# Appendix 5.2.1

# Supplemental Vehicle Emissions Analysis

SUPPLEMENTAL VEHICLE EMISSIONS ANALYSIS
PROVIDED BY AAF JANUARY 23, 2015
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AAF utilized per vehicle emission factors prepared for the 2007 base year inventory development evaluation for the Southeastern States Air Resources Managers (SESARM). The per vehicle emission factors were developed using MOVES2010A for a variety of temperature and humidity conditions for a winter and summer month and were used, thus reducing the number of model runs. Since vehicle fleet emissions tend to decrease in each subsequent year due to continual improvements in control programs and fleet turnover, these emission factors represent worst case emissions.

Emission factors were available for crankcase extended idle exhaust (CEI), crankcase start exhaust (CXS), evaporative fuel leakage (EFL), evaporative permeation (EPM), start exhaust (EXS) and extended idle exhaust (EXT). Emission factors for CEI, EFL, EPM and EXT were averaged together across all conditions to develop average vehicle emission factors. Start emissions were removed since the vehicle queuing at railroad intersections does not involve start emissions.

In order to estimate the number of vehicles queuing at intersections traversed by passenger trains, information obtained from the Synchro 8 reports generated for the Transportation and Railroad Crossing Analysis were used to evaluate the change in queue length and the corresponding number of vehicles impacted. AAF used the $50^{th}$ percentile queue length value from those reports to estimate the length of the queue. An average value of 19.5 feet per vehicle was used to estimate the number of vehicles represented by the queue length estimate. That value was obtained from http://ops.fhwa.dot.gov/publications/fhwahop08054/sect4.htm, Section 4.1.4, Computation of Queue. The number of lanes for through traffic was then used to evaluate the total number of vehicles.

Once the total number of vehicles was obtained, the emissions were calculated for the intersections evaluated in the Transportation and Railroad Crossing Analysis report. The number of hourly cycles was determined based on information presented in Tables 3-4 through 3-13 of that report. That value was multiplied by 24 hours per day to determine the number of cycles per day. Normal (which means automotive traffic during periods when no freight trains are passing), and freight train cycles were combined to provide an overall estimate of current conditions. Then passenger train cycles were estimated separately to determine the emissions potentially associated with vehicle queuing for the passenger trains. In all cases for passenger trains and freight trains the number of cycles were estimated at 2 per hour or 48 cycles per day.

The overall emissions were then calculated for all of the criteria pollutants. Greenhouse gas pollutants were not calculated since emission factors per vehicle were not available from the available MOVES2010A runs performed for SESARM. Estimates were made for both 2016 and 2036 (using the same 2007 emission factors). The results (all emission values in tons/day) are presented in the tables that follow. In only two cases were the normal plus freight emissions

greater than 1 ton per day – Banyan Blvd and Northlake Blvd crossings. Adding passenger trains increases the emissions typically by less than 50% of the combined normal and freight emission levels. As with the normal plus freight emissions, emissions for vehicle queuing for passenger trains were generally significantly less than 1 ton per day, which constitutes a de-minimis impact on overall emission levels. Total emissions from all sources (normal cycle, freight and passenger) generally amount to less than 1 ton/day with the exception of NOx emissions for Banyan Blvd and Northlake Blvd crossings. Emissions at those two crossings are still considered de-minimus pursuant to EPA standards.

Normal and Freight

| IntersectionShort | Year | CO | NOX | VOC | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|---|
| 19th 20th Place Crossing | 2016 | 0.063 | 0.159 | 0.043 | 0.000 | 0.003 | 0.003 |
| 19th 20th Place Crossing | 2036 | 0.076 | 0.191 | 0.051 | 0.000 | 0.003 | 0.003 |
| Banyan Blvd Crossing | 2016 | 0.428 | 1.043 | 0.285 | 0.001 | 0.019 | 0.019 |
| Banyan Blvd Crossing | 2036 | 0.672 | 1.638 | 0.447 | 0.002 | 0.031 | 0.030 |
| Monterey Rd Crossing | 2016 | 0.132 | 0.333 | 0.089 | 0.000 | 0.006 | 0.006 |
| Monterey Rd Crossing | 2036 | 0.169 | 0.424 | 0.114 | 0.001 | 0.008 | 0.007 |
| North Causeway Crossing | 2016 | 0.065 | 0.164 | 0.044 | 0.000 | 0.003 | 0.003 |
| North Causeway Crossing | 2036 | 0.083 | 0.209 | 0.056 | 0.000 | 0.004 | 0.004 |
| Northlake Blvd Crossing | 2016 | 0.474 | 1.155 | 0.316 | 0.001 | 0.022 | 0.021 |
| Northlake Blvd Crossing | 2036 | 0.752 | 1.835 | 0.501 | 0.002 | 0.034 | 0.033 |
| Oslo Rd Crossing | 2016 | 0.175 | 0.441 | 0.118 | 0.001 | 0.008 | 0.008 |
| Oslo Rd Crossing | 2036 | 0.238 | 0.600 | 0.161 | 0.001 | 0.011 | 0.011 |
| Palm Bay Rd Crossing | 2016 | 0.065 | 0.163 | 0.044 | 0.000 | 0.003 | 0.003 |
| Palm Bay Rd Crossing | 2036 | 0.123 | 0.311 | 0.083 | 0.000 | 0.006 | 0.005 |
| Pineda Causeway Crossing | 2016 | 0.187 | 0.471 | 0.127 | 0.001 | 0.009 | 0.008 |
| Pineda Causeway Crossing | 2036 | 0.327 | 0.824 | 0.221 | 0.001 | 0.015 | 0.014 |
| SE Indian Street Crossing | 2016 | 0.087 | 0.218 | 0.059 | 0.000 | 0.004 | 0.004 |
| SE Indian Street Crossing | 2036 | 0.114 | 0.286 | 0.077 | 0.000 | 0.005 | 0.005 |
| Seaway Drive Crossing | 2016 | 0.084 | 0.211 | 0.057 | 0.000 | 0.004 | 0.004 |
| Seaway Drive Crossing | 2036 | 0.117 | 0.294 | 0.079 | 0.000 | 0.005 | 0.005 |

Passenger

| IntersectionShort | Year | CO | NOX | VOC | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|---|
| 19th 20th Place Crossing | 2016 | 0.034 | 0.087 | 0.023 | 0.000 | 0.002 | 0.002 |
| 19th 20th Place Crossing | 2036 | 0.053 | 0.132 | 0.036 | 0.000 | 0.002 | 0.002 |
| Banyan Blvd Crossing | 2016 | 0.162 | 0.395 | 0.108 | 0.000 | 0.007 | 0.007 |
| Banyan Blvd Crossing | 2036 | 0.240 | 0.585 | 0.160 | 0.001 | 0.011 | 0.011 |
| Monterey Rd Crossing | 2016 | 0.050 | 0.125 | 0.034 | 0.000 | 0.002 | 0.002 |
| Monterey Rd Crossing | 2036 | 0.083 | 0.208 | 0.056 | 0.000 | 0.004 | 0.004 |
| North Causeway Crossing | 2016 | 0.012 | 0.029 | 0.008 | 0.000 | 0.001 | 0.001 |
| North Causeway Crossing | 2036 | 0.011 | 0.029 | 0.008 | 0.000 | 0.001 | 0.000 |
| Northlake Blvd Crossing | 2016 | 0.201 | 0.490 | 0.134 | 0.001 | 0.009 | 0.009 |
| Northlake Blvd Crossing | 2036 | 0.312 | 0.761 | 0.208 | 0.001 | 0.014 | 0.014 |
| Oslo Rd Crossing | 2016 | 0.082 | 0.207 | 0.056 | 0.000 | 0.004 | 0.004 |
| Oslo Rd Crossing | 2036 | 0.098 | 0.248 | 0.067 | 0.000 | 0.004 | 0.004 |
| Palm Bay Rd Crossing | 2016 | 0.022 | 0.055 | 0.015 | 0.000 | 0.001 | 0.001 |
| Palm Bay Rd Crossing | 2036 | 0.072 | 0.182 | 0.049 | 0.000 | 0.003 | 0.003 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pineda Causeway Crossing | 2016 | 0.092 | 0.231 | 0.062 | 0.000 | 0.004 | 0.004 |
| Pineda Causeway Crossing | 2036 | 0.186 | 0.469 | 0.126 | 0.001 | 0.008 | 0.008 |
| SE Indian Street Crossing | 2016 | 0.041 | 0.103 | 0.028 | 0.000 | 0.002 | 0.002 |
| SE Indian Street Crossing | 2036 | 0.091 | 0.224 | 0.061 | 0.000 | 0.004 | 0.004 |
| Seaway Drive Crossing | 2016 | 0.033 | 0.083 | 0.022 | 0.000 | 0.002 | 0.001 |
| Seaway Drive Crossing | 2036 | 0.046 | 0.117 | 0.031 | 0.000 | 0.002 | 0.002 |

Percent Passenger of Normal and Freight

| IntersectionShort | Year | CO | NOX | VOC | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|---|
| 19th 20th Place Crossing | 2016 | 54.67% | 54.67% | 54.67% | 54.67% | 54.67% | 54.67% |
| 19th 20th Place Crossing | 2036 | 69.29% | 69.29% | 69.29% | 69.29% | 69.29% | 69.29% |
| Banyan Blvd Crossing | 2016 | 37.90% | 37.90% | 37.90% | 37.90% | 37.90% | 37.90% |
| Banyan Blvd Crossing | 2036 | 35.72% | 35.72% | 35.72% | 35.72% | 35.72% | 35.72% |
| Monterey Rd Crossing | 2016 | 37.53% | 37.53% | 37.53% | 37.53% | 37.53% | 37.53% |
| Monterey Rd Crossing | 2036 | 49.12% | 49.12% | 49.12% | 49.12% | 49.12% | 49.12% |
| North Causeway Crossing | 2016 | 17.73% | 17.73% | 17.73% | 17.73% | 17.73% | 17.73% |
| North Causeway Crossing | 2036 | 13.64% | 13.64% | 13.64% | 13.64% | 13.64% | 13.64% |
| Northlake Blvd Crossing | 2016 | 42.38% | 42.38% | 42.38% | 42.38% | 42.38% | 42.38% |
| Northlake Blvd Crossing | 2036 | 41.49% | 41.49% | 41.49% | 41.49% | 41.49% | 41.49% |
| Oslo Rd Crossing | 2016 | 47.00% | 47.00% | 47.00% | 47.00% | 47.00% | 47.00% |
| Oslo Rd Crossing | 2036 | 41.34% | 41.34% | 41.34% | 41.34% | 41.34% | 41.34% |
| Palm Bay Rd Crossing | 2016 | 33.58% | 33.58% | 33.58% | 33.58% | 33.58% | 33.58% |
| Palm Bay Rd Crossing | 2036 | 58.56% | 58.56% | 58.56% | 58.56% | 58.56% | 58.56% |
| Pineda Causeway Crossing | 2016 | 48.96% | 48.96% | 48.96% | 48.96% | 48.96% | 48.96% |
| Pineda Causeway Crossing | 2036 | 56.98% | 56.98% | 56.98% | 56.98% | 56.98% | 56.98% |
| SE Indian Street Crossing | 2016 | 47.28% | 47.28% | 47.28% | 47.28% | 47.28% | 47.28% |
| SE Indian Street Crossing | 2036 | 79.74% | 78.17% | 78.97% | 79.74% | 79.74% | 79.74% |
| Seaway Drive Crossing | 2016 | 39.59% | 39.59% | 39.59% | 39.59% | 39.59% | 39.59% |
| Seaway Drive Crossing | 2036 | 39.84% | 39.84% | 39.84% | 39.84% | 39.84% | 39.84% |