

**RMP Component:** Smart Growth Component  
**Technical Report:** Baseline Air Quality  
**Memorandum Title:** On-road Mobile Source Evaluation  
**Status:** Preliminary Draft  
**Date:** July 25, 2006 (revised August 2, 2006)

## **EXECUTIVE SUMMARY**

This technical memorandum provides an overview of the on-road mobile source pollution segment of the air quality component which will serve to support the development of the Highlands Regional Master Plan (RMP). A Highlands travel demand sub-model was developed based on the larger North Jersey Regional Transportation Model (NJRTM). A set of assumptions were used to capture transportation-related mobile source pollution and corresponding air quality implications. The Highlands Water Protection and Planning Council (Highlands Council) retained a modeling consultant in order to assist in the development and evaluation of transportation patterns and air quality conditions. This assessment documents the base year 2002 traffic pattern and system status in terms of air quality using the Highlands demand model which was developed specifically for the Highlands Region. The Council consulted with the New Jersey Department of Transportation (NJDOT) as well as other agencies, and technical and local stakeholders in order to develop an approach and methodology. The Highlands Council is presently developing a technical report that will include a similar approach for stationary pollutant sources, broader air quality concerns, and existing programs at the federal, state and regional levels.

## **INTRODUCTION**

Each of the seven counties included in the Highlands Region is currently in nonattainment of at least one pollutant. Nonattainment status is imposed when air pollution levels persistently exceed the National Ambient Air Quality Standards (NAAQS). Areas that either fail or have failed to meet air quality standards must ensure that new transportation plans and projects do not further contribute to air quality degradation. This process is known as air quality conformity. By documenting transportation conditions, this evaluation determines the impact from 2002 traffic patterns and conditions on regional air quality.

The air-quality performance measures were assessed using the base year 2002 model transportation conditions. The base year 2002 model run serves as the baseline for comparison of future Highlands Region buildout scenarios. Note that there is no reference emissions level that can be used in order to compare against the Highlands Region model, such as the "emission budget" used by the North Jersey Transportation Planning Authority (NJTPA) transportation baseline emissions analysis which determines conformance with the State Implementation Plan (SIP) for attainment of the NAAQS.

## **LEGAL REQUIREMENTS FROM THE HIGHLANDS ACT**

Section 11 of the Highlands Water Protection and Planning Act (Highlands Act) mandates that the regional master plan shall include:

11.a. (1)(a) *A resource assessment which determines the amount and type of human development and activity which the ecosystem of the Highlands Region can sustain while still maintaining the overall ecological values thereof, with special reference to...air quality.*

## **MOBILE SOURCE EVALUATION**

### **Methodology**

The purpose of estimating the air-quality performance measures during the initial phase of the project was to develop a process which provides information down to the link level. A link represents a transportation connection which is assigned physical attributes such as: number of lanes, average free flow speed, and general lane capacities. Because of the continuous nature of transportation networks and because the Highlands Region encompasses only portions of seven different counties, a process was needed to develop emissions at the link level in addition to the county level. The standard air-quality analysis for the NJTPA is performed using the PPSuite, a program that incorporates EPA Mobile 6.2 model which is used by many agencies. Mobile 6.2 is an EPA emissions factor model for estimating pollution from on-road motor vehicles. PPSuite is a preprocessor and postprocessor to Mobile 6.2. It produces output of emission factors and measurements based on the Mobile 6.2 model, allowing the user to perform adjustments on those outputs.

The emissions inventories were developed following the industry standard process using Mobile 6.2. Mobile 6.2 provides emission estimates for the following pollutants: Ozone [Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOX)], Carbon Monoxide (CO) and Particulate Matter 2.5. Particulate Matter (PM) 2.5 is estimated as required for those counties in nonattainment as well as the entire Highlands region. The number 2.5 defines the maximum size of the particulate matter being recorded which must be 2.5 micrometers in diameter or smaller.

The emissions factors were developed using the assumptions and input data consistent with the one used for the 2002 Baseline Interim PM2.5 Emissions Project, which was recently completed for the NJTPA FY07 Baseline Emissions Analysis for the North Jersey Region. The majority of input data for this project was provided by NJDOT and NJDEP, such as:

- Temperature and Humidity Data
- Vehicle Type Mix
- Inspection and Maintenance Program
- Vehicle Registration Distribution
- Diesel Fraction

The emissions factors were defined as emissions per vehicle per mile (in kilograms or tons). To obtain the emission estimates for each pollutant, the emission factors were multiplied by vehicle miles traveled (VMT). The emission estimates are usually expressed in tons/day or tons/year. The ozone emissions were developed for the conditions of highest ozone that typically occur during the warmest summer days of the year, while the CO emissions were developed for the conditions of highest CO that typically occur during the winter. The PM2.5 emissions were developed using a two-season approach, consistent with the 2002 Baseline Interim PM2.5 Emissions Project. This approach determined the PM2.5 emission factors for one “average” summer day and one “average” winter day. Since the emissions estimates for PM2.5 are generally expressed in annual terms, the average summer emissions factor was weighted by 183 days and winter by 182 days.

### **Development of Annual Emissions for 2002 Highlands Region**

The link level emissions were developed using a series of tables for each pollutant based on the type of roadway, county, and the average travel speed on the link. Similar to the NJTPA

analysis, links were divided into three categories: Freeways (e.g. I-78, I-80 and I-287), Arterials (e.g. NJ 23, US 46), and Collectors/Local (smaller roadways with moderately low speed limits). Each link in the network was coded with revised county codes for the Highlands Region. The values from these tables were multiplied with the link VMT, in order to estimate annual emissions. Those values were then aggregated at the county level for different zones within the region. The summary of annual emissions is presented in Table 1 for the base year 2002. It was estimated that the vehicles traveling within the Highlands Region would emit on an annual basis: 178,000 tons of CO, 8,000 tons of VOC, 18,900 tons of NOX and 210 tons of PM2.5.

Appendix A includes lookup tables for the seven counties within the Highlands Region. These tables were estimated for speeds ranging from 2.5 mph to 65 mph evaluated at increments of 2.5 mph. The pollutant emissions levels, shown in terms of grams per vehicle mile, were estimated at various speeds. Several trends were observed. For CO and NOX, it was found that pollution intensity diminished at increasing speed increments until reaching 35 mph, thereafter the amount of pollution emitted increased until reaching the highest evaluated speed of 65 mph. PM2.5 followed a similar trend, however, once 35 mph was reached, the amount of measured pollution remained constant. VOC emissions were highest at 2.5 mph and lowest at 65 mph

## **NEXT STEPS**

The mobile source evaluation will serve as a baseline for comparison with future Highlands buildout scenarios in subsequent phases of Regional Master Plan development.

Table 1: Summary of Annual Emission Estimates (tons) for 2002

NJ County		CO	VOC	NOX	PM2.5
Name	In/Out of Highlands				
<b>Bergen</b>	Outside Highlands	120,440	6,047	13,110	237.2
<b>Bergen</b>	Inside Highlands	9,636	433	1,088	18.4
<b>Hunterdon</b>	Outside Highlands	15,519	703	1,450	NA
<b>Hunterdon</b>	Inside Highlands	19,268	801	2,898	NA
<b>Morris</b>	Outside Highlands	8,814	429	767	13.4
<b>Morris</b>	Inside Highlands	93,223	4,182	8,465	140.5
<b>Passaic</b>	Outside Highlands	48,155	2,378	5,643	102.7
<b>Passaic</b>	Inside Highlands	10,278	497	1,105	19.6
<b>Somerset</b>	Outside Highlands	43,812	2,234	4,803	90.0
<b>Somerset</b>	Inside Highlands	15,477	668	1,896	31.1
<b>Sussex</b>	Outside Highlands	7,777	383	701	NA
<b>Sussex</b>	Inside Highlands	12,711	628	1,212	NA
<b>Warren</b>	Outside Highlands	4,666	176	894	NA
<b>Warren</b>	Inside Highlands	17,047	735	2,227	NA
<b>Total Inside Highlands Region</b>		<b>177,639</b>	<b>7,944</b>	<b>18,891</b>	<b>209.6</b>

## **APPENDIX A**

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Bergen County  
Emission Factors in Grams per Vehicle per Mile

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	51.179	6.734	4.409	19.016	53.561	7.313	3.728	15.184	54.829	7.467	2.771	8.158
5.0	35.119	3.101	4.006	19.016	34.221	2.953	3.294	15.184	34.664	2.936	2.408	8.158
7.5	28.507	2.139	3.533	19.016	28.144	2.138	2.913	15.184	28.599	2.110	2.102	8.158
10.0	25.159	1.718	3.256	19.016	25.105	1.730	2.723	15.184	25.566	1.697	1.949	8.158
12.5	23.314	1.497	3.016	19.016	23.469	1.531	2.507	15.184	24.041	1.505	1.780	8.158
15.0	22.127	1.358	2.837	19.016	22.378	1.399	2.364	15.184	23.024	1.377	1.667	8.158
17.5	21.549	1.266	2.750	19.016	21.568	1.295	2.247	15.184	22.289	1.278	1.581	8.139
20.0	21.210	1.200	2.700	19.016	20.961	1.216	2.160	15.184	21.737	1.204	1.516	8.139
22.5	20.941	1.151	2.659	18.980	20.529	1.159	2.090	15.129	21.356	1.151	1.465	8.103
25.0	20.725	1.112	2.626	18.943	20.184	1.114	2.035	15.074	21.051	1.109	1.424	8.066
27.5	20.550	1.080	2.604	18.907	20.003	1.078	1.994	15.038	20.908	1.077	1.391	7.993
30.0	20.406	1.049	2.584	18.870	19.853	1.048	1.960	15.001	20.789	1.050	1.363	7.957
32.5	20.417	1.026	2.579	18.834	19.898	1.021	1.945	14.965	20.868	1.025	1.348	7.920
35.0	20.449	1.002	2.574	18.797	19.936	0.998	1.932	14.928	20.935	1.004	1.335	7.884
37.5	20.786	0.986	2.595	18.797	20.295	0.982	1.949	14.928	21.337	0.990	1.344	7.884
40.0	21.100	0.971	2.619	18.797	20.609	0.969	1.964	14.928	21.688	0.978	1.351	7.884
42.5	21.452	0.958	2.662	18.797	20.978	0.956	1.997	14.928	22.091	0.967	1.367	7.884
45.0	21.805	0.946	2.713	18.797	21.307	0.945	2.026	14.928	22.448	0.957	1.381	7.884
47.5	22.172	0.934	2.778	18.797	21.687	0.934	2.075	14.928	22.852	0.947	1.402	7.884
50.0	22.565	0.924	2.866	18.797	22.028	0.924	2.119	14.928	23.215	0.937	1.420	7.884
52.5	22.948	0.915	2.959	18.797	22.419	0.915	2.188	14.928	23.621	0.929	1.447	7.884
55.0	23.396	0.909	3.102	18.797	22.774	0.907	2.251	14.928	23.989	0.921	1.472	7.884
57.5	23.841	0.903	3.261	18.797	23.186	0.901	2.349	14.928	24.399	0.915	1.507	7.884
60.0	24.316	0.899	3.463	18.797	23.564	0.896	2.438	14.928	24.775	0.909	1.540	7.884
62.5	24.447	0.898	3.518	18.797	23.995	0.892	2.574	14.928	25.189	0.904	1.587	7.884
65.0	24.578	0.897	3.573	18.797	24.393	0.888	2.700	14.928	25.572	0.899	1.630	7.884

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors

**Hunterdon County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	51.222	6.504	5.920	NA	56.047	7.335	3.893	NA	56.565	7.379	3.271	NA
5.0	35.916	3.077	5.432	NA	36.295	3.009	3.448	NA	36.437	2.937	2.870	NA
7.5	29.347	2.151	4.878	NA	29.988	2.184	3.056	NA	30.256	2.118	2.525	NA
10.0	25.987	1.741	4.555	NA	26.835	1.771	2.860	NA	27.166	1.709	2.353	NA
12.5	24.025	1.518	4.262	NA	25.114	1.568	2.637	NA	25.557	1.514	2.159	NA
15.0	22.731	1.375	4.040	NA	23.967	1.432	2.488	NA	24.484	1.384	2.030	NA
17.5	22.031	1.276	3.911	NA	23.115	1.325	2.367	NA	23.697	1.283	1.928	NA
20.0	21.585	1.204	3.824	NA	22.475	1.245	2.276	NA	23.107	1.206	1.851	NA
22.5	21.229	1.148	3.754	NA	22.018	1.186	2.204	NA	22.693	1.152	1.790	NA
25.0	20.942	1.104	3.697	NA	21.652	1.139	2.146	NA	22.362	1.108	1.742	NA
27.5	20.713	1.067	3.660	NA	21.454	1.102	2.104	NA	22.198	1.074	1.705	NA
30.0	20.523	1.036	3.631	NA	21.289	1.071	2.069	NA	22.061	1.046	1.674	NA
32.5	20.491	1.006	3.622	NA	21.322	1.043	2.055	NA	22.124	1.020	1.659	NA
35.0	20.485	0.981	3.617	NA	21.350	1.019	2.043	NA	22.178	0.998	1.646	NA
37.5	20.772	0.962	3.650	NA	21.701	1.002	2.061	NA	22.566	0.983	1.659	NA
40.0	21.044	0.945	3.686	NA	22.008	0.988	2.077	NA	22.906	0.970	1.670	NA
42.5	21.360	0.930	3.753	NA	22.373	0.975	2.113	NA	23.300	0.958	1.695	NA
45.0	21.683	0.917	3.835	NA	22.698	0.963	2.145	NA	23.650	0.948	1.717	NA
47.5	22.025	0.904	3.939	NA	23.076	0.952	2.199	NA	24.050	0.937	1.752	NA
50.0	22.402	0.894	4.083	NA	23.417	0.942	2.248	NA	24.410	0.927	1.784	NA
52.5	22.773	0.884	4.234	NA	23.809	0.933	2.326	NA	24.816	0.919	1.833	NA
55.0	23.219	0.877	4.471	NA	24.165	0.925	2.396	NA	25.185	0.911	1.877	NA
57.5	23.669	0.872	4.737	NA	24.608	0.921	2.505	NA	25.600	0.904	1.945	NA
60.0	24.164	0.867	5.074	NA	25.014	0.918	2.605	NA	25.982	0.898	2.007	NA
62.5	24.302	0.866	5.167	NA	25.479	0.916	2.758	NA	26.410	0.894	2.100	NA
65.0	24.440	0.865	5.260	NA	25.908	0.914	2.900	NA	26.805	0.889	2.186	NA

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors  
 NA – Not Applicable

**Morris County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	52.230	6.848	3.569	13.505	54.008	7.368	3.395	12.738	54.639	7.445	2.950	9.508
5.0	35.614	3.101	3.213	13.505	34.378	2.948	2.985	12.738	34.608	2.946	2.574	9.508
7.5	28.931	2.122	2.784	13.505	28.304	2.129	2.631	12.738	28.527	2.120	2.254	9.508
10.0	25.567	1.695	2.532	13.505	25.266	1.719	2.454	12.738	25.487	1.708	2.094	9.508
12.5	23.776	1.476	2.321	13.505	23.668	1.523	2.254	12.738	23.936	1.514	1.916	9.508
15.0	22.643	1.341	2.165	13.505	22.603	1.392	2.121	12.738	22.903	1.385	1.798	9.508
17.5	22.132	1.253	2.103	13.505	21.818	1.289	2.015	12.738	22.152	1.285	1.706	9.508
20.0	21.852	1.191	2.073	13.505	21.230	1.212	1.936	12.738	21.588	1.210	1.637	9.508
22.5	21.632	1.146	2.049	13.468	20.816	1.157	1.872	12.683	21.196	1.156	1.582	9.453
25.0	21.455	1.110	2.028	13.432	20.484	1.112	1.822	12.629	20.883	1.113	1.539	9.399
27.5	21.311	1.080	2.014	13.395	20.317	1.078	1.784	12.592	20.732	1.080	1.504	9.362
30.0	21.193	1.055	2.003	13.359	20.178	1.049	1.752	12.556	20.606	1.053	1.475	9.326
32.5	21.230	1.031	1.997	13.322	20.234	1.023	1.737	12.519	20.678	1.028	1.460	9.289
35.0	21.285	1.009	1.992	13.286	20.282	1.001	1.724	12.483	20.739	1.006	1.447	9.234
37.5	21.654	0.994	2.007	13.286	20.656	0.986	1.738	12.483	21.131	0.992	1.458	9.234
40.0	21.997	0.980	2.024	13.286	20.982	0.973	1.750	12.483	21.475	0.979	1.467	9.234
42.5	22.375	0.968	2.052	13.286	21.363	0.960	1.777	12.483	21.871	0.968	1.486	9.234
45.0	22.750	0.957	2.087	13.286	21.702	0.949	1.801	12.483	22.222	0.957	1.503	9.234
47.5	23.135	0.946	2.129	13.286	22.090	0.939	1.840	12.483	22.621	0.947	1.529	9.234
50.0	23.542	0.936	2.186	13.286	22.439	0.929	1.876	12.483	22.980	0.937	1.552	9.234
52.5	23.936	0.927	2.246	13.286	22.835	0.920	1.930	12.483	23.382	0.929	1.587	9.234
55.0	24.384	0.920	2.336	13.286	23.195	0.912	1.980	12.483	23.747	0.921	1.619	9.234
57.5	24.824	0.915	2.437	13.286	23.606	0.906	2.056	12.483	24.161	0.915	1.666	9.234
60.0	25.286	0.910	2.562	13.286	23.984	0.901	2.125	12.483	24.539	0.909	1.709	9.234
62.5	25.414	0.908	2.597	13.286	24.409	0.896	2.230	12.483	24.960	0.905	1.773	9.234
65.0	25.542	0.906	2.632	13.286	24.802	0.892	2.328	12.483	25.348	0.901	1.832	9.234

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors

**Passaic County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	50.661	6.678	4.857	21.936	53.683	7.327	3.620	14.399	54.664	7.447	2.941	9.435
5.0	34.881	3.107	4.429	21.936	34.259	2.948	3.193	14.399	34.620	2.947	2.565	9.435
7.5	28.294	2.154	3.933	21.936	28.190	2.132	2.821	14.399	28.536	2.122	2.247	9.435
10.0	24.948	1.734	3.642	21.936	25.155	1.724	2.635	14.399	25.494	1.709	2.087	9.435
12.5	23.070	1.512	3.387	21.936	23.533	1.526	2.425	14.399	23.943	1.515	1.910	9.435
15.0	21.852	1.371	3.195	21.936	22.452	1.395	2.284	14.399	22.909	1.386	1.792	9.435
17.5	21.236	1.277	3.096	21.936	21.652	1.291	2.171	14.399	22.158	1.286	1.700	9.435
20.0	20.863	1.208	3.035	21.918	21.051	1.213	2.086	14.399	21.595	1.210	1.631	9.435
22.5	20.567	1.157	2.985	21.899	20.626	1.157	2.019	14.344	21.203	1.157	1.577	9.362
25.0	20.328	1.116	2.945	21.863	20.285	1.112	1.965	14.308	20.890	1.114	1.533	9.326
27.5	20.136	1.082	2.918	21.826	20.109	1.076	1.925	14.253	20.739	1.081	1.499	9.289
30.0	19.977	1.053	2.898	21.790	19.963	1.047	1.892	14.216	20.614	1.054	1.470	9.253
32.5	19.974	1.026	2.890	21.753	20.012	1.020	1.877	14.180	20.685	1.028	1.455	9.198
35.0	19.993	1.002	2.885	21.717	20.053	0.997	1.864	14.143	20.746	1.007	1.442	9.161
37.5	20.311	0.984	2.910	21.717	20.418	0.982	1.880	14.143	21.139	0.993	1.452	9.161
40.0	20.609	0.969	2.938	21.717	20.736	0.969	1.894	14.143	21.483	0.980	1.461	9.161
42.5	20.947	0.955	2.987	21.717	21.110	0.956	1.925	14.143	21.878	0.969	1.480	9.161
45.0	21.288	0.943	3.048	21.717	21.442	0.945	1.952	14.143	22.230	0.958	1.497	9.161
47.5	21.644	0.931	3.124	21.717	21.825	0.934	1.998	14.143	22.629	0.948	1.523	9.161
50.0	22.029	0.921	3.229	21.717	22.169	0.924	2.039	14.143	22.988	0.938	1.546	9.161
52.5	22.406	0.912	3.339	21.717	22.562	0.916	2.104	14.143	23.390	0.930	1.581	9.161
55.0	22.857	0.906	3.511	21.717	22.919	0.907	2.162	14.143	23.755	0.922	1.612	9.161
57.5	23.307	0.900	3.702	21.717	23.329	0.901	2.253	14.143	24.169	0.916	1.659	9.161
60.0	23.792	0.897	3.944	21.717	23.705	0.896	2.335	14.143	24.549	0.910	1.702	9.161
62.5	23.927	0.896	4.011	21.717	24.133	0.892	2.461	14.143	24.970	0.906	1.765	9.161
65.0	24.062	0.895	4.078	21.717	24.528	0.888	2.578	14.143	25.359	0.902	1.823	9.161

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors

**Somerset County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	51.357	6.754	4.289	18.250	53.344	7.287	3.913	16.571	54.137	7.382	3.241	11.625
5.0	35.207	3.105	3.893	18.250	34.152	2.961	3.466	16.571	34.407	2.934	2.843	11.625
7.5	28.576	2.140	3.426	18.250	28.064	2.147	3.071	16.571	28.356	2.115	2.500	11.625
10.0	25.221	1.717	3.153	18.250	25.020	1.739	2.873	16.571	25.331	1.706	2.329	11.625
12.5	23.381	1.497	2.917	18.250	23.359	1.539	2.649	16.571	23.758	1.512	2.136	11.625
15.0	22.200	1.358	2.741	18.250	22.251	1.406	2.499	16.571	22.709	1.382	2.008	11.625
17.5	21.630	1.267	2.658	18.250	21.426	1.300	2.376	16.552	21.940	1.281	1.907	11.625
20.0	21.298	1.201	2.611	18.250	20.806	1.221	2.285	16.534	21.363	1.205	1.831	11.589
22.5	21.035	1.152	2.573	18.213	20.364	1.163	2.212	16.498	20.958	1.150	1.771	11.552
25.0	20.823	1.114	2.541	18.177	20.010	1.117	2.153	16.461	20.635	1.106	1.722	11.516
27.5	20.653	1.082	2.520	18.140	19.822	1.080	2.111	16.425	20.475	1.073	1.685	11.479
30.0	20.512	1.055	2.503	18.104	19.665	1.050	2.076	16.388	20.342	1.045	1.655	11.443
32.5	20.526	1.028	2.496	18.067	19.702	1.023	2.061	16.352	20.405	1.019	1.640	11.370
35.0	20.561	1.005	2.492	18.031	19.734	0.999	2.049	16.315	20.459	0.997	1.627	11.333
37.5	20.901	0.989	2.512	18.031	20.084	0.983	2.067	16.315	20.841	0.982	1.639	11.333
40.0	21.219	0.974	2.535	18.031	20.390	0.969	2.083	16.315	21.176	0.970	1.650	11.333
42.5	21.574	0.961	2.575	18.031	20.752	0.956	2.119	16.315	21.563	0.958	1.675	11.333
45.0	21.930	0.949	2.625	18.031	21.075	0.944	2.151	16.315	21.908	0.947	1.696	11.333
47.5	22.299	0.938	2.686	18.031	21.450	0.933	2.206	16.315	22.301	0.936	1.730	11.333
50.0	22.694	0.928	2.770	18.031	21.787	0.923	2.255	16.315	22.654	0.927	1.761	11.333
52.5	23.078	0.919	2.858	18.031	22.174	0.914	2.333	16.315	23.053	0.918	1.809	11.333
55.0	23.528	0.912	2.993	18.031	22.526	0.906	2.403	16.315	23.415	0.910	1.853	11.333
57.5	23.974	0.907	3.145	18.031	22.941	0.901	2.513	16.315	23.822	0.904	1.918	11.333
60.0	24.449	0.903	3.335	18.031	23.321	0.896	2.613	16.315	24.195	0.898	1.978	11.333
62.5	24.581	0.902	3.388	18.031	23.757	0.892	2.766	16.315	24.613	0.893	2.069	11.333
65.0	24.713	0.901	3.441	18.031	24.160	0.888	2.908	16.315	24.999	0.888	2.152	11.333

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors

**Sussex County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	50.599	6.670	4.905	NA	53.811	7.344	3.579	NA	54.378	7.415	3.289	NA
5.0	34.851	3.105	4.474	NA	34.321	2.958	3.156	NA	34.560	2.979	2.888	NA
7.5	28.269	2.153	3.975	NA	28.230	2.139	2.787	NA	28.420	2.152	2.543	NA
10.0	24.925	1.734	3.683	NA	25.185	1.730	2.603	NA	25.350	1.738	2.370	NA
12.5	23.044	1.512	3.426	NA	23.561	1.532	2.394	NA	23.743	1.540	2.176	NA
15.0	21.823	1.371	3.233	NA	22.478	1.400	2.255	NA	22.671	1.408	2.047	NA
17.5	21.204	1.276	3.133	NA	21.677	1.296	2.144	NA	21.886	1.305	1.945	NA
20.0	20.828	1.208	3.070	NA	21.077	1.218	2.060	NA	21.297	1.228	1.868	NA
22.5	20.529	1.156	3.020	NA	20.652	1.162	1.993	NA	20.882	1.172	1.807	NA
25.0	20.288	1.116	2.979	NA	20.312	1.116	1.940	NA	20.551	1.128	1.758	NA
27.5	20.095	1.081	2.952	NA	20.136	1.081	1.900	NA	20.383	1.093	1.721	NA
30.0	19.935	1.052	2.931	NA	19.990	1.052	1.867	NA	20.243	1.064	1.690	NA
32.5	19.930	1.025	2.923	NA	20.038	1.025	1.853	NA	20.298	1.038	1.676	NA
35.0	19.948	1.001	2.918	NA	20.080	1.002	1.840	NA	20.346	1.015	1.663	NA
37.5	20.264	0.983	2.943	NA	20.444	0.987	1.856	NA	20.719	1.000	1.676	NA
40.0	20.561	0.968	2.971	NA	20.763	0.973	1.869	NA	21.046	0.987	1.688	NA
42.5	20.898	0.954	3.021	NA	21.137	0.961	1.899	NA	21.427	0.975	1.713	NA
45.0	21.237	0.941	3.083	NA	21.470	0.950	1.926	NA	21.766	0.964	1.735	NA
47.5	21.593	0.930	3.161	NA	21.852	0.939	1.971	NA	22.153	0.953	1.771	NA
50.0	21.977	0.919	3.267	NA	22.197	0.929	2.011	NA	22.502	0.943	1.804	NA
52.5	22.353	0.910	3.380	NA	22.589	0.920	2.074	NA	22.897	0.935	1.855	NA
55.0	22.804	0.904	3.554	NA	22.946	0.912	2.131	NA	23.257	0.927	1.901	NA
57.5	23.254	0.899	3.748	NA	23.361	0.907	2.219	NA	23.682	0.922	1.970	NA
60.0	23.740	0.895	3.994	NA	23.741	0.901	2.299	NA	24.073	0.918	2.034	NA
62.5	23.874	0.894	4.063	NA	24.173	0.897	2.422	NA	24.511	0.914	2.130	NA
65.0	24.008	0.893	4.132	NA	24.572	0.894	2.535	NA	24.915	0.911	2.219	NA

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors  
 NA=Not Applicable

**Warren County**  
**Emission Factors in Grams per Vehicle per Mile**

Speed	Freeway				Arterial				Local			
	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5	CO	VOC	NOX	PM2.5
2.5	50.813	6.255	6.174	NA	56.202	7.100	3.626	NA	56.818	7.157	3.107	NA
5.0	35.706	3.005	5.680	NA	36.322	2.908	3.212	NA	36.544	2.876	2.731	NA
7.5	29.173	2.115	5.119	NA	30.082	2.114	2.847	NA	30.353	2.081	2.406	NA
10.0	25.826	1.720	4.790	NA	26.962	1.717	2.664	NA	27.257	1.683	2.243	NA
12.5	23.851	1.501	4.491	NA	25.291	1.522	2.456	NA	25.660	1.494	2.061	NA
15.0	22.543	1.360	4.264	NA	24.177	1.392	2.317	NA	24.596	1.367	1.939	NA
17.5	21.824	1.262	4.128	NA	23.353	1.289	2.206	NA	23.819	1.268	1.843	NA
20.0	21.360	1.190	4.036	NA	22.735	1.212	2.122	NA	23.236	1.194	1.772	NA
22.5	20.991	1.135	3.962	NA	22.296	1.156	2.056	NA	22.828	1.141	1.715	NA
25.0	20.692	1.091	3.902	NA	21.945	1.112	2.002	NA	22.502	1.099	1.669	NA
27.5	20.454	1.054	3.863	NA	21.762	1.077	1.963	NA	22.342	1.066	1.635	NA
30.0	20.257	1.022	3.833	NA	21.609	1.048	1.931	NA	22.210	1.039	1.606	NA
32.5	20.217	0.993	3.825	NA	21.655	1.021	1.917	NA	22.277	1.014	1.592	NA
35.0	20.205	0.967	3.820	NA	21.695	0.998	1.906	NA	22.335	0.992	1.580	NA
37.5	20.482	0.948	3.855	NA	22.062	0.983	1.922	NA	22.729	0.979	1.592	NA
40.0	20.745	0.931	3.895	NA	22.383	0.970	1.937	NA	23.073	0.966	1.603	NA
42.5	21.054	0.917	3.966	NA	22.760	0.958	1.970	NA	23.472	0.955	1.626	NA
45.0	21.371	0.903	4.054	NA	23.096	0.947	1.998	NA	23.826	0.945	1.646	NA
47.5	21.708	0.891	4.166	NA	23.484	0.936	2.046	NA	24.229	0.934	1.678	NA
50.0	22.081	0.881	4.320	NA	23.832	0.927	2.088	NA	24.591	0.925	1.707	NA
52.5	22.448	0.871	4.483	NA	24.230	0.918	2.155	NA	24.999	0.917	1.751	NA
55.0	22.891	0.864	4.737	NA	24.592	0.910	2.216	NA	25.370	0.909	1.790	NA
57.5	23.340	0.858	5.022	NA	25.021	0.905	2.309	NA	25.788	0.903	1.849	NA
60.0	23.836	0.854	5.383	NA	25.414	0.900	2.394	NA	26.171	0.897	1.904	NA
62.5	23.973	0.853	5.483	NA	25.861	0.897	2.524	NA	26.599	0.892	1.984	NA
65.0	24.110	0.852	5.583	NA	26.274	0.893	2.644	NA	26.995	0.888	2.059	NA

Note: CO, VOC, and NOX = Daily factors, PM2.5 = Annual factors  
NA- Not Applicable