Direction and Location		2030 NB Demand Volume (veh/hr)	Simulated Throughput (veh/hr)	% Difference	2045 NB Demand Volume (veh/hr)	Simulated Throughput (veh/hr)	% Difference	Existing Volumes (veh/hr)
I-95 Mainline (Weekday AM Peak Hour)								
I-95 NB	South of Exit 126	2850	2841	0%	3640	3632	0%	2273
	From Exit 126 to Exit 130	3970	3596	9%	4840	4272	12%	3278
	From Exit 130 to Exit 133	5760	5434	6%	6670	4530	32%	5072
	From Exit 133 to Exit 136 - Exp. Ln	450	422	6%	660	371	44%	NA
	From Exit 133 to Exit 136	4940	4611	7%	5850	3341	43%	4760
	North of Exit 136 - Exp. Ln	810	745	8%	1190	684	43%	NA
	North of Exit 136	3840	3353	13%	4060	2301	43%	4007
I-95 SB	North of Exit 136	3280	3294	0%	3600	3614	0%	2797
	North of Exit 136 - Exp. Ln	0	0		0	0		NA
	From Exit 136 to Exit 133	3480	3457	1%	3870	3865	0%	2819
	From Exit 136 to Exit 130 - GP Lane	1920	1865	3%	2200	2193	0%	3041
	From Exit 133 to Exit 130 - CD Lane	1820	1809	1%	2240	2238	0%	
	From Exit 130 to Exit 126	3330	3282	1%	3960	3781	5%	2685
	South of Exit 126	2830	2825	0%	3280	3000	8%	2377
I-95 Mainline (Weekday PM Peak Hour)								
I-95 NB	South of Exit 126	3520	3513	0%	4260	4242	0%	3038
	From Exit 126 to Exit 130	4200	3793	10%	4960	4481	10%	3620
	From Exit 130 to Exit 133	5190	4107	21%	6090	2610	57%	4599
	From Exit 133 to Exit 136 - Exp. Ln	0	0		0	0		NA
	From Exit 133 to Exit 136	4910	4025	18%	5610	2218	60%	4233
	North of Exit 136 - Exp. Ln	0	0		0	0		NA
	North of Exit 136	4630	3771	19%	4900	1989	59%	4244
I-95 SB	North of Exit 136	4330	4339	0%	4910	2836	42%	4843
	North of Exit 136 - Exp. Ln	840	844	0%	1330	1333	0%	NA
	From Exit 136 to Exit 133	4700	4650	1%	5750	2207	62%	4920
	From Exit 136 to Exit 130 - GP Lane	2980	2940	1%	3390	1631	52%	5278
	From Exit 133 to Exit 130 - CD Lane	4200	2226	47%	5920	1916	68%	
	From Exit 130 to Exit 126	6050	3546	41%	7600	3872	49%	4216
	South of Exit 126	3660	2247	39%	5020	2696	46%	2997
I-95 Mainline (Weekend Sunday PM Peak Hour)								
I-95 NB	South of Exit 126	5410	4502	17%	6620	4797	28%	4465
	From Exit 126 to Exit 130	5110	4225	17%	6230	4501	28%	4221
	From Exit 130 to Exit 133	5860	4577	22%	6780	4621	32%	5158
	From Exit 133 to Exit 136 - Exp. Ln	430	337	22%	630	430	32%	NA
	From Exit 133 to Exit 136	4330	3504	19%	5020	3536	30%	4247
	North of Exit 136 - Exp. Ln	750	600	20%	1080	754	30%	NA
	North of Exit 136	4130	3516	15%	4360	3309	24%	4269
I-95 SB	North of Exit 136	5050	5069	0%	5590	5615	0%	4290
	North of Exit 136 - Exp. Ln	0	0		0	0		NA
	From Exit 136 to Exit 133	5300	5298	0%	5900	5896	0%	4297
	From Exit 136 to Exit 130 - GP Lane	2920	2899	1%	3350	3334	0%	4909
	From Exit 133 to Exit 130 - CD Lane	3190	3058	4%	4000	2359	41%	
	From Exit 130 to Exit 126	5610	4882	13%	6780	5193	23%	4489
	South of Exit 126	4740	3897	18%	5610	4203	25%	3945

Legend:

Resultant Congestion (yellow)

Causal Congestion (orange)

Percentage Throughput Reduction

0 - 10% (green)

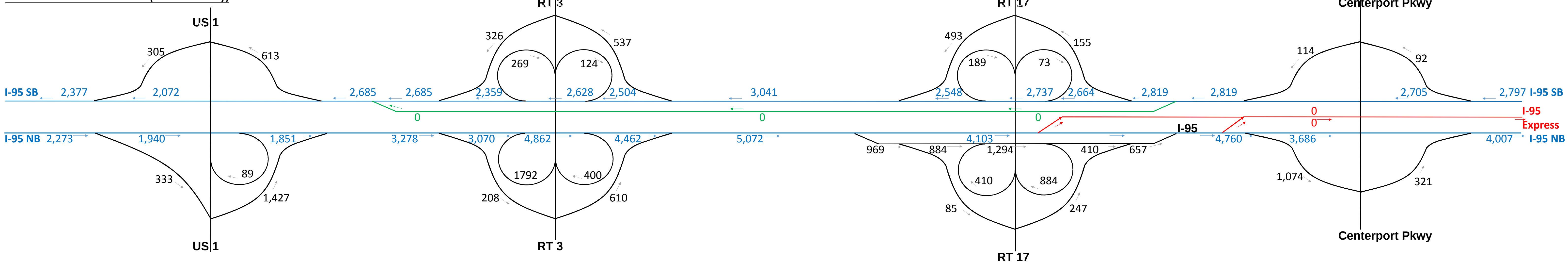
10% - 25% (blue)

25% - 50% (grey)

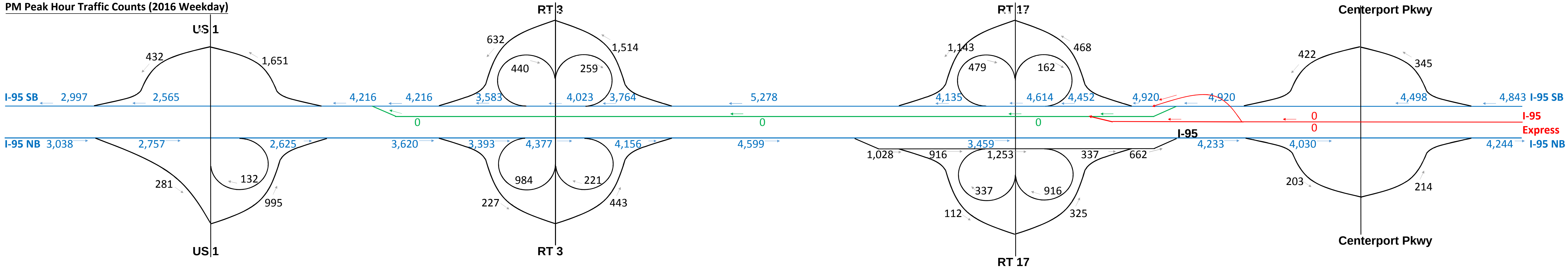
50% - 75% (purple)

75% - 100% (red)

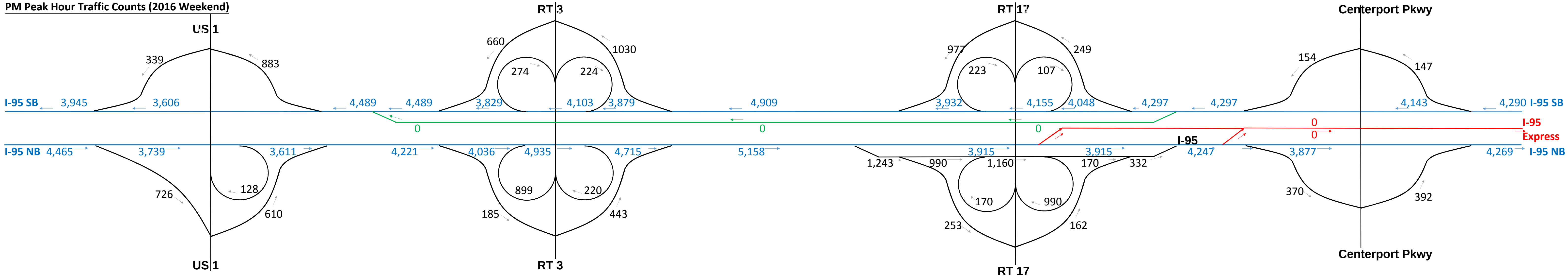
AM Peak Hour Traffic Counts (2016 Weekday)



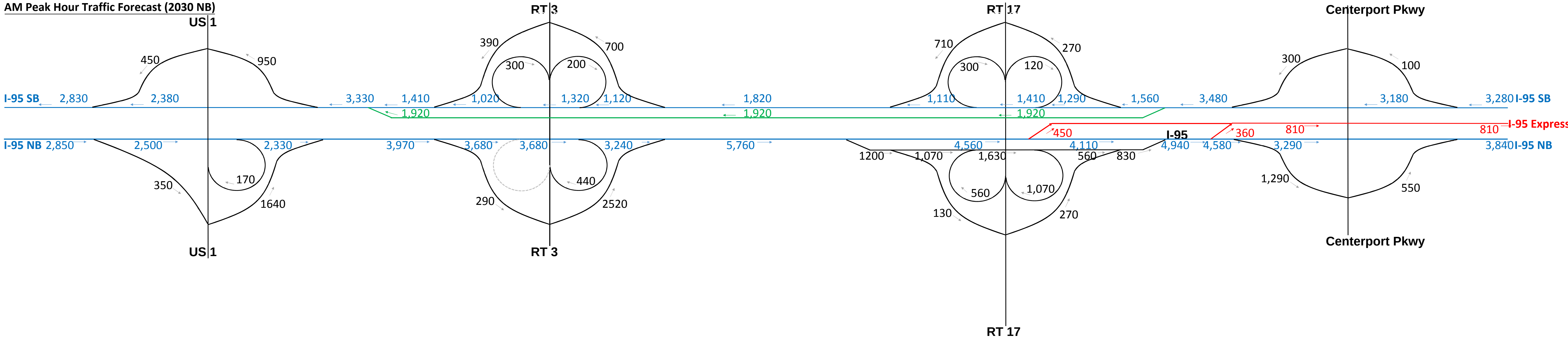
PM Peak Hour Traffic Counts (2016 Weekday)



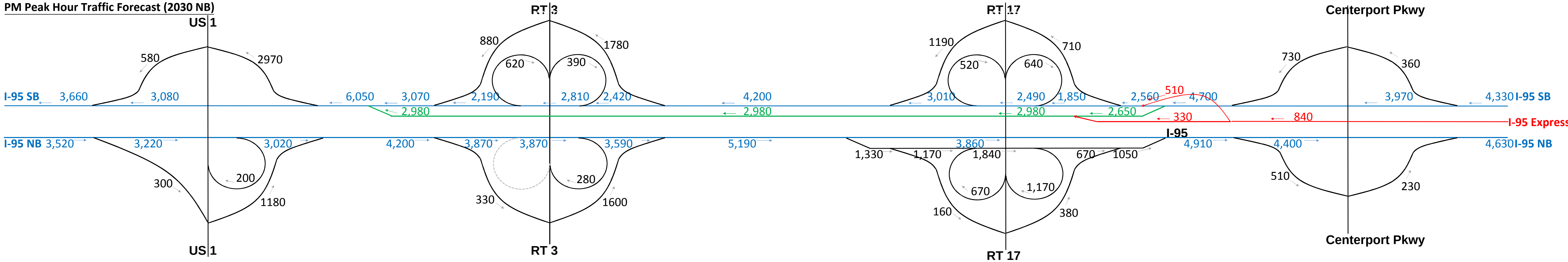
PM Peak Hour Traffic Counts (2016 Weekend)



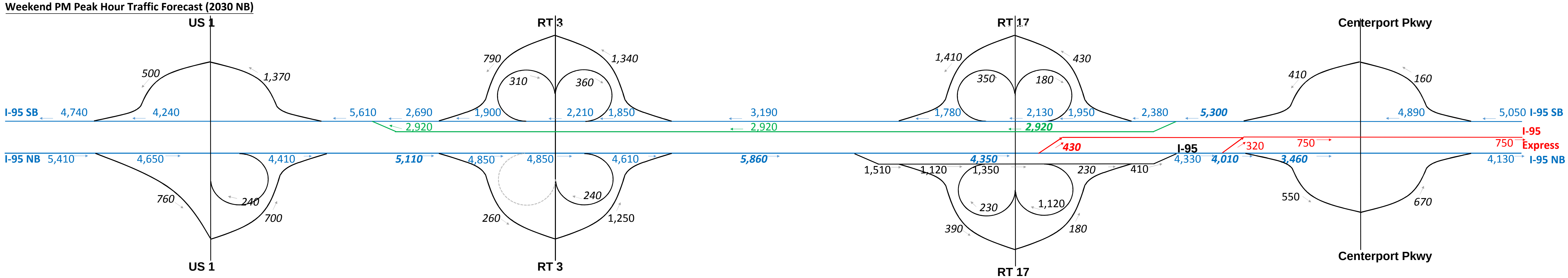
AM Peak Hour Traffic Forecast (2030 NB)



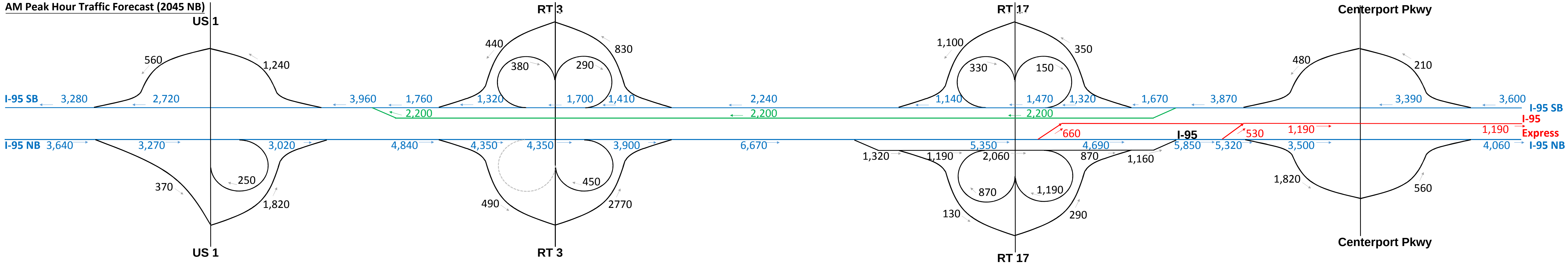
PM Peak Hour Traffic Forecast (2030 NB)



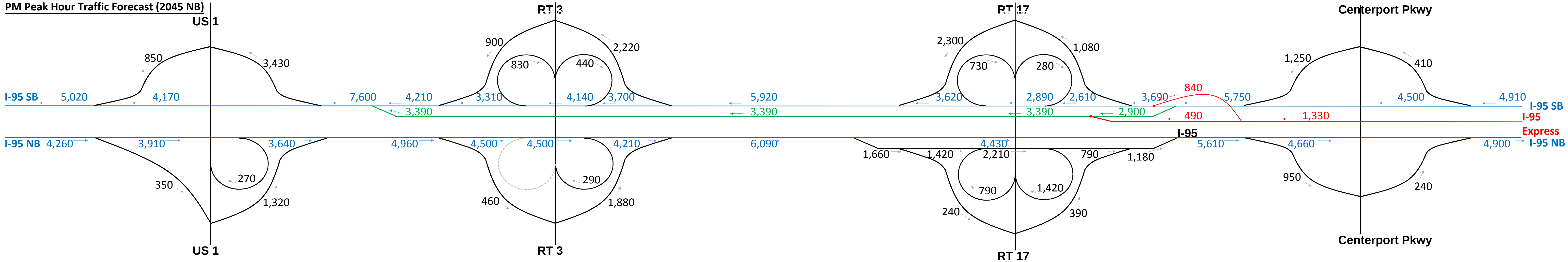
Weekend PM Peak Hour Traffic Forecast (2030 NB)



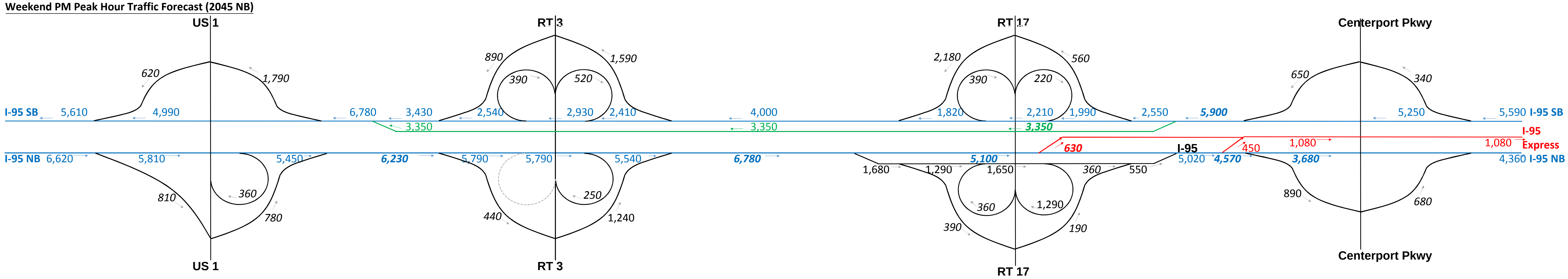
AM Peak Hour Traffic Forecast (2045 NB)



PM Peak Hour Traffic Forecast (2045 NB)



Weekend PM Peak Hour Traffic Forecast (2045 NB)



Potential ITS Strategies for I-95 Phase 2 Study

The FHWA Active Transportation and Demand Management (ATDM) has three elements: Active Traffic Management, Active Demand Management and Active Parking Management.

Active Traffic Management: https://ops.fhwa.dot.gov/atdm/approaches/atm.htm

- ARM—Adaptive Ramp Metering (Not likely to pass local legislation)
- ATSC—Adaptive Traffic Signal Control (Arterial signal strategy for mitigation on corridors, to be studied at a later stage when close to construction of planned improvements)
- DJC—Dynamic Junction Control (Not applicable)
- DLA—Dynamic Lane Assignment (or Dynamic Lane Use Control) (Not applicable)
- DLR—Dynamic Lane Reversal (Possible if the 3-lane GP section for I-95 SB with the South River Crossing has the leftmost GP lane constructed as a reversible lane. With construction of 1 additional I-95 NB lane between Exits 126 and the beginning of the Fredex Lanes, using the reversible SB GP lane in the NB direction, there can be 2-lane capacity in the NB direction when needed, while still preserving 2 GP lanes in the SB direction)
- DMC—Dynamic Merge Control (Not applicable)
- DShL—Dynamic Shoulder Lane (As VDOT is open to 4th lane construction using hard shoulder on I-95 SB between Exit 130 and 126, this strategy may have application on I-95 NB between River and Exit 143. VDOT has studied this only for I-95 SB before, same possibility exists for I-95 NB)
- DSpL—Dynamic Speed Limit (Yes, potential safety benefits but very limited operational benefits)
- QW—Queue Warning (Yes, potential; major safety benefits, minor operational benefits)
- TSP—Transit Signal Priority (Arterial signal strategy for transit, not applicable to this project)

Active Demand Management: https://ops.fhwa.dot.gov/atdm/approaches/adm.htm

- Dynamic Routing: This strategy uses variable destination messaging to disseminate information to make better use of roadway capacity by directing motorists to less congested facilities. These messages could be posted on dynamic message signs in advance of major routing decisions. In an ATDM approach, real-time and anticipated conditions can be used to provide route guidance and distribute the traffic spatially to improve overall system performance. (Limited applicability and benefits switching traffic between I-95 and Route 1 during incidents)
- Dynamic Fare Reduction (Not applicable)
- Dynamic High-Occupancy Vehicle (HOV) / Managed Lanes (Not applicable)
- Dynamic Pricing (Not applicable)
- Dynamic Ridesharing (Not applicable)
- On-Demand Transit (Not applicable)
- Predictive Traveler Information (Not applicable)
- Transfer Connection Protection (Not applicable)

Active Parking Management: https://ops.fhwa.dot.gov/atdm/approaches/apm.htm

- Dynamic Overflow Transit Parking: This strategy dynamically utilizes overflow parking facilities in the vicinity of transit stations and/or park-and-ride facilities when the existing parking facilities are at or near capacity. The overflow parking are typically underutilized, such as large retail parking lots, and transit agencies could have agreements with these entities for occasional use of pre-designated, underutilized areas of the parking lots. In an ATDM approach, the parking demand and availability is continuously monitored and real-time determinations are made if overflow parking is needed, and accompanying dynamic routing information would be provided to travelers.
- Dynamic Parking Reservation: This strategy provides travelers the ability to utilize technology to reserve a parking space at a destination facility on demand to ensure availability. In an ATDM approach, the parking availability is continuously monitored and system users can reserve the parking space ahead of arriving at the parking location.
- Dynamic Wayfinding: This is the practice of providing real-time parking-related information to travelers associated with space availability and location so as to optimize the use of parking facilities and minimize the

time spent searching for available parking. In an ATDM approach, the parking availability is continuously monitored and routing information to the parking space is provided to the user.

- Dynamically Priced Parking: This strategy involves parking fees that are dynamically varied based on demand and availability to influence trip timing choice and parking facility or location choice in an effort to more efficiently balance parking supply and demand, reduce the negative impacts of travelers searching for parking, or to reduce traffic impacts associated with peak period trip making. In an ATDM approach, the parking availability is continuously monitored and parking pricing is used as a means to influence travel and parking choices and dynamically manage the traffic demand.

Sample of Current APM Deployments in the United States (source: FHWA)			
Project	**Location(s)**	**APM Strategy(ies)**	**Active Technologies**
SFpark	San Francisco, CA	Dynamically priced parking, dynamic wayfinding	Parking sensors, wireless connectivity, smartphone applications, text messages, upgraded smart meters, 511, demand-responsive pricing
PARK Smart	New York, NY	Dynamically priced parking	Demand-responsive pricing, upgraded smart meters
ExpressPark™	Los Angeles, CA	Dynamically priced parking, dynamic wayfinding	Parking sensors, upgraded smart meters, real-time parking guidance system, integrated parking management
QuickPark	San Diego, CA	Dynamically priced parking, dynamic parking reservations	Parking space sensors, parking lots sensors, real-time parking availability information
e-Park	Seattle, WA	Dynamic Wayfinding	Parking sensors, real-time parking information web site
ParkMe	Santa Monica, CA (base) with 30,000 worldwide locations including 30 US cities	Dynamic parking reservations, rewards and incentives, dynamic wayfinding (on and off street)	GPS and in-car navigation, web site and online widgets, smartphone apps, advanced rate calculation

Integrated Corridor Management (ICM) https://www.its.dot.gov/research_archives/icms/icm_plan.htm
There is rail, arterial (Route 1) and interstate (I-95) activity parallel to each other from NoVa to Fredericksburg. With substantial investments ($10M-$25M), mobility between all these parallel modes can be better integrated.

ITS-JPO's Dynamic Mobility Applications (DMA) Program and Intelligent Network Flow Optimization (INFLO)
https://www.its.dot.gov/research_archives/dma/bundle/inflo_plan.htm
The only viable strategy is Queue Warning (Q-WARN) - By having overhead gantries every ¼ mile to ½ mile to alert traffic to potential queuing conditions downstream using infrastructure-based detection and prediction; all other strategies use Connected Vehicles. Results similar to Q-WARN can be achieved with Dynamic Speed Limit signs on lanes in conjunction with information on downstream queuing.