

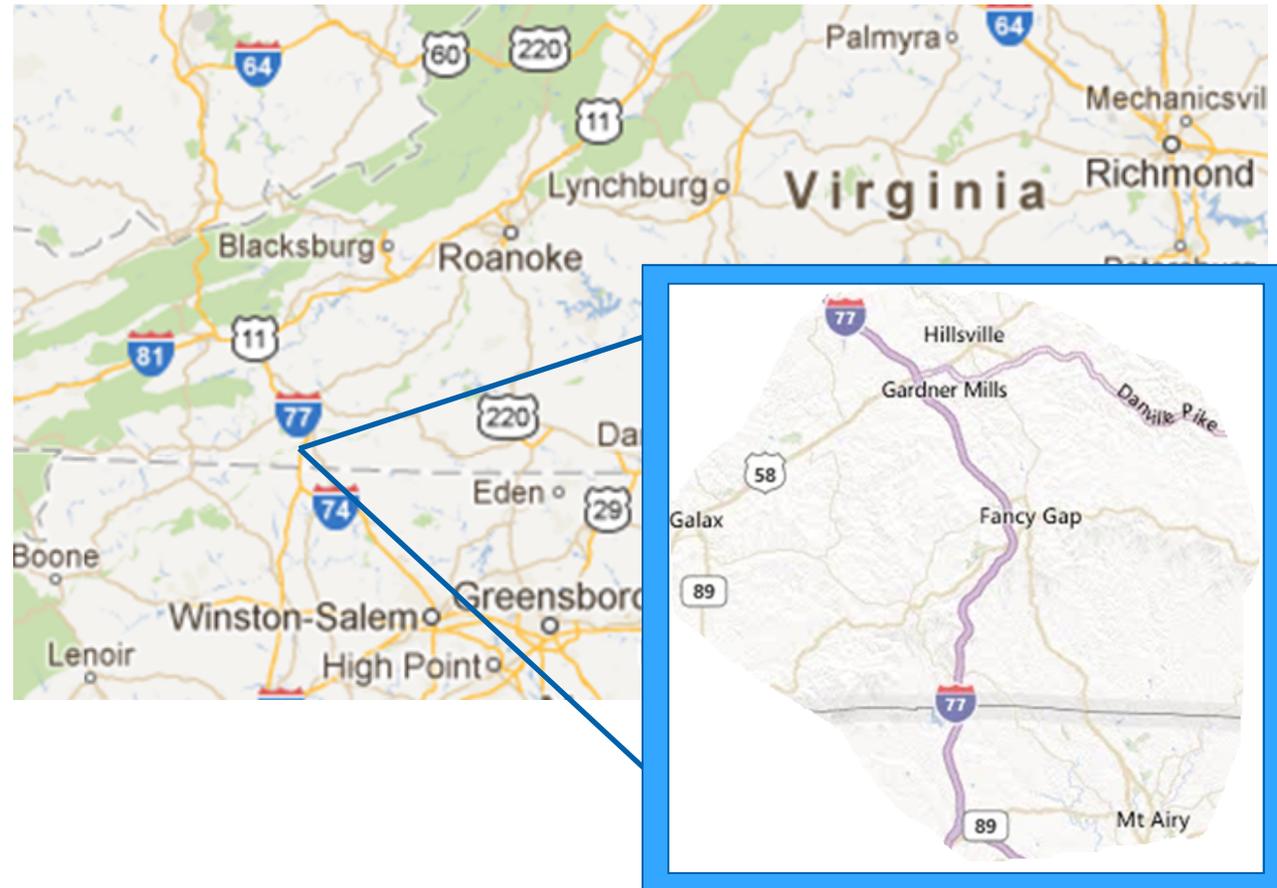


Active Traffic & Safety Management System for Interstate 77 in Virginia

Mike McPherson
Regional Traffic Signal and Freeway Operations Engineer

I-77 at Fancy Gap Mountain

- **Speed Limit of 65 MPH**
- **1,000 feet of elevation drop**
- **Over 11 horizontal curves**
- **Area subject to dense fog and severe cross winds**
- **Traffic Volume 35,000 AADT**



Problem Statement



Motorist transition from Sunny Skies

To Thickening Fog



MM 5.3, 197 ft



MM 4.3, 430 ft



MM 1.9, 2000 ft

Resulting in Rear-end Crashes



I-77 at Fancy Gap Mountain Significant Fog Incidents

Date of Crash	Vehicles	Fatalities	Injured	Direction
March 31, 2013	96	3	25	Southbound
Nov. 16, 2011	75	2	16	Southbound
Oct. 27, 2006	30	0	10	Southbound
Sept. 25, 2005	50	0	25	Both
Jan. 21, 2005	20	0	5	Both
May 21, 2001	40-50	0	12	Southbound
Jan. 18, 2000	60	2	N/A	Southbound
Oct. 5, 1998	46	0	10	Northbound
Feb. 14, 1997	65	0	11	Southbound

March 31, 2013 Incident Summary

96

- Total Vehicles Involved

17

- Separate Crashes

15

- Vehicles on Escape Ramp

3

- Fatalities

10 hrs/
42 min

- Incident Duration

167
feet

- Shortest Visibility

>60
MPH

- Speeds

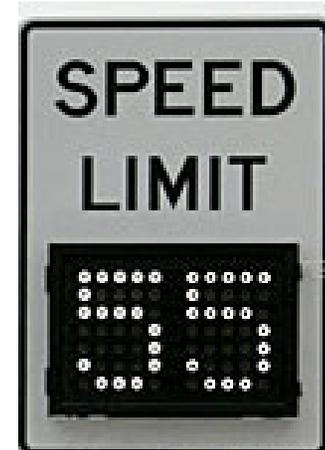


I-77 ATSMS Project Elements

Project Devices		Quantity
Type 1 DMS	Full Size Walk-in DMS	6
Type 2 DMS	Arterial DMS	3
Type 3 DMS	Corridor Entry DMS	4
Type 4 DMS	Full Matrix DMS Speed Limit Display	36
VSL Signs	Static + DMS insert	8
Traffic Sensors	Wavetronix	22
CCTV Cameras	Pelco PTZ dome	25
RWIS	Vaisala (new and upgraded sites)	14
Flashers	Static Signs with Flashers	12
Power	Redundant Power System (AEP)	12 Miles
Comm.	Fiber Optic network with leased backup	14 Miles
UPS	6 hrs battery backup at each device	

Signs

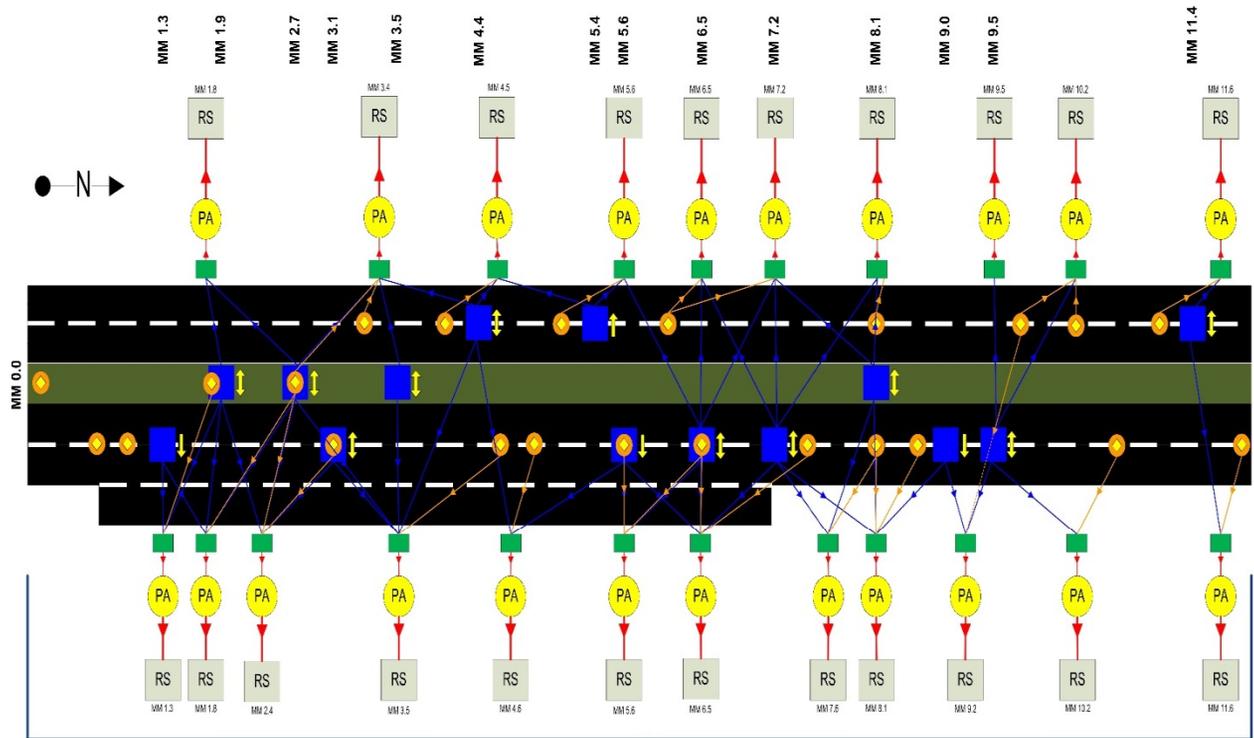
A total of 69 signs of various types (static, VMS, etc.) will be put in place in support of the traffic safety system.



SPEED LIMIT MAY VARY
NEXT 12 MILES



Corridor Map

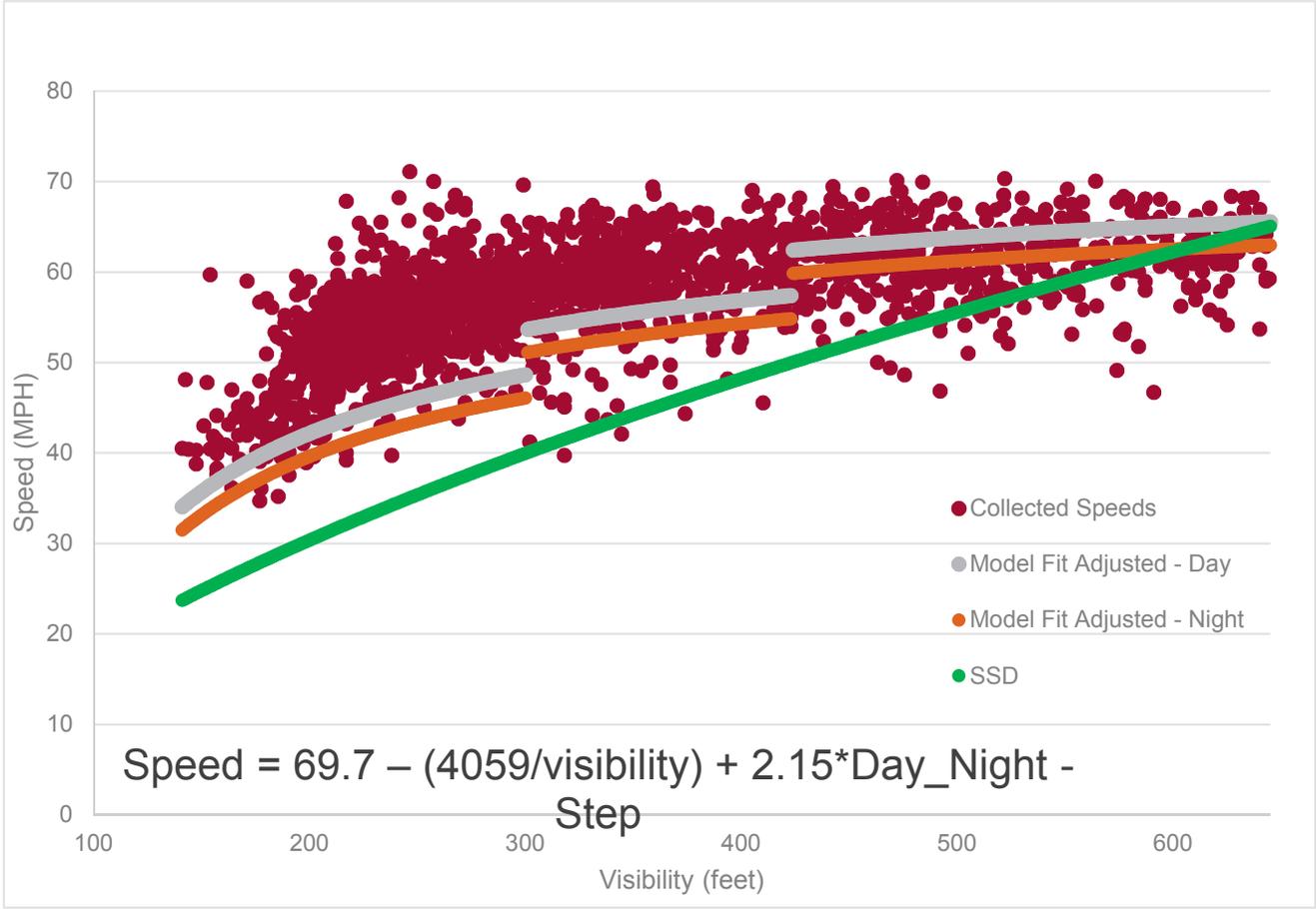


Legend

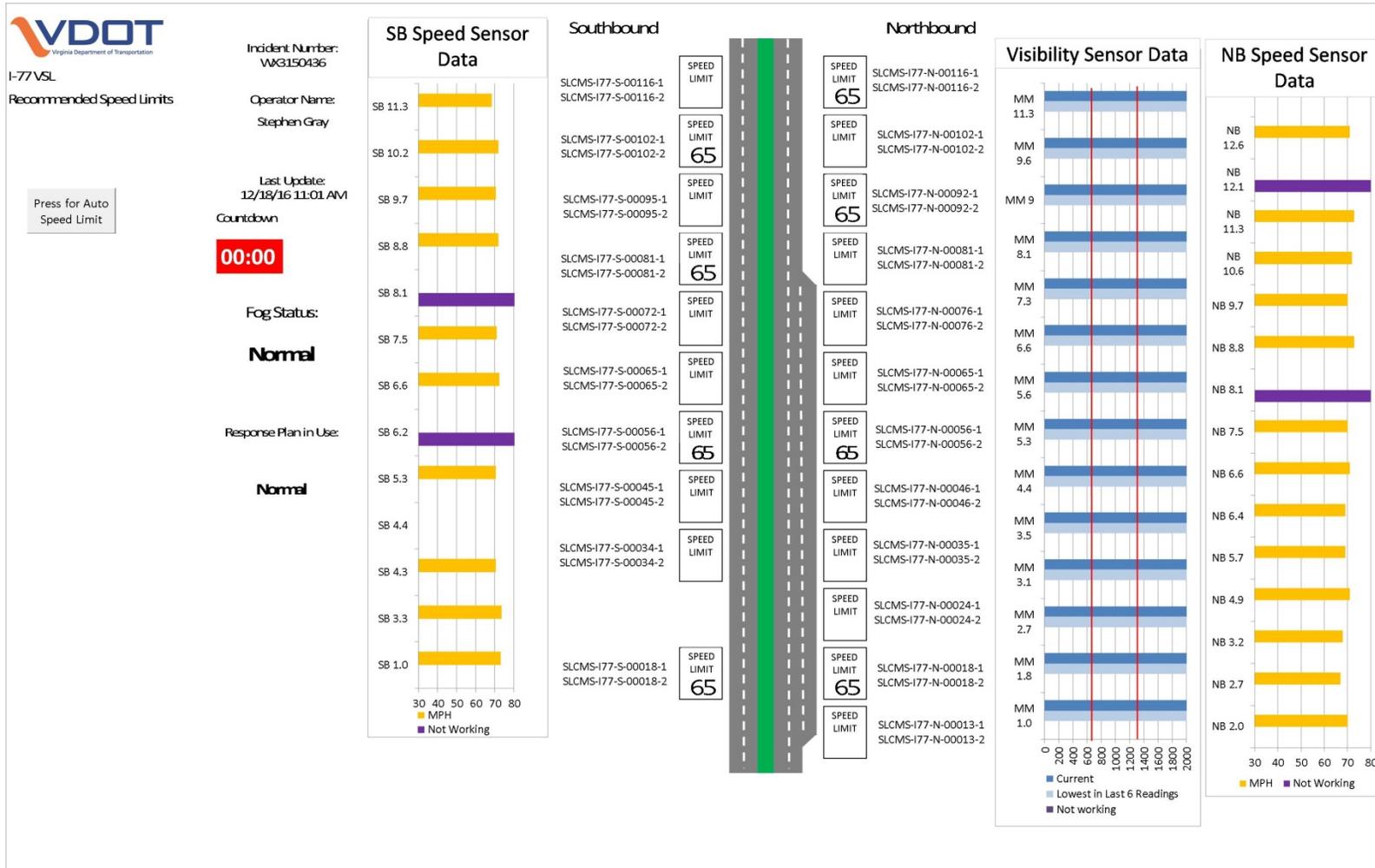
- Point Algorithm
- Recommended Speed
- SB Location
- Median Location
- NB Location
- RWIS Mile Marker
- Camera Location
- Wavetronix Location
- Link from Wavetronix to PA
- RWIS Location
- Directional Capability of RWIS
- Link from RWIS to PA
- VSL Sign
- VSL Sign Mile Marker

Recommended Speeds will be trooped and smoothed according to the procedures outlined in the Corridor Algorithm Operations section

Adjusted Step Model



Operating the System



<http://66.210.103.189/>

Operating the System



Outputs



Output for State Police

Incident Number: friday2datasummary

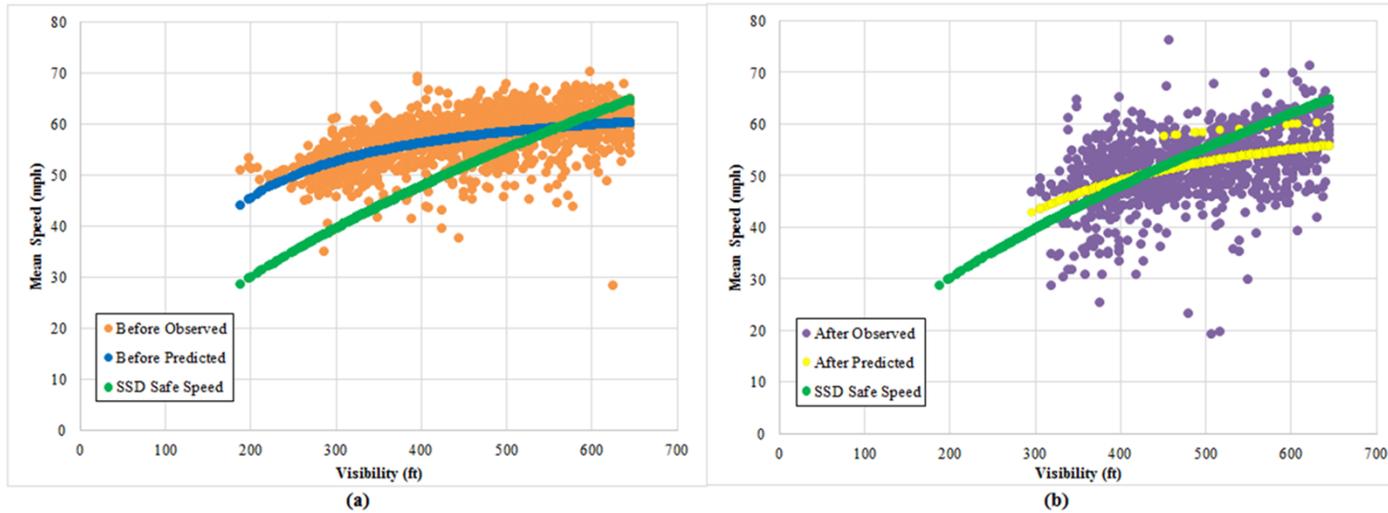
RWIS Station at Mile Post	Current Visibility													
	1.3	1.9	2.7	3.1	3.5	4.4	5.4	5.6	6.5	7.2	8.1	9	9.5	11.4
Time	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL
9/16/2016 10:59	2000	2000	2000	2000	2000	2000	2000	2000	549	155	2000	2000	2000	2000
9/16/2016 10:54	2000	2000	2000	2000	2000	2000	2000	2000	274	160	2000	2000	2000	2000
9/16/2016 10:48	2000	2000	2000	2000	2000	2000	2000	2000	318	188	2000	2000	2000	2000
9/16/2016 10:41	2000	2000	2000	2000	2000	2000	2000	2000	484	202	2000	2000	2000	2000
9/16/2016 10:36	2000	2000	2000	2000	2000	2000	2000	2000	464	184	2000	1442	2000	2000
9/16/2016 10:30	2000	2000	2000	2000	2000	2000	2000	2000	736	277	1990	553	2000	1223
9/16/2016 10:24	2000	2000	2000	2000	2000	2000	2000	2000	502	126	1410	338	2000	946
9/16/2016 10:18	2000	2000	2000	2000	2000	2000	2000	2000	613	99	1406	336	2000	1138
9/16/2016 10:13	2000	2000	2000	2000	2000	2000	2000	2000	1808	727	97	1124	299	2000
9/16/2016 10:07	2000	2000	2000	2000	2000	2000	2000	2000	1388	331	107	1032	329	2000
9/16/2016 10:01	2000	2000	2000	2000	2000	2000	2000	2000	1314	209	96	1060	483	2000
9/16/2016 9:55	2000	2000	2000	2000	2000	2000	2000	2000	1107	382	77	1117	491	2000
9/16/2016 9:50	2000	2000	2000	2000	2000	2000	2000	2000	1247	632	99	1150	527	2000
9/16/2016 9:44	2000	2000	2000	2000	2000	2000	2000	2000	945	515	129	874	538	2000
9/16/2016 9:38	2000	2000	2000	2000	2000	2000	2000	2000	1011	327	128	865	510	2000
9/16/2016 9:30	2000	2000	2000	2000	2000	2000	2000	2000	888	310	87	1085	387	2000
9/16/2016 9:25	2000	2000	2000	2000	2000	2000	2000	2000	495	138	75	535	283	1321
9/16/2016 9:19	2000	2000	2000	2000	2000	2000	1948	425	128	75	359	205	1202	665

Output to Datasummary

Sign_ID	Speed_Limit	Date_Stamp
SWRO-SLCMS-I77-N-00013-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00013-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00018-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00018-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00018-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00018-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00024-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00024-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00034-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00034-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00035-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00035-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00045-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-S-00045-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00046-1	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00046-2	65	2016-10-04T10:10:20-5:00
SWRO-SLCMS-I77-N-00056-1	65	2016-10-04T10:10:20-5:00

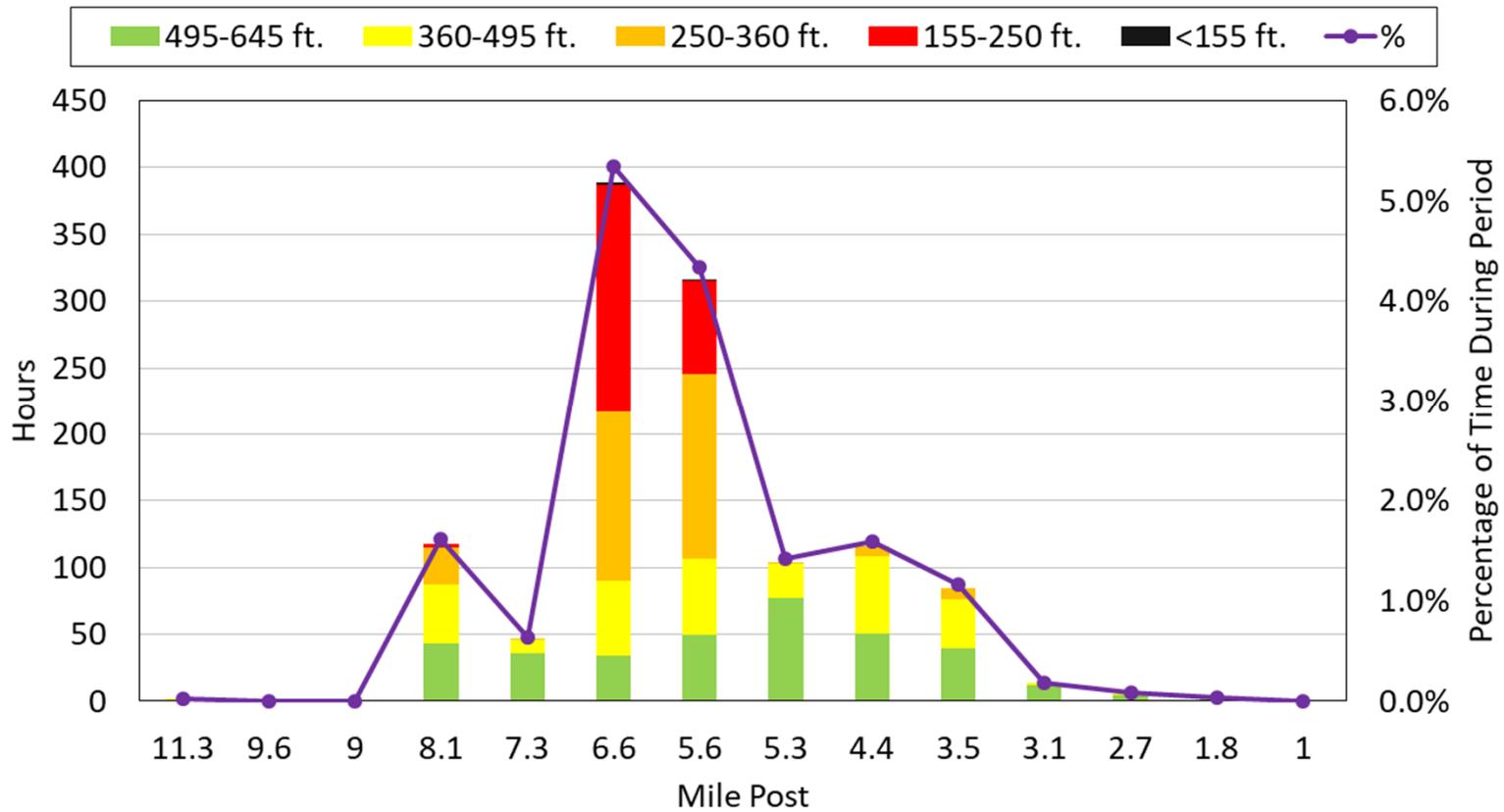
Output to Vanguard

Results

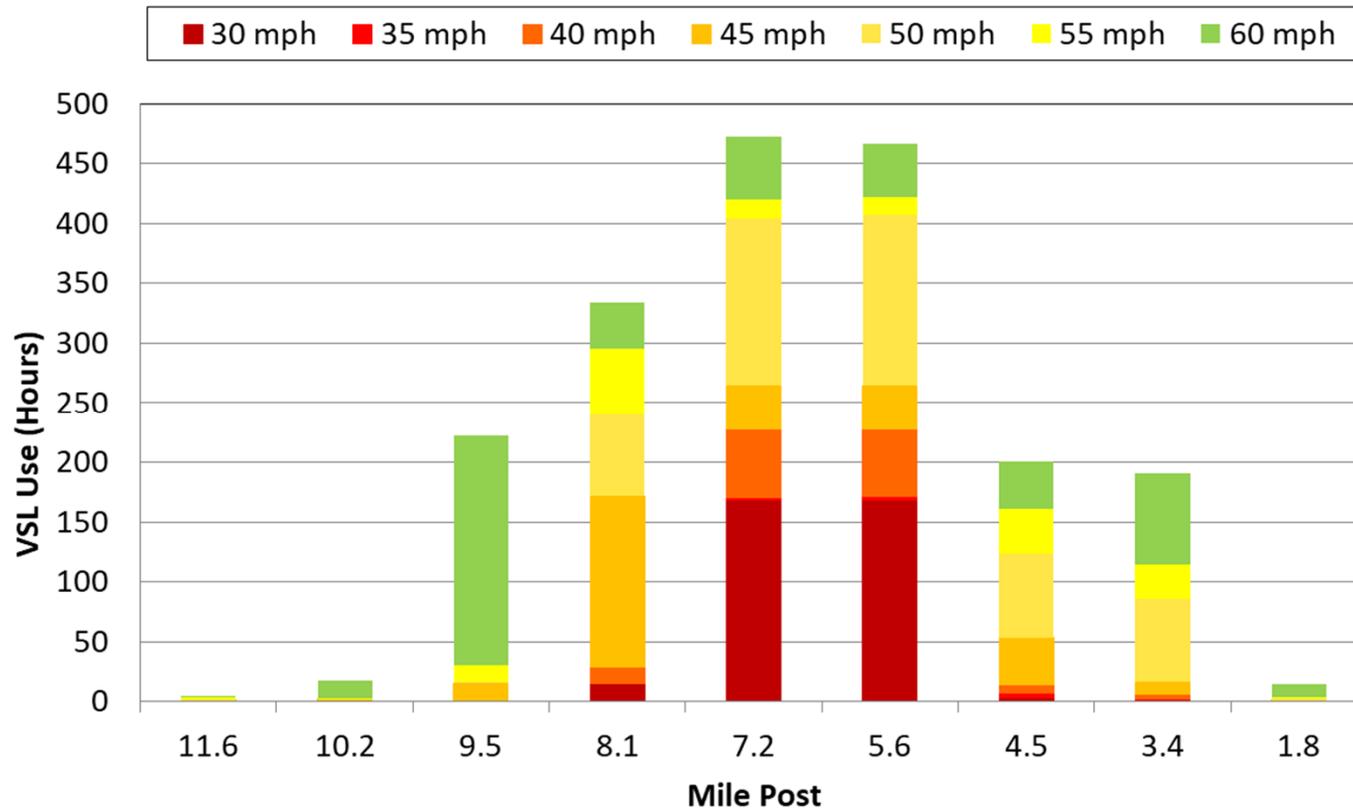


Visibility Bin (ft.)	SSD Safe Speed (mph)	Before			After		
		No. of Intervals	Mean Speed (mph)	Standard Deviation (mph)	No. of Intervals	Mean Speed (mph)	Standard Deviation (mph)
495-645	55-65	513	59.88	8.45	451	54.05	5.93
360-495	45-55	524	56.63	9.03	543	50.27	5.68
250-360	35-45	297	52.43	8.83	74	46.47	7.21
155-250	25-35	22	49.75	7.96	0	-	-
<155	<25	0	-	-	0	-	-

“After” Fog Distribution



“After” Posted VSL Speed Limits



Posted vs Observed Speed Differentials

Observed Speed minus Posted Speed	Posted Speed Limit								
	VSL Location	65	60	55	50	45	40	35	30
11.6	-0.3	2.6	1.8	-	-	-	-	-	-
10.2	2.2	0	-	-	-	-	-	-	-
9.5	2.6	4.5	3.7	-	4.3	-	-	-	-
8.1	0.3	1.7	5.3	4.9	11.1	10.2	-	12.1	-
7.2	3.8	7.2	9.7	12.5	13.3	17	22.4	22.7	-
5.6	0.5	5.5	5.1	10.2	10.7	14.5	15.6	20.8	-
4.5	-0.7	1.8	2.5	4.4	4.6	4.5	6.6	-	-
4.5	-0.1	2.8	2.6	4.2	3.7	4.2	4.2	-	-
3.4	2.2	4.4	3.2	6.5	5.3	4.6	-	-	-
1.8	3.4	4.7	-	-	-	-	-	-	-

Summary of Results

- Lag Reaction in VSL until drivers encounter fog
- Speeds still above PSL but closer to SSD Safe Speeds
- Continuing analysis on compliance



Questions?