Introduction of New Base Saturation Flow Rates (BSFRs) for New Jersey Department of Transportation's Signal Optimization Practice

Background

Saturation flow rate is one of the crucial elements in estimating the capacity of a signalized intersection. The Highway Capacity Manual 2010 (HCM 2010) has established procedures for estimating saturation flow rates along with eleven other adjustment factors that are related to prevailing site traffic and geometric conditions. In most current practices, the estimation of saturation flow rate is based on the nationwide **Base Saturation Flow Rate** (BSFR) of 1,900 pc/hr/ln. However, as reported in a number of previous research studies, the 1,900 BSFR often does not reflect the localized prevailing traffic conditions because of deteriorating traffic conditions and the improvements in vehicle performance resulting in different driving behavior.

When the BSFR does not reflect actual traffic conditions, the impacts are inefficiencies in traffic operations and fair share contribution estimation. In particular, optimization of signal timings with inaccurate BSFR would produce defective green time splits and offsets for coordinated signals. Thus, it is not appropriate to apply the nationwide BSFR to every signalized intersection, especially where different driving behaviors and traffic conditions are observed.

New BSFRs by Region

NJDOT's Division of Mobility and Systems Engineering (MSE) and the New Jersey Institute of Technology (NJIT) conducted a research study that refined BSFR for signalized intersections on New Jersey arterials. To achieve more accurate BSFR results, large scale data collection activities were conducted to measure saturation headways at a total of 79 signalized intersections within three of the *four different regions* based on the Bureau of Data Development's Regional Facilities map. The saturation headways were then analyzed and calibrated to estimate the actual BSFR in the region. The adjusted BSFR for each region is:

1. Region 1: 2,100 pc/hr/ln
2. Region 2: 1,900 pc/hr/ln*
3. Region 3: 1,950 pc/hr/ln
4. Region 4: 1,900 pc/hr/ln

*The default value is being used here since no data has been collected for this region.

NJDOT strongly recommends the use of adjusted BSFRs for the current NJDOT practices, including traffic operations and fair share contribution estimation.

BSFR for Intersections Located on Region Boundaries

To support developers and traffic engineers in selecting the correct BSFR, the signalized intersections and corridors located on the boundary lines between regions have been identified and summarized in Table 1 below. The locations of these intersections are displayed with the milepost and the recommended BSFR region.

Table 1. Regional Classification of Intersections Located on the Regional Boundary Lines

No.	Major Road	Minor Road	SRI	MP	Recommended BSFR Region
1	NJ 31	Lambertville Hopewell Tpke	00000031__	12.2	3
2	US 9	Edinburgh Dr	00000009__	110.9	3
3	US 9	Covered Bridge Jughandle	00000009__	119.3	4
4	NJ 37	Northampton Blvd	00000037__	2.57	4
5	US 22	County Line Rd	00000022__	28.59	3
6	NJ 28	Prospect Pl	00000028__	8.52	1
7	NJ 28	East St	00000028__	8.09	3
8	NJ 27	Suttons Ln	00000027__	18.23	1
9	NJ 27	Highland Ave	00000027__	17.79	3
10	NJ 18	Hillsdale Rd	00000018__	35.12	3
11	NJ 18	Farmbrook Dr	00000018__	33.38	4
12	NJ 70	Whitesville Rd	00000070__	48.62	4
13	NJ 70	Green Acres Rd	00000070__	47.79	3
14	US 202	Whiton Rd	00000202__	18.26	3
15	US 202	Summer Rd	00000202__	15.89	2
16	US 202	Manor Dr	00000202__	29.23	3
17	US 202	Burnt Mills Rd	00000202__	29.65	2
18	NJ 15	Berkshire Valley Rd	00000015__	3.3	1
19	NJ 15	Union Tpke	00000015__	3.91	2
20	NJ 23	Old Rte 23	00000023__	21.7	1
21	NJ 23	Clinton Rd	00000023__	22.61	1
22	US 22	King Georges Rd	00000022__	40.04	1
23	US 22	Vosseller Ave	00000022__	38.04	3
24	NJ 79	Ryan Rd	00000079__	3.39	3
25	NJ 79	Kozloski Rd	00000079__	4.64	4
26	NJ 34	Newman Springs Rd	00000034__	17.4	4
27	NJ 34	Conover Rd	00000034__	15.15	3
28	NJ 33	Halls Mill Rd	00000033__	29.04	3
29	NJ 33	Howell Rd	00000033__	30.04	4
30	US 30	Fleming Pike	00000030__	26.58	3
31	US 30	Old Forks Rd	00000030__	28.54	4
32	US 322	East Piney Hollows Rd	00000322__	31.67	3
33	US 322	Cains Mill Rd	00000322__	33.08	4
34	NJ 56	Gershal Ave	00000056__	6.72	3
35	NJ 56	South Mill Rd	00000056__	8.21	4
36	NJ 49	Gouldtown	00000049__	28.31	4
37	NJ 49	S. Burlington Rd	00000049__	26.94	3
38	NJ 35	Smith St	00000035__	52.18	1
39	NJ 35	Chevalier Ave	00000035__	50.8	4

In addition, geographic information of the locations in Table 1 can be found in Figure 1 below.
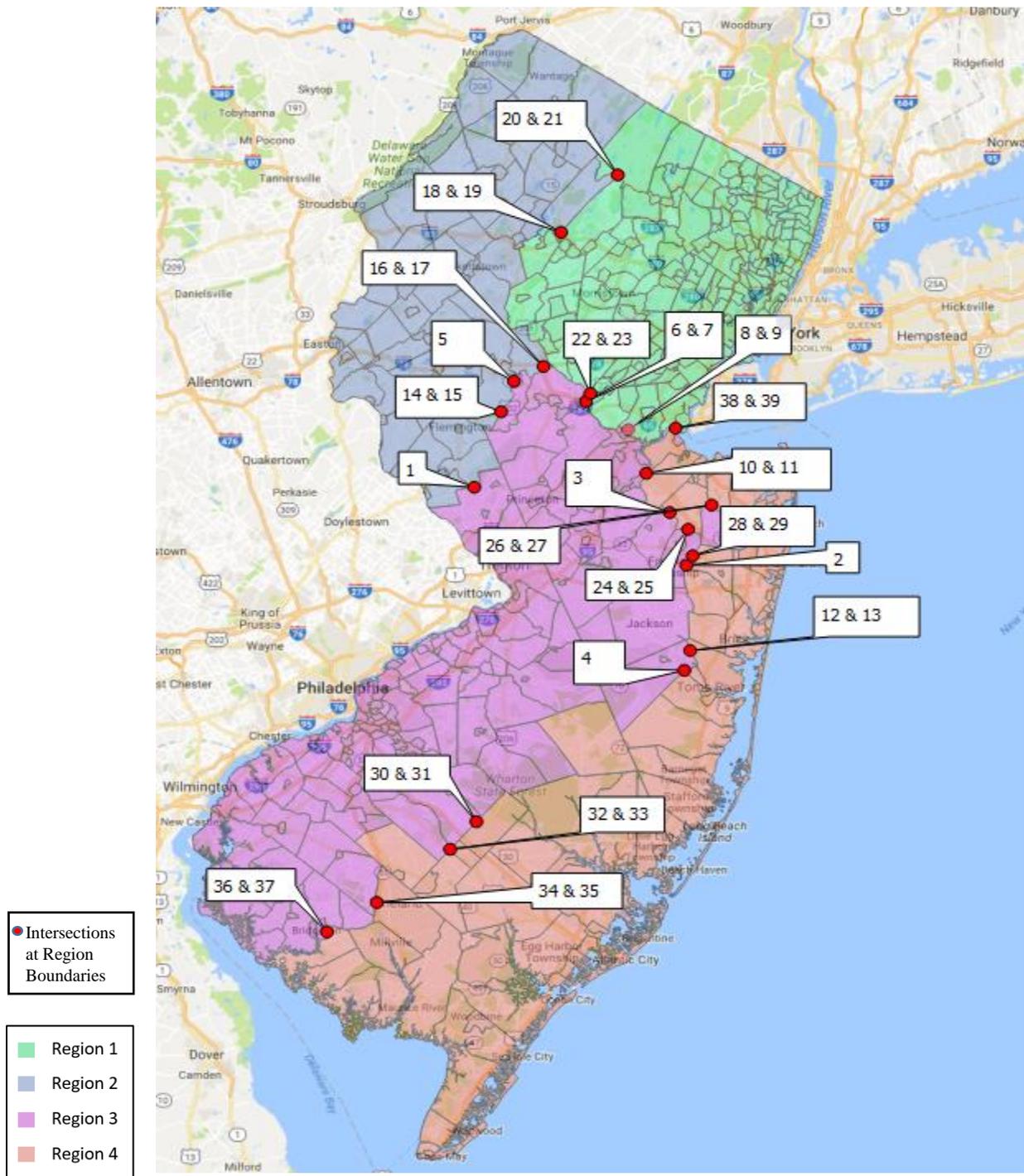

Figure 1. Locations of Signalized Intersections on the Regional Boundary

Note:
1. This study was limited to the state arterials.
2. These BSFR values will be applicable to all projects starting January 30, 2019