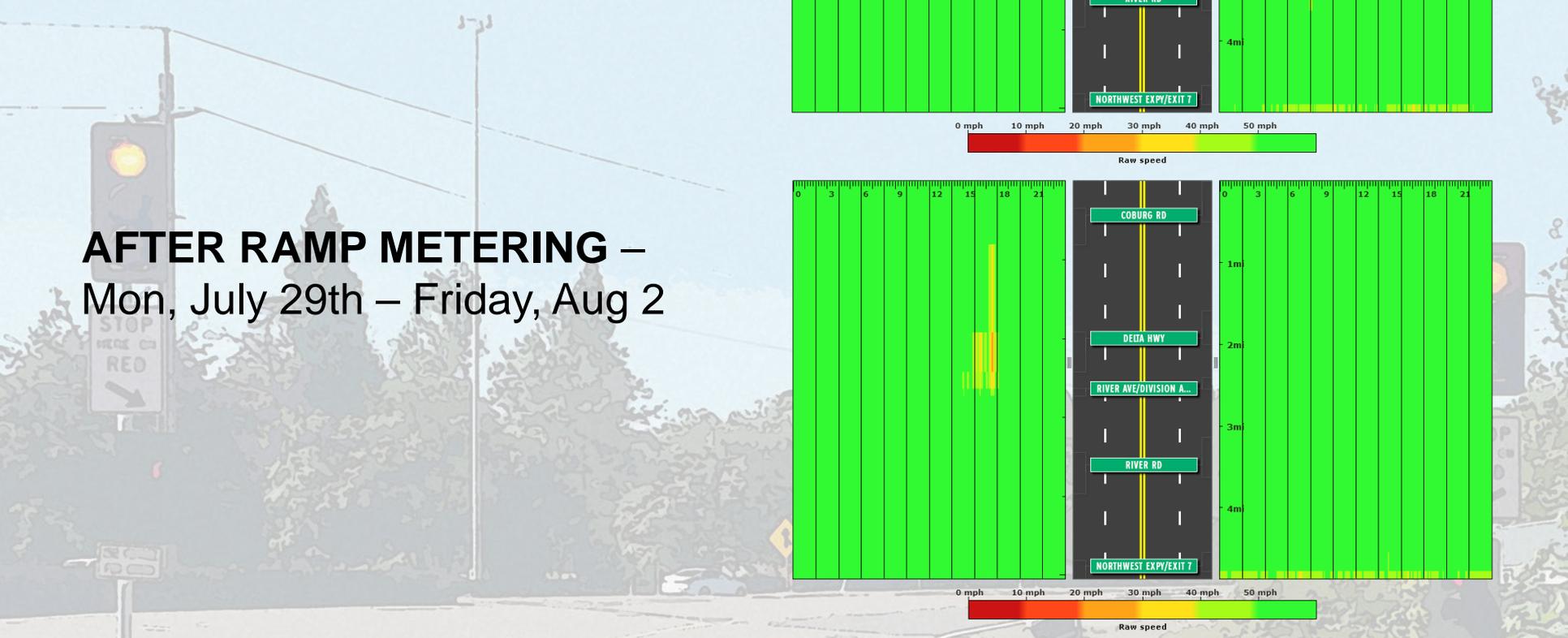
Congestion on BELT LINE HWY between Northwest Expy/Exit 7 and Coburg Rd
Data shown is averaged from Monday Jul 8, 2013 to Friday Jul 12, 2013 at 5 minute intervals.

Westbound BELT LINE HWY Eastbound



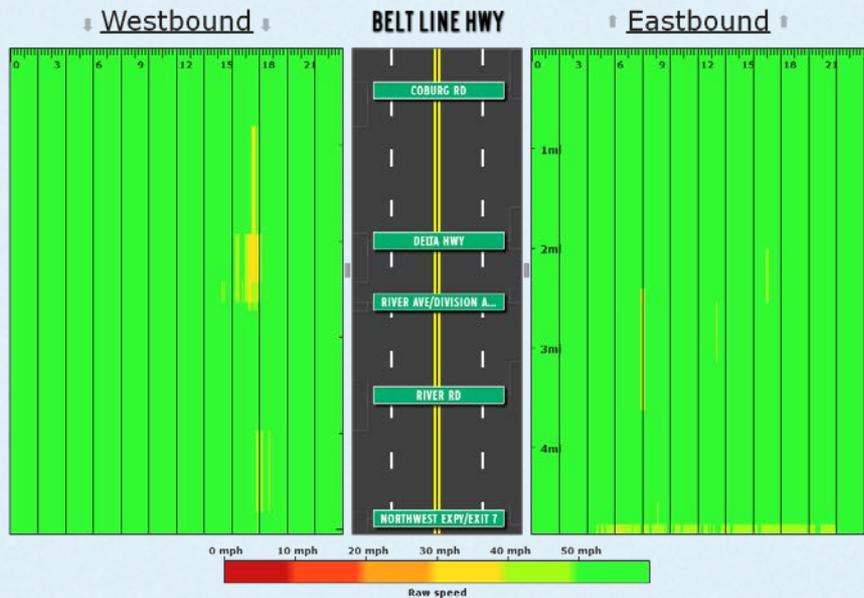
BEFORE RAMP METERING –
Mon, July 8 – Friday, July 12

AFTER RAMP METERING –
Mon, July 29th – Friday, Aug 2

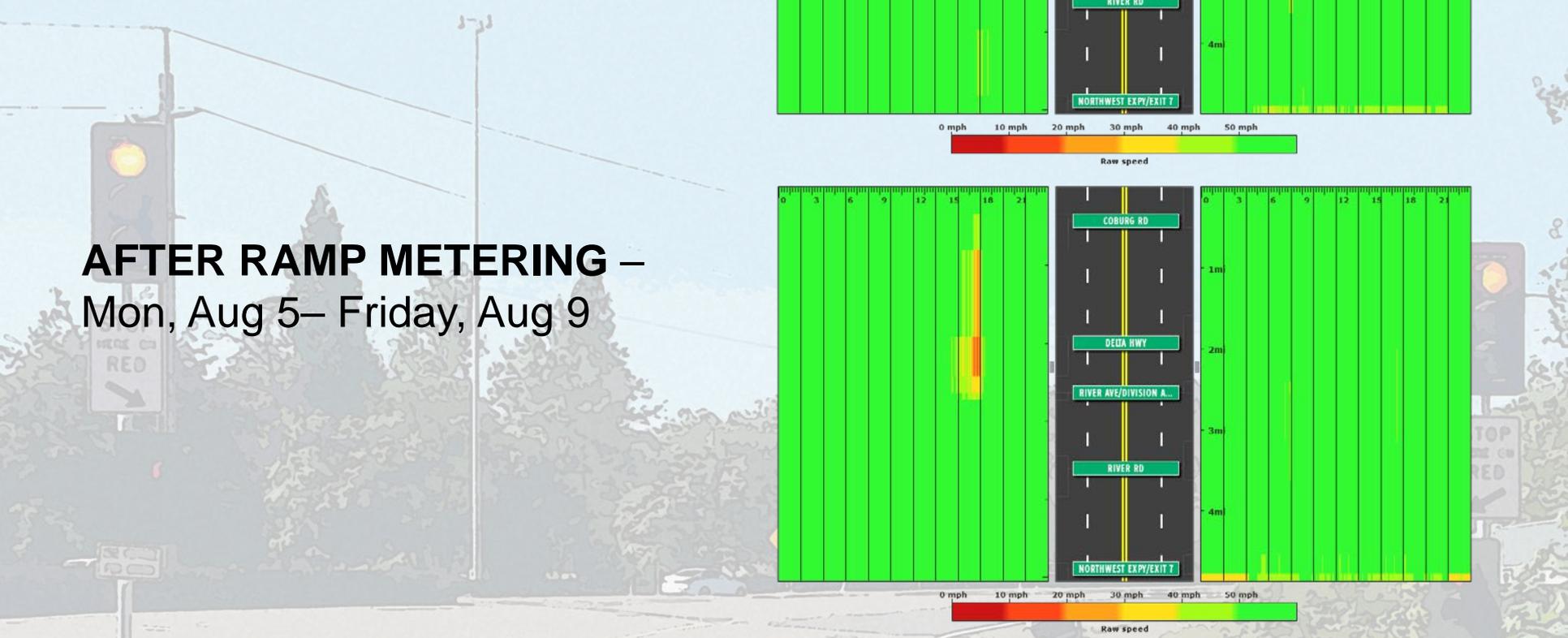
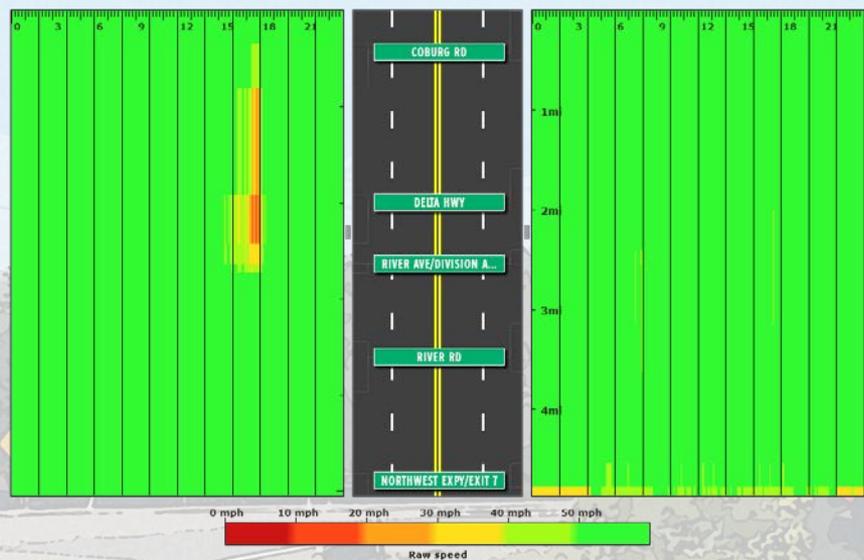


BEFORE RAMP METERING –
Mon, June 24 – Friday, June 28

Speed on BELT LINE HWY between Northwest Expy/Exit 7 and Coburg Rd
Date shown is averaged from Monday Jun 24, 2013 to Friday Jun 28, 2013 at 5 minute intervals.



AFTER RAMP METERING –
Mon, Aug 5– Friday, Aug 9





What's Next?



Any Questions?

