NORTHEASTERN INDIANA REGIONAL COORDINATING COUNCIL

2040

AIR QUALITY CONFORMITY DETERMINATION

Adopted September 2018

Illustrations of the transportation network within the Metropolitan Planning Area. Areas include portions of Allen County, Cities of Fort Wayne and New Haven, and Towns of Grabill, Huntertown, and Leo-Cedarville.

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Air Quality Conformity Determination
Allen County

2040 Long Range Transportation Plan

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Northeastern Indiana Regional Coordinating Council

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Executive Summary

The Air Quality Conformity Determination for the 2040 Transportation Plan was performed to ensure the Plan remains compliant with federal regulations regarding the National Ambient Air Quality Standards (NAAQS), Fixing America's Surface Transportation Act (FAST Act), and judicial interpretations of applicable rules, regulations and legislation. Allen County was designated nonattainment for the 1997 ozone NAAQS and was re-designated to attainment for the pollutant ozone in February 2007, and guidance indicated that conformity determinations were no longer required. Recently, the U.S. Court of Appeals for the D.C. Circuit issued a decision in *South Coast Air Quality Management District v. EPA*, No. 15-1115, which struck down portions of the *2008 Ozone NAAQS SIP Requirements Rule* concerning the ozone National Ambient Air Quality Standards (NAAQS). The Court ruling has placed a shadow of uncertainty on the region's ability to advance transportation projects without demonstrating conformity. The Northeastern Indiana Regional Coordinating Council (NIRCC), with guidance from its stakeholders, has decided to perform an Air Quality Conformity Determination for 2040 Transportation Plan to address any potential backsliding of the 2008 ozone requirements and ensure project implementation can proceed on schedule. NIRCC will demonstrate that its transportation plan conforms to the 2020 air quality emission budgets established for the ozone precursor pollutants of volatile organic compounds (VOC) and nitrogen oxides (NOx). In addition, the analysis will demonstrate that Allen County, the designated attainment area, in its entirety will conform to the established 2020 State Implementation Plan (SIP) budget.

Air quality conformity for the 2040 Transportation Plan was determined based on the analysis included in this report. As required, an emissions analysis was performed for the base year 2015, and each of the study years of the plan. The analysis demonstrates the emissions of VOC and NOx will not exceed the 2020 SIP budget if the projects in the 2040 Transportation Plan are implemented as proposed. The emissions analysis addresses all of Allen County. Figure 1 displays the Metropolitan Planning Area and Allen County boundaries. The conformity analysis demonstrates that vehicle emissions based on the 2040 Transportation Plan will remain below the 2020 budget for analysis years 2020, 2030, and 2040 (See table 1). Thus, the NIRCC 2040 Transportation Plan conforms to the Clean Air Act as amended. The analysis also demonstrates that Allen County meets the conformity requirements of the Clean Air Act as amended.

Table 1: 2015, 2020, 2030 and 2040 Analysis Year Comparison to 2020 SIP Budget

Analysis Year	Total VOC Emissions tons/day	2020 VOC SIP Budget tons/day	Total NOx Emissions tons/day	2020 NOx SIP Budget tons/day
2015	5.43	NA	12.73	NA
2020	3.81	4.52	8.18	9.72
2030	3.19	4.52	6.28	9.72
2040	3.40	4.52	6.93	9.72

The conformity determination was coordinated with stakeholder and regulatory agencies through an Interagency Consultation process to formally deliberate any issues. A consultation group conference call was conducted on May 29, 2018 at which time representatives from Indiana Department of Environmental Management (IDEM), Federal Highway Administration (FHWA), US Environmental

Protection Agency (USEPA), Indiana Department of Transportation (INDOT), Convergence Planning and Northeastern Indiana Regional Coordinating Council (NIRCC). Representatives from the Federal Transit Administration (FTA) and Citilink were invited to the meeting but were unable to attend. The Interagency Consultation Group (ICG) agreed that as information from the analysis was available, it could be distributed to the ICG via email and members would decide if subsequent meetings would be necessary.

A follow-up email was sent to the ICG on June 29, 2018 with Table 1 demonstrating Allen County meets the conformity requirements of the Clean Air Act as amended. NIRCC received comments back from INDOT, IDEM, FHWA, and USEPA stating that because the analysis demonstrates that Allen County is meeting the conformity requirements a second ICG meeting is not needed.

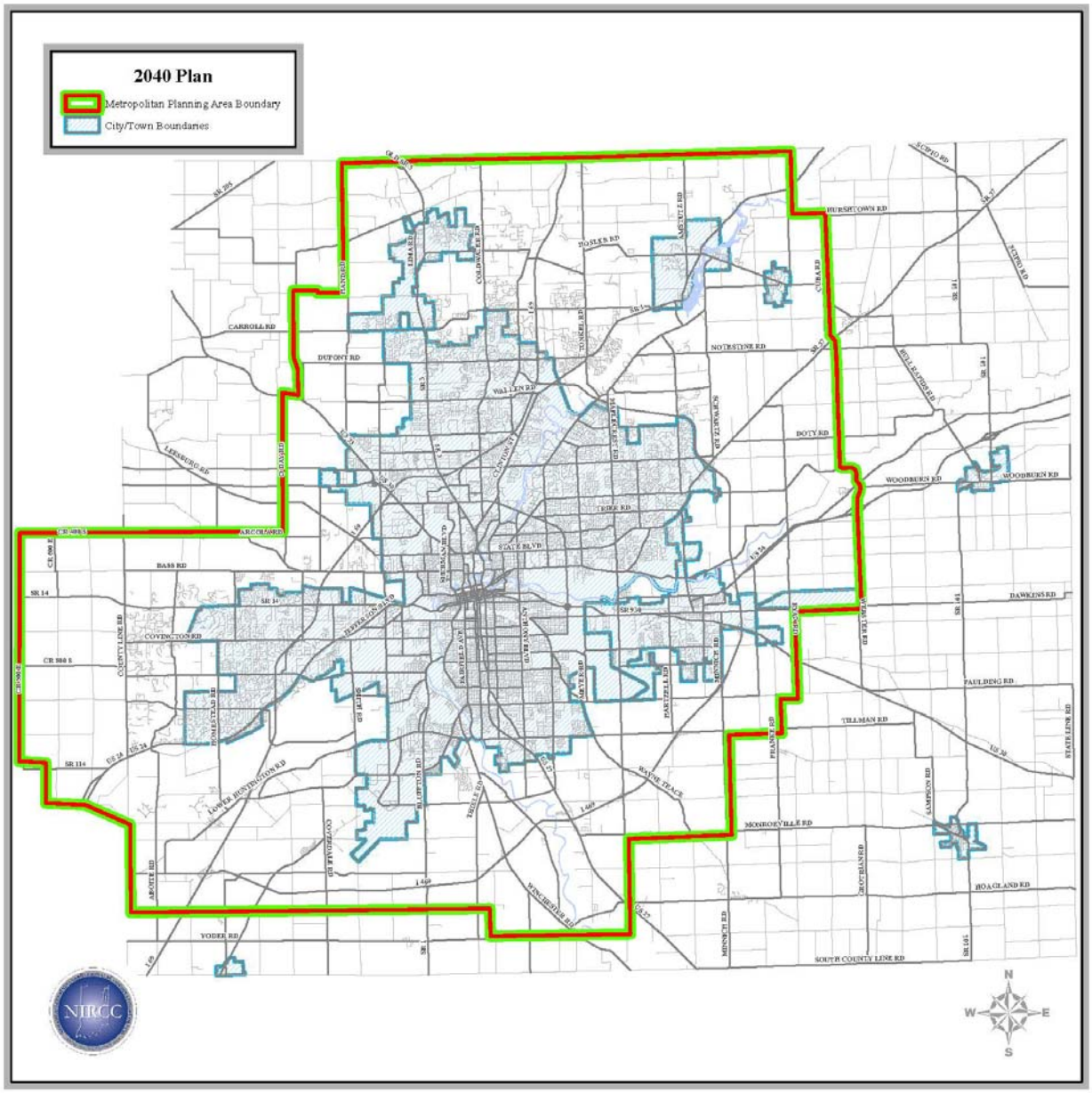

FIGURE 1: MPA within Allen County Boundaries

The Indiana Traffic Modelers group, comprised of MPO and INDOT modelers, and representatives from IDEM and FHWA meet bi-monthly to provide an open forum to discuss the modeling processes, parameters, and as a mechanism for assuring that the partners have more than adequate opportunity to participate in the travel demand forecasting process. Air Quality analyses are also discussed.

1.0 Introduction

As part of the joint regulatory requirements of the Clean Air Act, the U.S. Department of Transportation (DOT), and the U.S. Environmental Protection Agency (EPA) NIRCC is required to conduct an air quality conformity analysis for the Transportation Plan (TP). This was triggered by the fact that Allen County was designated as being in non-attainment of the National Ambient Air Quality Standard (NAAQS) for ozone. Allen County has since been re-designated as attainment and establishing Allen County as a maintenance area.

Under the Clean Air Act (CAA), Allen County, Indiana was re-designated as meeting attainment for ozone under the 8-hour ozone standard in February 12, 2007. This process establishes Allen County as a maintenance area for air quality conformity demonstration and requires Allen County, and the Metropolitan Planning Area within Allen County, to meet conformity rules and regulations. The Northeastern Indiana Regional Coordinating Council, the Metropolitan Planning Organization for the Fort Wayne-New Haven-Allen County Area is the agency responsible for conducting the air quality analyses. All plans, programs and projects must be reviewed for conformity with the standards to assure that they do not exceed the established budget. Through the process, a 2020 SIP Budget was developed through consultation.

There is a need to efficiently and effectively calculate emissions inventories for any area that is in non-attainment of the National Ambient Air Quality Standards (NAAQS). The current version of the mobile source emissions model developed by the U.S. Environmental Protection Agency (EPA) is the Motor Vehicle Emissions Simulator (MOVES). MOVES replaces its predecessor model, Mobile6.2. On March 2, 2010 EPA released a federal register notice officially announcing the release of MOVES and its adoption by EPA as the standard emissions model for the development of State Implementation Plans (SIP) and regional transportation conformity analyses. The current version of MOVES is MOVES2014b.

While it is possible to use MOVES to calculate emissions inventories directly, EPA policy does support the use of emissions rates produced by MOVES as applied to key outputs developed by a travel demand model. These outputs include vehicle-miles-traveled (VMT), vehicle-hours traveled (VHT), and speeds. The benefits of using the emissions rates from MOVES as part of an air quality post-processor for a travel demand model are greater ease and precision in assessing the benefits to air quality achieved by improvements to the area's transportation system.

It is for these reasons that the Indiana Department of Transportation (INDOT) developed a post-processing tool for applying emissions rates developed in MOVES2014a to the output data produced by the travel demand models used in Indiana. Since the majority of the travel demand models used in Indiana run on the TransCAD modeling platform, this tool was developed in that platform. For those cases in which a model exists in a platform other than TransCAD, the requisite input data can be imported into the proper TransCAD formats and used with this tool.

Methodology

The Indiana Department of Transportation Air Quality Post-Processor (INDOT AQPP) was developed to calculate emissions estimates through the application of emissions rates developed in MOVES to the outputs of travel demand models. Though MOVES can calculate emissions inventories directly, the

effort involved in preprocessing the input data sets needed to accurately reflect each transportation and land use scenario being analyzed can be quite effort intensive. Though the initial pre-processing required to developing emissions rates in MOVES is comparable to running MOVES in emissions inventory mode, once the emissions rates have been developed, they can continue to be applied to travel demand model outputs without further preprocessing. This is particularly advantageous if one is planning to test a variety of transportation scenarios. The methodology employed in the INDOT AQPP is fairly straightforward. The INDOT AQPP takes travel demand model data as an input along with the emissions rates developed in MOVES. The travel demand model vehicle-miles-traveled are then disaggregated into a finer level of detail and factored by the emissions rates to produce emissions estimates.

2.0 Regulations Governing Conformity Determinations

Federal Regulations for Metropolitan Planning in 23 CFR (Code of Federal Regulations) Part 450 require that federally funded highway and transit projects be included in a conforming plan and Transportation Improvement Program (TIP). 40 CFR Part 93, as revised July 1, 2006, outlines the requirements for making conformity determinations under Subpart A. Applicable requirements are listed below.

1. The Transportation Plan must specifically describe the transportation system envisioned for certain future years, which are called horizon years.

- The horizon years may be no more than 10 years apart.
- The first horizon year may not be more than 10 years from the base year used to validate the travel demand model.
- If the attainment year is in the time span of the Transportation Plan, the attainment year must be a horizon year.
- The last horizon year must be the last year of the Transportation Plan's forecast year.

The base year for validation of the travel demand model is 2015. A State Implementation Plan (SIP) established a 2020 budget for Allen County as part of the re-designation process to attainment status. Section 3 Travel Demand Model Validation contains documentation on the validation of the travel demand model to the 2015 base year. The base and horizon years used in developing the conformity analysis of the NIRCC 2040 Transportation Plan are:

- 2015: The validated base year for the transportation network
- 2020: Year selected to be no more than ten years between analysis years and SIP Budget Year
- 2030: Year selected to be no more than ten years between analysis years
- 2040: Final horizon year of the Transportation Plan

2. The Transportation Plan will quantify and document the demographic and employment factors influencing the expected transportation demand; and the highway and transit system shall be described in terms of the regionally significant additions or modifications to the existing transportation network, which the transportation plan envisions to be operational in the horizon years.

The socio-economic data for all study-years is included in the Transportation Plan. This data represents the estimates of population, households, automobiles and employment. Assumptions on the future land use were made after reviewing the general land use plans adopted by local governments and then verifying the information with appropriate agencies. Areas targeted for economic development activities were included. The development of the socioeconomic estimates used numerous tools including the geographic information system for Allen County, aerial photography, and zoning maps. These methodologies are clearly documented in the 2040 Transportation Plan.

The vehicle miles traveled (VMT) estimates for Allen County were developed with the TransCAD computer software program. TransCAD, a travel demand forecasting application, provided vehicle miles

traveled (VMT) by functional classification for the base year (2015) and each analysis year (2020, 2030 and 2040). Table 5-1 contains the VMT for Allen County.

The MOVES software program was used to determine the appropriate Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx) emission factors for Allen County. The INDOT AQPP was used to calculate the emissions estimates for each functional classification.

The highway and transit systems are detailed as part of the Transportation Plan. Each lists regionally significant projects. Highway improvement projects that will be completed prior to the individual analysis years are identified. Transit ridership in the MPA represents less than one percent of the total regional trips. At this level of transit usage, a reliable representation and accurate assignment of transit trips can not be accomplished through the travel forecasting procedures. This does not preclude the fact that transit provides a valuable service and can assist in reducing vehicle travel. Transit projects, policies and strategies are a viable component of the Transportation Plan.

3. The Transportation Plan must be financially reasonable and the TIP must be fiscally constrained consistent with the U.S. DOT's metropolitan planning regulations at 23 CFR part 450 and U.S. EPA's conformity regulations at 40 CFR part 93 in order to be found in conformity.

The Transportation Plan contains a section on financial analysis, which demonstrates that the TP is financially reasonable. Cost information from the Indiana Department of Transportation (INDOT) and other jurisdictions have been utilized. Anticipated revenues from federal, state, and local sources have been identified. Estimated revenues exceed anticipated project costs.

4. The conformity determination must be based on the latest emission estimation model available.

Motor Vehicle Emissions Simulator (MOVES2014a) was used during the development of this plan. Indiana Department of Transportation (INDOT) developed a post-processing tool for applying emissions rates developed in MOVES2014a. The post processor makes use of emissions rates files developed by MOVES2014a based on each scenario. These files are:

- Link Table: contains data from the TDM that occurs on the highway network
- Intrazonal Table: contains data on travel not on the highway network
- Rate per Distance: captures running exhaust, break wear, and tire wear
- Rate per Vehicle: capture start and idle exhaust
- Rate per Profile: capture evaporative emissions when vehicles are stationary

The Link Table and the Intrazonal Table are created in NIRCC's TDM. The Rate per Distance, Rate per Vehicle, and Rate per Profile files is exported directly from the SQL output databases generated by MOVES into a comma delimited text (CSV) format. INDOT developed emissions rates for NIRCC's analysis area. The rates were produced in consultation with the area's interagency consultation group (ICG). More details on these variables can be found in section 4.0 INDOT AQPP Inputs. The INDOT AQPP documentation can be found as an attachment to this document

The outputs used for the Allen County conformity analysis from the INDOT AQPP model include Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx) emission factors for each of the

functional classes. These outputs are based on the default inputs to MOVES and all of the inputs listed in section 4.0 MOVES Inputs. The emission factors were multiplied by the corresponding VMT for each functional classification and added to determine the total emissions. The compiled outputs are included in section 5.0 INDOT AQPP Outputs, which shows the total emissions estimated for each network year.

5. The MPO must make the conformity determination according to the interagency consultation procedures required in 40 CFR Parts 51 and 93 (sections 51.390 and 93.105), and according to the public involvement procedures established by the MPO in compliance with 23 CFR Part 450.

NIRCC in conjunction with its air quality partners held an interagency consultation meeting on May 29, 2018 to discuss the methodology and budgets that were used for the 2035 Air Quality Determination can be used in this conformity determination and to receive guidance on various issues. The consultation included representatives from NIRCC, IDEM, USEPA, INDOT, Citilink, and FHWA. Representatives from FTA, were invited but were unable to participate. A Draft conformity determination was also made available for review prior to final adoption of the Transportation Plan. The interagency consultation is summarized in section 6.0 Interagency Consultation and briefly defined in the Executive Summary of this document.

The Conformity Determination and 2040 Transportation Plan were made available for public comment from July 24, 2018 through August 28, 2018. No comments were received regarding the conformity demonstration or analysis. A complete listing including meeting minutes of the formal and informal opportunities for partner input is listed as Appendix A of this document.

6. The Transportation Plan must provide for the timely implementation of Transportation Control Measures (TCM) from the applicable State Implementation Plan (SIP). Nothing in the plan may interfere with the implementation of any TCM in the applicable implementation plan.

Allen County is designated as a attainment area for the pollutant ozone. A SIP with a motor vehicle emissions budget for Allen County has been developed.

7. The Transportation Plan must be consistent with the motor vehicle emissions budget in the applicable State Implementation Plan (SIP).

Allen County is designated as a attainment area for the pollutant ozone. A SIP with a motor vehicle emissions budget for Allen County has been developed. Through the consultation process, it was agreed that the 2020 motor vehicle emissions budgets are in tons of pollutant per day and are provided in Table 2-1 and would be used the Allen County conformity analysis.

Table 2-1: 2020 Motor Vehicle Emissions Budget

Year	VOC (HC) tons/day	NOx tons/day
2020	4.52	9.72

8. The regional emissions analysis shall estimate emissions from the entire transportation system, including all regionally significant projects contained in the Transportation Plan and all other regionally significant highway and transit projects expected in the maintenance area in the time frame of the Transportation Plan.

The analysis estimates emissions of both Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx) as ozone precursors. Allen County is in attainment for Carbon Monoxide (CO) emissions and conformity is not required. Analysis for Carbon Monoxide (CO) emissions was not performed. Tables 2-2 and 2-3 provides a comparison of the analysis years with the 2015 baseline and 2020 emissions budgets.

Table 2-2: Baseline Test Emissions Analysis Summary

Base Year	Total VOC Emissions tons/day	Total NOx Emissions tons/day
2015	5.43	12.73

Table 2-3: Emissions Analysis Summary and Budget Comparison

Analysis Years	Total VOC Emissions tons/day	Total NOx Emissions tons/day
2020 Budget	**4.52**	**9.72**
2020	3.81	8.18
2030	3.19	6.28
2040	3.40	6.93

Since the emissions budget test is passed for each analysis year, the Transportation Plan and other projects in Allen County are in conformity and therefore comply with the Clean Air Act and other applicable federal and state requirements.

9. The emissions analysis methodology shall meet the requirement of section 93.119: (a) Regional emissions analysis for the Transportation Plan shall include all regionally significant projects expected in the maintenance area. Projects that are not regionally significant are not required to be explicitly modeled, but VMT from such projects must be estimated in accordance with reasonable professional practices. The effects of TCM's and similar projects that are not regionally significant may also be estimated in accordance with reasonable professional practices. (b) For TCM's demonstrating a quantifiable emission reduction benefit, the emissions analysis may include that emissions reduction credit. (c) For areas with a Transportation Plan that meets the content requirements of section 93.106, the emissions analysis shall be performed for each horizon year.

The emissions analysis methodology meets the requirement of section 93.119.

(a) The transportation model includes all regionally significant projects that are planned to occur over the life of this plan. In addition, the VMT from projects not specifically modeled, have been accounted for with the validation of the travel demand model output.

(b) There are no required TCM's for the Allen County maintenance area. There are also no additional credits being sought from the Congestion Mitigation and Air Quality (CMAQ) program funded projects that will be implemented in Allen County.

(c) The emissions analysis was performed for the baseline year 2015 and each analysis year; the results were then summarized in a spreadsheet and included in section 5.0 INDOT AQPP Outputs.

3.0 Travel Demand Model Validation

The following analysis was performed to determine the validity of the Travel Demand Model (TDM) being used for the 2040 Transportation Plan. In addition, this section includes the methodology used to convert the TDM outputs into inputs for the air quality model, for purposes of the Conformity Determination.

3.1 Background

The model being used to forecast future traffic on the transportation network being proposed by the 2040 Transportation Plan is based on the traditional 4-step travel demand forecasting process - trip generation, trip distribution, mode split, and traffic assignment.

The NIRCC model was based on the in MINUTP software, and calibrated to a 1990 base year. Since that time, the model has been converted to the TransCAD software platform and recalibrated to a 2010 base year as part of the 2035 Transportation Plan Update. The socioeconomic data utilized for the 2010 base year was developed from 2010 Census information and employment data obtained from Indiana Business Research Center Kelley School of Business.

3.2 TDM Network Preparation

The 2015 base year network was developed using street centerline data from the geographical information system and aerial photography. Link attributes were updated as necessary to reflect the 2015 highway network. Traffic count data was also updated with the most recent Annual Average Daily Traffic (AADT) count data, adjusted to 2015 numbers. The baseline, analysis, and horizon year networks were based upon the 2015 network. Modifications were made to represent the network for the appropriate analysis year. The 2015, 2020, 2030 and 2040 networks correspond to the Transportation Plan project list and expected completion dates.

Socioeconomic data for the baseline, analysis, and horizon years was determined using data from the previous 2035 Transportation Plan, the 2015 ACS - Census information including the Census Transportation Planning Package, and forecasts from STATS Indiana. This data was disaggregated to traffic analysis zones using input from local officials, planners, and developers, to derive future year numbers. A complete description of the process and methods used can be found in the 2040 Transportation Plan.

3.3 Base Year Model Output Validation

The TransCAD model was calibrated for the 2010 base year, as part of the 2035 Transportation Plan update to the traffic counts from NIRCC's three-year traffic count program. This program includes state traffic counts, HPMS traffic counts, and counts collected at all railroad crossings. The model was calibrated within an acceptable tolerance (0.22%) based on traffic count data, as compared to the TDM's assigned values. A comparison of TDM and actual traffic volume is provided in Table 3-1.

Table 3-1: Travel Demand Model and Actual Traffic Count VMT Comparison

Facility Type	Traffic Count	Total Loading	Percent Diff	Percent RMSE	VMT Percent Diff
Freeway	879,772	825,063	-6.22	19.99	-8.62
Major Arterial	2,023,514	2,087,813	3.18	24.26	5.44
Minor Arterial	269,231	242,724	-9.85	32.31	-9.44
Collector	140,024	164,149	17.23	45.78	10.54
Total	**3,312,541**	**3,319,749**	**0.22**	**26.60**	**-4.96**

The model is under-calculating the VMT for the interstate and minor arterials, and over-calculating the VMT for the major arterials and collectors. All major roadway facility types are within an eleven-percent range of difference. The TDM VMT for local roadways is generally expected to have a larger percent difference from actual traffic count VMT since the local network is represented by centroid connectors. The overall total VMT for the model compared to the total VMT from the traffic counts represents a difference of only 4.96 percent.

4.0 INDOT AQPP Inputs

The following tables represent the data used as inputs to INDOT AQPP from the MOVES2014a outputs when the defaults are not utilized. The input files used to test for conformity are too large to be included in this document, but can be supplied upon request.

Table 4-1: INDOT AQPP Inputs

Command	Description
LINK TABLE	Travel demand occurring on roadway network
INTRAZONAL TABLE	Travel demand on facilities on captured on the model's network
RATE PER DISTANCE	This file contains emissions rates that are applied by the INDOT AQPP to travel demand model VMT
RATE PER VEHICLE	This file contains emissions rates that are applied by the INDOT AQPP to vehicle population data.
RATE PER PROFILE	This file contains emissions rates that are applied by the INDOT AQPP to vehicle population data.
HOUR VMT FRACTION	This file contains the factors necessary to divide daily VMT into hourly VMT.
HPMS ADJUSTMENT FACTORS	This file contains adjustment factors that can be used to convert the model VMT inputs to values more consistent with HPMS VMT estimates. Though the consistent consensus throughout the ICG process for analysis areas in Indiana has been to not use HPMS adjustment factors, this feature has been included as an option should the use of adjustment factors be desired at some point in the future.
VEHICLE CLASS DISTRIBUTIONS	This file is used in combination with the source type population data for any given scenario to disaggregate the total vehicle flows on each link into thirteen distinct vehicle flows based on MOVES source types.
SOURCE TYPE POPULATIONS	This file contains scenario specific source type population data. These data identify the number of vehicles for each MOVES source type that are believed to be located in the analysis area.
YEAR LIST	This file contains a list of all available years four up to eight possible scenarios per analysis area.

Hourly Speed Estimation

The INDOT AQPP provides an estimate of hourly speeds for each link in the model network being analyzed. It does this by applying the Bureau of Public Roads (BPR) volume-delay function (VDF) found in many travel demand models. MOVES makes use of sixteen speed bins that further disaggregate emissions rates on the basis of the speed being encountered by a given source type for a given road type in a given hour. Each speed bin covers a range of travel speeds centered on an average speed for that bin. The INDOT AQPP identifies two speed bins for every speed estimated by the post-processor. One speed bin represents the bin which average bin speed is just below the estimated speed. The other speed bin represents the bin which average bin speed is just above the estimated speed.

5.0 INDOT AQPP Outputs

The following tables represent the emissions analyses performed for the Conformity Determination on the 2040 Transportation Plan. The TransCAD transportation model was run to determine the amount of vehicle miles of travel for each horizon year by functional classification of the road. The INDOT AQPP model computed the emission factors for volatile organic compounds (VOC), and nitrogen oxides (NOx). Copies of the descriptive outputs are included in Appendix B.

The total emissions generated for VOC and NOx by functional classification of roadway are compared against the allowable budget set by the year 2020 Budget. The Emissions Budget test was passed for each analysis year, and therefore the 2040 Transportation Plan is in conformity.

Table 5-1: VMT Data

Functional Classification	2015 VMT	2020 VMT	2030 VMT	2040 VMT
Rural Interstate	786,516	819,262	957,820	1,208,365
Rural Other Principal Arterial	611,717	646,275	730,252	816,993
Rural Minor Arterial	99,634	107,936	122,163	136,931
Rural Major Collector	621,041	662,305	747,875	853,847
Rural Minor Collector	177,242	199,101	220,191	261,068
Urban Interstate	1,543,391	1,581,542	1,705,377	1,976,783
Urban Other Freeway/Expressway	73,900	80,717	89,345	91,990
Urban Other Principal Arterial	2,049,507	2,108,697	2,257,523	2,479,674
Urban Minor Arterial	1,614,420	1,715,015	1,909,695	2,140,611
Urban Collector	530,322	565,430	618,148	641,579
Urban Local	603,887	624,740	668,974	727,207
Rural Local	230,440	244,195	276,953	326,638
Total Local	834,327	868,935	945,927	1,053,845
Grand Total	**8,942,017**	**9,355,214**	**10,304,316**	**11,661,685**

Table 5-2: 2015 Network Emissions Analysis

Functional Class	Vehicle Miles Traveled	VOC Emissions (Tons/Day)	NOx Emissions (Tons/Day)
Rural Interstate	786,516	0.10	1.44
Rural Other Principal Arterial	611,717	0.07	0.82
Rural Minor Arterial	99,634	0.01	0.07
Rural Major Collector	621,041	0.07	0.53
Rural Minor Collector	177,242	0.02	0.15
Urban Interstate	1,543,391	0.20	1.87
Urban Other Freeway/Expressway	73,900	0.01	0.08
Urban Other Principal Arterial	2,049,507	0.25	1.32
Urban Minor Arterial	1,614,420	0.20	0.99
Urban Collector	530,322	0.07	0.34
Rural and Urban Local	834,327	0.20	0.85
Total Running		1.18	8.47
Total Non-Running		4.25	4.26
Totals:	**8,942,017**	**5.43**	**12.73**

Table 5-3: 2020 Network Emissions Analysis

Functional Class	Vehicle Miles Traveled	VOC Emissions (Tons/Day)	NOx Emissions (Tons/Day)
Rural Interstate	819,262	0.06	0.78
Rural Other Principal Arterial	646,275	0.04	0.45
Rural Minor Arterial	107,936	0.01	0.05
Rural Major Collector	662,305	0.04	0.30
Rural Minor Collector	199,101	0.01	0.09
Urban Interstate	1,581,542	0.10	0.97
Urban Other Freeway/Expressway	80,717	0.00	0.04
Urban Other Principal Arterial	2,108,697	0.15	0.73
Urban Minor Arterial	1,715,015	0.13	0.57
Urban Collector	565,430	0.04	0.19
Rural and Urban Local	868,935	0.12	0.47
Total Running		0.71	4.63
Total Non-Running		3.10	3.54
Totals:	**9,355,214**	**3.81**	**8.18**
Budget:		**4.52**	**9.72**
Passed By:		**0.71**	**1.54**

Table 5-4: 2030 Network Emissions Analysis

Functional Class	Vehicle Miles Traveled	VOC Emissions (Tons/Day)	NOx Emissions (Tons/Day)
Rural Interstate	957,820	0.05	0.50
Rural Other Principal Arterial	730,252	0.03	0.27
Rural Minor Arterial	122,163	0.001	0.03
Rural Major Collector	747,875	0.03	0.20
Rural Minor Collector	220,191	0.01	0.06
Urban Interstate	1,705,377	0.07	0.54
Urban Other Freeway/Expressway	89,345	0.004	0.03
Urban Other Principal Arterial	2,257,523	0.11	0.46
Urban Minor Arterial	1,909,695	0.10	0.38
Urban Collector	618,148	0.04	0.12
Rural and Urban Local	945,927	0.10	0.29
Total Running		0.54	2.89
Total Non-Running		2.65	3.40
Totals:	**10,304,316**	**3.19**	**6.28**
Budget:		**4.52**	**9.72**
Passed By:		**1.33**	**3.44**

Table 5-5: 2040 Network Emissions Analysis

Functional Class	Vehicle Miles Traveled	VOC Emissions (Tons/Day)	NOx Emissions (Tons/Day)
Rural Interstate	1,208,365	0.05	0.58
Rural Other Principal Arterial	816,993	0.03	0.29
Rural Minor Arterial	136,931	0.003	0.03
Rural Major Collector	853,847	0.04	0.22
Rural Minor Collector	261,068	0.01	0.06
Urban Interstate	1,976,783	0.08	0.61
Urban Other Freeway/Expressway	91,990	0.003	0.03
Urban Other Principal Arterial	2,479,674	0.12	0.46
Urban Minor Arterial	2,140,611	0.11	0.40
Urban Collector	641,579	0.04	0.12
Rural and Urban Local	1,053,845	0.10	0.31
Total Running		0.59	3.13
Total Non-Running		2.81	3.80
Totals:	**11,661,685**	**3.40**	**6.93**
Budget:		**4.52**	**9.72**
Passed By:		**1.12**	**2.79**

6.0 Interagency Consultation

The Northeastern Indiana Regional Coordinating Council provided opportunity for interagency consultation on the 2040 Transportation Plan (TP). The interagency consultation process began with the identification of the necessary stakeholder agencies that required involvement. The list of participants included representatives from the Federal Highway Administration (FHWA), Environmental Protection Agency (EPA), Indiana Department of Transportation (INDOT), Indiana Department of Environment Management (IDEM), Fort Wayne Public Transportation Corporation-Citilink, and Northeastern Indiana Regional Coordinating Council (NIRCC).

Appendix A lists the interagency and partner formal and informal opportunities for consultation.

7.0 Air Quality Analysis Exempt Projects

The transportation improvement project list is documented as part of the 2040 Transportation Plan as Amended. There are two categories that the projects can fall into for air quality purposes: exempt, and non-exempt. The transportation projects in the 2040 Transportation Plan have been classified as either exempt or non-exempt. A list of the exempt and non-exempt projects, including the time period corresponding to the air quality analysis years has been included in Appendix D.

The following are definitions of the exempt and non-exempt categories as provided in the conformity rules.

Exempt Projects

Safety

Railroad/highway crossing.
Hazard elimination program.
Safer non-Federal-aid system roads.
Shoulder improvements.
Increasing sight distance.
Safety improvement program.
Traffic control devices and operating assistance other than signalization projects.
Railroad/highway crossing warning devices.
Guardrails, median barriers, crash cushions.
Pavement resurfacing and/or rehabilitation.
Pavement marking demonstration.
Emergency relief (23 U.S.C. 125).
Fencing.
Skid treatments.
Safety roadside rest areas.
Adding medians.
Truck climbing lanes outside the urbanized area.
Lighting improvements.
Widening narrow pavements or reconstructing bridges (no additional travel lanes).
Emergency truck pullovers.

Mass Transit

Operating assistance to transit agencies.
Purchase of support vehicles.
Rehabilitation of transit vehicles [1] .
Purchase of office, shop, and operating equipment for existing facilities.
Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts, etc.).
Construction or renovation of power, signal, and communications systems.
Construction of small passenger shelters and information kiosks.
Reconstruction or renovation of transit buildings and structures (e.g., rail or bus buildings, storage and maintenance facilities, stations, terminals, and ancillary structures).
Rehabilitation or reconstruction of track structures, track, and trackbed in existing rights-of-way.
Purchase of new buses and rail cars to replace existing vehicles or for minor expansions of the fleet [1] .

Construction of new bus or rail storage/maintenance facilities categorically excluded in 23 CFR part 771.

Air Quality
Continuation of ride-sharing and van-pooling promotion activities at current levels.
Bicycle and pedestrian facilities.

Other
Specific activities which do not involve or lead directly to construction, such as:
Planning and technical studies.
Grants for training and research programs.
Planning activities conducted pursuant to titles 23 and 49 U.S.C.
Federal-aid systems revisions.
Engineering to assess social, economic, and environmental effects of the proposed action or alternatives to that action.
Noise attenuation.
Emergency or hardship advance land acquisitions (23 CFR 710.503).
Acquisition of scenic easements.
Plantings, landscaping, etc.
Sign removal.
Directional and informational signs.
Transportation enhancement activities (except rehabilitation and operation of historic transportation buildings, structures, or facilities).
Repair of damage caused by natural disasters, civil unrest, or terrorist acts, except projects involving substantial functional, locational or capacity changes.

Note:
[1] In PM_{10} non-attainment or maintenance areas, such projects are exempt only if they are in compliance with control measures in the applicable implementation plan.
[62 FR 43801, Aug. 15, 1997, as amended at 69 FR 40081, July 1, 2004]

Projects Exempt From Regional Emissions Analyses

Intersection channelization projects.
Intersection signalization projects at individual intersections.
Interchange reconfiguration projects.
Center Turn Lane projects
Changes in vertical and horizontal alignment.
Truck size and weight inspection stations.
Bus terminals and transfer points.

Non-Exempt Projects
These projects are included in the Air Quality analysis and travel demand-forecasting model and are generally comprised of added capacity projects greater than a mile in length or new road construction.

Appendix A

Consultation Meeting Minutes

May 29, 2018
Conformity Consultation Conference Call – Discussion of Onroad Mobile Emission Estimates for Allen County

Attendees: NIRCC – Dan Avery, Jeff Bradtmiller
IDEM – Shawn Seals, Brian Callahan, Gale Ferris, Leslie Ferguson
INDOT – Jay Mitchell, Frank Baukert, Stephanie Belch, John Sullivan
FHWA – Joyce Newland
EPA – Tony Maietta
Citilink – Betsy Kachmar
Convergence Planning – Dean Munn

Call began at 2:00 PM

I. Mr. Avery stated that because of the current court case that NIRCC will go ahead and run Air Quality Conformity Determination.
II. Mr. Avery stated that for conformity we will be doing a 2015 base year, 2020 budget year, 2030, and 2040 horizon year, and will be using the current Moves2014a input files. Everyone state that sounded good.
III. Mr. Avery stated that for conformity we will be using the current 2020 budgets of NOx 9.72 and VOC's 4.52.
IV. Mr. Seals stated that he believes those are budgets are correct but will get back with us.
    1. Mr. Seals followed up the CC with an email stating the budgets are correct.
V. Mr. Avery asked if there were any other comments or questions.
VI. There were no more questions so the meeting adjourned at approximately 2:17 PM.

A follow-up email was sent to the ICG on June 29, 2018 with Table 1 demonstrating Allen County meets the conformity requirements of the Clean Air Act as amended. NIRCC received comments back from INDOT, IDEM, FHWA, and USEPA stating that because the analysis demonstrates that Allen County is meeting the conformity requirements a second ICG meeting is not needed.

Appendix B

INDOT AQPP Input/ Output Files/Data

Report Summary File INDOT Air Quality Post Processor

Scenario: Allen_2015
Scenario Description: 2015INAQPP
Scenario File: C:\NIRCC Model\AQPP\Allen_2015.scn
Analysis Area: Allen County
Analysis Year: 2015
Emission Type: Ozone
Peak Spreading: Yes

Travel Demand Model Input Files
Link Table: C:\NIRCC Model\AQPP\link_table_2015.bin
Intrazonal Table: C:\NIRCC Model\AQPP\taz_intra_2015.bin

Air Quality Rate Input Files
Rates per Distance: C:\NIRCC Model\AQPP\Master Inputs\Alle_2015_ratesperdistance_oz.csv
Rates per Vehicle: C:\NIRCC Model\AQPP\Master Inputs\Alle_2015_ratespervehicle_oz.csv
Rates per Profile: C:\NIRCC Model\AQPP\Master Inputs\Alle_2015_ratesperprofile_oz.csv
HPMS Fraction: C:\NIRCC Model\AQPP\Master Inputs\HPMS_Fraction_INStatewide.csv
Hourly Fraction: C:\NIRCC Model\AQPP\Master Inputs\HourVMTFraction.csv
Vehicle Class Distribution: C:\NIRCC Model\AQPP\Master Inputs\VehClassDist.csv
Source Type Population: C:\NIRCC Model\AQPP\Master Inputs\Alle_2015_SourceTypePopulation.csv

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Output Files
Link Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2015\EMIS_daily.bin
Intrazonal Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2015\Intra_VMT_daily.bin
Peak Spreading Indicator Table: C:\NIRCC Model\AQPP\Output_Allen_2015\Spreading_Indicator.bin
Emissions by Functional Class. Table: C:\NIRCC Model\AQPP\Output_Allen_2015\Emission_by_HPMS_FC.csv

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Emissions (grams) by County, Type, and Functional Classification

County	Emission Type	HPMS Func. Class.	Dly NOx - Oz	Dly NOx - PM	Dly VOC	Dly PM
"Allen"	"Running"	"Rural Interstate"	1,306,930.29	n/a	94,217.72	n/a
"Allen"	"Running"	"Rural Principal Arterial"	744,272.98	n/a	67,247.93	n/a
"Allen"	"Running"	"Rural Minor Arterial"	63,612.33	n/a	8,062.62	n/a
"Allen"	"Running"	"Rural Major Collector"	481,555.36	n/a	63,827.07	n/a
"Allen"	"Running"	"Rural Minor Collector"	132,565.20	n/a	17,746.68	n/a
"Allen"	"Running"	"Rural Local"	288,018.40	n/a	49,757.63	n/a
"Allen"	"Running"	"Urban Interstate"	1,697,409.58	n/a	156,458.39	n/a
"Allen"	"Running"	"Urban Principal Arterial"	71,364.93	n/a	7,342.05	n/a
"Allen"	"Running"	"Urban Other Arterial"	1,198,660.48	n/a	225,304.45	n/a
"Allen"	"Running"	"Urban Minor Arterial"	901,930.32	n/a	183,657.30	n/a
"Allen"	"Running"	"Urban Collector"	311,489.39	n/a	67,085.23	n/a
"Allen"	"Running"	"Urban Local"	478,685.02	n/a	132,402.80	n/a
"Allen"	"Running"	"All HPMS Classes"	7,676,494.28	n/a	1,073,109.89	n/a
"Allen"	"Running Intrazonal"	"All HPMS Classes"	11,762.89	n/a	2,938.30	n/a
"Allen"	"Tot Running"	"All HPMS Classes"	7,688,257.17	n/a	1,076,048.19	n/a
"All"	"Non-Running"	"All HPMS Classes"	3,861,377.64	n/a	3,852,547.97	n/a
"All"	"Tot Emissions"	"All HPMS Classes"	11,549,634.81	n/a	4,928,596.16	n/a

Report Summary File INDOT Air Quality Post Processor

Scenario: Allen_2020
Scenario Description: 2020INAQPP
Scenario File: C:\NIRCC Model\AQPP\Allen_2020.scn
Analysis Area: Allen County
Analysis Year: 2020
Emission Type: Ozone
Peak Spreading: Yes

Travel Demand Model Input Files
Link Table: C:\NIRCC Model\AQPP\link_table_2020AQ.bin
Intrazonal Table: C:\NIRCC Model\AQPP\taz_intra_2020AQ.bin

Air Quality Rate Input Files
Rates per Distance: C:\NIRCC Model\AQPP\Master Inputs\Alle_2020_ratesperdist_oz.csv
Rates per Vehicle: C:\NIRCC Model\AQPP\Master Inputs\Alle_2020_ratesperveh_oz.csv
Rates per Profile: C:\NIRCC Model\AQPP\Master Inputs\Alle_2020_ratesperprofile_oz.csv
HPMS Fraction: C:\NIRCC Model\AQPP\Master Inputs\HPMS_Fraction_INStatewide.csv
Hourly Fraction: C:\NIRCC Model\AQPP\Master Inputs\HourVMTFraction.csv
Vehicle Class Distribution: C:\NIRCC Model\AQPP\Master Inputs\VehClassDist.csv
Source Type Population: C:\NIRCC Model\AQPP\Master Inputs\Alle_2020_SourceTypePopulation.csv

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Output Files
Link Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2020\EMIS_daily.bin
Intrazonal Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2020\Intra_VMT_daily.bin
Peak Spreading Indicator Table: C:\NIRCC Model\AQPP\Output_Allen_2020\Spreading_Indicator.bin
Emissions by Functional Class. Table: C:\NIRCC Model\AQPP\Output_Allen_2020\Emission_by_HPMS_FC.csv

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Emissions (grams) by County, Type, and Functional Classification

County	Emission Type	HPMS Func. Class.	Dly NOx - Oz	Dly NOx - PM	Dly VOC	Dly PM
"Allen"	"Running"	"Rural Interstate"	703,723.24	n/a	53,727.86	n/a
"Allen"	"Running"	"Rural Principal Arterial"	404,329.35	n/a	37,979.40	n/a
"Allen"	"Running"	"Rural Minor Arterial"	41,281.70	n/a	5,493.61	n/a
"Allen"	"Running"	"Rural Major Collector"	269,640.89	n/a	37,959.43	n/a
"Allen"	"Running"	"Rural Minor Collector"	79,238.56	n/a	11,091.68	n/a
"Allen"	"Running"	"Rural Local"	160,102.14	n/a	29,773.04	n/a
"Allen"	"Running"	"Urban Interstate"	884,324.17	n/a	89,044.36	n/a
"Allen"	"Running"	"Urban Principal Arterial"	36,577.52	n/a	3,946.47	n/a
"Allen"	"Running"	"Urban Other Arterial"	661,798.74	n/a	135,136.11	n/a
"Allen"	"Running"	"Urban Minor Arterial"	517,829.48	n/a	114,364.16	n/a
"Allen"	"Running"	"Urban Collector"	171,616.27	n/a	40,412.34	n/a
"Allen"	"Running"	"Urban Local"	265,157.96	n/a	80,887.17	n/a
"Allen"	"Running"	"All HPMS Classes"	4,195,620.02	n/a	639,815.63	n/a
"Allen"	"Running Intrazonal"	"All HPMS Classes"	6,469.76	n/a	1,762.76	n/a
"Allen"	"Tot Running"	"All HPMS Classes"	4,202,089.79	n/a	641,578.39	n/a
"All"	"Non-Running"	"All HPMS Classes"	3,215,854.19	n/a	2,812,782.72	n/a
"All"	"Tot Emissions"	"All HPMS Classes"	7,417,943.98	n/a	3,454,361.11	n/a

Report Summary File INDOT Air Quality Post Processor

Scenario: Allen_2030
Scenario Description: 2030INAQPP
Scenario File: C:\NIRCC Model\AQPP\Allen_2030.scn
Analysis Area: Allen County
Analysis Year: 2030
Emission Type: Ozone
Peak Spreading: Yes

Travel Demand Model Input Files
Link Table: C:\NIRCC Model\AQPP\link_table_2030AQ.bin
Intrazonal Table: C:\NIRCC Model\AQPP\taz_intra_2030AQ.bin

Air Quality Rate Input Files
Rates per Distance: C:\NIRCC Model\AQPP\Master Inputs\Alle_2030_ratesperdist_oz.csv
Rates per Vehicle: C:\NIRCC Model\AQPP\Master Inputs\Alle_2030_ratesperveh_oz.csv
Rates per Profile: C:\NIRCC Model\AQPP\Master Inputs\Alle_2030_ratesperprofile_oz.csv
HPMS Fraction: C:\NIRCC Model\AQPP\Master Inputs\HPMS_Fraction_INStatewide.csv
Hourly Fraction: C:\NIRCC Model\AQPP\Master Inputs\HourVMTFraction.csv
Vehicle Class Distribution: C:\NIRCC Model\AQPP\Master Inputs\VehClassDist.csv
Source Type Population: C:\NIRCC Model\AQPP\Master Inputs\Alle_2030_SourceTypePopulation.csv

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Output Files
Link Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2030\EMIS_daily.bin
Intrazonal Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2030\Intra_VMT_daily.bin
Peak Spreading Indicator Table: C:\NIRCC Model\AQPP\Output_Allen_2030\Spreading_Indicator.bin
Emissions by Functional Class. Table: C:\NIRCC Model\AQPP\Output_Allen_2030\Emission_by_HPMS_FC.csv

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Emissions (grams) by County, Type, and Functional Classification

County	Emission Type	HPMS Func. Class.	Dly NOx - Oz	Dly NOx - PM	Dly VOC	Dly PM
"Allen"	"Running"	"Rural Interstate"	452,322.50	n/a	40,929.18	n/a
"Allen"	"Running"	"Rural Principal Arterial"	249,176.25	n/a	27,546.43	n/a
"Allen"	"Running"	"Rural Minor Arterial"	27,195.81	n/a	4,289.76	n/a
"Allen"	"Running"	"Rural Major Collector"	182,262.05	n/a	30,360.01	n/a
"Allen"	"Running"	"Rural Minor Collector"	50,337.03	n/a	8,543.14	n/a
"Allen"	"Running"	"Rural Local"	100,980.25	n/a	22,808.16	n/a
"Allen"	"Running"	"Urban Interstate"	492,058.28	n/a	60,257.13	n/a
"Allen"	"Running"	"Urban Principal Arterial"	22,711.39	n/a	2,865.19	n/a
"Allen"	"Running"	"Urban Other Arterial"	414,146.68	n/a	103,040.65	n/a
"Allen"	"Running"	"Urban Minor Arterial"	343,079.61	n/a	91,867.36	n/a
"Allen"	"Running"	"Urban Collector"	112,670.42	n/a	32,576.65	n/a
"Allen"	"Running"	"Urban Local"	166,472.66	n/a	63,547.10	n/a
"Allen"	"Running"	"All HPMS Classes"	2,613,412.92	n/a	488,630.74	n/a
"Allen"	"Running Intrazonal"	"All HPMS Classes"	4,092.82	n/a	1,386.18	n/a
"Allen"	"Tot Running"	"All HPMS Classes"	2,617,505.75	n/a	490,016.92	n/a
"All"	"Non-Running"	"All HPMS Classes"	3,081,104.21	n/a	2,406,591.22	n/a
"All"	"Tot Emissions"	"All HPMS Classes"	5,698,609.96	n/a	2,896,608.15	n/a

Report Summary File INDOT Air Quality Post Processor

Scenario: Allen_2040
Scenario Description: 2040UDINAQPP
Scenario File: C:\NIRCC Model\AQPP\Allen_2040UD.scn
Analysis Area: Allen County
Analysis Year: 2040
Emission Type: Ozone
Peak Spreading: Yes

Travel Demand Model Input Files
Link Table: C:\NIRCC Model\AQPP\link_table_2040UD.bin
Intrazonal Table: C:\NIRCC Model\AQPP\taz_intra_2040uD.bin

Air Quality Rate Input Files
Rates per Distance: C:\NIRCC Model\AQPP\Master Inputs\Alle_2040_ratesperdist_oz.csv
Rates per Vehicle: C:\NIRCC Model\AQPP\Master Inputs\Alle_2040_ratesperveh_oz.csv
Rates per Profile: C:\NIRCC Model\AQPP\Master Inputs\Alle_2040_ratesperprofile_oz.csv
HPMS Fraction: C:\NIRCC Model\AQPP\Master Inputs\HPMS_Fraction_INStatewide.csv
Hourly Fraction: C:\NIRCC Model\AQPP\Master Inputs\HourVMTFraction.csv
Vehicle Class Distribution: C:\NIRCC Model\AQPP\Master Inputs\VehClassDist.csv
Source Type Population: C:\NIRCC Model\AQPP\Master Inputs\Alle_2040_SourceTypePopulation.csv

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Output Files
Link Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2040UD\EMIS_daily.bin
Intrazonal Emissions Table: C:\NIRCC Model\AQPP\Output_Allen_2040UD\Intra_VMT_daily.bin
Peak Spreading Indicator Table: C:\NIRCC Model\AQPP\Output_Allen_2040UD\Spreading_Indicator.bin
Emissions by Functional Class. Table: C:\NIRCC Model\AQPP\Output_Allen_2040UD\Emission_by_HPMS_FC.csv

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Emissions (grams) by County, Type, and Functional Classification

County	Emission Type	HPMS Func. Class.	Dly NOx - Oz	Dly NOx - PM	Dly VOC	Dly PM
"Allen"	"Running"	"Rural Interstate"	530,330.92	n/a	48,732.34	n/a
"Allen"	"Running"	"Rural Principal Arterial"	261,249.73	n/a	29,337.67	n/a
"Allen"	"Running"	"Rural Minor Arterial"	26,446.00	n/a	4,202.89	n/a
"Allen"	"Running"	"Rural Major Collector"	195,289.24	n/a	33,312.78	n/a
"Allen"	"Running"	"Rural Minor Collector"	55,044.93	n/a	9,579.23	n/a
"Allen"	"Running"	"Rural Local"	111,739.31	n/a	25,424.72	n/a
"Allen"	"Running"	"Urban Interstate"	557,583.39	n/a	70,066.04	n/a
"Allen"	"Running"	"Urban Principal Arterial"	25,791.23	n/a	3,470.92	n/a
"Allen"	"Running"	"Urban Other Arterial"	419,789.32	n/a	106,660.15	n/a
"Allen"	"Running"	"Urban Minor Arterial"	364,157.78	n/a	99,862.07	n/a
"Allen"	"Running"	"Urban Collector"	107,690.87	n/a	32,003.27	n/a
"Allen"	"Running"	"Urban Local"	169,741.50	n/a	67,516.56	n/a
"Allen"	"Running"	"All HPMS Classes"	2,824,854.24	n/a	530,168.65	n/a
"Allen"	"Running Intrazonal"	"All HPMS Classes"	15,325.64	n/a	5,236.53	n/a
"Allen"	"Tot Running"	"All HPMS Classes"	2,840,179.87	n/a	535,405.18	n/a
"All"	"Non-Running"	"All HPMS Classes"	3,444,988.56	n/a	2,552,585.46	n/a
"All"	"Tot Emissions"	"All HPMS Classes"	6,285,168.43	n/a	3,087,990.64	n/a

Appendix C

Citizen Comments

Appendix D

2040 Transportation Project List

2040 Transportation Plan Projects - Allen County

The list below includes the air quality "Non-Exempt" and "Exempt" highway and transit projects. The numbers preceding the highway projects corresponds to the time periods analyzed for air quality conformity. The 2040 Transportation Plan Project Identification Number, as listed in the 2014-2017 TIP, has been provided following the description for each project (XX-XXX). XX- indicates the initial plan the project was listed in, -XXX indicates the project number as listed below.
The time periods are:
Period 1 2015-2020
Period 2 2021-2030
Period 3 2031-2040

Highway Improvements

Air Quality Non-Exempt Projects

New Construction
New two-lane construction
2 Connector Street from Wells Street to Spy Run Avenue (30-001)
3 Paul Shaffer Drive from Clinton Street to California Road (30(II)-002)

Interchange-new construction
3 Interstate 69 at Hursh Road (25-003)

Widening Projects
Widen to four lanes
2 Adams Center Road – State Road 930 to Moeller Road (25-004)
2 Ardmore Avenue – Covington Road to Engle Road (30-005)
3 Ardmore Avenue – Engle Road to Lower Huntington Road (30-006)
2 Clinton Street – Auburn Road to Wallen Road (25-007)
3 Clinton Street – Wallen Road to Dupont Road/State Road 1 (25-008)
2 Diebold Road – Clinton Street to Dupont Road/State Road 1 (35-009)
1 Dupont Road – Coldwater Road to Lima Road/State Road 3 (25-010)
2 Hillegas Road – s/o Bass Road to Coliseum Boulevard (25-011)
3 Hillegas Road – Coliseum Boulevard to Washington Center Road (25-012)
1 Lafayette Center Road/E 900 North Road – Fogwell Parkway to US 24 (35-113)
1 Maplecrest Road – Lake Avenue to State Boulevard (10-014)
2 Maplecrest Road – State Boulevard to Stellhorn Road (10-015)
1 Maysville Road – Stellhorn Road to Koester Ditch (30-016)
1 State Boulevard – Spy Run Avenue to Clinton Street (10-017)
2 State Boulevard – Clinton Street to Cass Street (10-018)
3 Stellhorn Road – Maplecrest Road to Maysville Road (35-019)
3 Tonkel Road – Dupont Road/State Road 1 to Union Chapel Road (10-020)
3 Washington Center Road – Lima Road/State Road 3 to US 33 (25-021)

Air Quality Exempt Projects

Congestion Management Strategy Implementation
Center Turn Lane Improvement
3 Auburn Road – Cook Road to Interstate 469 Exit Ramp (3-lane) (15-022)
2 Coldwater Road – Mill Lake Road to Union Chapel Road (3-lane) (25-023)
2 Engle Road – Bluffton Road to Smith Road (3-lane) (30-024)
1 Gump Road – State Road 3 to Coldwater Road (3-lane) (25-025)
2 Gump Road – Coldwater Road to Auburn Road (3-lane) (25-026)
2 Saint Joe Center Road – Clinton Street to River Run Trail (5-lane) (10-027)
2 Saint Joe Center Road – Reed Road to Maplecrest Road (35-028)
3 Saint Joe Center Road – Maplecrest Road to Meijer Drive (3-lane) (35-029)

Turn Lane Extension
2 Jefferson Boulevard from Lutheran Hospital Entrance to Interstate 69 Ramps (25-030)

Road Reconstruction – Road Diet
2 Anthony Boulevard – Tillman Road to Rudisill Boulevard (35-031)
2 Anthony Boulevard – Rudisill Boulevard to Pontiac Street (35-032)
2 Anthony Boulevard – Pontiac Street to Wayne Trace (35-033)
2 Anthony Boulevard – Wayne Trace to Crescent Avenue (35-034)
2 Broadway Street - Bell Avenue to North River Road (40-035)
2 Calhoun Street - Paulding Road to Tillman Road (40-036)
2 Clay Street - Main Street to Lewis Street (40-037)
2 Coliseum Boulevard/Pontiac Street – New Haven Avenue to Wayne Trace (35-038)
2 Columbia Street - Saint Joe Boulevard to Lake Avenue (40-039)
2 Harrison Street - Superior Street to Second Street (40-040)
1 Hobson Road – Coliseum Boulevard to State Boulevard (40-041)
2 Lake Avenue - Saint Joe Boulevard to Delta Boulevard (40-042)
2 Landin Road – North River Road to Maysville Road (30-043)
2 Paulding Road – US 27/Lafayette Street to Anthony Boulevard (35-044)
2 Paulding Road – Anthony Boulevard to Hessen Cassel Road (35-045)
2 Superior Street - Calhoun Street to Wells Street (40-046)
2 Tillman Road - Anthony Boulevard to Hessen Cassel Road (40-047)
2 Washington Boulevard - Lafayette Street to Van Buren Street (40-048)

Intersection Reconstruction
1 Bass Road, Hadley Road and Yellow River Road (30-049)
1 Bethel Road, Huguenard Road and Till Road (35-050)
2 Broadway and Taylor Street (35-051)
2 Clinton Street and Wallen Road (35-052)
2 Clinton Street and Washington Center/Saint Joe Center Road (25-053)
1 Constitution Way and Getz Road (40-054)
2 Coldwater Road and Ludwig Road (35-135)
2 Coldwater Road and Union Chapel Road (40-055)

2 Corbin Road and Union Chapel Road (35-056)
3 Coverdale Road, Winters Road and Indianapolis Road (25-057)
3 Flaugh Road and Leesburg Road (30(II)-058)
2 Goshen Road, Lillian Avenue and Sherman Street (35-059)
1 Green Road and State Road 930 (35-060)
2 Homestead Road and Lower Huntington Road (40-061)
2 Leesburg Road and Main Street (35-062)
1 Liberty Mills Road and W County Line Road (40-063)
2 Ludwig Road and Huguenard Road (40-064)
1 Minnich Road and Tillman Road (40-065)
3 Rothman Road and Saint Joe Road (35-066)
2 State Road 930/Coliseum Boulevard and Coldwater Road (40-067)
2 State Road 930/Coliseum Boulevard and Goshen Road (40-068)
2 State Road 930/Coliseum Boulevard and US 27/Lima Road (40-069)
2 Wayne Trace and Monroeville Road (40-070)

Reconstruction and Realignment
3 Adams Center Road – Moeller Road to Paulding Road (35-071)
3 Adams Center Road – Paulding Road to Interstate 469 (35-072)
3 Allen County/Whitley County Line Road – US 24 to SR 14 (30-073)
2 Amstutz Road – Hosler Road to State Road 1/Leo Road (30(II)-074)
2 Adrmore Avenue - Airport Expressway to Ferguson Road (40-075)
1 Bass Road – Hadley Road to Clifty Parkway (35-076)
2 Bass Road – Clifty Parkway to Thomas Road (35-077)
2 Bass Road – Thomas Road to Hillegas Road (35-078)
2 Bass Road – Hadley Road to Scott Road (35-079)
1 Carroll Road – Preserve Boulevard to Bethel Road (25-080)
2 Carroll Road - State Road 3/Lima Road to Springs Drive (40-081)
2 Carroll Road - Bethel Road to Millstone Drive (40-082)
1 Coliseum Boulevard – Hillegas Road to 1,500' e/o Hillegas Road (35-083)
2 Coldwater Road - Gump Road to Allen County Line Road (40-084)
3 Cook Road – US 33 to O'Day Road (30(II)-085)
3 Crescent Avenue – Sirlin Drive to Coliseum Boulevard (30(II)-086)
2 Dunton Road - Hathaway Road to Cedar Canyons (40-087)
2 Goshen Avenue – Sherman Boulevard to Coliseum Boulevard/State Road 930(35-088)
2 Hathaway Road - Corbin Road to State Road 3/Lima Road (40-089)
2 Hathaway Road - State Road 3/Lima Road to Hand Road (40-090)
3 Huguenard Road – Washington Center Road to Cook Road (25-091)
3 Lake Avenue – Reed Road to Maysville Road (35-092)
2 Leesburg Road – Main Street to Jefferson Boulevard (35-093)
3 Maysville Road – State Boulevard to Stellhorn Road (3-lane) (25-094)
3 Moeller Road – Hartzell Road to Adams Center (30-095)
1 Ryan Road – Dawkins Road to US 24 (35-096)
4 State Boulevard – Maysville Road to Georgetown North Boulevard (10-097)
3 Saint Joe Road – Evard Road to Mayhew Road (3-lane) (10-098)
3 Saint Joe Road – Maplecrest Road to Eby Road (3-lane) (25-099)

2 Till Road – Lima Road to Dawson Creek Boulevard (30-100)
3 Wallen Road – Hanauer Road to Auburn Road (30-101)
3 Wells Street – State Boulevard to Fernhill Avenue (35-102)
4 Witmer Road – Schwartz Road to Country Shoals Lane (30(II)-103)

Other Highway Improvements
New Railroad Grade Separation
2 Anthony Boulevard and Norfolk Southern Railroad (25-104)
3 Airport Expressway and Norfolk Southern Railroad (15-105)
3 Ardmore Avenue and Norfolk Southern Railroad (40-106)

Reconstruct Railroad Grade Separation
2 Anthony Boulevard and CSX Railroad (25-107)

Interchange/Ramp-Modification
2 Interstate 69 and State Road 14/Illinois Road Interchange (WB to NB Ramp) (35-108)
2 Interstate 469 and Interstate 69 Interchange (mm 315) (25-116)
2 Interstate 469 and US 24 Interchange (25-109)
1 US 30/US 33 Interchange (30(II)-110)
2 US 24 and Bruick/Ryan Road (30-111)

Bridge Reconstruction/Modification
1 Bass Road over Interstate 69 (40-112)
1 Washington Center Road Bridge over Spy Run Creek (35-113)

Additional Projects for Illustrative Purposes Only
Widening Projects - six lanes
Interstate 69 – Interstate 469 to US 24 (10-114)
Interstate 69 – Dupont Road/State Road 1 to Hursh Road (25-115)
Interstate 469 – Maplecrest Road to Interstate 69 (25-116)
Jefferson Boulevard – Illinois Road South to Main Street (10-117)
Jefferson Boulevard – Interstate 69 to Illinois Road South (30(II)-118)
State Road 3 – Dupont Road to Gump Road (25-119)
State Road 3 – Gump Road to Allen County Line (30(II)-120)
US 24 – Interstate 69 to Homestead Road (25-121)

Upgrade to Full Access Control (Freeway Design)
US 30 – Interstate 69 to US 33 (10-122)
US 30 – US 33 to Flaugh Road (10-123)
US 30 – Flaugh Road to O'Day Road (25-124)

Widening Projects - four lanes
State Road 1/Leo Road – Tonkel Road to Union Chapel Road (25-125)
State Road 1/Leo Road – Union Chapel Road to Grabill Road (30(II)-126)
State Road 1/Bluffton Road – Interstate 469 to State Road 116/124 (30-127)
State Road 14/Illinois Road – West Hamilton Road to Allen/Whitley County Line Road (25-128)

State Road 37 – Doty Road to Interstate 469 (10-129)
US 33 – Cook Road to O'Day Road (10-130)
US 33 – O'Day Road to State Road 205 (30-131)

Reconstruction and Realignment
Clinton Street – Parnell Avenue to Auburn Road (30-132)
State Road 37 – Doty Road to Cuba Road (30-133)

Center Turn Lane Improvement
Auburn Road – Dupont Road to Gump Road (35-133)
State Road 930 – Minnich Road to Brookwood Drive (30(II)-134)

Interchange – Modification
Interstate 69 and State Road 1 / Dupont Road (40-136)

Bridge Reconstruction/Modification
Hillegas Road over Interstate 69 (25-137)
US 27/Spy Run Avenue Bridge over St. Mary's River w/Pedestrian Treatment (25-138)

Transit Improvements
Air Quality Exempt Projects
Transit Improvement Projects

Public Transit Improvement Projects

**Projects are numbered for identification purposes only, not by priority*

Project 1 Expanded transit service in the growing urbanized area where ridership warrants. Potential locations include the Fort Wayne International Airport and surrounding area, Chapel Ridge and surrounding area, and Aboite, Perry, and Cedar Creek Townships. Types of service will be determined based upon projected demands and proposed service levels.

Project 2 Replacement of transit coaches and service vehicles as necessary to maintain a dependable transit fleet.

Project 3 Install and upgrade bus shelters, benches, and other customer amenities by both Citilink and other entities (public and private). Placement of shelters (Bus Huts) should be consistent with Citilink service, accessible, and have sidewalk connectivity.

Project 4 Reduce headways on selected routes where current and potential ridership levels warrant.

Project 5 Expand service hours into the evening and provide Sunday service through fixed route and other types of transit services.

Project 6 Provide customer access to innovative technology to promote and sustain transit ridership.

Project 7 Design and construct a satellite transfer center to serve the northern portion of the service area.

Project 8 Encourage the construction of accessible pedestrian facilities to and from bus stop locations, within developments, and in areas where pedestrian facilities currently do not exist (sidewalk placement and connectivity).

Project 9 High Priority Corridors: Designate corridors to include amenities that allow busses and para-transit vehicles to safely pull off the corridor to load and unload as well as provide safe pedestrian facilities. These corridors should include Broadway, Wells Street, Lima Road, Calhoun Street, Lafayette Street / Spy Run Avenue, Clinton Street, Anthony Boulevard, Washington Boulevard, Jefferson Boulevard / Maumee Avenue, State Boulevard, and Washington Center Road.

Project 10 Review and update the Comprehensive Operations Analysis / Transit Development Plan on a four-year cycle.
Establishing Evaluation Markers
Establishing Performance Measures
Providing continuous monitoring and evaluation

Project 11 Rural and Regional Connectivity: Complete a study and report identifying and recommending connection opportunities between Citilink and other providers operating in Allen County and the surrounding region whom travel to and from the Metropolitan Area to provide better rural / urban connectivity.

Specific Improvements from the Transit Development Plan

Increased service frequency – routes 1, 2 and 3
Extend evening/nighttime service hours
Provide limited service on Sundays
Update Transit Development Plan

Identified Transportation Strategies from Coordinated Transit Plan

Strategies Applicable to All Programs and Providers:

Identify new revenue sources to increase operating budgets necessary to expand and maintain services and fleets

Keep costs low / maintain affordable rates

Section 5310 Enhanced Mobility of Seniors and Individuals with Disabilities Program – Capital Funding

Maintain existing service / fleets

Maintain and increase coordination / efficiency between all transportation providers

Expand existing service / fleets

Increase public awareness of available services and programs offered by providers that are available to them

Section 5310 Enhanced Mobility of Seniors and Individuals with Disabilities Program – Operational

Provide transportation above and beyond existing complimentary paratransit service

Provide transportation outside current service areas

Provide transportation within and outside current service schedules

Job Access Reverse Commute Related Projects Strategies:

Provide transportation to destinations outside of the current service area

Provide transportation within and in particular outside of the current service schedules

Facilitate multiple destination trips from a single service provider. (ie. daycare/job)

Inform the public about transportation services available in the community and train them to use the services to get to work, job training, and child care as efficiently as possible

Bicycle, Pedestrian and Enhancement Improvements

Current / Proposed Enhancement Projects

Pufferbelly Trail -Lawton Park to Franke Park and Fernhill Avenue

Pufferbelly Trail Dupont Road Grade Separation

Pufferbelly Trail Bridge over State Boulevard

IPFW Bridge over State Road 930

Dupont Road Trail - Coldwater Road to Lima Road

Appendix E

Indiana Department of Transportation
Air Quality Post-Processor Documentation
Moves2014a was used in the Analysis

MOVES2014 Input Data and Parameters

May 27, 2015

Other Indiana Counties with a History of Air Quality Conformity

MACOG – St. Joseph and Elkhart Counties,
NIRCC – Allen County,
WCIEDD – Vigo County,
DMMPC – Delaware County,
Green County,
and Jackson County

Developed for:
Indiana Department of Transportation

Developed by:
THE CORRADINO GROUP
Engineers • Planners • Program Managers • Environmental Scientists

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1.0 Introduction

This report documents the methods used to create input parameters that will enable running a set of MOVES2014 emission rate runs for all of the other metropolitan and rural counties which have had an air quality conformity requirement in the past. This report covers the following areas in Indiana:

- MACOG – St. Joseph and Elkhart Counties
- NIRCC – Allen County
- WCIEDD – Vigo County
- DMMPC – Delaware County
- Rural – Green and Jackson Counties

This report contains a discussion of the development of the input datasets that are compatible with MOVES 2014. These inputs are needed to develop a default set of emission rates for each area that can be used for conformity determination and is part of a statewide effort being conducted by the Indiana Department of Transportation (INDOT) for all participating MPOs or other jurisdictions with air quality conformity needs.

What Has Been Updated?

MOVES Input	Updated?	Notes
Source (Vehicle) Type Population	Yes	*New BMV data*
Vehicle Type VMT (by 13 MOVES Vehicle Types)	Yes	*HourVMTFraction updated using INDOT WIM & ATR data*
Age Distribution (Vehicle Population by Age of Vehicle)	Yes	*New BMV data*
Fuel (AVFT, % Fuel Type/Engine Type by Vehicle Type)	Yes	*New BMV data*
Fuel (all other files)	Yes	*Used MOVES2014 defaults for each county*
Average Speed Distribution (% of VHT in each 5 mph speed bin)	No	*Not Needed for Emission Rate Mode (Dummy Inputs)*
Road Type Distribution (VMT by 5 MOVES Road Types)	No	*Retained inputs from 2012 emission rate development*
Ramp Fraction	No	*Retained inputs from 2012 emission rate development*
Meteorology Data	No	*Retained inputs from 2012 emission rate development*
I/M Program	No	*Retained inputs from 2012 emission rate development*

2.0 Source Type Population

The vehicle populations for light duty vehicles, which include motorcycles, passenger cars, passenger trucks, and light commercial trucks (source types 11, 21, 31, and 32 respectively) were developed from a new vehicle registration dataset provided to INDOT by the Indiana Bureau of Motor Vehicles (BMV) in December of 2014. These are discussed in section 2.1 below. The vehicle populations for heavy duty vehicles, which include trucks and buses (source types 41, 42, 43, 51, 52, 53, 54, 61, and 62 respectively) were developed using procedures recommended in EPA's MOVES guidance. This is discussed in section 2.2 below.

2.1 BMV Vehicle Registration and License Data

A statewide vehicle fleet dataset was provided to the Indiana Department of Transportation (INDOT) from the Indiana Bureau of Motor Vehicles (BMV) in December of 2014. The analysis was performed by the Corradino Group under contract to INDOT. The dataset was processed by BMV and combined attributes of both vehicle title/registration (VIN) and license type.

The raw BMV dataset contained the number of vehicles classified by the combination of:

- Vehicle Type, and
- Vehicle Year, and
- Fuel Type, and
- County

There were approximately 6.67 million VINs in the statewide data set. Out of these, approximately 5.85 million were for On-Road vehicles of interest to this analysis.

BMV Vehicle Type Records Excluded from Further Analysis:

- Low Speed
- Off-Road Vehicle
- RV-Travel Trailer
- Snowmobile
- Special Machinery
- Trailer
- Watercraft

Table 2 shows how the BMV Vehicle Type classifications were cross-mapped to MOVES Source Type ID categories. The vehicle populations for light duty vehicles, which including motorcycles, passenger cars, passenger trucks, and light commercial trucks (source types 11, 21, 31, and 32 respectively) were developed from the 2014 BMV vehicle registration. The vehicle populations for heavy duty vehicles, which include trucks and buses (source types 41, 42, 43, 51, 52, 53, 54, 61, and 62 respectively) used the BMV heavy duty vehicle population as a control total for each county.

Table 2: BMV Data to MOVES2014

BMV Type	MOVES Usage			
	Source Type ID	Source Type Population	Vehicle Age Distribution	AVFT File
MOTORCYCLE	11	X	X	MD
Dealer	21	X	X	X
PASSENGER	21	X	X	X
RV-Truck Camper	31	X	X	X
Truck 7,000	31	X	X	X
Truck 9,000	31	X	X	X
Truck Camper	31	X	X	X
Farm Truck	32	X	X	X
Truck 10,000	32	X	X	X
Truck 11,000	32	X	X	X
City Bus	42	T	MD	MD
Commercial Bus	42	T	MD	MD
Church Bus	43	T	MD	MD
School Bus	43	T	MD	MD
Special Bus	43	T	MD	MD
Recovery Vehicle	52	T	MD	MD
Truck 16,000	52	T	MD	MD
Truck 20,000	52	T	MD	MD
Truck 23,000	52	T	MD	MD
Truck 26,000	52	T	MD	MD
Truck 30,000	52	T	MD	MD
Truck 36,000	53	T	MD	MD
Truck 42,000	53	T	MD	MD
Truck 48,000	53	T	MD	MD
Truck 54,000	53	T	MD	MD
Truck 60,000	53	T	MD	MD
RV	54	T	MD	MD
RV-Motorhome	54	T	MD	MD
Farm Semi Tractor	61	T	MD	MD
Truck 66,000	61	T	MD	MD
Truck 66,000+	61	T	MD	MD
Semi Tractor	62	T	MD	MD
Truck	62	T	MD	MD
SEMI	62	T	MD	MD
Semi	62	T	MD	MD
LOW SPEED	N/A	N/A	N/A	N/A
OFF-ROAD VEHICLE	N/A	N/A	N/A	N/A
RV-Travel Trailer	N/A	N/A	N/A	N/A
SNOWMOBILE	N/A	N/A	N/A	N/A
SPECIAL MACHINERY	N/A	N/A	N/A	N/A
TRAILER	N/A	N/A	N/A	N/A
WATERCRAFT	N/A	N/A	N/A	N/A

Legend	
X	BMV values were used
MD	Moves Defaults used in place of BVM data
T	BMV data used for Heavy Duty Veh. control total applied to MAR method
N/A	Discarded

2.2 Heavy Vehicle Source Types

Vehicle populations for all other source types (buses and heavy vehicles) were derived by applying the Mileage Accumulation Rate (MAR) method documented in EPA's Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity, Section 3.3 Source Type Population.

Mileage Accumulation Rates

Development of the Mileage Accumulation Rates was done during the previous 2011-2012 emission rate development process facilitated by INDOT. The MARs developed at that time have been carried forward into this update, but have been updated to reconcile with current BMV data related to heavy vehicles. The default MARs were extracted from MOVES by running MOVES for a single pollutant and a single year for all vehicles, fuels, months, days, and hours. The activity output was set to report both distance and population. A ratio of population to vehicle-miles-traveled (VMT) was calculated from these outputs. The ratios were calculated for each source type.

For each area, VMT by MOVES road types was extracted from the travel demand model's base year. Since the default MARs in MOVES vary by year (but not by location), the MOVES run that was executed to extract the MARs was run for a year consistent with the travel demand model's base year. This resulted in MARs that could be applied directly to the validated VMTs reported by the travel demand model. The travel demand model VMTs were converted into annual VMT and distributed by vehicle types using statewide default VMT distribution factors documented in this report in the section on Default VMT Distributions. The MARs were then applied to the annual vehicle type VMTs. The result was an estimated vehicle population for each source type for the travel demand model's base year. Since the vehicle populations for source types 11, 21, 31, and 32 were developed directly from the vehicle registration data, the population estimates derived for those source types using the MAR method were discarded and the observed data were used instead. As a final step, MAR-derived heavy duty vehicle classes were adjusted proportionally to match heavy duty vehicle population totals for each county from BMV data.

2.3 Forecasting Vehicle Populations by Source Types

Future year vehicle populations were developed base on socioeconomic growth rates for the maintenance area. The MPO provided base year and horizon year population and employment data for the area. Annual growth rates were calculated for population growth and employment growth individually. Population growth rates were then used to grow the light vehicle populations (source types 11, 21, 31, and 32). Employment growth rates were used to grow the heavy vehicle populations (source types 41, 42, 43, 51, 52, 53, 54, 61, and 62). Vehicle populations were calculated in 5 year increments from 2015 to 2045. The county level source type values and forecasts are shown in Appendix A.

2.4 Vehicle Age Distribution

The vehicle age distributions for MOVES source types 11, 21, 31, and 32 (motorcycles, cars, passenger trucks, and light commercial vehicles respectively) were developed through an analysis of Indiana's 2014 vehicle registration data. The BMV dataset allowed the totals for each model year by vehicle type and county to be assembled into the required MOVES 2014 format. Whereby, the vehicles are classified into one year age bins between 0 and 29 years old, and older vehicles into the 30 years old or more bin.

In keeping with previous practice, vehicle age distributions were only derived for light duty vehicles from the BMV data (source types 11, 21, 31, and 32 from the vehicle registration data). Because of the transient nature of the heavy vehicle classes, MOVES2014 default vehicle age distributions specific to each source types were used. Vehicle age distributions for all source types were kept constant for all future years. The vehicle age derived for each of the counties included in this study are shown in Appendix A of this report.

3.0 Vehicle Type VMT

As part of the previous 2011-2012 emission rate development effort, INDOT developed a default set of VMT distribution factors by Highway Performance Monitoring System (HPMS) vehicle type and by MOVES road type. The original distribution factors were developed by analyzing four consecutive years of continuous traffic count data ending in 2010 for twenty permanent traffic count stations throughout Indiana. During the current update, the Corradino Group evaluated the latest four years of continuous traffic count data; covering the years 2011, 2012, 2013, and 2014.

The stations were selected to provide a spread of locations corresponding to each of the four MOVES road types. Furthermore, these stations were selected from among sites that were concentrated in nonattainment and maintenance areas. An inventory of the sites used to develop the distributions is shown in Figure 1. Of the available sites, 16 unique Weigh in Motion (WIM) sites and 26 ATR sites were utilized.

The vehicle counts reported at each station were provided by vehicle class. These were aggregated into the six basic HPMS vehicle types: motorcycle, passenger car, light truck, bus, single-unit heavy truck, and combination heavy truck. The distribution of VMT by vehicle type was calculated for each road type by taking each vehicle type's percentage of total traffic.

3.1 Road Type, Daily, and Monthly Distributions

Road Type, Daily and Monthly distribution factors were calculated from INDOT's official count adjustment factors which are more commonly used to develop AADT from raw traffic counts. These factors are based on the set of daily traffic counts collected from all permanent count stations throughout the state. The daily distribution factors determine what percentage of VMT is occurring on weekdays and what percentage is occurring on weekends. The monthly

distribution factors determine what percentage of annual VMT is occurring in each month of the year. After comparing results for Daily and Monthly distributions developed using the 2007-2010 data versus the newer 2011-2014 data, the differences were trivial and the previously developed MOVES Daily and Monthly VMT fraction files were retained for use in the MOVES2014 analysis.

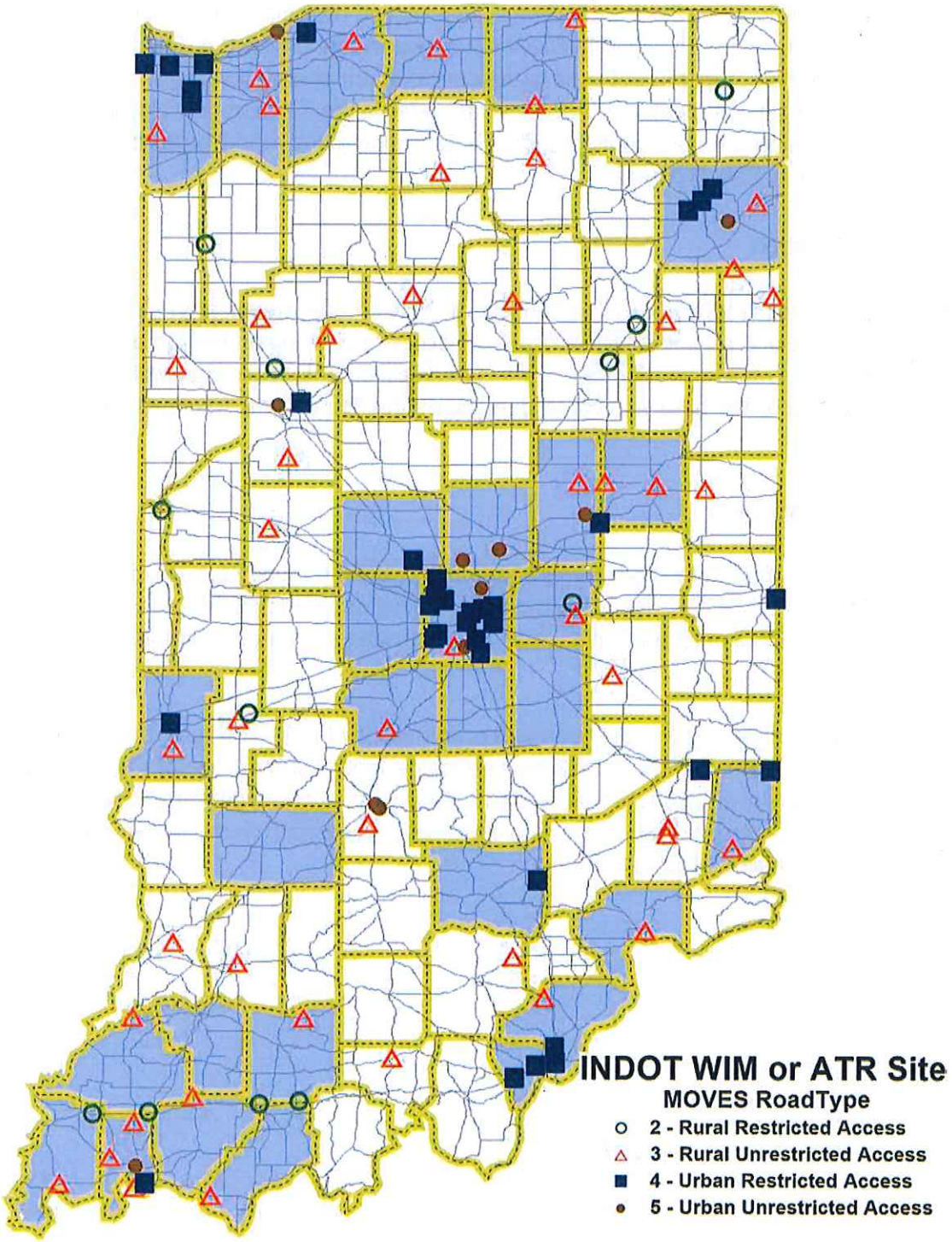
VehTypeVMT - When converting files from MOVES 2010 format to MOVES 2014 format, HPMS Base Year VMT by HPMS Vehicle Type ID was converted so that VMT for HPMS vehicle types 20 and 30 were combined and classified as HPMS vehicle type 25.

The statewide default daily distribution factors are shown in Tables C-1, C-2, and C-4 in Appendix C. The statewide default monthly distribution factors are also shown in Appendix C.

3.2 Hourly Distributions

The same set of forty two permanent traffic count locations discussed in the section on Default VMT Distributions was analyzed to develop a set of hourly distribution factors. These factors were calculated by road type, by HPMS vehicle type. Hourly factors were only calculated for the average weekday. The hourly distribution pattern for each traffic count location was reviewed. Any data that appeared to reflect either an error in the data or an outlier of behavior were removed to prevent bias in the data. The statewide default hourly distribution factors are presented in Appendix B.

Figure 1 - INDOT Continuous Count Locations



4.0 Average Speed Distribution

National MOVES defaults are used for the average speed distribution inputs. Per the *User Guide for MOVES2014*, when running MOVES2014 in emission rate mode, the speed distribution is needed for model setup, but not used in the development of emission rates. The speed distribution for a given scenario is accounted for later in the inventory development process, when the emission rates are applied to detailed travel demand model outputs as part of the INDOT Air Quality Post-Processor.

5.0 Ramp Fraction

The ramp fractions represent the percentage of vehicle-hours-traveled (VHT) for road types 2 (rural restricted access) and 4 (urban restricted access) occurring on the ramps associated with those road types. These fractions were calculated based on the percentage of VHT occurring on ramps reported by the base year travel demand model. These ramp fractions are reported in Appendix C.

6.0 Meteorology Data

The default set of hourly temperatures and hourly relative humidity for use in MOVES 2014 was retained from the MOVES 2010a inputs originally developed using EPA's data converters for changing MOBILE6.2 minimum / maximum temperatures and absolute humidity to the MOVES equivalent formats.

Meteorological data reflect average annual conditions for the PM 2.5 runs. During the previous emission rate update, the MOBILE6.2 meteorological input data for each of the twelve months of the years were averaged together to create average annual temperatures and humidity. These were then passed through the data converters. The data reflect summer conditions for ozone using MOBILE6.2 inputs for July.

7.0 Fuel

The 2014 version of MOVES has features developed as a result of the EPAct Tier 2 Gasoline Model, impacts of ethanol and other key fuel properties, and incorporates the EPA Sulfur Effects Model. MOVES2014 has a new set of Fuel Supply Regions based on regional fuels, and reduces the number of Fuels in MOVES from approximately 300 to 40. MOVES2014 contains the most current ethanol (E10, E15,E85) and fuel formulation projections based on AEO2014.

Figure 2-Indiana Fuel Supply Regions

Development of the updated emission rates uses default MOVES2014 fuel formulation assumptions based on each county's Fuel Supply Region, and defaults to summer conditions

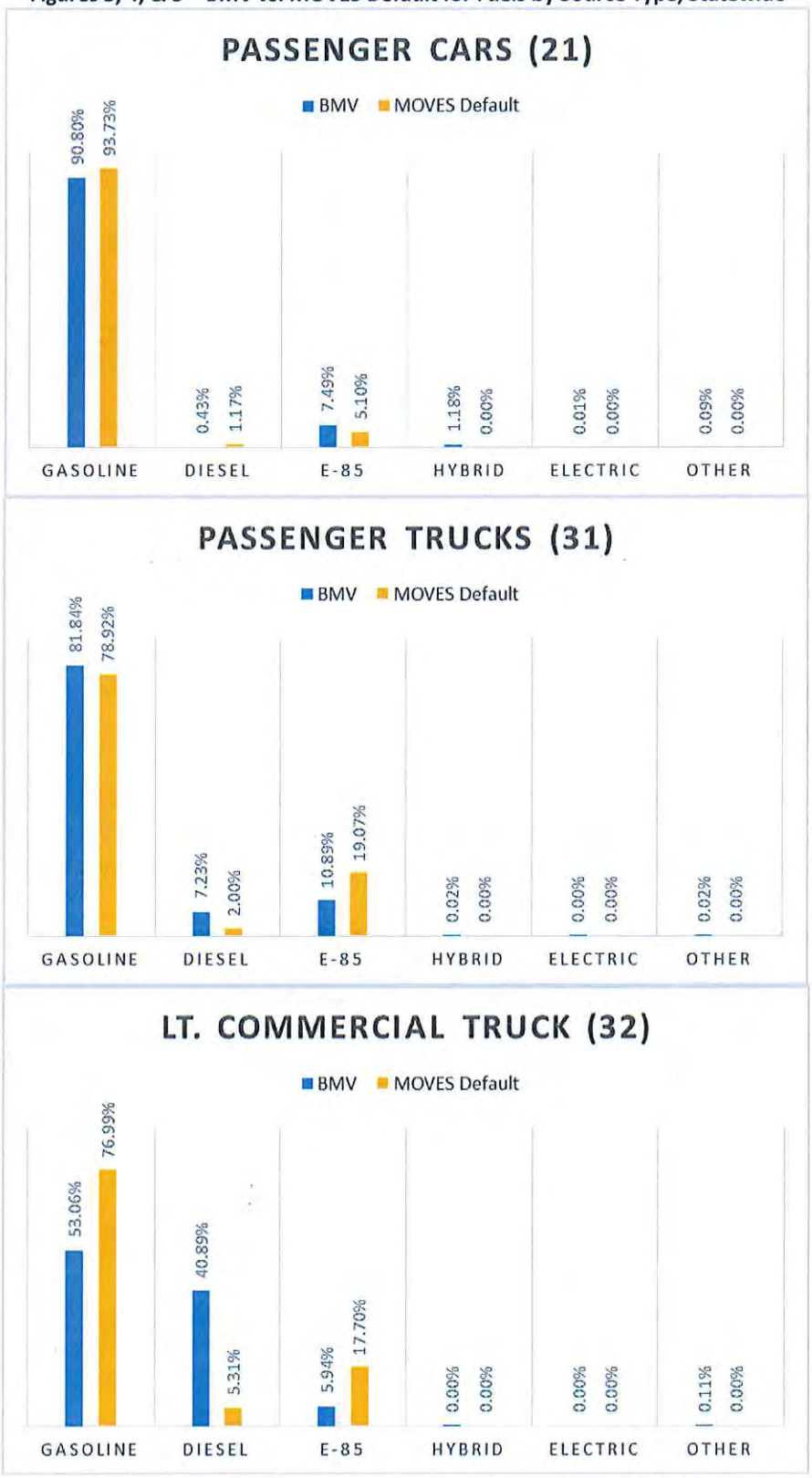
AVFT Assumptions

The 2014 BMV fleet mix data allowed the differentiation of vehicle types by fuel types. An evaluation of differences between BMV-derived data and MOVES 2014 defaults was conducted for light duty vehicles. Results showed that in many of the urban counties, the number of hybrid and electric passenger cars is large enough to warrant inclusion in the AVFT input file. The default MOVES file assumes zero hybrid or electric cars statewide. Additionally, BMV data shows a much larger fraction of diesel powered light duty trucks than indicated in the default data. And, the E-85 market share is actually much smaller in Indiana, than assumed in the default data. Statewide results are shown in Table 3, and Figures 3, 4, and 5. Because of these differences, it was decided that the BMV data provides a better set of assumptions for the light duty vehicle classes. Specific AVFT values used for this region are shown in the appendix A.

Table 3: Comparison of BMV Data to MOVES2014 AVFT Defaults

Fuel Type and Vehicle Technology *Statewide*			FuelType -->	1	2	5	1	9	X
			EngTech -->	1	1	1	12	30	X
Data Source	**Vehicle Type**	**Code**	**Year**	**Gasoline**	**Diesel**	**E-85**	**Hybrid**	**Electric**	**Other**
BMV	Passenger Car	21	2015	90.80%	0.43%	7.49%	1.18%	0.01%	0.09%
BMV	Passenger Truck	31	2015	81.84%	7.23%	10.89%	0.02%	0.00%	0.02%
BMV	Light Commercial Truck	32	2015	53.06%	40.89%	5.94%	0.00%	0.00%	0.11%
MOVES Default	Passenger Car	21	2015	93.73%	1.17%	5.10%	0.00%	0.00%	0.00%
MOVES Default	Passenger Truck	31	2015	78.92%	2.00%	19.07%	0.00%	0.00%	0.00%
MOVES Default	Light Commercial Truck	32	2015	76.99%	5.31%	17.70%	0.00%	0.00%	0.00%

Figures 3, 4, & 5 – BMV vs. MOVES Default for Fuels by Source Type, Statewide



8.0 I/M Program

None of the historically affected Indiana counties are covered by an inspection and maintenance program.

9.0 Summary of MOVES2014 Runs and Settings

Table 4 –Summary of Emission Rate Runs

Ozone Runs	MOVES Input Item	
	Screen	Ozone
Description	Description	User Choice
Scale	Domain/Scale	County
	Calculation Type	Emission Rate
Time Spans	Time Aggregation Level	Hour
	Year	2015, 2020, 2025, 2030, 2035, 2040, 2045
	Months	July
	Days	Weekday
	Hours	Select All
Geographic Bounds	Geographic Bounds	Each County
Vehicles	Vehicles	All Gas and Diesel Combinations
Road Type	Road Type	Select All
Pollutants/ Processes	Pollutants/ Processes	VOC, NOx, and supporting
General Output	Database Name	Ozone
	Units	Select "Grams" and "Miles" and "Joules"
	Activity	Distance, Population
Output Emissions Detail	On Road	Select "Source Use Type" and "Road Type"

Table 5 –Summary of County Data Manager Inputs

County Data Manager Input	Excel Sheet Tab Name	Ozone	
Source (Vehicle) Type Population	sourceTypeYear	Local Registration for Source Types 11, 21, 31, and 32; Estimated population using default MOVES mileage accumulation rates and local VMT for all other source types. Future year vehicle populations based on population growth rates for source types 11, 21, 31, and 32. Employment growth used for all other source types.	
Vehicle Type VMT (by 13 MOVES Vehicle Types)	HPMSVTypeYear	Statewide default vehicle distributions across road types developed by INDOT using an analysis of permanent count station data from a statewide data set.	
	MonthVMTFraction	Statewide default monthly fractions developed by INDOT using an analysis of permanent count station data from a statewide data set.	
	DayVMTFraction	Statewide default daily fractions developed by INDOT using an analysis of permanent count station data from a statewide data set.	
	HourVMTFraction	Statewide default hourly fractions developed by INDOT using an analysis of permanent count station data from a statewide data set.	
Average Speed Distribution (% of VHT in each 5 mph speed bin)	avgSpeed Distribution	National defaults.	
Road Type Distribution (VMT by 5 MOVES Road Types)	roadType Distribution	Calculated from local VMT data. Use travel demand model base year distributions for all years.	
Age Distribution (Vehicle Population by Age of Vehicle)	sourceTypeAge Distribution	Local age distributions developed from vehicle registration data for source types 11, 21, 31, and 32. Default MOVES age distributions for all other source types.	
Ramp Fraction	RoadType	Based on travel demand model.	
Meteorology Data	ZoneMonthHour	MOBILE6 Summer Met Data Converted to MOVES format	MOBILE6 12 month Met Data Converted to MOVES format and averaged to annual meteorology
Fuel (% of Market Share by Fuel Type)	FuelFormulation	MOVES Defaults	
	FuelSupply	County MOVES Defaults for Summer (check if varies among counties)	County MOVES Defaults for annual (check if varies among counties)
I/M Program	IMCoverage	N/A	

MOVES Codes used in the Appendices

Throughout the following appendices, references are made to MOVES2014 codes for two types of data. The values for the source type codes are shown in the Table 7 below. The values for the road type codes are shown in Table 8.

Table 6 - MOVES (vehicle) Source Types

SourceTypeID	Description
11	Motorcycles
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
43	School Bus
51	Refuse Truck
52	Single Unit Short-haul Truck
53	Single Unit Long-haul Truck
54	Motor Home
61	Combination Short-haul Truck
62	Combination Long-haul Truck

Table 7 - MOVES Road Types

RoadTypeID	Description
1	Off Network
2	Rural Restricted Access
3	Rural Unrestricted Access
4	Urban Restricted Access
5	Urban Unrestricted Access

Appendix A – Updated Vehicle Fleet Assumptions Derived from BMV Data

Section A1 – MACOG Counties

Table A1-1: Vehicle Population for St. Joseph County

	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	3,417	3,493	3,565	3,638	3,712	3,788	3,866	3,938
21	113,647	116,207	118,585	121,011	123,487	126,014	128,592	130,985
31	65,697	67,176	68,551	69,954	71,385	72,846	74,336	75,719
32	20,114	20,567	20,988	21,417	21,856	22,303	22,759	23,183
41	66	71	75	79	83	87	92	96
42	35	37	39	41	43	46	48	50
43	450	480	506	533	561	591	623	649
51	17	18	19	20	21	23	24	25
52	1,175	1,256	1,323	1,393	1,468	1,546	1,628	1,696
53	151	161	170	179	189	199	209	218
54	272	290	306	322	339	357	377	392
61	1,644	1,757	1,851	1,949	2,053	2,163	2,278	2,373
62	1,967	2,102	2,214	2,332	2,457	2,587	2,725	2,839

Table A1-2: Vehicle Population for Elkhart County

	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	6,288	6,430	6,562	6,696	6,833	6,973	7,115	7,248
21	117,738	121,300	124,536	127,859	131,270	134,772	138,367	141,630
31	32,249	33,225	34,111	35,021	35,956	36,915	37,900	38,793
32	1,827	1,882	1,932	1,984	2,037	2,091	2,147	2,197
41	46	48	49	50	52	53	55	56
42	24	25	26	26	27	28	29	29
43	314	324	333	342	352	362	372	381
51	14	14	15	15	16	16	17	17
52	958	989	1,017	1,046	1,075	1,105	1,137	1,165
53	123	127	131	134	138	142	146	150
54	222	229	235	242	249	256	263	269
61	1,321	1,364	1,402	1,442	1,483	1,524	1,568	1,606
62	1,580	1,631	1,677	1,725	1,774	1,824	1,875	1,922

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Vehicle Age Distribution for St.Joseph County

Table A1-3: Vehicle Age Distribution for St. Joseph County

	SourceTypeID												
AgeID	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.002806	0.006538	0.002421	0.016340	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.024630	0.039314	0.022303	0.041939	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.029306	0.047156	0.026775	0.051198	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.030865	0.046229	0.024838	0.053922	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.023383	0.046349	0.031675	0.040305	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.020889	0.043531	0.024269	0.021786	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.043336	0.037125	0.018714	0.015795	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.051910	0.057194	0.042128	0.062636	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.058613	0.061424	0.038682	0.043573	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.061263	0.059216	0.049050	0.051743	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.065004	0.067119	0.051614	0.052288	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.052377	0.063547	0.056997	0.051198	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.070928	0.061065	0.058194	0.047386	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.049415	0.061316	0.060814	0.038671	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.046454	0.052014	0.056513	0.034858	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.038036	0.049226	0.059960	0.040850	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.038036	0.042251	0.057396	0.041939	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.025565	0.031956	0.047996	0.012527	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.022603	0.027230	0.048537	0.026144	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.020577	0.019059	0.035976	0.014706	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.017615	0.016911	0.035007	0.023965	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.015588	0.011228	0.033156	0.019608	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.009977	0.007872	0.019113	0.013617	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.007794	0.006066	0.014926	0.009259	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.007950	0.004385	0.010767	0.013617	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.005768	0.003159	0.009941	0.011983	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.009353	0.002794	0.011080	0.010893	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.007482	0.002243	0.009799	0.008715	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.007482	0.001890	0.005412	0.013072	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.015121	0.001807	0.005982	0.005447	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.119875	0.022786	0.029966	0.110022	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A1-4: Vehicle Age Distribution for Elkhart County

Vehicle Age Distribution for Elkhart County

AgeID	SourceTypeID												
	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.002333	0.005087	0.002408	0.006908	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.028616	0.029629	0.021971	0.021254	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.032504	0.040305	0.022603	0.033475	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.033748	0.043083	0.025041	0.045165	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.025816	0.042069	0.028412	0.041445	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.020840	0.041171	0.023025	0.018066	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.045568	0.036010	0.017758	0.030287	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.053033	0.057988	0.038224	0.041977	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.069051	0.063495	0.040813	0.055260	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.072628	0.060932	0.047765	0.075983	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.061742	0.068491	0.053845	0.061637	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.050078	0.065326	0.061550	0.053666	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.064852	0.063627	0.061821	0.060043	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.050078	0.066612	0.064500	0.062168	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.046190	0.056290	0.063567	0.041977	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.034992	0.053405	0.060105	0.044633	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.034837	0.044633	0.061610	0.053666	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.025505	0.033430	0.049631	0.022848	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.019596	0.027395	0.051136	0.036132	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.017263	0.019340	0.033980	0.020191	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.016952	0.016735	0.032295	0.018597	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.014774	0.011369	0.028111	0.021254	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.009487	0.007898	0.019955	0.014878	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.006221	0.006265	0.014357	0.010096	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.007154	0.004295	0.010474	0.010096	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.005599	0.003273	0.009691	0.008502	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.006843	0.002836	0.009571	0.005313	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.006376	0.002110	0.008548	0.005845	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.007465	0.001789	0.004364	0.005313	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.012286	0.001426	0.004966	0.012221	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.117574	0.023685	0.027901	0.061105	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A1-5: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
St. Joseph County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	92.11%	0.37%	6.02%	1.38%	0.02%	0.09%
BMV	Passenger Truck	31	2015	83.58%	6.13%	10.20%	0.03%	0.00%	0.05%
BMV	Light Commercial Truck	32	2015	55.23%	36.82%	7.90%	0.00%	0.00%	0.05%

Table A1-6: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Elkhart County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	91.67%	0.38%	6.75%	1.11%	0.01%	0.08%
BMV	Passenger Truck	31	2015	82.08%	7.90%	9.99%	0.02%	0.00%	0.00%
BMV	Light Commercial Truck	32	2015	46.17%	47.82%	5.95%	0.00%	0.00%	0.05%

Section A2 – NIRCC Allen County

Table A2-1: Vehicle Population for Allen County

Allen County	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	9,195	9,574	9,966	10,375	10,800	11,244	11,706	12,081
21	158,245	164,740	171,500	178,538	185,865	193,492	201,433	207,892
31	90,532	94,247	98,115	102,141	106,332	110,697	115,239	118,934
32	27,717	28,855	30,039	31,271	32,555	33,891	35,282	36,413
41	128	132	137	144	151	158	166	171
42	67	69	72	75	79	83	87	90
43	872	899	942	987	1,034	1,084	1,137	1,173
51	35	35	36	38	40	42	44	45
52	2,361	2,438	2,555	2,677	2,806	2,941	3,082	3,183
53	303	312	326	342	359	376	394	407
54	546	563	590	619	648	679	712	735
61	3,173	3,277	3,434	3,600	3,772	3,954	4,144	4,280
62	3,796	3,921	4,110	4,307	4,514	4,731	4,957	5,120

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Table A2-2: Vehicle Age Distribution for Allen County

Vehicle Age Distribution for Allen County

	SourceTypeID												
AgeID	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.002059	0.005418	0.003259	0.014060	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.022547	0.036671	0.028350	0.036204	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.030989	0.045952	0.030064	0.044640	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.035828	0.049044	0.029123	0.047803	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.025739	0.049582	0.036375	0.061160	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.023783	0.044342	0.025770	0.022847	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.042932	0.040403	0.021004	0.022496	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.057758	0.063150	0.040915	0.060105	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.075981	0.064341	0.042968	0.063269	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.071451	0.061621	0.047659	0.065729	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.065479	0.065167	0.052387	0.055536	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.049830	0.060431	0.056211	0.048155	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.057243	0.057970	0.060280	0.046397	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.053639	0.058321	0.056757	0.035149	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.043653	0.048489	0.049505	0.040422	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.036549	0.048761	0.058358	0.043234	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.030063	0.041021	0.055024	0.042179	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.023165	0.031745	0.046246	0.021090	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.017708	0.026581	0.045247	0.028120	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.017708	0.018431	0.032042	0.022847	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.015649	0.016982	0.032589	0.020387	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.012149	0.011458	0.030893	0.015817	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.009575	0.007938	0.019798	0.015466	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.007001	0.006591	0.015673	0.009842	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.006177	0.004863	0.011397	0.007381	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.005560	0.003524	0.010285	0.009139	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.007722	0.003020	0.011020	0.007381	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.005765	0.002304	0.009814	0.010545	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.005868	0.002114	0.005387	0.005272	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.013487	0.001851	0.005614	0.006327	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.126943	0.021913	0.029989	0.071002	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A2-3: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Allen County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	91.03%	0.34%	7.35%	1.20%	0.01%	0.07%
BMV	Passenger Truck	31	2015	82.67%	5.40%	11.90%	0.01%	0.00%	0.02%
BMV	Light Commercial Truck	32	2015	56.06%	34.20%	9.56%	0.00%	0.00%	0.18%

Section A3 – WCIECDD Vigo County

Table A3-1: Vehicle Population for Vigo County

Vigo County	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	3,119	3,112	3,104	3,098	3,091	3,083	3,077	3,070
21	40,012	39,923	39,833	39,744	39,655	39,567	39,478	39,389
31	29,373	29,309	29,243	29,177	29,112	29,047	28,982	28,916
32	8,992	8,973	8,952	8,932	8,912	8,893	8,872	8,852
41	31	29	29	29	29	29	29	28
42	16	14	14	14	14	14	14	13
43	213	210	209	209	208	208	208	206
51	9	7	7	7	7	7	7	6
52	639	634	633	631	630	628	627	624
53	82	80	80	80	79	79	79	78
54	148	146	145	145	145	144	144	143
61	721	714	712	711	709	707	706	703
62	863	856	854	852	850	849	847	844

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Table A3-2: Vehicle Age Distribution for Vigo County

Vehicle Age Distribution for Vigo County

AgeID	SourceTypeID												
	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.000958	0.005346	0.001850	0.013683	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.025879	0.036376	0.021717	0.019384	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.030990	0.048553	0.024785	0.027366	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.041214	0.050947	0.025466	0.035348	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.024601	0.045583	0.030725	0.026226	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.025879	0.045810	0.025369	0.018244	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.051118	0.038787	0.020451	0.023945	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.051757	0.059054	0.037932	0.046750	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.064217	0.058862	0.041145	0.038769	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.069649	0.056328	0.049180	0.041049	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.062300	0.061063	0.050007	0.033067	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.063259	0.057586	0.056337	0.031927	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.070288	0.057743	0.053611	0.037628	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.056550	0.057272	0.051858	0.036488	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.043450	0.049043	0.052198	0.045610	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.036741	0.050353	0.050689	0.057013	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.029073	0.044745	0.052685	0.059293	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.022045	0.031676	0.046988	0.014823	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.019169	0.028374	0.047767	0.034208	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.020767	0.020092	0.034231	0.015964	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.015974	0.018572	0.034231	0.027366	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.008946	0.012579	0.034620	0.017104	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.008946	0.009959	0.024346	0.015964	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.006709	0.007373	0.018893	0.014823	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.006709	0.005940	0.015436	0.013683	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.007668	0.003914	0.013829	0.015964	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.004153	0.003599	0.014121	0.014823	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.003514	0.003040	0.011443	0.010262	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.005751	0.002551	0.006914	0.013683	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.009904	0.002184	0.007693	0.011403	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.111821	0.026696	0.043482	0.188141	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A3-3: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Vigo County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	90.61%	0.36%	7.54%	1.40%	0.01%	0.08%
BMV	Passenger Truck	31	2015	83.48%	6.71%	9.75%	0.05%	0.00%	0.00%
BMV	Light Commercial Truck	32	2015	57.13%	38.20%	4.68%	0.00%	0.00%	0.00%

Section A4 – DMMPC Delaware County

Table A4-1: Vehicle Population for Delaware County

Delaware Co.	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	2,772	2,833	2,894	2,956	3,020	3,085	3,152	3,212
21	42,675	43,598	44,540	45,503	46,486	47,492	48,518	49,439
31	28,469	29,085	29,713	30,356	31,011	31,682	32,367	32,981
32	8,716	8,904	9,096	9,292	9,493	9,699	9,909	10,096
41	52	50	51	53	55	57	59	59
42	27	25	25	26	27	28	29	29
43	351	347	358	370	383	395	409	415
51	16	15	15	15	15	16	16	16
52	1,093	1,083	1,119	1,157	1,196	1,236	1,278	1,300
53	141	139	143	148	153	159	163	166
54	253	250	258	267	276	285	295	300
61	1,689	1,675	1,731	1,789	1,849	1,911	1,976	2,010
62	2,021	2,004	2,071	2,141	2,213	2,286	2,363	2,404

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Table A4-2: Vehicle Age Distribution for Delaware County

Vehicle Age Distribution for Delaware County

AgeID	SourceTypeID												
	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.002033	0.005704	0.003137	0.005447	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.028455	0.044555	0.028584	0.022876	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.031504	0.050290	0.032269	0.025054	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.036247	0.054087	0.025845	0.034858	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.021003	0.045899	0.027638	0.032680	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.016938	0.040991	0.020268	0.014161	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.046070	0.036991	0.018176	0.011983	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.053523	0.052400	0.033962	0.032680	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.061992	0.056697	0.038892	0.035948	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.070461	0.058119	0.043474	0.049020	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.053523	0.059401	0.045516	0.037037	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.058943	0.058432	0.053683	0.046841	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.073509	0.056260	0.056621	0.049020	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.060637	0.057213	0.054828	0.032680	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.044038	0.047555	0.051143	0.044662	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.034892	0.049446	0.057816	0.029412	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.038957	0.041492	0.054977	0.043573	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.022358	0.034756	0.044470	0.025054	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.021680	0.028724	0.048952	0.041394	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.017276	0.020910	0.035656	0.025054	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.014905	0.018675	0.036353	0.027233	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.011856	0.012643	0.031622	0.014161	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.011518	0.009298	0.021363	0.023965	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.006775	0.008595	0.019870	0.010893	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.003726	0.006345	0.013944	0.013072	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.008130	0.004579	0.014093	0.015251	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.007114	0.004251	0.014392	0.015251	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.008130	0.003438	0.013246	0.014161	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.009146	0.003219	0.007719	0.011983	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.012873	0.002579	0.008665	0.009804	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.111789	0.026458	0.042827	0.204793	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A4-3: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Delaware County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	89.98%	0.41%	8.07%	1.42%	0.00%	0.10%
BMV	Passenger Truck	31	2015	82.72%	6.16%	11.07%	0.04%	0.00%	0.01%
BMV	Light Commercial Truck	32	2015	56.86%	36.60%	6.54%	0.00%	0.00%	0.00%

Section A5 – Greene County

Table A5-1: Vehicle Population for Greene County

Greene Co.	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	1,418	1,459	1,499	1,544	1,588	1,633	1,678	1,719
21	12,522	12,880	13,246	13,624	14,013	14,413	14,824	15,180
31	12,713	13,076	13,448	13,832	14,226	14,632	15,050	15,411
32	3,891	4,003	4,116	4,234	4,355	4,479	4,606	4,717
41	5	4	4	4	4	4	4	4
42	3	2	2	2	2	2	2	2
43	33	33	34	35	37	40	42	43
51	4	3	3	3	3	3	3	3
52	214	223	234	246	259	273	287	297
53	23	23	24	25	26	28	29	30
54	49	50	52	55	57	61	64	66
61	269	281	294	310	326	343	361	374
62	290	303	317	334	352	370	390	404

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Vehicle Age Distribution for Greene County

Table A5-2: Vehicle Age Distribution for Greene County

	SourceTypeID												
AgeID	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.001370	0.004839	0.001528	0.008721	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.017123	0.032704	0.017190	0.017442	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.029452	0.048498	0.022920	0.031977	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.032877	0.052167	0.020533	0.017442	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.024658	0.047860	0.027982	0.034884	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.023288	0.043978	0.022156	0.008721	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.052740	0.035097	0.017095	0.010174	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.063699	0.057697	0.031516	0.049419	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.060959	0.058016	0.035336	0.024709	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.068493	0.054241	0.045172	0.046512	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.063014	0.058601	0.048037	0.031977	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.054110	0.057432	0.060166	0.043605	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.062329	0.057166	0.055200	0.037791	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.060274	0.057112	0.055391	0.033430	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.040411	0.049295	0.054245	0.046512	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.034247	0.049242	0.057110	0.039244	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.030822	0.041957	0.053959	0.046512	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.028082	0.034246	0.044313	0.018895	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.020548	0.029886	0.049279	0.031977	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.019178	0.021484	0.033903	0.033430	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.015753	0.018293	0.038965	0.033430	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.014384	0.015475	0.036959	0.017442	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.007534	0.011965	0.024066	0.021802	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.010274	0.008508	0.020819	0.018895	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.004795	0.007073	0.014421	0.014535	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.006164	0.005690	0.012320	0.011628	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.005479	0.004786	0.018336	0.017442	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.002740	0.003563	0.012511	0.008721	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.010274	0.002606	0.010696	0.014535	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.015068	0.002340	0.008786	0.014535	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.119863	0.028184	0.049088	0.213663	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A5-3: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Greene County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	90.01%	0.69%	8.30%	0.88%	0.01%	0.11%
BMV	Passenger Truck	31	2015	81.87%	8.63%	9.48%	0.01%	0.00%	0.00%
BMV	Light Commercial Truck	32	2015	44.33%	53.49%	2.18%	0.00%	0.00%	0.00%

Section A6 – Jackson County

Table A6-1: Vehicle Population for Jackson County

Jackson Co.	Year							
sourceTypeID	2010	2015	2020	2025	2030	2035	2040	2045
11	1,674	1,697	1,720	1,743	1,767	1,792	1,816	1,839
21	17,708	17,951	18,197	18,446	18,699	18,955	19,215	19,457
31	16,387	16,612	16,839	17,070	17,304	17,541	17,781	18,006
32	5,017	5,086	5,155	5,226	5,298	5,371	5,444	5,513
41	27	27	27	28	29	30	32	32
42	15	14	14	15	15	16	17	17
43	184	188	194	202	210	218	227	233
51	6	5	5	5	5	5	6	5
52	344	353	366	380	395	411	427	439
53	37	37	37	39	40	42	44	44
54	78	80	82	85	89	92	96	98
61	1,033	1,061	1,101	1,144	1,188	1,234	1,282	1,318
62	1,113	1,143	1,186	1,232	1,280	1,329	1,381	1,419

Data Sources: SourceTypes 11, 21, 31, and 32 use 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use Mileage Accumulation Rate (MAR) method.

Table A6-2: Vehicle Age Distribution for Jackson County

Vehicle Age Distribution for Jackson County

	SourceTypeID												
AgeID	11	21	31	32	41	42	43	51	52	53	54	61	62
0	0.000583	0.004103	0.001060	0.007955	0.064302	0.054574	0.062222	0.049424	0.058853	0.078754	0.061510	0.053563	0.067085
1	0.018648	0.034480	0.016220	0.014320	0.062673	0.053191	0.060645	0.048172	0.057361	0.076759	0.059951	0.053563	0.067085
2	0.023893	0.046337	0.022414	0.038982	0.062485	0.053032	0.060464	0.048028	0.057190	0.076529	0.059772	0.054105	0.067762
3	0.030886	0.049537	0.019969	0.023071	0.062423	0.052979	0.060403	0.047980	0.057133	0.076453	0.059712	0.057558	0.072087
4	0.020396	0.044945	0.025348	0.025457	0.061737	0.052397	0.059740	0.047452	0.056505	0.075612	0.059056	0.056418	0.070660
5	0.024476	0.043853	0.020295	0.014320	0.055917	0.047458	0.054108	0.042979	0.051178	0.068485	0.053488	0.048929	0.061280
6	0.043706	0.037040	0.018176	0.013524	0.046837	0.039751	0.045321	0.035999	0.042867	0.057363	0.044802	0.036603	0.045843
7	0.044872	0.060717	0.032521	0.044551	0.042579	0.036137	0.041201	0.032727	0.038970	0.052148	0.040729	0.034074	0.042676
8	0.061189	0.058797	0.038878	0.025457	0.046827	0.039743	0.045312	0.035992	0.042858	0.057351	0.044793	0.035809	0.044849
9	0.062354	0.058383	0.041894	0.037391	0.053438	0.045353	0.051709	0.041073	0.048909	0.065448	0.051117	0.052629	0.065914
10	0.073427	0.064895	0.056076	0.054893	0.053271	0.045212	0.051548	0.040945	0.048756	0.065244	0.050958	0.062452	0.078217
11	0.060023	0.058044	0.056565	0.042164	0.040795	0.053620	0.041108	0.031356	0.039149	0.052388	0.030273	0.047826	0.059899
12	0.076923	0.058157	0.057869	0.036595	0.033192	0.048994	0.038293	0.025512	0.029448	0.039407	0.046610	0.038913	0.048735
13	0.060023	0.059663	0.055913	0.041368	0.027735	0.045609	0.033375	0.054598	0.031640	0.019477	0.029167	0.032515	0.046299
14	0.051282	0.049725	0.053794	0.036595	0.036429	0.037775	0.043086	0.063266	0.036444	0.019469	0.034780	0.042708	0.046207
15	0.042541	0.050704	0.062271	0.032617	0.028351	0.033295	0.021016	0.039565	0.035789	0.031185	0.033520	0.033237	0.030044
16	0.036713	0.040315	0.058929	0.051710	0.023588	0.027913	0.025367	0.034157	0.025999	0.023020	0.023315	0.027654	0.023052
17	0.026224	0.033012	0.045643	0.023071	0.017564	0.024497	0.020683	0.014635	0.019796	0.005226	0.020675	0.020591	0.013845
18	0.022727	0.026349	0.049637	0.028640	0.020119	0.025048	0.026689	0.040196	0.019374	0.003721	0.015546	0.023587	0.010007
19	0.020396	0.019800	0.033418	0.030231	0.022579	0.036661	0.030145	0.034228	0.022734	0.017578	0.020363	0.026470	0.009860
20	0.014569	0.018407	0.039368	0.038982	0.022641	0.028197	0.017388	0.027008	0.028940	0.018387	0.026594	0.026543	0.009576
21	0.012821	0.015283	0.037982	0.019889	0.021297	0.022441	0.020903	0.036743	0.025509	0.012162	0.023847	0.024967	0.008340
22	0.008741	0.009147	0.022740	0.024662	0.022137	0.020761	0.021174	0.029424	0.021171	0.002921	0.023292	0.025952	0.002197
23	0.008741	0.006851	0.017198	0.008751	0.018775	0.017685	0.018686	0.036737	0.025574	0.000660	0.017364	0.022011	0.002282
24	0.006993	0.005383	0.014019	0.015911	0.016580	0.015344	0.016222	0.019537	0.018134	0.001323	0.018639	0.019438	0.002895
25	0.004079	0.003839	0.011981	0.018298	0.013046	0.011961	0.012527	0.020286	0.010153	0.001326	0.018907	0.015295	0.001496
26	0.004662	0.003839	0.013041	0.012729	0.005207	0.011471	0.004628	0.005879	0.015824	0.000000	0.012386	0.006104	0.000305
27	0.008159	0.003275	0.012144	0.008751	0.004438	0.006255	0.003427	0.006619	0.008243	0.000585	0.007312	0.005202	0.000237
28	0.009324	0.003011	0.010025	0.012729	0.003853	0.002715	0.004023	0.005865	0.007845	0.000422	0.004020	0.004518	0.000754
29	0.012821	0.002033	0.009129	0.021480	0.005020	0.007381	0.003956	0.001470	0.008291	0.000000	0.000530	0.005885	0.000248
30	0.107809	0.030076	0.045480	0.194909	0.004164	0.002547	0.004629	0.002149	0.009364	0.000597	0.006972	0.004882	0.000264

Data Sources: SourceTypes 11, 21, 31, and 32 were obtained directly from Dec. 2014 Indiana BMV summary statistics for vehicle registration & license plate data by county. All other Source Types use MOVES defaults.

Table A6-3: AVFT percentages for Light Duty Vehicles

Fuel Type and Vehicle Technology									
Jackson County			FuelType -->	1	2	5	1	9	X
			engTech -->	1	1	1	12	30	X
Data Source	Vehicle Type	Code		Gasoline	Diesel	E-85	Hybrid	Electric	Other
BMV	Passenger Car	21	2015	90.91%	0.39%	7.83%	0.78%	0.00%	0.09%
BMV	Passenger Truck	31	2015	84.12%	6.94%	8.92%	0.02%	0.00%	0.00%
BMV	Light Commercial Truck	32	2015	49.24%	46.54%	4.14%	0.00%	0.00%	0.08%

Appendix B – Updated Hourly VMT Fractions Derived from INDOT Data

Table B-1: Hourly VMT Fraction: RoadType 1, Off Network

	SourceTypeID												
Hr	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
2	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
3	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
4	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
6	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
7	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
8	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
9	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
10	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
11	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
12	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
13	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
14	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
15	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
16	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
17	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077
18	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077
19	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
20	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
21	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
22	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
23	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
24	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018

- RoadType1 uses default values

Table B-2: Hourly VMT Fraction: RoadType 2, Rural Restricted Access

	SourceTypeID												
Hr	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.017	0.010	0.008	0.008	0.017	0.017	0.017	0.010	0.010	0.007	0.007	0.038	0.027
2	0.012	0.006	0.005	0.005	0.019	0.019	0.019	0.008	0.008	0.010	0.010	0.019	0.024
3	0.010	0.004	0.004	0.004	0.026	0.026	0.026	0.008	0.008	0.006	0.006	0.023	0.025
4	0.010	0.004	0.004	0.004	0.019	0.019	0.019	0.009	0.009	0.008	0.008	0.036	0.023
5	0.010	0.006	0.007	0.007	0.033	0.033	0.033	0.012	0.012	0.013	0.013	0.025	0.026
6	0.012	0.016	0.021	0.021	0.036	0.036	0.036	0.032	0.032	0.025	0.025	0.028	0.031
7	0.028	0.035	0.042	0.042	0.064	0.064	0.064	0.065	0.065	0.046	0.046	0.039	0.036
8	0.052	0.050	0.049	0.049	0.044	0.044	0.044	0.073	0.073	0.056	0.056	0.047	0.037
9	0.055	0.046	0.048	0.048	0.060	0.060	0.060	0.056	0.056	0.057	0.057	0.048	0.041
10	0.055	0.046	0.049	0.049	0.052	0.052	0.052	0.050	0.050	0.058	0.058	0.043	0.050
11	0.055	0.053	0.057	0.057	0.067	0.067	0.067	0.051	0.051	0.060	0.060	0.061	0.056
12	0.051	0.058	0.061	0.061	0.057	0.057	0.057	0.049	0.049	0.060	0.060	0.065	0.061
13	0.059	0.059	0.063	0.063	0.074	0.074	0.074	0.053	0.053	0.069	0.069	0.063	0.062
14	0.060	0.061	0.062	0.062	0.050	0.050	0.050	0.052	0.052	0.063	0.063	0.057	0.059
15	0.064	0.064	0.066	0.066	0.052	0.052	0.052	0.055	0.055	0.065	0.065	0.048	0.057
16	0.064	0.074	0.074	0.074	0.075	0.075	0.075	0.063	0.063	0.073	0.073	0.051	0.057
17	0.069	0.084	0.083	0.083	0.071	0.071	0.071	0.075	0.075	0.073	0.073	0.051	0.055
18	0.069	0.090	0.083	0.083	0.036	0.036	0.036	0.076	0.076	0.066	0.066	0.041	0.049
19	0.066	0.073	0.066	0.066	0.026	0.026	0.026	0.065	0.065	0.053	0.053	0.032	0.043
20	0.059	0.052	0.049	0.049	0.034	0.034	0.034	0.046	0.046	0.043	0.043	0.033	0.038
21	0.038	0.041	0.037	0.037	0.030	0.030	0.030	0.034	0.034	0.036	0.036	0.034	0.035
22	0.036	0.031	0.028	0.028	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.033	0.040
23	0.025	0.023	0.021	0.021	0.020	0.020	0.020	0.020	0.020	0.016	0.016	0.047	0.036
24	0.023	0.015	0.013	0.013	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.038	0.033

Source: INDOT Selected Weigh in Motion and ATR site data

Table B-3: Hourly VMT Fraction: RoadType 3, Rural Unrestricted Access

	SourceTypeID												
Hr	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.009	0.005	0.005	0.005	0.002	0.002	0.002	0.003	0.003	0.005	0.005	0.010	0.006
2	0.005	0.003	0.002	0.002	0.002	0.002	0.002	0.020	0.020	0.007	0.007	0.007	0.004
3	0.004	0.003	0.002	0.002	0.002	0.002	0.002	0.014	0.014	0.007	0.007	0.005	0.003
4	0.004	0.004	0.003	0.003	0.002	0.002	0.002	0.008	0.008	0.008	0.008	0.005	0.004
5	0.018	0.010	0.008	0.008	0.004	0.004	0.004	0.003	0.003	0.011	0.011	0.009	0.009
6	0.016	0.017	0.023	0.023	0.015	0.015	0.015	0.034	0.034	0.030	0.030	0.021	0.021
7	0.009	0.023	0.032	0.032	0.025	0.025	0.025	0.062	0.062	0.063	0.063	0.033	0.033
8	0.009	0.040	0.044	0.044	0.088	0.088	0.088	0.096	0.096	0.051	0.051	0.038	0.046
9	0.036	0.044	0.050	0.050	0.077	0.077	0.077	0.073	0.073	0.047	0.047	0.047	0.044
10	0.018	0.055	0.066	0.066	0.053	0.053	0.053	0.084	0.084	0.072	0.072	0.058	0.054
11	0.027	0.065	0.074	0.074	0.134	0.134	0.134	0.073	0.073	0.072	0.072	0.067	0.067
12	0.091	0.075	0.088	0.088	0.108	0.108	0.108	0.107	0.107	0.083	0.083	0.069	0.077
13	0.118	0.077	0.084	0.084	0.050	0.050	0.050	0.067	0.067	0.076	0.076	0.071	0.079
14	0.132	0.075	0.071	0.071	0.093	0.093	0.093	0.062	0.062	0.065	0.065	0.072	0.079
15	0.146	0.076	0.072	0.072	0.105	0.105	0.105	0.076	0.076	0.049	0.049	0.072	0.083
16	0.036	0.086	0.085	0.085	0.015	0.015	0.015	0.059	0.059	0.050	0.050	0.065	0.088
17	0.064	0.089	0.081	0.081	0.066	0.066	0.066	0.076	0.076	0.042	0.042	0.065	0.085
18	0.046	0.083	0.071	0.071	0.034	0.034	0.034	0.037	0.037	0.055	0.055	0.074	0.072
19	0.073	0.056	0.053	0.053	0.056	0.056	0.056	0.011	0.011	0.063	0.063	0.068	0.049
20	0.046	0.041	0.034	0.034	0.031	0.031	0.031	0.008	0.008	0.055	0.055	0.052	0.034
21	0.027	0.028	0.023	0.023	0.005	0.005	0.005	0.008	0.008	0.037	0.037	0.037	0.025
22	0.028	0.022	0.014	0.014	0.028	0.028	0.028	0.003	0.003	0.025	0.025	0.027	0.017
23	0.018	0.014	0.011	0.011	0.002	0.002	0.002	0.011	0.011	0.017	0.017	0.016	0.012
24	0.018	0.008	0.005	0.005	0.002	0.002	0.002	0.006	0.006	0.010	0.010	0.013	0.008

Source: INDOT Selected Weigh in Motion and ATR site data

Table B-4: Hourly VMT Fraction: RoadType 4, Urban Restricted Access

	SourceTypeID												
Hr	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.003	0.014	0.012	0.012	0.018	0.018	0.018	0.010	0.010	0.018	0.018	0.017	0.026
2	0.004	0.008	0.007	0.007	0.017	0.017	0.017	0.007	0.007	0.012	0.012	0.013	0.024
3	0.004	0.005	0.005	0.005	0.013	0.013	0.013	0.005	0.005	0.009	0.009	0.011	0.024
4	0.007	0.005	0.005	0.005	0.013	0.013	0.013	0.006	0.006	0.008	0.008	0.012	0.024
5	0.012	0.006	0.009	0.009	0.015	0.015	0.015	0.009	0.009	0.011	0.011	0.015	0.027
6	0.007	0.014	0.023	0.023	0.027	0.027	0.027	0.020	0.020	0.017	0.017	0.018	0.033
7	0.009	0.029	0.049	0.049	0.038	0.038	0.038	0.040	0.040	0.027	0.027	0.032	0.040
8	0.016	0.046	0.058	0.058	0.042	0.042	0.042	0.053	0.053	0.051	0.051	0.062	0.045
9	0.112	0.061	0.058	0.058	0.058	0.058	0.058	0.057	0.057	0.080	0.080	0.079	0.049
10	0.214	0.056	0.054	0.054	0.076	0.076	0.076	0.059	0.059	0.058	0.058	0.055	0.048
11	0.109	0.049	0.052	0.052	0.071	0.071	0.071	0.057	0.057	0.059	0.059	0.058	0.053
12	0.029	0.050	0.051	0.051	0.061	0.061	0.061	0.058	0.058	0.055	0.055	0.055	0.056
13	0.030	0.052	0.053	0.053	0.061	0.061	0.061	0.059	0.059	0.058	0.058	0.054	0.057
14	0.033	0.056	0.056	0.056	0.065	0.065	0.065	0.060	0.060	0.058	0.058	0.053	0.056
15	0.040	0.060	0.060	0.060	0.067	0.067	0.067	0.065	0.065	0.058	0.058	0.051	0.058
16	0.040	0.066	0.067	0.067	0.068	0.068	0.068	0.072	0.072	0.062	0.062	0.055	0.056
17	0.029	0.076	0.079	0.079	0.058	0.058	0.058	0.080	0.080	0.064	0.064	0.068	0.055
18	0.147	0.081	0.078	0.078	0.052	0.052	0.052	0.075	0.075	0.055	0.055	0.066	0.049
19	0.085	0.076	0.067	0.067	0.048	0.048	0.048	0.063	0.063	0.068	0.068	0.065	0.045
20	0.022	0.058	0.049	0.049	0.039	0.039	0.039	0.047	0.047	0.057	0.057	0.051	0.042
21	0.016	0.043	0.036	0.036	0.028	0.028	0.028	0.035	0.035	0.039	0.039	0.036	0.039
22	0.012	0.035	0.029	0.029	0.023	0.023	0.023	0.026	0.026	0.028	0.028	0.029	0.035
23	0.007	0.030	0.025	0.025	0.021	0.021	0.021	0.020	0.020	0.024	0.024	0.025	0.031
24	0.012	0.022	0.018	0.018	0.019	0.019	0.019	0.015	0.015	0.023	0.023	0.022	0.029

Source: INDOT Selected Weigh in Motion and ATR site data

Table B-5: Hourly VMT Fraction: RoadType 5, Urban Unrestricted Access

	SourceTypeID												
Hr	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.009	0.009	0.006	0.006	0.013	0.013	0.013	0.004	0.004	0.004	0.004	0.011	0.011
2	0.006	0.005	0.004	0.004	0.010	0.010	0.010	0.004	0.004	0.004	0.004	0.012	0.012
3	0.005	0.004	0.003	0.003	0.007	0.007	0.007	0.004	0.004	0.004	0.004	0.012	0.012
4	0.005	0.004	0.004	0.004	0.011	0.011	0.011	0.006	0.006	0.006	0.006	0.014	0.014
5	0.008	0.008	0.009	0.009	0.015	0.015	0.015	0.009	0.009	0.009	0.009	0.021	0.021
6	0.023	0.020	0.024	0.024	0.026	0.026	0.026	0.019	0.019	0.019	0.019	0.030	0.030
7	0.044	0.048	0.054	0.054	0.045	0.045	0.045	0.042	0.042	0.042	0.042	0.044	0.044
8	0.060	0.072	0.068	0.068	0.069	0.069	0.069	0.073	0.073	0.073	0.073	0.059	0.059
9	0.056	0.057	0.064	0.064	0.075	0.075	0.075	0.088	0.088	0.088	0.088	0.064	0.064
10	0.049	0.047	0.060	0.060	0.080	0.080	0.080	0.092	0.092	0.092	0.092	0.068	0.068
11	0.050	0.047	0.059	0.059	0.077	0.077	0.077	0.094	0.094	0.094	0.094	0.070	0.070
12	0.057	0.052	0.062	0.062	0.075	0.075	0.075	0.091	0.091	0.091	0.091	0.070	0.070
13	0.061	0.056	0.063	0.063	0.074	0.074	0.074	0.090	0.090	0.090	0.090	0.069	0.069
14	0.061	0.056	0.063	0.063	0.078	0.078	0.078	0.091	0.091	0.091	0.091	0.067	0.067
15	0.065	0.061	0.067	0.067	0.076	0.076	0.076	0.091	0.091	0.091	0.091	0.065	0.065
16	0.072	0.072	0.075	0.075	0.073	0.073	0.073	0.078	0.078	0.078	0.078	0.061	0.061
17	0.077	0.080	0.076	0.076	0.053	0.053	0.053	0.046	0.046	0.046	0.046	0.056	0.056
18	0.077	0.083	0.068	0.068	0.035	0.035	0.035	0.026	0.026	0.026	0.026	0.051	0.051
19	0.064	0.064	0.053	0.053	0.029	0.029	0.029	0.017	0.017	0.017	0.017	0.040	0.040
20	0.048	0.046	0.037	0.037	0.022	0.022	0.022	0.011	0.011	0.011	0.011	0.031	0.031
21	0.038	0.039	0.029	0.029	0.017	0.017	0.017	0.008	0.008	0.008	0.008	0.027	0.027
22	0.031	0.033	0.024	0.024	0.014	0.014	0.014	0.006	0.006	0.006	0.006	0.023	0.023
23	0.021	0.024	0.017	0.017	0.014	0.014	0.014	0.005	0.005	0.005	0.005	0.019	0.019
24	0.015	0.016	0.011	0.011	0.012	0.012	0.012	0.005	0.005	0.005	0.005	0.016	0.016

Source: INDOT Selected Weigh in Motion and ATR site data

Appendix C – Inputs Carried Over from MOVES2010a Rate Development

Table C-1: Indiana Default VMT Distributions by Vehicle Type and Road Type

Road Type	Motorcycle	Passenger Car	Light Duty Truck	Bus	Single Unit Truck	Combination Truck
2	0.00703	0.50641	0.16379	0.00417	0.00777	0.31082
3	0.00173	0.65975	0.22577	0.00079	0.01096	0.10099
4	0.00397	0.56995	0.25420	0.00283	0.00908	0.15996
5	0.00279	0.70275	0.24524	0.00140	0.00976	0.03805

Source: Statewide averages developed from Indiana Department of Transportation traffic count data.

Table C-2: Indiana Default Daily Distribution Factors

	dayID	
monthID	2	5
1	0.232541	0.767459
2	0.238055	0.761945
3	0.239340	0.760660
4	0.239605	0.760395
5	0.248476	0.751524
6	0.248974	0.751026
7	0.248115	0.751885
8	0.252703	0.747297
9	0.249608	0.750392
10	0.246281	0.753719
11	0.243974	0.756026
12	0.225878	0.774122

Source: Statewide averages developed from Indiana Department of Transportation traffic count data

Table C-3: Indiana Default Monthly Distribution Factors

monthID	monthVMTFraction
1	0.07334
2	0.06937
3	0.08270
4	0.08318
5	0.08913
6	0.08882
7	0.09080
8	0.09185
9	0.08542
10	0.08752
11	0.08124
12	0.07664

Source: Statewide averages developed from Indiana Department of Transportation traffic count data.

Indiana Department of Transportation
Air Quality Post-Processor

INDOT Planning Contract

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CDM Smith

INDIANA DEPARTMENT OF TRANSPORTATION
INDOT

Table of Contents

Introduction

There is a need to efficiently and effectively calculate emissions inventories for any area that is in non-attainment of the National Ambient Air Quality Standards (NAAQS). The current version of the mobile source emissions model developed by the U.S. Environmental Protection Agency (EPA) is the Motor Vehicle Emissions Simulator (MOVES). MOVES replaces its predecessor model, Mobile6.2. On March 2, 2010 EPA released a federal register notice officially announcing the release of MOVES and its adoption by EPA as the standard emissions model for the development of State Implementation Plans (SIP) and regional transportation conformity analyses. The notice also kicked off a two year grace period after which Mobile6.2 will no longer be accepted for SIP and regional conformity analyses and MOVES will be required. Though as of this writing, there is a proposed rulemaking issued October 13, 2011 by EPA that would extend the grace period by another year to March 3, 2013, there is yet to be a final ruling. The previous final ruling was withdrawn on December 5, 2011 due to adverse comments. While a final rule on the grace period extension is still pending, many state agencies and metropolitan planning organizations (MPO) have begun the process of transitioning their air quality analysis practices to make use of MOVES. The current version of MOVES is MOVES2010a.

While it is possible to use MOVES to calculate emissions inventories directly, EPA policy does support the use of emissions rates produced by MOVES as applied to key outputs developed by a travel demand model. These outputs include vehicle-miles-traveled (VMT), vehicle-hours traveled (VHT), and speeds. The benefits of using the emissions rates from MOVES as part of an air quality post-processor for a travel demand model are greater ease and precision in assessing the benefits to air quality achieved by improvements to the area's transportation system.

It is for these reasons that the Indiana Department of Transportation (INDOT) developed a post-processing tool for applying emissions rates developed in MOVES to the output data produced by the travel demand models used in Indiana. Since the majority of the travel demand models used in Indiana run on the TransCAD modeling platform, this tool was developed in that platform. For those cases in which a model exists in a platform other than TransCAD, the requisite input data can be imported into the proper TransCAD formats and used with this tool.

This document contains information on the INDOT Air Quality Post Processor (AQPP) developed for Indiana Department of Transportation. The methodology, specifications of the tool, installation, setup, and application steps; file directory structure, and input / output files and data are presented. This document assumes the user has familiarity with TransCAD software. There are two general sections in this document. The first section discusses the methodology employed in the INDOT AQPP. The second section is a users' guide that provides instruction on how to use the INDOT AQPP.

Methodology

The INDOT AQPP was developed to calculate emissions estimates through the application of emissions rates developed in MOVES to the outputs of travel demand models. Though MOVES can calculate emissions inventories directly, the effort involved in preprocessing the input data sets needed to

accurately reflect each transportation and land use scenario being analyzed can be quite effort intensive. Though the initial pre-processing required to develop emissions rates in MOVES is comparable to running MOVES in emissions inventory mode, once the emissions rates have been developed, they can continue to be applied to travel demand model outputs without further preprocessing. This is particularly advantageous if one is planning to test a variety of transportation scenarios.

The methodology employed in the INDOT AQPP is fairly straightforward. The INDOT AQPP takes travel demand model data as an input along with the emissions rates developed in MOVES. The travel demand model vehicle-miles-traveled are then disaggregated into a fine level of detail and factored by the emissions rates to produce emissions estimates. **Figure 1** shows a flowchart of the post-processor's function. The rest of this section describes the data files and disaggregation methods used by the INDOT AQPP.

Travel Demand Model Inputs

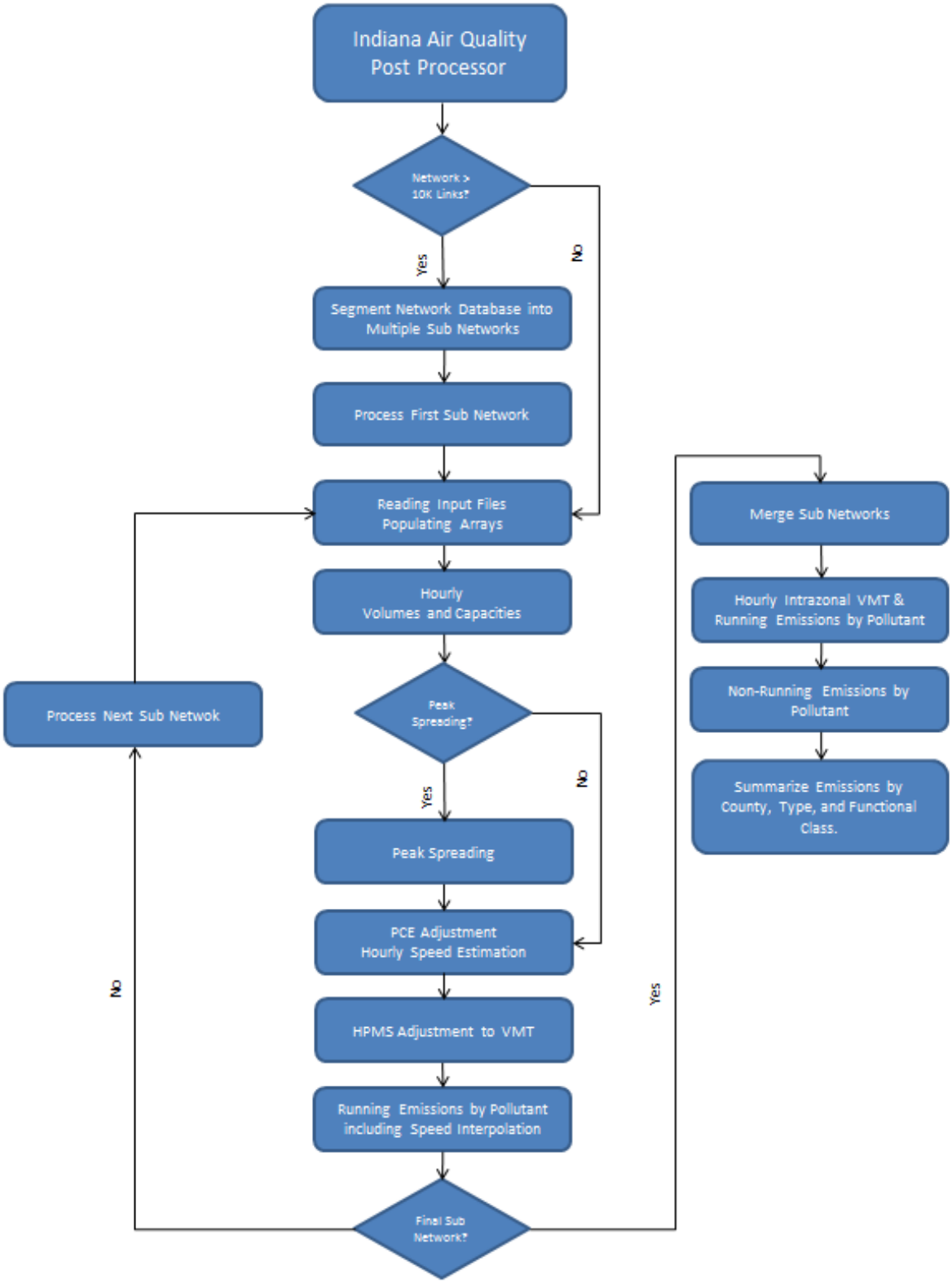
Each scenario executed using the INDOT AQPP requires the user to supply two separate files containing data from a travel demand model. These files must be provided in a specific format for use in the post-processor. The INDOT AQPP does not automatically format the required data. The user will need to create these tables by formatting their travel demand model outputs as needed.

Link Table – This file contains data on travel demand occurring on the roadway network corresponding to the area of analysis. It can possess any file name desired by the user. This file is to be formatted as a TransCAD fixed-format binary (FFB) file with the following attributes:

Name: Any
File Format: TransCAD Fixed Format Binary (FFB)

Field	Type	Width	Decimals	Description
LinkID	Integer (4 bytes)	10	0	Unique ID number per link
Dir	Integer (2 bytes)	2	0	TransCAD direction code
Length	Real (4 bytes)	10	2	Link length in miles
County	Character	16	0	County name
HPMS_FC	Integer (4 bytes)	10	0	HPMS functional classification code
ROAD_TYPE	Integer (4 bytes)	8	0	MOVES road type code
AB_Alpha	Real (8 bytes)	12	2	BPR VDF alpha parameter in the AB and BA directions
BA_Alpha	Real (8 bytes)	12	2	
AB_Beta	Real (8 bytes)	12	2	BPR VDF beta parameter in the AB and BA directions
BA_Beta	Real (8 bytes)	12	2	
AB_FF_TIME	Real (8 bytes)	12	2	Free-flow travel time in minutes in the AB and BA directions
BA_FF_TIME	Real (8 bytes)	12	2	
AB_CAP	Real (8 bytes)	10	2	Hourly directional capacity in the AB and BA directions
BA_CAP	Real (8 bytes)	10	2	
AB_Veh_Flow	Real (8 bytes)	10	2	Total daily directional vehicle flow in the AB and BA directions
BA_Veh_Flow	Real (8 bytes)	10	2	

Figure 1: INDOT AQPP Flow Chart



Intrazonal Table – This file contains information on travel occurring on roadway facilities not captured on the model's highway network. This could include travel in parking lots, on driveways, and on local and subdivision streets. As these activities account for some amount of running emissions, the INDOT AQPP accounts for these by analyzing intrazonal travel. Intrazonal travel is all travel that is said to occur interior to a traffic analysis zone (TAZ) and as such is never assigned to the model's highway network. This information will need to be developed by analyzing the model's vehicle trip table and distance skim matrix. The file can have any name desired by the user. This file is to be formatted as a TransCAD fixed-format binary (FFB) file with the following attributes:

Name: Any
File Format: TransCAD Fixed Format Binary (FFB)

Field	Type	Width	Decimals	Description
TAZ_ID	Integer (4 bytes)	10	0	TAZ ID number
County	Character	16	0	County name
Area_Type	Character	10	0	Area type: URBAN RURAL
Distance	Real (8 bytes)	10	2	Average intrazonal travel distance in miles
Dly_Intrazonal_Trips	Real (8 bytes)	10	2	Number of intrazonal vehicle trips

MOVES Emissions Rates Files

The post processor makes use of up to three emissions rates files developed by MOVES based on scenario. These files are:

- Rate per Distance: captures running exhaust, break wear, and tire wear
- Rate per Vehicle: capture start and idle exhaust
- Rate per Profile: capture evaporative emissions when vehicles are stationary

Each of these files is exported directly from the SQL output databases generated by MOVES into a comma delimited text (CSV) format. INDOT extended an offer to develop emissions rates for any analysis area in the state that wished to participate. Emissions rates files were developed for those areas that elected to participate. The rates were produced in consultation with each analysis area's interagency consultation group (ICG). The input data and MOVES reports for these areas are documented in a series of ICG coordination documents that are available from INDOT. For those analysis areas that chose not to participate in the emissions rate development process, the INDOT AQPP is still available for their use. All that is required is that the user has emissions rates available in the formats described below. These files should be copied into the Master Inputs subfolder of the AQPP folder.

Rate per Distance – This file contains emissions rates that are applied by the INDOT AQPP to travel demand model VMT. The file must be in CSV format and should be directly exported from the SQL

ratesperdistance database generated by MOVES for a given scenario. This file should be in the following format:

Name: XXXX_yyyy_ratesperdistance_zz.csv; where,

- XXXX = first four characters of the analysis area name as displayed in the INDOT AQPP menu
- yyyy = four number year
- zz = pollution abbreviation (oz = ozone, pm = particulate matter 2.5)

File Format: comma delimited text (CSV)

Field	Description
MOVESScenarioID	MOVES scenario ID number
MOVESRunID	MOVES run number
yearID	Four digit year
monthID	Month code
dayID	MOVES day type code
hourID	MOVES hour
linkID	MOVES link ID number (not reported as MOVES output)
pollutantID	MOVES pollutant code
processID	MOVES emissions process code
sourceTypeID	MOVES source type code
SCC	Source Classification Code (not reported as MOVES output)
fuelTypeID	MOVES fuel type code (not reported as MOVES output)
modelYearID	Vehicle model year (not reported as MOVES output)
roadTypeID	MOVES road type code
avgSpeedBinID	MOVES speed bin code
temperature	Average temperature (not reported as MOVES output)
relHumidity	Relative humidity (not reported as MOVES output)
ratePerDistance	Emissions rate per VMT

Rate per Vehicle – This file contains emissions rates that are applied by the INDOT AQPP to vehicle population data. These population data are the same as those used to develop the emissions rates in MOVES. The file must be in CSV format and should be directly exported from the SQL ratespervehicle database generated by MOVES for a given scenario. This file should be in the following format:

Name: XXXX_yyyy_ratespervehicle_zz.csv; where,

- XXXX = first four characters of the analysis area name as displayed in the INDOT AQPP menu
- yyyy = four number year
- zz = pollution abbreviation (oz = ozone, pm = particulate matter 2.5)

File Format: comma delimited text (CSV)

Field	Description
MOVESScenarioID	MOVES scenario ID number
MOVESRunID	MOVES run number
yearID	Four digit year

monthID	Month code
dayID	MOVES day type code
hourID	MOVES hour
zoneID	Geographic location based on FIPS code
pollutantID	MOVES pollutant code
processID	MOVES emissions process code
sourceTypeID	MOVES source type code
SCC	Source Classification Code (not reported as MOVES output)
fuelTypeID	MOVES fuel type code (not reported as MOVES output)
modelYearID	Vehicle model year (not reported as MOVES output)
temperature	Average temperature (not reported as MOVES output)
ratePerVehicle	Emissions rate per vehicle

Rate per Profile – This file contains emissions rates that are applied by the INDOT AQPP to vehicle population data. These population data are the same as those used to develop the emissions rates in MOVES. The file must be in CSV format and should be directly exported from the SQL ratesperprofile database generated by MOVES for a given scenario. This file should be in the following format:

Name: XXXX_yyyy_ratesperdistance_zz.csv; where,

- XXXX = first four characters of the analysis area name as displayed in the INDOT AQPP menu
- yyyy = four number year
- zz = pollution abbreviation (oz = ozone, pm = particulate matter 2.5)

File Format: comma delimited text (CSV)

Field Names:	**Description**
MOVESScenarioID	MOVES scenario ID number
MOVESRunID	MOVES run number
temperatureProfileID	MOVES temperature profile code
yearID	Four digit year
dayID	MOVES day type code
hourID	MOVES hour
pollutantID	MOVES pollutant code
processID	MOVES emissions process code
sourceTypeID	MOVES source type code
SCC	Source Classification Code (not reported as MOVES output)
fuelTypeID	MOVES fuel type code (not reported as MOVES output)
modelYearID	Vehicle model year (not reported as MOVES output)
temperature	Average temperature (not reported as MOVES output)
ratePerVehicle	Emissions rate per vehicle

Miscellaneous Files

The INDOT AQPP also makes use of a number of other files. Except where noted, these files are all supplied with the post-processor.

Hour VMT Fraction – This file contains the factors necessary to divide daily VMT into hourly VMT. The factors contained in this file are the same as those used by INDOT to develop the emissions rates. These factors were developed based on an analysis of twenty permanent traffic count stations around the state. The format of the file is as follows:

Name: HourVMTFraction.csv
File Format: comma delimited text (CSV)

Field	Description
sourceTypeID	MOVES vehicle source type code
roadTypeID	MOVES road type code
dayID	MOVES day type code
hourID	MOVES hour code
hourVMTFraction	Hourly VMT factor

HPMS Adjustment Factors – This file contains adjustment factors that can be used to convert the model VMT inputs to values more consistent with HPMS VMT estimates. Though the consistent consensus throughout the ICG process for analysis areas in Indiana has been to not use HPMS adjustment factors, this feature has been included as an option should the use of adjustment factors be desired at some point in the future. The format of the file is as follows:

Name: HPMS_Adjustment.bin
File Format: TransCAD Fixed Format Binary (FFB)

Field	Type	Width	Decimals	Description
County	Character	25	0	County name
AdjFC_1	Real (8 bytes)	16	4	Adjustment factor for functional class 1
AdjFC_2	Real (8 bytes)	16	4	Adjustment factor for functional class 2
AdjFC_6	Real (8 bytes)	16	4	Adjustment factor for functional class 6
AdjFC_7	Real (8 bytes)	16	4	Adjustment factor for functional class 7
AdjFC_8	Real (8 bytes)	16	4	Adjustment factor for functional class 8
AdjFC_9	Real (8 bytes)	16	4	Adjustment factor for functional class 9
AdjFC_11	Real (8 bytes)	16	4	Adjustment factor for functional class 11
AdjFC_12	Real (8 bytes)	16	4	Adjustment factor for functional class 12
AdjFC_14	Real (8 bytes)	16	4	Adjustment factor for functional class 14
AdjFC_16	Real (8 bytes)	16	4	Adjustment factor for functional class 16
AdjFC_17	Real (8 bytes)	16	4	Adjustment factor for functional class 17
AdjFC_19	Real (8 bytes)	16	4	Adjustment factor for functional class 19

Vehicle Class Distributions – This file is used in combination with the source type population data for any given scenario to disaggregate the total vehicle flows on each link into thirteen distinct vehicle flows based on MOVES source types. The format of the file is as follows:

Name: VehClassDist.csv
File Format: comma delimited text (CSV)

Field	Description
RoadType	Moves road type code
Motorcycle	Fraction of VMT belonging to motor-cycles for this road type
Passenger Car	Fraction of VMT belonging to passenger cars for this road type
Passenger Truck	Fraction of VMT belonging to passenger trucks for this road type
Bus	Fraction of VMT belonging to busses for this road type
Single Unit Truck	Fraction of VMT belonging to single unit trucks for this road type
Combination Truck	Fraction of VMT belonging to combination trucks for this road type

Source Type Populations – This file contains scenario specific source type population data. These data identify the number of vehicles for each MOVES source type that are believed to be located in the analysis area. For areas that participated in the INDOT effort to develop emissions rates, source type population data that has the consensus of the ICG have been developed and are provided with the post-processor. All other areas wishing to make use of the post-processor will need to provide source type population data in the following format:

Name: XXXX_yyyy_SourceTypePopulation.csv; where,

- XXXX = first four characters of the analysis area name as displayed in the INDOT AQPP menu
- yyyy = four number year

File Format: comma delimited text (CSV)

Field	Description
yearID	Four digit year of the scenario
sourceTypeID	MOVES source type code
sourceTypePopulation	Number of vehicles located in analysis area for that source type

Year List – This file contains a list of all available years four up to eight possible scenarios per analysis area. Should the user decide to run a scenario for a year not listed in the INDOT AQPP, this table will need to be modified to contain the desired year. The user should note that other input data used by the post-processor are also year sensitive. Year specific source type populations and emissions rates will be needed along with year specific travel demand model outputs in order to use the INDOT AQPP for a given year.

Name: Yearlist.csv

File Format: comma delimited text (CSV)

Field	Description
Alle_oz	Four digit scenario years for Allen County for ozone scenarios
Ande_oz	Four digit scenario years for the Anderson MPO for ozone scenarios
Cent_oz	Four digit scenario years for Central Indiana for ozone scenarios
Cent_pm	Four digit scenario years for Central Indiana for pm 2.5 scenarios
Cent_both	Not used
Clar_oz	Four digit scenario years for Clark and Floyd Counties for ozone scenarios
Clar_pm	Four digit scenario years for Clark and Floyd Counties for pm 2.5 scenarios
Clar_both	Not used
Madi_pm	Four digit scenario years for Madison Township for pm 2.5 scenarios
Evan_oz	Four digit scenario years for the Evansville MPO for ozone scenarios
Evan_pm	Four digit scenario years for the Evansville MPO for pm 2.5 scenarios
Evan_both	Not used
Non-_pm	Four digit scenario years for Non-MPO Southwestern IN for ozone scenarios
Lake_oz	Four digit scenario years for Lake and Porter Counties for ozone scenarios
Lake_pm	Four digit scenario years for Lake and Porter Counties for pm 2.5 scenarios
Lake_both	Not used
LaPo_oz	Four digit scenario years for La Porte County for ozone scenarios
Lawr_oz	Four digit scenario years for Lawrenceburg Township for ozone scenarios
Lawr_pm	Four digit scenario years for Lawrenceburg Township for pm 2.5 scenarios
Lawr_both	Not used
Lint_oz	Four digit scenario years for Linton for ozone scenarios
Munc_oz	Four digit scenario years for Muncie for ozone scenarios
Seym_oz	Four digit scenario years for Seymour for ozone scenarios
Sain_oz	Four digit scenario years for Saint Joseph and Elkhart Counties for ozone scenarios
Terr_oz	Four digit scenario years for the Terre Haute MPO for ozone scenarios

Vehicle Flow Disaggregation

Some of the travel demand models used in Indiana are 24-hour daily models while others are time-of-day. Some models assign trips to the highway network distinguishing by vehicle types while others do not. Even in cases where the travel demand models used possess a greater level of detail in terms of temporal resolution or vehicle types being modeled, the validation of these more detailed elements is typically less rigorous than the validation of overall 24-hour total daily volumes. The INDOT AQPP was designed to work with total daily directional vehicle flows. This allows emissions estimates to be applied using a universal method throughout the state while relying on the most reliable element of a highway assignment, the total daily vehicle flow. These daily flows are then disaggregated in the INDOT AQPP

using a variety of factors developed through an analysis of traffic count data taken from throughout Indiana.

The factors were developed by analyzing four years of continuous hourly vehicle classification count data taken from twenty automated traffic recording (ATR) stations located throughout the state. These stations were correlated with MOVES road types and hourly factors by road type by vehicle type were developed. The data collected were carefully reviewed for reasonableness. Some stations reported odd or irregular traffic patterns for some or all of the vehicle classes analyzed. These irregularities may have been due to equipment malfunction, human error, or the unique characteristics of the location where the data collection occurred. The irregular counts were removed from the analysis to avoid biasing the results.

There are two forms of vehicle flow disaggregation performed by the INDOT AQPP:

- Source type disaggregation
- Hourly disaggregation

Source Type Disaggregation – The INDOT AQPP disaggregates total vehicle flows from the travel demand model into source type flows. The result is a set of vehicle flows corresponding to the thirteen source type categories used in MOVES. This is accomplished first by disaggregating the vehicle flows into six primary vehicle types and then further subdividing the six vehicle types into the thirteen source types. The disaggregation into the six vehicle types is performed by applying a set of factors developed for this purpose. These factors are located in the *VehClassDist.csv* file and identify what percentage of traffic occurring on a given road type occur in each vehicle type. This file is the same for all analysis areas. The INDOT AQPP also develops a set of ratios based on the local and year specific source type population data to determine the percentage of each vehicle type that belongs in each source type.

Hourly Disaggregation – The INDOT AQPP also disaggregates daily vehicle flows into hourly source type flows. Once the vehicle flows have been subdivided into source type flows, the INDOT AQPP applies a set of hourly distribution factors that are specific to each source type and each road type. These factors are located in the *HourVMTFraction.csv* file. The factors were developed from the same source data as the vehicle type factors described above and are the same for all analysis areas in Indiana.

Peak Spreading

The INDOT AQPP possesses an optional peak spreading feature that can be selected by the user. The purpose of the peak spreading feature is to adjust link specific hourly volumes. Most travel demand models use “soft” capacity constraints when assigning vehicle trips to the network. When model links become congested, the model assesses higher travel times against those links. This makes those links less desirable during highway assignment with the result being a distribution of trips along the network that more closely reflects traveler responses to congestion. Despite these greater travel times, the model may still assign trips to over capacity links. In the case of extremely congested model networks, many links may be assigned at two to three times over capacity, if not more. In reality, such conditions would not occur as there are actual physical constraints on the number of vehicles carried on a

particular stretch of road. Peak spreading allows the post-processor to distribute high congestion traffic throughout the day to reflect the actual consequences of congestion encountered on a roadway network by travelers.

The peak spreading method used by the INDOT AQPP takes traffic occurring in hours that are over capacity and even distributes the over capacity component between the preceding hour and the next hour. This is done for all hours that are over capacity. Since the process may result in an hour that was previously under capacity becoming over capacity, the peak spreading is conducted iteratively until all hours of the day are at or under capacity.

Passenger cars and passenger trucks are treated as being highly sensitive to peak spreading while all other source types are treated as less sensitive. The INDOT AQPP checks the source type traffic volumes after the peak spreading adjustments have taken place to make sure that the final daily source type volumes continue to match the initial daily source type volumes fed into the peak spreading process. Due to these adjustments, the final peak spread volumes may not all be under capacity. This effect is more pronounced if the initial daily volumes result in high over-capacity rations in the peak hour. The end result is a set of source type hourly volumes that provide more reasonable volume to capacity relationships for use in the INDOT AQPP hourly speed estimation procedure.

Hourly Speed Estimation

The INDOT AQPP provides an estimate of hourly speeds for each link in the model network being analyzed. It does this by applying the Bureau of Public Roads (BPR) volume-delay function (VDF) found in many travel demand models.

$$T_1 = T_0 \left(1 + \alpha \left(\frac{V}{C}\right)^{\beta}\right)$$

Where:
T_1 = congested travel time
T_0 = free flow travel time
V = hourly directional volume
C = hourly directional capacity
α, β = BPR coefficient and exponent respectively

While some models may still employ the standard values of 0.15 for α and 4 for β, many models make use of carefully tailored parameters that are more reflective of the travel behavior in their local areas. The INDOT AQPP assumes no default values for either α or β. The user must supply these parameters. The link table input database developed by the user from the travel demand model loaded network has attribute fields intended to be populated with the exact values of α and β for each link.

The INDOT AQPP uses passenger car equivalent (PCE) factors when summing together the hourly source type flows to arrive at the total directional hourly vehicle flow used in the BPR function. The PCE for

motorcycles, passenger cars, passenger trucks, and light commercial trucks is 1.0. The PCE for buses and single unit trucks is 1.5. The PCE for combination trucks is 2.0.

Once hourly speeds for each link have been determined, these speeds are associated with the average speed bins used in MOVES.

Speed Bin Rate Interpolation

MOVES makes use of sixteen speed bins that further disaggregate emissions rates on the basis of the speed being encountered by a given source type for a given road type in a given hour. Each speed bin covers a range of travel speeds centered on an average speed for that bin. These bins are documented in the Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity issued by EPA.

A straightforward approach to using these speeds bins is to identify the bin within which the average travel speed of a given link is found. For example, if the average speed for a given hour on a given link is 23.4mph then the emissions rates associated with speed bin 6 would be used since the range of speeds associated with Speed Bin 6 is 22.5mph to 27.5mph. The MOVES users' guide recommends a more sophisticated approach that is believed to make the resulting emissions estimates less sensitive to minute changes in travel speeds. This is believed to result in more stable emissions estimates. The INDOT AQPP makes use of this more sophisticated method.

The INDOT AQPP identifies two speed bins for every speed estimated by the post-processor. One speed bin represents the bin which average bin speed is just below the estimated speed. The other speed bin represents the bin which average bin speed is just above the estimated speed. Returning to our previous example, Speed Bin 5 has an average bin speed of 20mph and Speed Bin 6 has an average bin speed of 25mph. Our example estimated speed of 23.4mph falls between the average bin speeds of these two bins. The post processor then interpolates an emission rate between the rates associated with these two bins based on the relationship of the estimated speed to these two average bin speeds. The following formula is used.

$$EmisRate = Rate_L + \frac{(Spd_E - Spd_L)\, Rate_H - (Spd_E - Spd_L)\, Rate_L}{Spd_H - Spd_L}$$

Where:
EmisRate = Emission rate used for estimating emissions
$Rate_L$ = Emission rate associated with the speed bin with the lower average bin speed
$Rate_H$ = Emission rate associated with the speed bin with the higher average bin speed
Spd_E = Estimated hourly speed
Spd_L = Average bin speed of the speed bin with the lower average bin speed
Spd_H = Average bin speed of the speed bin with the higher average bin speed

In cases where the estimated speed equals the average bin speed of a given speed bin, no interpolation takes place and the emissions rates associated with that speed bin are used. Intrazonal trips are assumed to have an estimated speed of 15mph for the purposes of this post processor.

Users' Guide

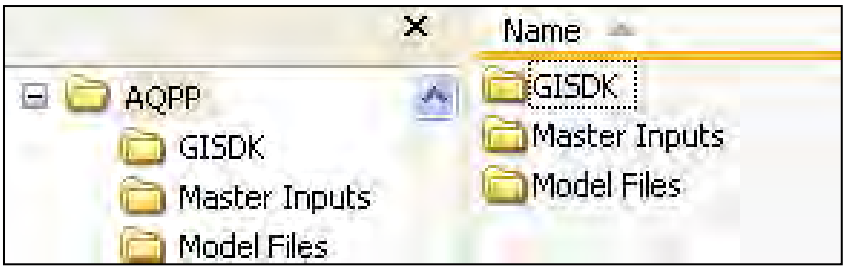
The INDOT AQPP is a relatively simple tool to use. This section provides instruction on the installation and use of this post-processor.

Specifications

The INDOT AQPP was developed in TransCAD version 5.0r4 travel demand modeling software. The AQPP uses output data from local area travel demand models as well as rates directly exported from MOVES. The program takes approximately 1 hour of runtime per 1,100 highway link records based on the following hardware configuration: Intel Core i5 CPU M540 @ 2.53GHz with 2.98 GB of RAM.

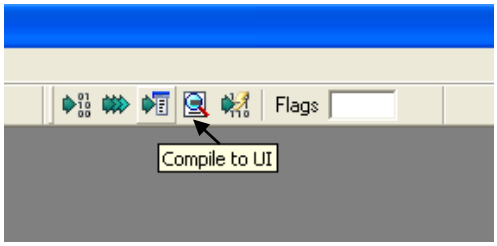
Directory Structure

The required directory structure and folder names for the INDOT AQPP are shown in the image below.



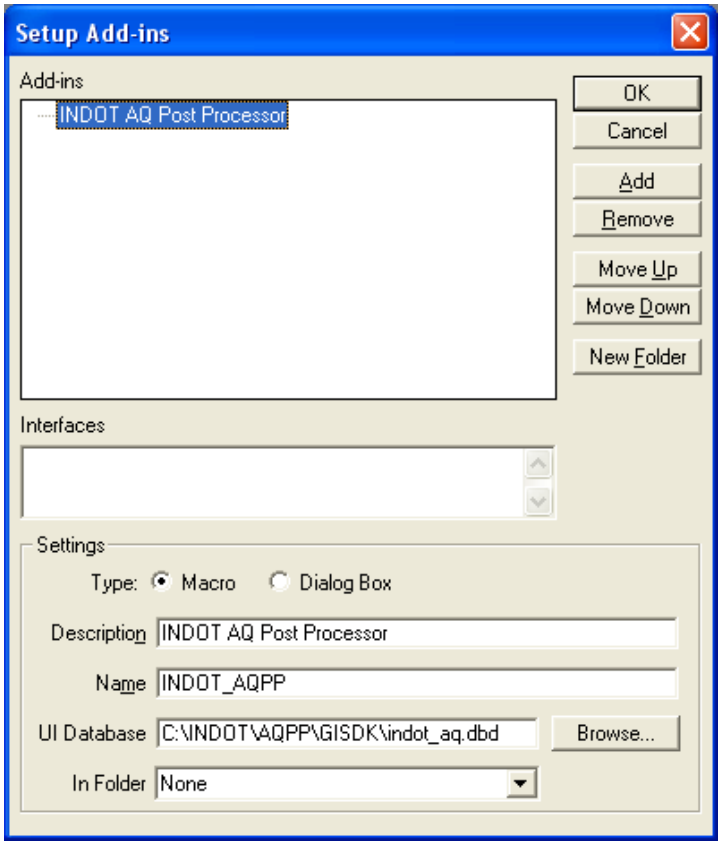
Installation

1. Copy the files provided to an appropriate folder on your hard drive. The default folder is "C:\INDOT\AQPP\".
2. Open TransCAD 5.0
3. Open the GIS Developer's Kit toolbox
4. Click on the middle button "Compile to UI"
    a. Browse to Open the resource file "INDOT_AQ_v122011.rsc"
    b. Browse to Save the user interface file "indot_aq.dbd"



5. From the Menu bar navigate to Tools > Setup Add-Ins…
6. From the "Setup Add-ins" dialogue box click "Add"

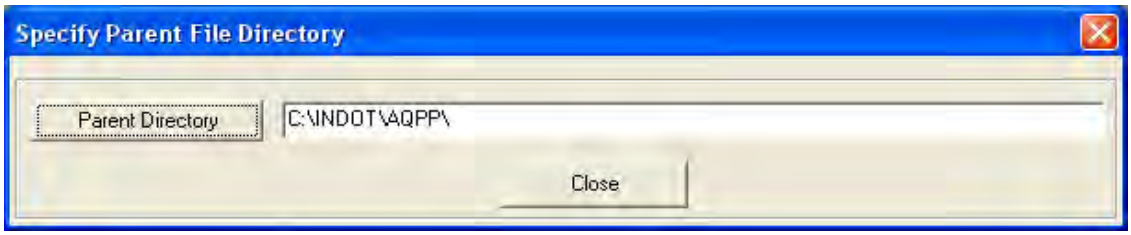
7. Fill out the Settings as shown below and click OK:
    a. Type: Macro
    b. Description: Can be user defined
    c. Name: INDOT_AQPP (must be exact)
    d. UI Database: browse to “indot_aq.dbd”
    e. In Folder: None



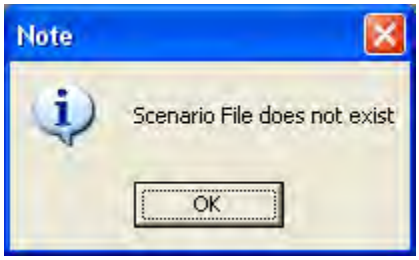
Note: The aforementioned steps only need to be completed once during the initial installation of the INDOT AQ Post Processor.

Setup

1. From the Menu bar navigate to Tools > Add-Ins > INDOT AQ Post Processor. This will launch the INDOT AQ Post Processor interface.
2. The “Specify Parent File Directory” dialog box will appear. The default parent directory is specified as “C:\INDOT\AQPP\”.
    a. Click “Parent Directory” to navigate to a new directory that houses all the AQPP files. This is the directory specified in step one of the Installation section.
    b. Click “Close” to accept the displayed parent directory.



3. If a scenario file (.scn) does not exist (such as the first time you are loading the interface) a note dialog box will appear saying “Scenario File does not exist”. This means that all settings will be blank/null. However, the next time you load the interface when a scenario file exist the latest settings will be activated.



4. The “Indiana Air Quality Post-Processor” dialog box will appear. The default Select Analysis Area is specified as null/blank. However, the previously selected analysis area will populate after initial execution of the interface.
    a. Click the dropdown bar to select a different analysis area
    b. Click “AQ Post-Processor” to open the scenario manager
    c. Click “Close” to exit the INDOT AQ Post Processor interface

5. After selecting the analysis area and clicking the “AQ Post-Processor” button the “Scenario Manager” dialog box will appear. The default scenario settings are specified as null/blank as shown in the first image blow. However, the previously specified settings will populate after initial execution of the interface as shown later in this document.
    a. Click “Main Menu” to navigate back to the “Indiana Air Quality Post-Processor” dialog box.

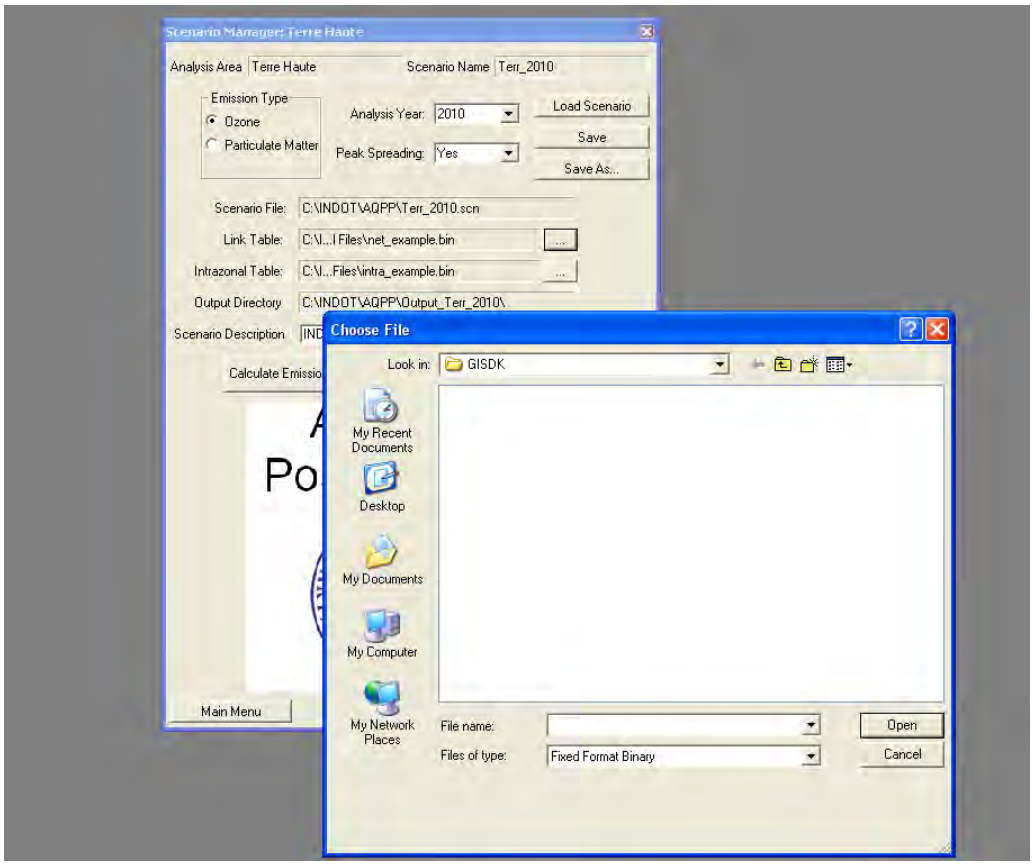
b. Click “Close” to exit the INDOT AQ Post Processor interface.

6. Populate the Settings:
   The settings that the user must specify include:
   a. Emission Type (toggle button)
   b. Analysis Year (dropdown item)
   c. Peak Spreading (dropdown item)
   d. Link Table (browse to file)
   e. Intrazonal Table (browse to file)
   f. Scenario Description (user defined text)
   g. Save / Save As… (overwrites or creates a .scn scenario file)

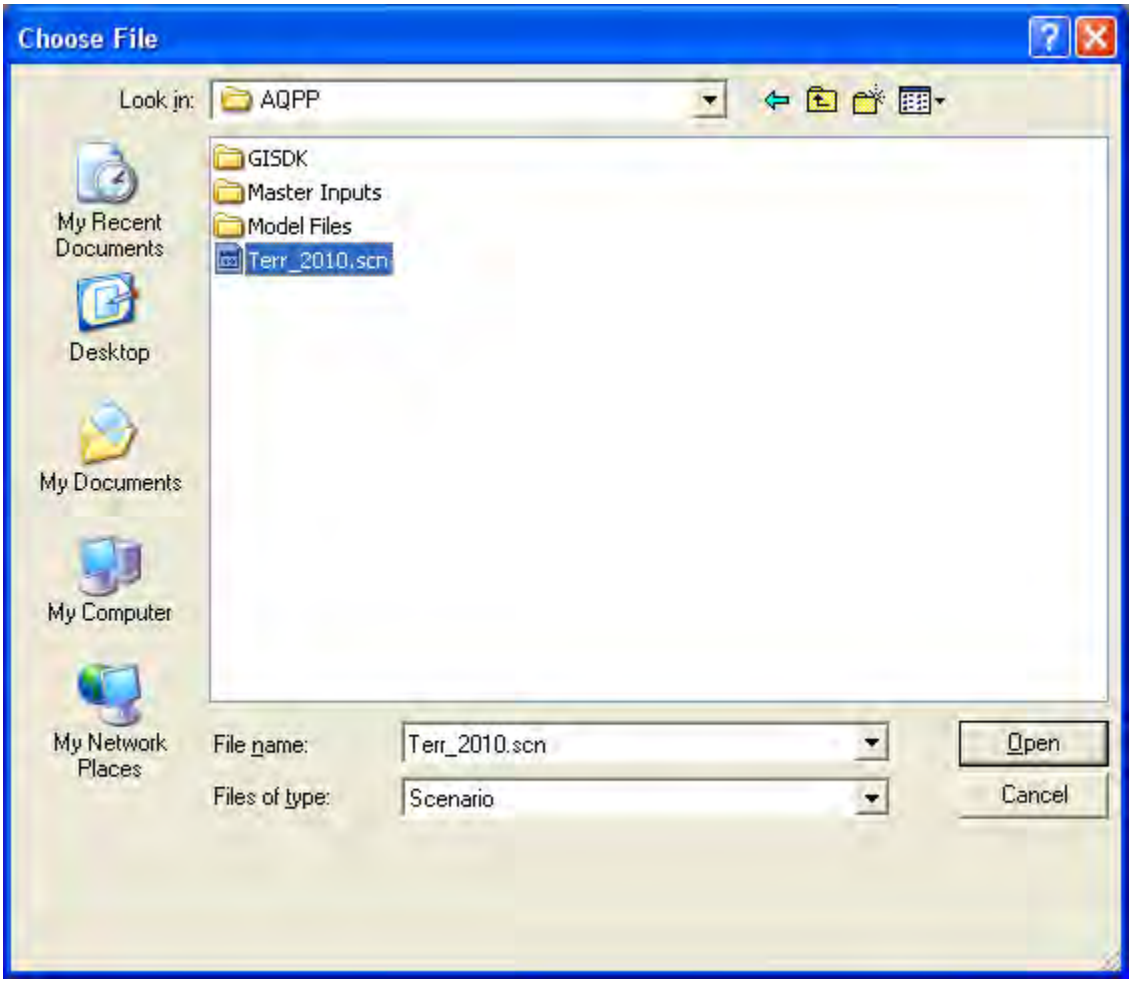
7. Specify the Emission Type to run the post processor based on Ozone or Particulate Matter.

a. If the Emission Type is not available for the selected analysis area then a note dialog box will appear that says “This analysis area does not support XX emission analysis. Please select the YY emission type.” Where XX / YY represents Ozone / Particulate Matter.

8. Specify the Analysis Year. This must be one of the years provided in the dropdown list. These are specific to each analysis area.
    a. For Example: 2002, 2010, 2015, 2020, 2025, 2030, 2035, and 2040
9. Specify the Peak Spreading option. This must be one of the years provided in the dropdown list.
    a. Options = Yes or No
10. Browse to the Link Table and to the Intrazonal Table which are fixed format binary (.bin) files. The user needs to develop these files prior to setting up a scenario in the INDOT AQPP. Information on proper file formats can be found in the methodology section of this document.



11. Specify a Scenario Description. The user has the option to document a description of the scenario run in this box.
12. Save the scenario settings. Scenario settings can be saved to overwrite an existing scenario or the settings can be saved as to create a new scenario (.scn) file.
13. Load an existing scenario. This button will load an existing scenario file and populate all settings.



14. Verify other Settings:

    The settings that are updated automatically by the interface include:

    a. Analysis Area (populated from the "Indiana Air Quality Post-Processor" dialog box)
    b. Scenario Name (populated based on the name of the saved or loaded .scn scenario file)
    c. Scenario File(populated based on the saved or loaded .scn scenario file)
    d. Output Directory (populated based on parent directory and creates a folder named "Output_xx" where xx is the name of the saved or loaded .scn scenario file)

    An image of the interface with all settings populated for the Terre Haute example is shown below.

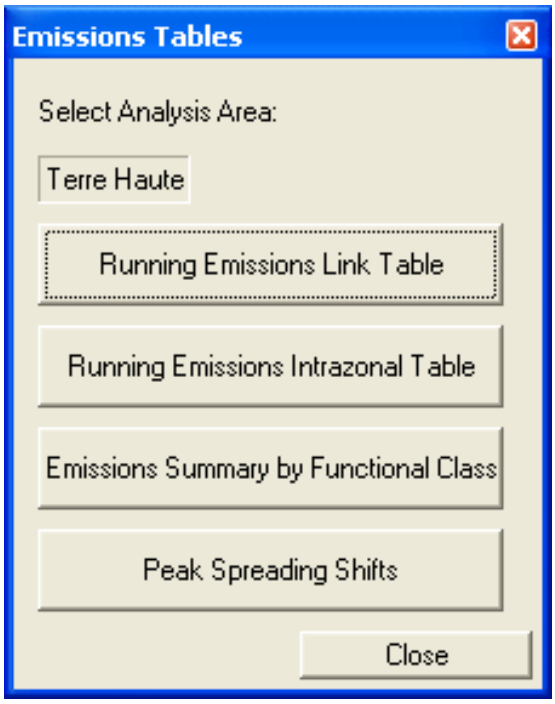
Application

There are three applications of the INDOT Air Quality Post Processor.

1. Calculate Emissions
2. Emissions Tables
3. Emissions Report

The “Calculate Emissions” button will execute the post processing steps for the loaded scenario.

The “Emissions Tables” button will open the “Emissions Tables” dialog box. This dialogue box will allow the user to open and view four output files from the model run. Note that the “Peak Spreading Shifts” output table will not exist if the Peak Spreading option is set to “No” for this scenario.



The “Emissions Repot” button will open the Report_Summary.txt file. This text file summarizes various settings about the model run, input files, output files, sequence settings, and emissions in grams.

Report_Summary.txt - Notepad

File Edit Format View Help

```
                        Report Summary File
                    INDOT Air Quality Post Processor

Run Start Date and Time: Mon Dec 12 14:06:01 2011
Run End Date and Time: Mon Dec 12 14:08:47 2011

Scenario:  Terr_2010
Scenario Description:  INDOT Webinar
Scenario File:  C:\INDOT\AQPP\Terr_2010.scn

Analysis Area:  Terre Haute
Analysis Year:  2010
Emission Type:  Ozone
Peak Spreading:  Yes

Travel Demand Model Input Files

   Link Table:
   C:\INDOT\AQPP\Model Files\net_example.bin

   Intrazonal Table:
   C:\INDOT\AQPP\Model Files\intra_example.bin

Air Quality Rate Input Files

   Rates per Distance:
   C:\INDOT\AQPP\Master Inputs\Terr_2010_ratesperdistance_oz.csv

   Rates per Vehicle:
   C:\INDOT\AQPP\Master Inputs\Terr_2010_ratespervehicle_oz.csv

   Rates per Profile:
   C:\INDOT\AQPP\Master Inputs\Terr_2010_ratesperprofile_oz.csv

   HPMS Fraction:
   C:\INDOT\AQPP\Master Inputs\HPMS_Fraction_INStatewide.csv

   Hourly Fraction:
   C:\INDOT\AQPP\Master Inputs\HourVMTFraction.csv

   Vehicle Class Distribution:
   C:\INDOT\AQPP\Master Inputs\VehClassDist.csv

   Source Type Population:
   C:\INDOT\AQPP\Master Inputs\Terr_2010_SourceTypePopulation.csv

Output Files

   Link Emissions Table:
   C:\INDOT\AQPP\Output_Terr_2010\EMIS_daily.bin

   Intrazonal Emissions Table:
   C:\INDOT\AQPP\Output_Terr_2010\Intra_VMT_daily.bin

   Peak Spreading Indicator Table:
   C:\INDOT\AQPP\Output_Terr_2010\Spreading_Indicator.bin

   Emissions by Functional Class. Table:
   C:\INDOT\AQPP\Output_Terr_2010\Emission_by_HPMS_FC.csv
```

Sequence Settings

Source Type:	Process:
11 - Motorcycle	1 - Exhaust
21 - Passenger Car	2 - Start Exhaust
31 - Passenger Truck	9 - Brakewear
32 - Light Commercial Truck	10 - Tirewear
41 - Intercity Bus	11 - Evap Permeation
42 - Transit Bus	12 - Evap Fuel Vapor Venting
43 - School Bus	13 - Evap Fuel Leaks
51 - Refuse Truck	15 - Crankcase Running Exhaust
52 - Single Unit Short-haul Truck	16 - Crankcase Start Exhaust
53 - Single Unit Long-haul Truck	17 - Crankcase Extended Idle Exhaust
54 - Motor Home	90 - Extended Idle Exhaust
61 - Combination Shourt-haul Truck	
62 - Combination Long-haul Truck	

Functional Classification	Road Type:
1 - Rural Interstate	2 - Rural Restricted Access
2 - Rural Principal Arterial	3 - Rural Unrestricted Access
6 - Rural Minor Arterial	4 - Urban Restricted Access
7 - Rural Major Collector	5 - Urban Unrestricted Access
8 - Rural Minor Collector	
9 - Rural Local	
11 - Urban Interstate	Pollutant Type:
12 - Urban Principal Arterial	3 - Oxides of Nitrogen
14 - Urban Other Arterial	87 - Volatile Organic Compounds
16 - Urban Minor Arterial	110 - Primary Exhaust PM2.5
17 - Urban Collector	116 - Primary PM2.5 - Breakwear Particulate
19 - Urban Local	117 - Primary PM2.5 - Tirewear Particulate

Emissions (grams) by County, Type, and Functional Classification

County	Emission Type	HPMS Func. Class.	Dly NOx - Oz	Dly NOx - PM
"Vigo"	"Running"	"Rural Interstate"	0.00	n/a
"Vigo"	"Running"	"Rural Principal Arterial"	0.00	n/a
"Vigo"	"Running"	"Rural Minor Arterial"	0.00	n/a
"Vigo"	"Running"	"Rural Major Collector"	22,872.21	n/a
"Vigo"	"Running"	"Rural Minor Collector"	4,921.54	n/a
"Vigo"	"Running"	"Rural Local"	10,366.05	n/a
"Vigo"	"Running"	"Urban Interstate"	0.00	n/a
"Vigo"	"Running"	"Urban Principal Arterial"	0.00	n/a
"Vigo"	"Running"	"Urban Other Arterial"	0.00	n/a
"Vigo"	"Running"	"Urban Minor Arterial"	3,054.24	n/a
"Vigo"	"Running"	"Urban Collector"	0.00	n/a
"Vigo"	"Running"	"Urban Local"	0.00	n/a
"Vigo"	"Running"	"All HPMS Classes"	41,214.04	n/a
"Vigo"	"Running Intrazonal"	"All HPMS Classes"	3,735.88	n/a
"Vigo"	"Tot Running"	"All HPMS Classes"	44,949.91	n/a
"All"	"Non-Running"	"All HPMS Classes"	1,351,803.57	n/a
"All"	"Tot Emissions"	"All HPMS Classes"	1,396,753.48	n/a