

Regional Effort on Performance-based Signal Timing and Coordination

Zong Z. Tian, Ph.D., P.E.

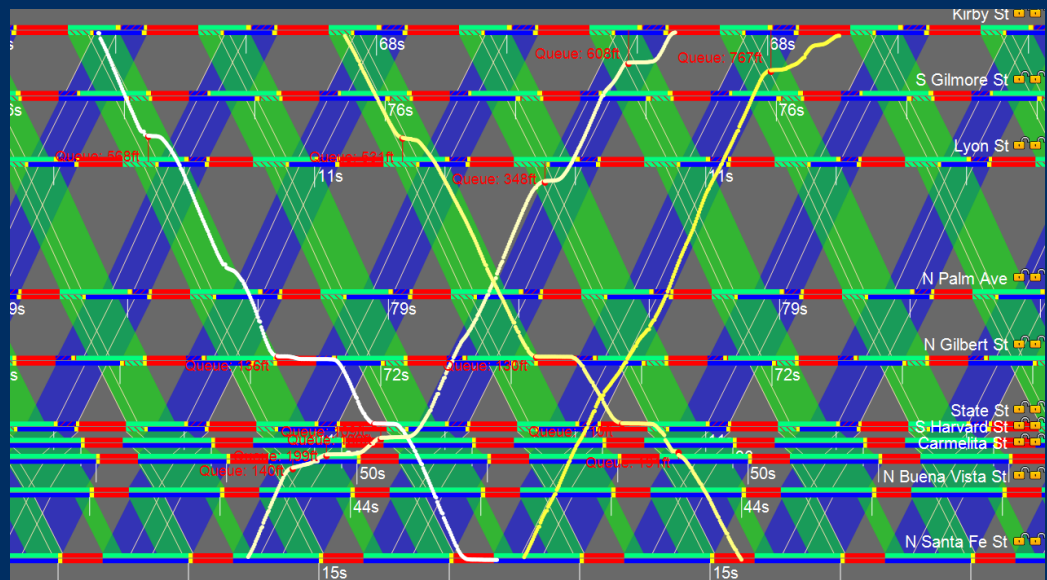
Center for Advanced Transportation
Education and Research (CATER)

University of Nevada, Reno



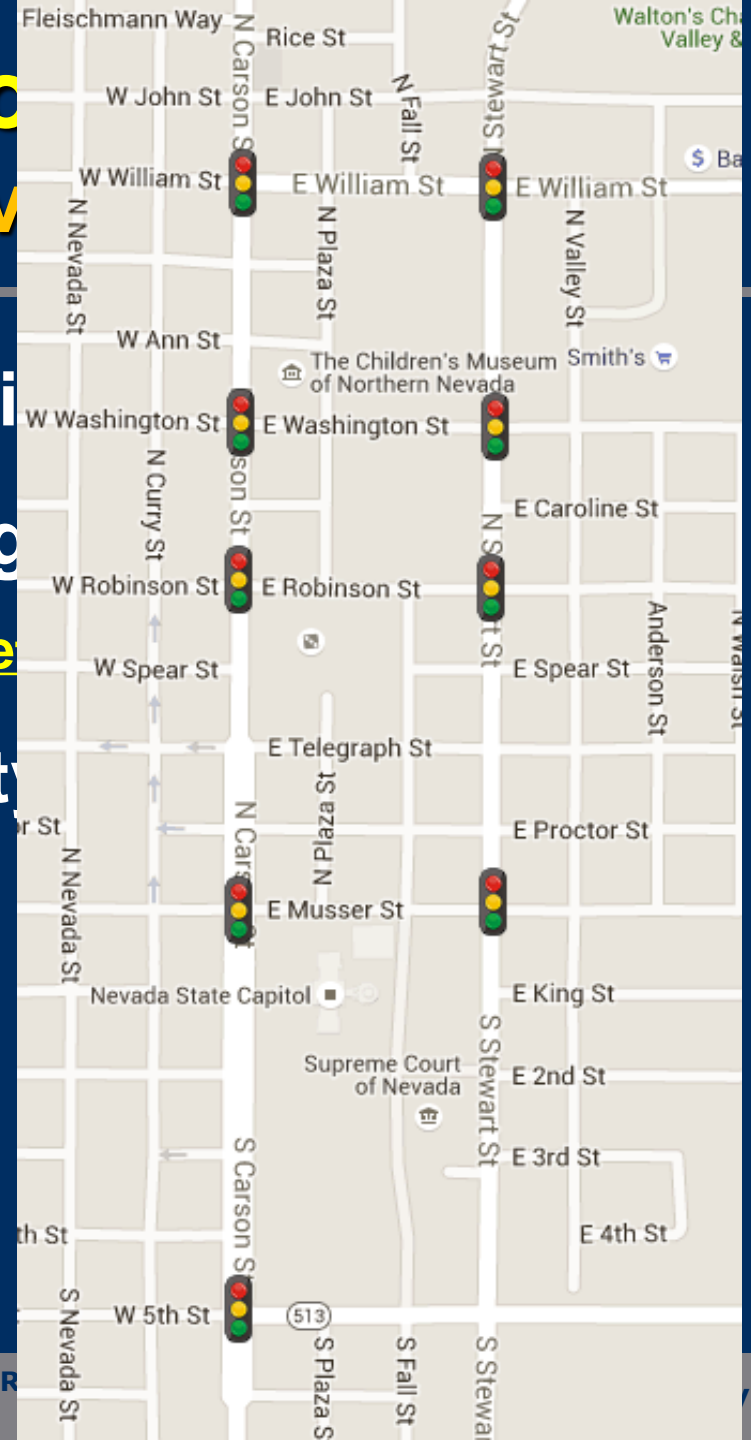
Outline

- ❑ Regional Activities in Northern Nevada
- ❑ UNR Signal Timing Research
- ❑ Case Demos



Major Activities in No (CATER Involv

- Carson Street Signal Re-ti
- Reno-Sparks Regional Sig
 - ❖ About \$300K-400K annual budget
- NDOT Research on Quality Performance Index



About Performance Measures

- ❑ PMs tell us how we are doing or how well we have done
- ❑ PMs **DO NOT** tell us how to do better
- ❑ Freeway operation and its PM are relatively more mature compared to arterials
- ❑ Arterial performance is largely dependent on the quality of **signal operations**
- ❑ No established PMs yet on signal operations

Purdue's Automated SPMs



Signal Performance Metrics



Charts

Reports

Links

FAQ

->Signal Metrics

Selected Signal

3012 Sahara Ave & Fort Apache Rd

Signals

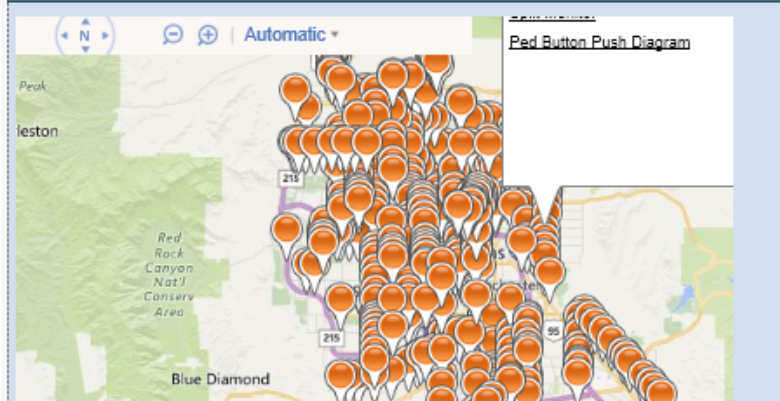
Region All

Metric Type All

Filter Signal Id Filter Clear Filter

Signal List

Map



Metric Settings

Metric Type

- Approach Delay
- Approach Volume
- Arrivals On Red
- Purdue Coordination Diagram
- Purdue Phase Termination
- Split Monitor
- Turning Movement Counts
- Ped Button Push Diagram

Time Y Axis Maximum 150

Volume Y Axis Maximum 2000

Volume Bin Size 15

Dot Size Small

Show Plan Statistics

Show Volumes

Dates

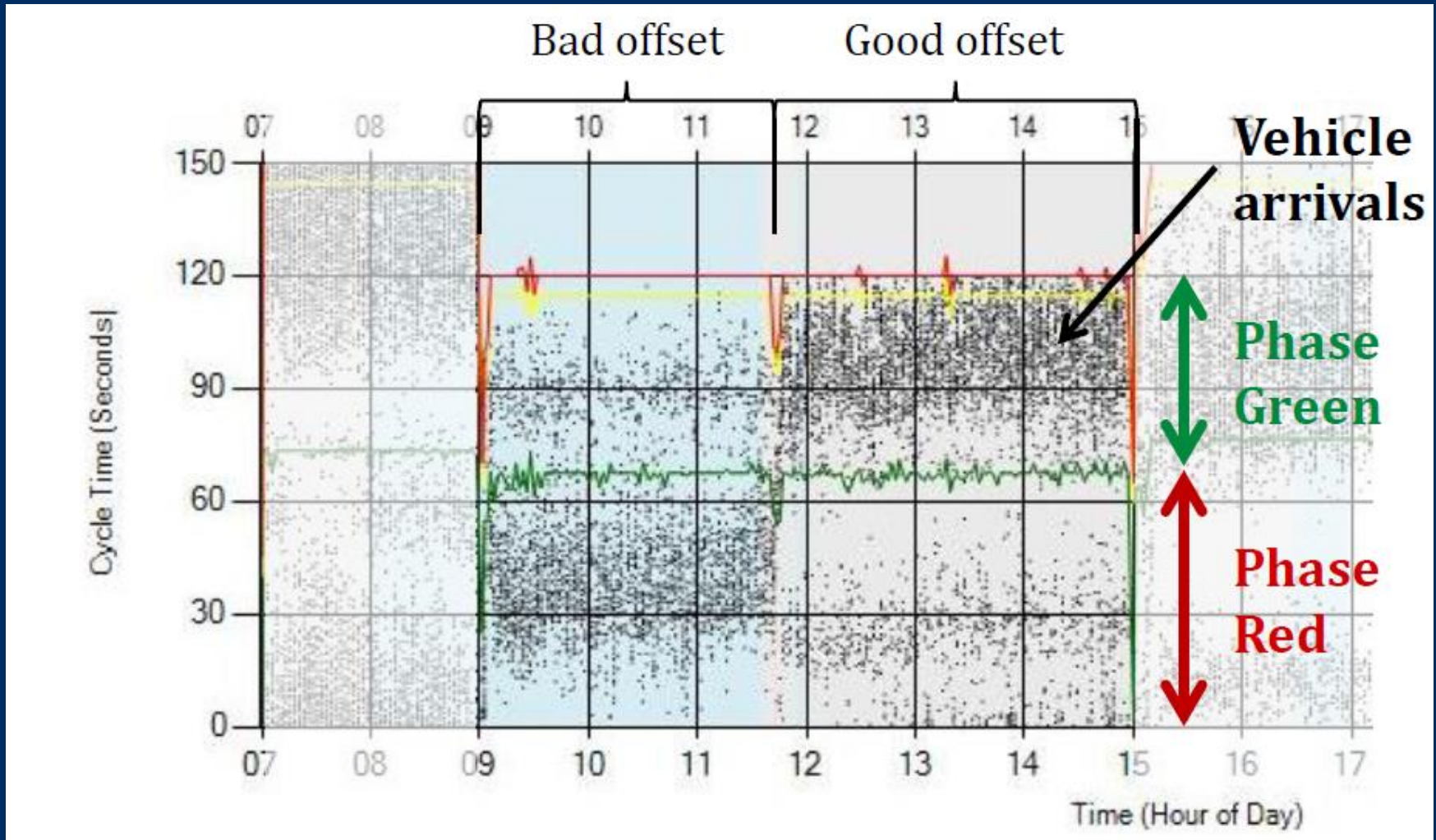
Start Date 5/9/2017 12 AM

End Date 5/9/2017 11:59 PM

Reset Date < May 2017 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1	2	3	4	5	6

Purdue's Automated SPMs








Orange County's CSPI

- Measures of Effectiveness (MOEs)
 - Average Speed (S)
 - Green per Red (GpR)
 - Stops per Mile (SpM)
- Performance index (PI)

$$\begin{aligned} \text{PI} &= 1.5*(S - 10) + \text{GpR}*8 + 40 - \text{SpM}*10 \\ &= 1.5*(30-10)+4*8+40-1*10 \\ &= \underline{92} \end{aligned}$$

OCTA's CSPI

CSPI Score	Signal Synchronization Description	Level
 >=80	<u>Very good progression</u> – traveling through signalized intersections with minimal stops and favorable travel speeds.	Tier 1
 70-80	<u>Good progression</u> – traveling through signalized intersections with few stops and good travel speeds.	Tier 2
 60-70	<u>Fair progression</u> – traveling through signalized intersections with moderate stops and fair travel speeds.	Tier 3
 50-60	<u>Limited progression*</u> – traveling through signalized intersections with moderately high stops and slower travel speeds.	Tier 4
 < 50	<u>Very limited progression*</u> – traveling through signalized intersections with frequent stops and slow travel speeds.	Tier 5

Case Demo - Carson Street

Corridor Synchronization Performance Index

Summary

Arterial: Project within William

Timing	No. of Runs	Average Speed (mph)	Average Speed Score	Average Stop Score	Average Score	Quality of Signal Timing
MD (Avg)	8	14.8	69	88	85	B
MD (NB)	4	14.2	67	83	81	B-
MD (SB)	4	15.5	72	93	89	B+

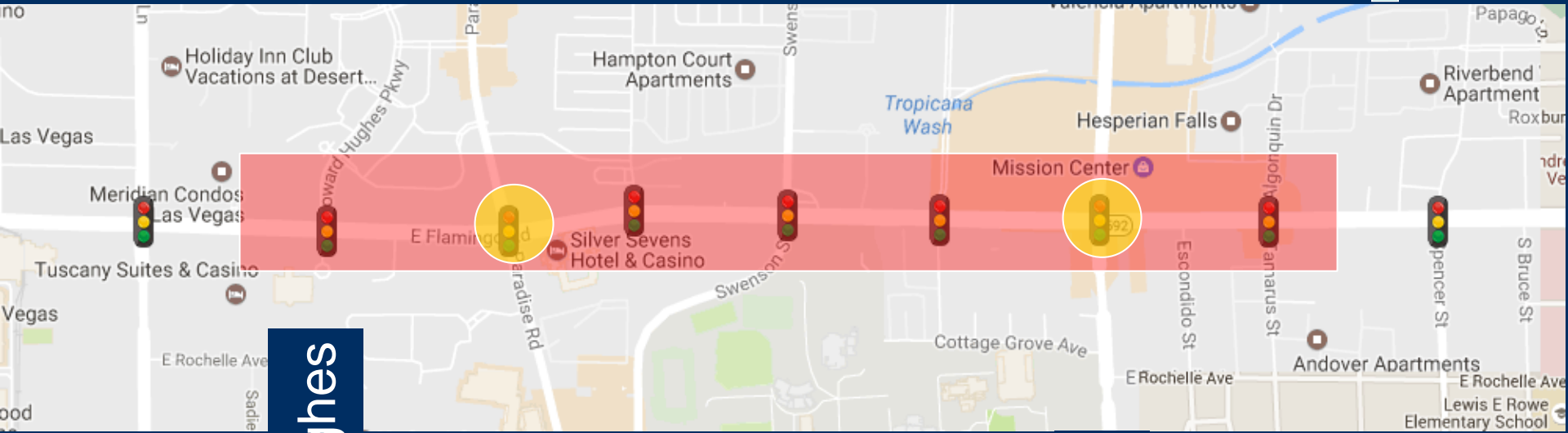
Details

Arterial: Project within William

Timing Plan: MD

Timing	GPS File Name	Average Speed (mph)	% Speed	Speed Score	No. of Stops	Stand No. of Stops	% Stop	Stop Score	Original Score	Cycle Adj.	Spacing Adj.	Adjusted Score	Quality of Signal Timing
MD (NB)	Project within William [MD]-NB-2017-04-18 12-42-07	14.2	57%	67	1	1.3	26%	80	76	77(+1)	79(+2)	79	C+
MD (NB)	Project within William [MD]-NB-2017-04-18 13-10-14	10.7	43%	53	3	1.7	33%	66	62	63(+1)	65(+2)	65	D
MD (NB)	Project within William [MD]-NB-2017-04-18 14-11-13	14.2	57%	67	3	1.2	23%	84	79	80(+1)	82(+2)	82	B-
MD (NB)	Project within William [MD]-NB-2017-04-18 14-18-00	17.7	71%	81	0	0	0%	100	94	95(+1)	97(+2)	97	A
MD (SB)	Project within William [MD]-SB-2017-04-18 12-47-17	13.6	55%	65	3	1	20%	88	81	82(+1)	84(+2)	84	B

Flamingo Rd, Las Vegas



Koval

Howard Hughes

Paradise

Maryland

Tamarus

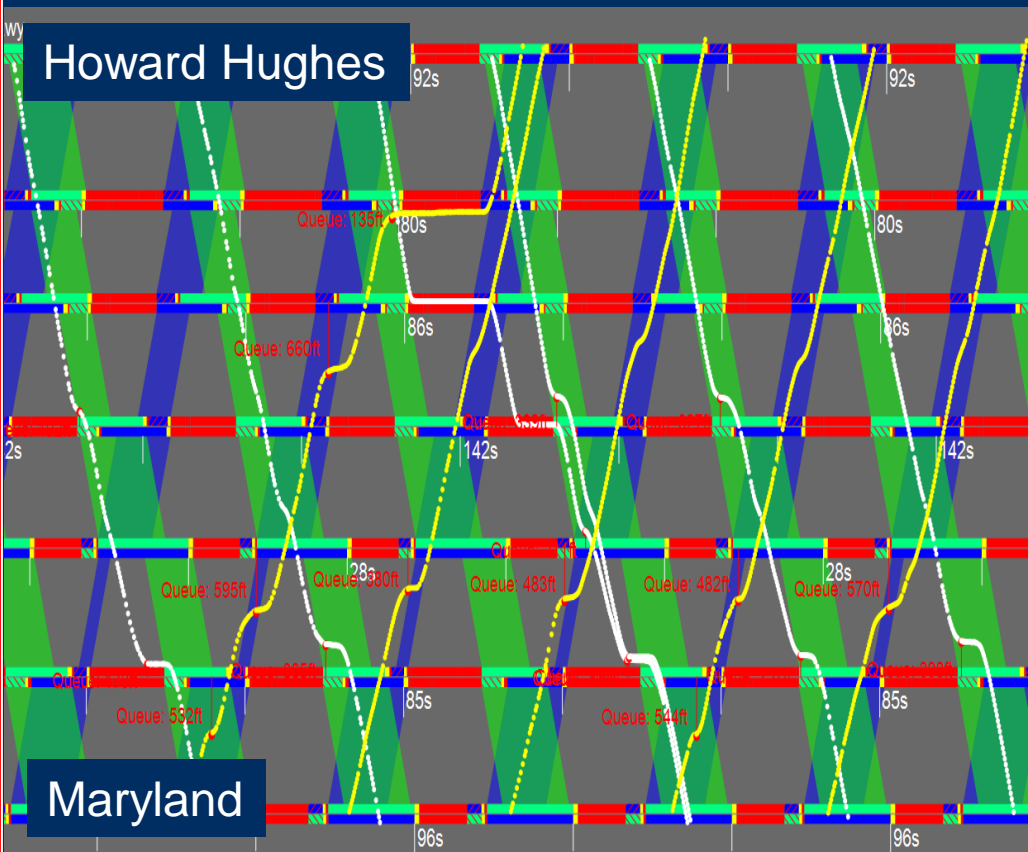
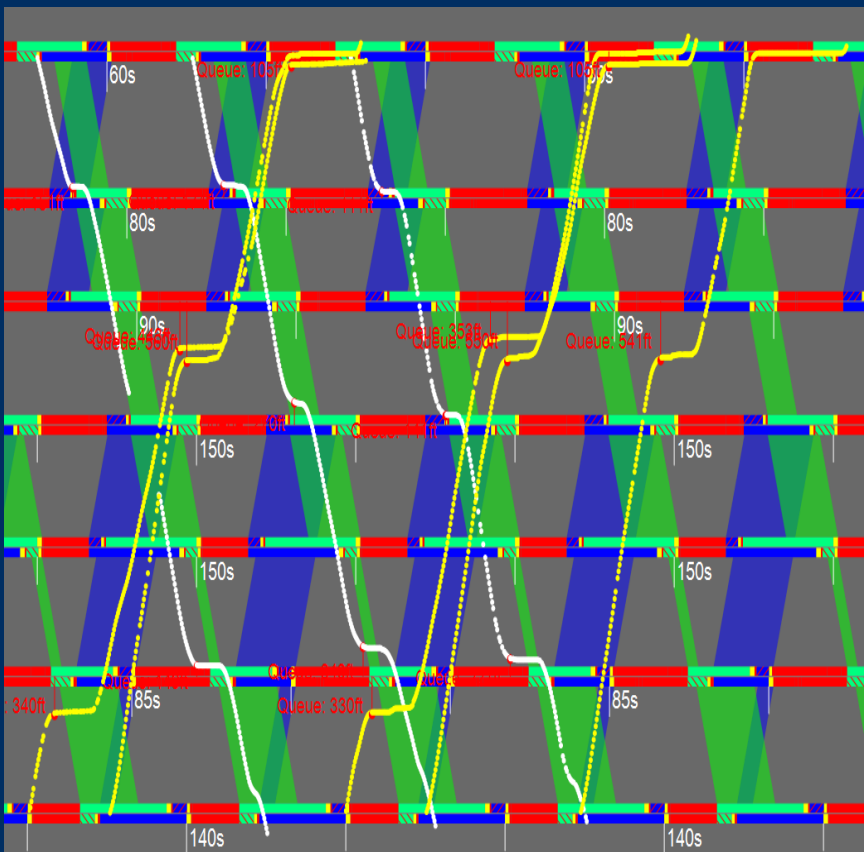
Spencer



UNR TranSync Data

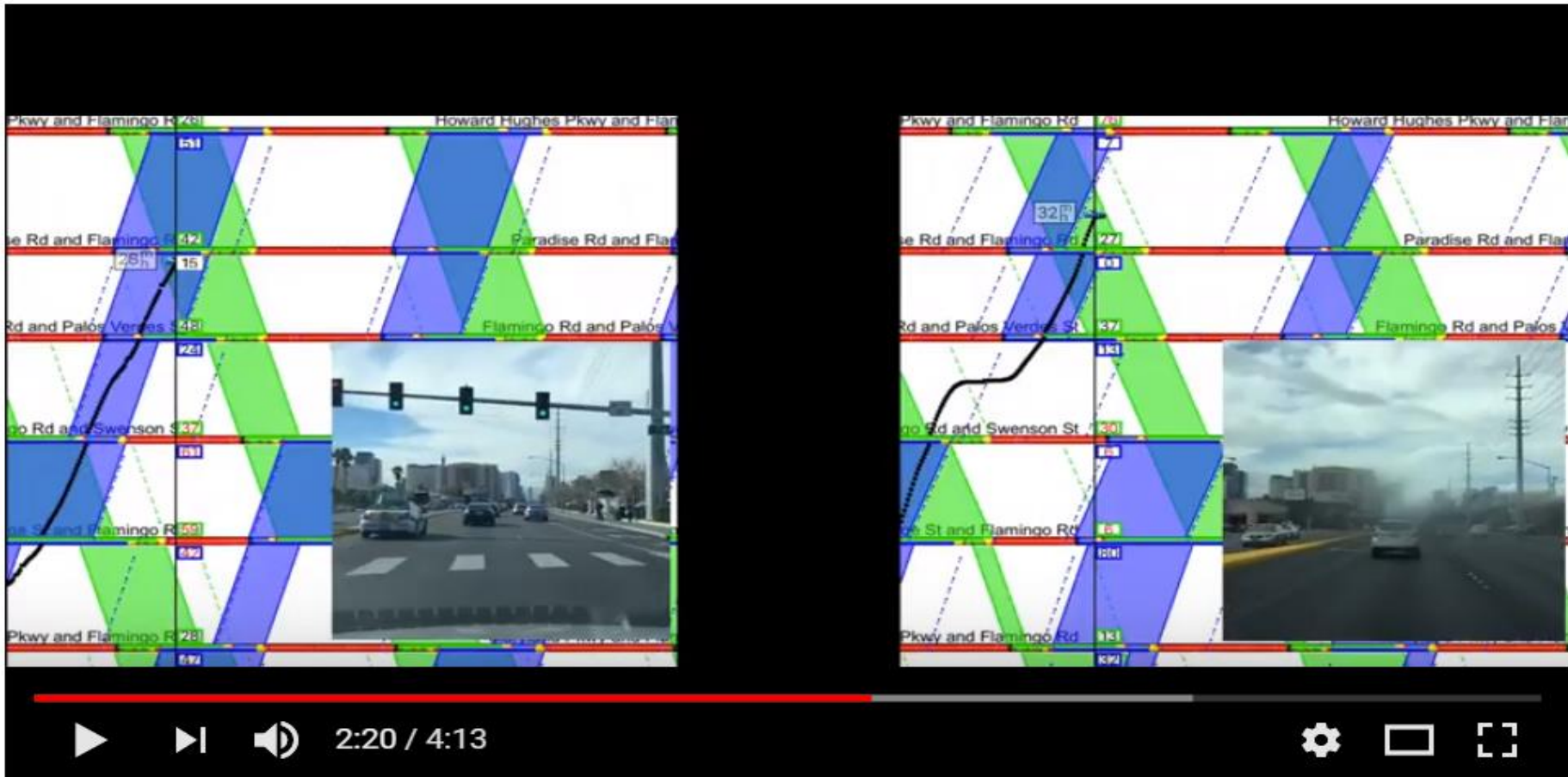
Before

After



Howard Hughes

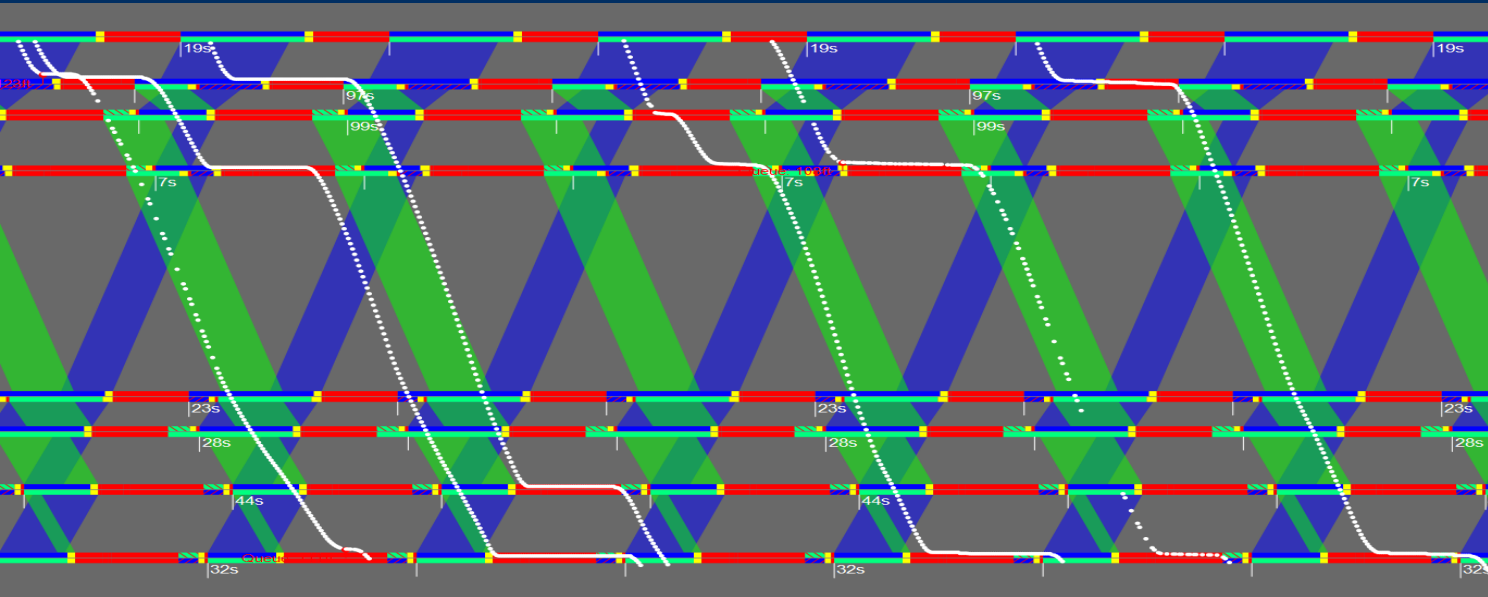
Maryland



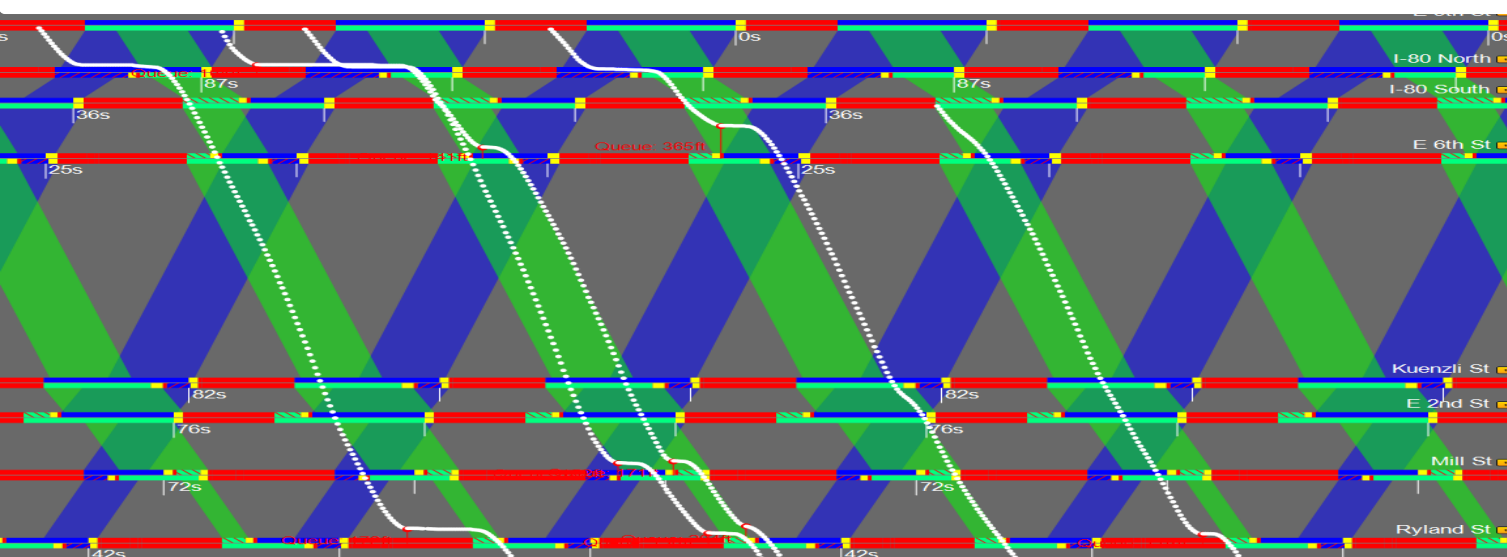
Before and After Re-timing on Flamingo Rd, Las Vegas

<https://www.youtube.com/watch?v=9Gf-ECjtfGE&t=30s>

Wells Avenue, Reno (SB)

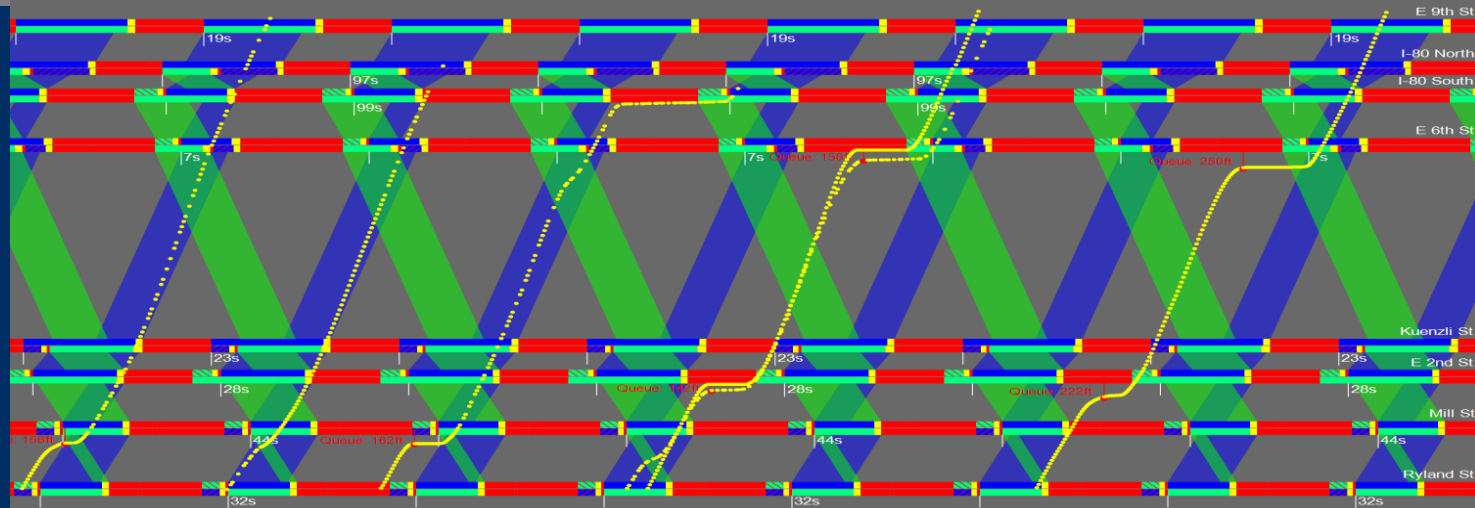


Before

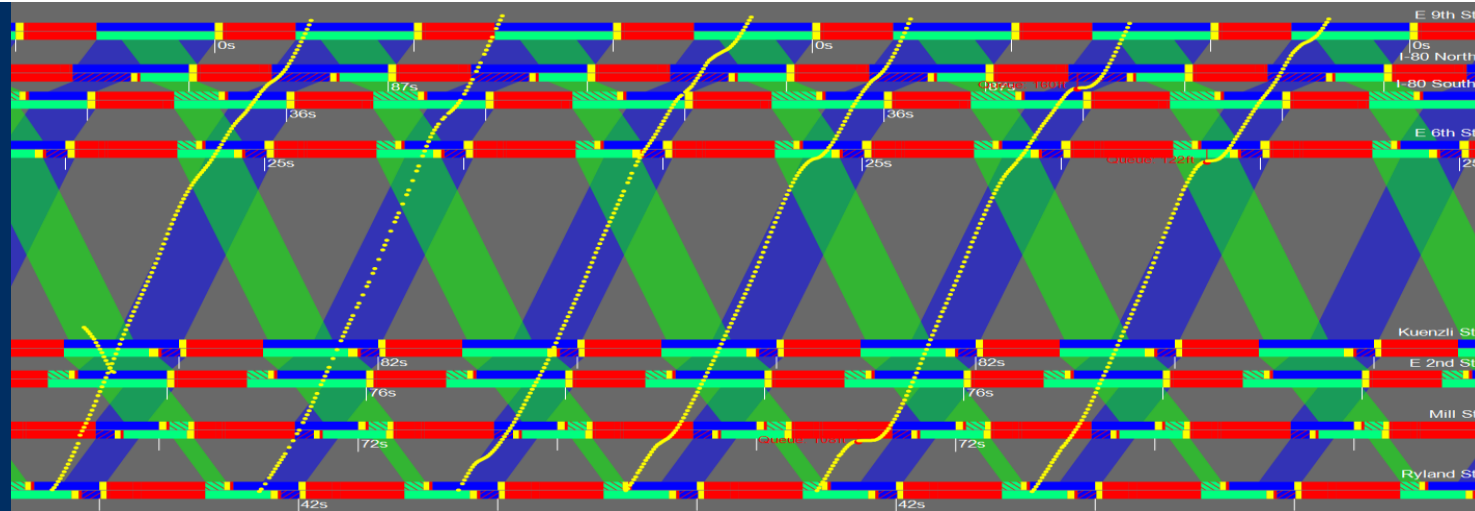


After

Wells Avenue – Reno (NB)



Before



After

Wells Avenue Re-timing Benefits

- The travel time savings per day is about **244** hours.
- The fuel savings per day is about **285** gallons.
- The average annual savings per traveler is about **\$68**.
- The total annual savings in both delay and fuel is about **\$1.5 million**.
- The benefit-cost ratio for one year of operation is about **62.5 to 1**.

Our Sincere Appreciation to the Continuous Support from NDOT and Other Agencies in the Region!

