CE-4

APPENDIX M: GREENHOUSE GAS ANALYSIS

From:	Passmore, Andrew D
To:	Kia Gillette; Jack Sinton
Cc:	Mauro, Cindy E; O"Neal, Shelby; Wheeler, Kyanna; Passmore, Andrew D
Subject:	RE: Des 1900162 Greenhouse Gas Analysis Review
Date:	Wednesday, November 1, 2023 3:48:20 PM
Attachments:	image004.png image007.png Des 1900162_Improve 64_GHG Analysis & Attachment A_20231023.pdf Des 1900162_Improve 64_GHG Analysis_20231023_tracked.docx

Kia,

INDOT ESD concurs with this analysis.

Drew Passmore
NEPA Review Team Lead
Environmental Services Division
Indiana Department of Transportation
Cell: (317) 439-7500

From: Kia Gillette <kgillette@HNTB.com>
Sent: Monday, October 23, 2023 5:08 PM
To: Passmore, Andrew D <APassmore@indot.IN.gov>; Jack Sinton <jsinton@HNTB.com>
Cc: Mauro, Cindy E <CMauro@indot.IN.gov>; O'Neal, Shelby <SOneal@indot.IN.gov>
Subject: RE: Des 1900162 Greenhouse Gas Analysis Review

Drew,

Attached is a revised tracked changes Word copy and a clean pdf copy of the GHG analysis. Please let us know if you have any additional questions.

Thanks,
Kia

Kia Gillette
Environmental Project Manager
Email kgillette@hntb.com

From: Passmore, Andrew D <APassmore@indot.IN.gov>
Sent: Friday, October 20, 2023 8:30 AM
To: Kia Gillette <kgillette@HNTB.com>; Jack Sinton <jsinton@HNTB.com>
Cc: Mauro, Cindy E <CMauro@indot.IN.gov>; O'Neal, Shelby <SOneal@indot.IN.gov>
Subject: RE: Des 1900162 Greenhouse Gas Analysis Review

Kia/Jack,

TO: **Drew Passmore, INDOT ES NEPA Review Team Lead**

FROM: **Kia Gillette and Jack Sinton, HNTB**

DATE: **October 23, 2023**

SUBJECT: **Des. No. 1900162, Improve 64 Draft Greenhouse Gas Analysis**

I. Introduction

On January 9, 2023, the Council on Environmental Quality (CEQ) issued the *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change.* This is interim guidance to assist agencies in analyzing greenhouse gas (GHG), the climate change effects of their proposed actions, and the potential impacts of climate change on the proposed action under the National Environmental Policy Act (NEPA). CEQ issued the guidance as interim guidance, is seeking public comment on the guidance, and intends to either revise it in response to public comments or finalize it. CEQ's intent with the interim guidance is to provide greater clarity and more consistency in how agencies address climate change in NEPA reviews. CEQ intended the interim guidance to be immediately implemented upon its release.

Following CEQ guidance, this analysis compares the global warming potential (GWP) and the social cost of greenhouse gas (GHG) emissions between project alternatives across the lifespan of the project. The analysis considers the preferred alternative and the no build alternative in the opening year (2026) and design year (2046) for the Improve 64 project. While traffic studies had considered an additional build alternative, this alternative is not the preferred build alternative and had not been required to go through other areas of the CE guidance. Mainline traffic volumes are projected to differ by no more than ±4% during peak periods. Therefore, it is likely that both build alternatives would have similar GHG emissions.

II. Project Description

The Improve 64 project is located along I-64 and I-265 in Floyd County, Indiana. A portion of the project is in the City of New Albany. It is within Georgetown, Lafayette, and New Albany Townships, as shown on the Georgetown, Indiana and New Albany, Indiana USGS Topographic Quadrangles, in Sections 22, 27, 28, 29, 30, 31, 32, 33, and 34 in Township 2 South and Range 6 East, and Sections 2 and 3 in Township 3 South and Range 6 East.

The project will include work on sections of I-64, I-265, and US 150. The proposed project limits will extend northwest along I-64 for approximately 4.23 miles from the I-64 bridge over Main Street in New Albany to the US 150 interchange and along I-265 for approximately 1.75 miles north-northeast to approximately the Green Valley Road overpass. The total length of the project is approximately 5.98 miles. Approximately 0.70 acre of additional permanent and temporary right-of-way is anticipated to be acquired for this project.

The project is anticipated to include the following elements:

- Addition of a travel lane in each direction on I-64 from US 150 to 2,000 feet north of Cherry Street. In most areas, the additional lanes will be added within the median. Rock excavation will be necessary to construct the travel lanes in the median.
- Addition of an auxiliary lane on eastbound I-265 from I-64 to State Street and a travel lane on eastbound I-265 from I-64 to 4,000 feet east of State Street. The auxiliary lane will be added on the outside and the travel lane added within the median.
- Addition of one lane to all I-64/I-265 interchange ramps and one lane on the I-64 westbound exit ramp to US 150.
- Replacement and/or rehabilitation of pavement on I-64, I-265, and US 150.
- Relocation of the eastbound I-64 to eastbound I-265 ramp within the I-64/I-265 interchange. Construction of a new bridge on eastbound I-64 is required to accommodate the ramp relocation.
- Replacement, widening, and deck rehabilitation of bridges throughout the project area.
- Replacement of culverts and storm sewers, and construction of detention basins.
- Installation of guardrail and concrete barrier wall, as needed, along I-64.
- Replacement and addition of signage, lighting, ITS conduit, and pavement markings.
- Above-ground and underground utility relocations.
- Acquisition of new right-of-way and drainage easement(s).
- Construction of retaining walls at multiple locations to minimize right-of-way acquisition and to accommodate new traffic lanes added within the median along I-64 between US 150 and the Captain Frank Road overpass, east of the I-265/I-64 system interchange ramps.
- Construction of three noise barriers along I-64 and I-265 in accordance with INDOT's Traffic Noise Analysis Procedure (2022) (Noise Policy).

The maintenance of traffic (MOT) plan is to maintain the existing number of lanes of traffic in each direction on I-64 and I-265 to the maximum extent possible. Intermittent lane restrictions will be implemented on I-64 and I-265 during off peak hours. Quarry Road, Captain Frank Road, State Street, Cherry Street and Spring Street will be closed for short durations during construction of the bridges above, and construction of foundations adjacent to, those roadways. Interchange ramps at the I-64/US 150, I-64/I-265, and I-64/State Street interchanges will require short-term off-peak closures. Additional longer-term closures of ramps at I-64/Spring Street interchange will be necessary. Longer term single lane closures on State Street will also be necessary during I-265 bridge construction over State Street. These longer-term closures will likely last 4-6 months.

III. Purpose and Need

The need for the project is due to existing traffic congestion as demonstrated by poor levels of service (LOS) on the interstate and interchange components, and deteriorating pavement within the project area. The purpose of the project is to reduce traffic congestion such that peak hour operating conditions are a LOS D or better, where possible, and to improve the deteriorating condition of the pavement.

IV. Quantifying, Disclosing, and Contextualizing Climate Impacts, and Addressing the Potential Climate Change Effects of Proposed Federal Actions

A. Quantifying a Proposed Action's GHG Emissions

The US Environmental Protection Agency (USEPA) identifies three major types of GHGs: carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4)[1]. These gases do not contribute to climate change equally.

[1] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

There is both a difference in the amount of each gas that is emitted by an activity, and there is a difference in the amount of heat that a given quantity of gas can trap in the atmosphere. The latter is known as a gas' Global Warming Potential (GWP). GWP is used to compare and aggregate the effects of these gases.

To understand the project's influence on climate change, the total GWP is calculated for the build and no build alternatives by considering vehicular traffic, construction, and roadway operations and maintenance emissions. Vehicular traffic emissions are calculated from traffic forecasts for the study area and USEPA guidance on GHG emissions by gallon of fuel consumed and miles traveled (Table 1)[2]. Emissions from construction and operations and maintenance are calculated using the Federal Highway Administration (FHWA) Infrastructure Carbon Estimator (ICE) tool[3].

1. Emissions Due to Traffic Volumes

To calculate vehicular GWP, the GHG emissions rates per mile are combined with vehicle-miles-traveled (VMT) projections along road segments. The segments considered in this analysis are consistent with those considered in traffic forecasting analysis. The study area for the traffic analysis is slightly larger than the anticipated project area (Figure 1). This is because anticipated traffic impacts do not terminate at the project area's boundaries. An extended study area gives better estimates on the true emissions impacts due to traffic volume changes as a result of the project.

Table 1: GHG emissions rates

Vehicle Type	Fuel Type	GHG Source	Emission Rate per Gallon (g/gal)	Emission Rate per Mile (g/mi)
Auto	Gasoline	Carbon Dioxide (CO_2)	8,780[4]	399
		Nitrous Oxide (N_2O)	N/A	0.0066[5]
		Methane (CH_4)	N/A	0.0173
Trucks	Diesel	Carbon Dioxide (CO_2)	10,210	1,547
		Nitrous Oxide (N_2O)	N/A	0.0048[6]
		Methane (CH_4)	N/A	0.0051[6]

Traffic forecasts for the build and no build alternatives provide the annual average daily traffic along road segments, which is combined with segment length to determine average daily VMT. Daily VMT is annualized and combined with the emissions rates to determine total emissions per segment. Emissions are converted to GWP via Table 2. See Table 3 for an example calculation and Attachment A for all complete results by the project alternative and GHG.

[2] USEPA. (2016). *Greenhouse Gas Inventory Guidance: Direct Emissions from Mobile Combustion Sources*. https://www.epa.gov/sites/default/files/2016-03/documents/mobileemissions_3_2016.pdf

[3] https://www.fhwa.dot.gov/environment/sustainability/energy/tools/carbon_estimator/index.cfm

[4] CO_2 emissions are given in grams per gallon in table A-1 of the *Greenhouse Gas Inventory Guidance.* They are converted to grams per mile using an average 22 miles per gallon of gasoline for automobiles and 6.6 miles per gallon of diesel for trucks.

[5] NO_2 and CH_4 rates are from Table B-1 of the *Greenhouse Gas Inventory Guidance.* The gasoline rate for N_2O is obtained from the value for vans, pickups, and SUVs from the years 2008-present. The gasoline rate for CH_4 is obtained from the value for passenger cars from the years 2009-present. These years are used because the majority of automobiles on the road are from years post-2009. The higher emissions value between passenger car versus van/pickup/SUV is chosen to provide a reasonable worst-case scenario.

[6] Diesel rates for N_2O and CH_4 are for medium/heavy-duty vehicles.

Figure 1: Analyzed traffic study area and the proposed project area

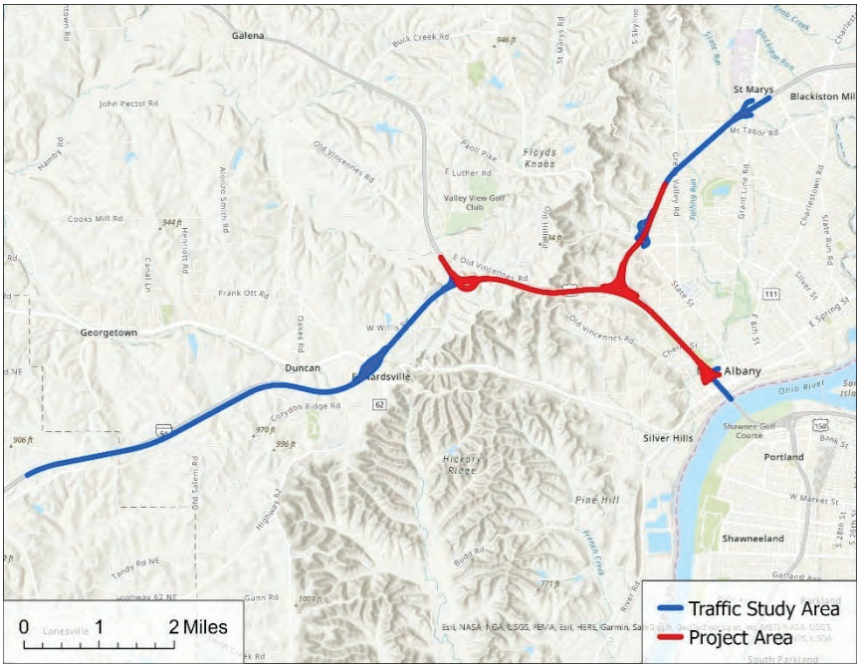


Table 2: GWP values[7]

	Carbon Dioxide (CO_2)	Nitrous Oxide (N_2O)	Methane (CH_4)
GWP Factor (per metric ton of GHG)	1	273	28.5

Table 3: Example calculation of vehicular emissions for gasoline autos in the 2046 no build scenario (values may be slightly different due to rounding)

Segment	EB I-64:US 150 to I-265	Calculation
Automobile AADT 2046 (No Build)	39,355	
Segment Length (mi)	1.479	
Daily Automobile VMT	58,207	AADT× Length
Annual Automobile VMT	21,245,388	Daily VMT× 365
Annual CO_2 (g)	8,478,841,029	Annual VMT × 399
Annual N_2O (g)	140,220	Annual VMT × 0.0066
Annual CH4 (g)	367,545	Annual VMT × 0.0173
CO_2 GWP	8,479	(Annual CO_2 / 1,000,000)× 1
N_2O GWP	38	(Annual N_2O / 1,000,000)× 273
CH_4 GWP	10	(Annual CH_4 / 1,000,000)× 28.5

[7] Compiled from https://www.epa.gov/ghgemissions/understanding-global-warming-potentials. As the EPA provides a GWP range for CH_4, the median value is used.

Projected vehicular emissions are determined for two years: the opening year (2026) and the design year (2046). Projected impacts are given in Table 4. In 2026, the build alternative results in a 4.54% GWP increase over the no build; however, this decreases to a 1.31% increase in 2046. While traffic volumes are anticipated to increase similarly in the long run between the build and no build scenarios, the build scenario accelerates this increase. Effectively, this means that external pressures will continue to increase traffic volumes within the study area, regardless of build or no build. This results in the 2026 increase being larger than the 2046 increase.

Table 4: Projected vehicular emissions

Scenario	GWP Impacts
2019 Base Year	152,126
2026 No Build	156,762
2026 Build	167,658
2046 No Build	191,927
2046 Build	194,551

2. Emissions Due to Congestion

Congestion and speed are additional sources of vehicular GHG emissions. Speed and volume data from traffic forecasts allow a comparison of build and no build emissions in 2046 for the morning and afternoon peak hours (7-10 AM and 4-7 PM) along mainline segments. Section IV.A.1. above estimated emissions along all segments (mainline and ramp) using daily traffic volumes for 2019, 2026, and 2046. As the speed forecasts are only available for mainline segments during 2046 peak hours, the emissions values in the that section cannot be adjusted to account for vehicle speed. However, this allows the team to make inferences as to the overall congestion effects.

To adjust emissions for speed effects, the Cal-B/C tool[8] relates fuel consumption rates (in gallons per vehicle mile) to vehicle speed. From this, one may determine vehicle miles per gallon (MPG) as a function of speed (see 2) and an appropriate adjustment coefficient (k) for fuel efficiency. The adjustment coefficient for a speed (s) may be calculated as the ratio of the MPG at that speed to the maximum MPG.

$$k_s = \frac{MPG_s}{\max(MPG)}$$

As indicated in 2, given an average automobile fuel efficiency of 22 mpg and CO_2 emissions rates of 8.780 kg/gal (see Section IV.A.1), it is possible to determine unadjusted and adjusted emissions for the 2046 peak periods. See Table 5 for an example calculation.

Performing these calculations across mainline segments provides the daily peak period CO_2 GWP values given in

[8] Fuel Consumption Rates Table from Cal-B/C SB-1 Emissions Calculator (XLSM), found at https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/transportation-economics. Downloaded on August 21, 2023.

Table 6. When comparing the build and no build alternatives, the build alternative has an 8% greater mainline CO_2 emissions at peak hours without adjusting for speed influences. However, when considering speed effects, the build only has 5% greater emissions at peak hours. This indicates that improvements in congestion due to the build alternative will lessen emissions when compared to a VMT-only analysis. Furthermore, assuming that N_2O and CH_4 emissions scale linearly with gallons consumed,[9] the percentage differences in Table 7 will also apply to GWP values for these gases.

In summary, the available traffic forecasts prevent a wholesale adjustment to emissions values in IV.A.1. However, this analysis demonstrates that adjusting for speed effects will further lessen the emissions of the build scenario when compared to the no build.

Figure 2: Relationship between MPG and Speed

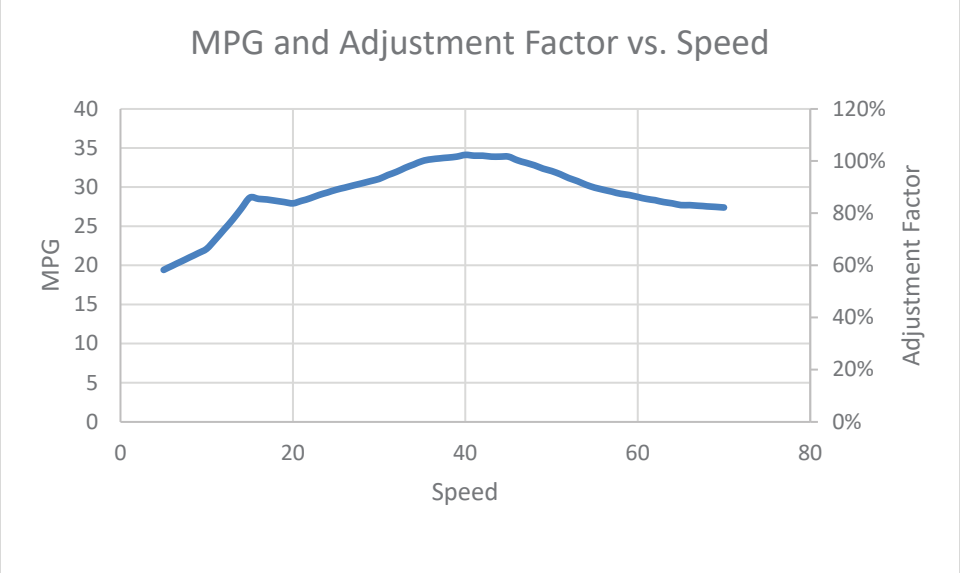


Table 5: Example daily emissions calculation for 2046 Build Alternative during the 7-8 AM hour

Segment	EB I-64 US 150 to I-265	Calculation
Length (mi)	1.479	N/A
Volume (veh)	4,354	N/A
Daily VMT	6,440	Length × Volume
Avg Speed (mi/hr)	54.06	N/A
MPG Unadjusted	22	N/A
MPG Adjustment Factor (k)	89%	Adjustment factor for 54 mi/hr
MPG Adjusted	19.5	MPG Unadjusted × MPG Adjustment Factor
CO_2 Unadjusted (kg)	2,570	(VMT / MPG Unadjusted) × 8.780
CO_2 Adjusted (kg)	2,895	(VMT / MPG Adjusted) × 8.780
Daily CO_2 GWP - Unadjusted	**2.570**	Divide by 1,000
Daily CO_2 GWP - Adjusted	**2.895**	Divide by 1,000

[9] As shown in Table 1, EPA emissions rates for N2O and CH4 are given in g/mi, not g/gal.

Table 6: Daily CO2 emissions rates for mainlines segments within the study area

	Build CO_2 GWP (Unadjusted)	Build CO_2 GWP (Adjusted)	No Build CO_2 GWP (Unadjusted)	No Build CO_2 GWP (Adjusted)
7:00 AM	20,613	23,659	17,738	20,724
8:00 AM	18,287	21,069	15,314	19,822
9:00 AM	14,673	17,086	17,302	21,473
4:00 PM	25,576	28,803	23,001	26,153
5:00 PM	23,658	26,705	21,460	24,546
6:00 PM	21,101	23,888	19,591	22,289
Total	**123,907**	**141,211**	**114,407**	**135,008**

Table 7: Percent increase in build over no-build emissions when adjusting and not adjusting for speed effects

	Unadjusted	Adjusted
7:00 AM	16%	14%
8:00 AM	19%	6%
9:00 AM	-15%	-20%
4:00 PM	11%	10%
5:00 PM	10%	9%
6:00 PM	8%	7%
Total	**8%**	**5%**

3. Emissions Due to Construction, Operations, and Maintenance

Construction and roadway operations and maintenance emissions are determined via the FHWA ICE tool. The estimates pertain to a project's lifetime. In this case, the lifetime is determined to be 20 years, a typical lifespan of a major pavement project. Critical inputs to the ICE tool for the build alternative are listed in Table 8. Inputs for the no build are identical, with the exception of zero lane-miles indicated for urban interstate/expressway additional lane construction.

Table 8: Critical ICE tool inputs (build alternative)

Location	Indiana
Project Lifetime (years)	20
Total existing centerline miles	36.724
Total newly constructed centerline miles	0
Urban interstate/expressway existing roadway (lane-miles)	73.11
Urban interstate/expressway additional lane construction (lane-miles)	8.65
Existing roadway lane-miles for all other facility types	0
Lane-miles of additional lane construction for all other facility types	0
Miles of all other construction types	0
Percentage of roadway construction on rocky/mountainous terrain	57.59%

The tool's outputs in GWP[10] are listed in Table 9. The tool's outputs include emissions from materials production, transportation of construction materials, construction itself, and operations and maintenance. As the materials, transportation, and construction emissions are all directly related to the construction of the build alternative, these emissions are wholly allocated to 2026 since it is the opening year. No construction is anticipated in 2046, so no construction-related emissions are allocated to that year. As operations and maintenance is an ongoing procedure, annual emissions are considered and allocated to both 2026 and 2046. Operations and maintenance are expected to result in slightly higher emission under the build scenario due to the proposed increase in lane-miles.

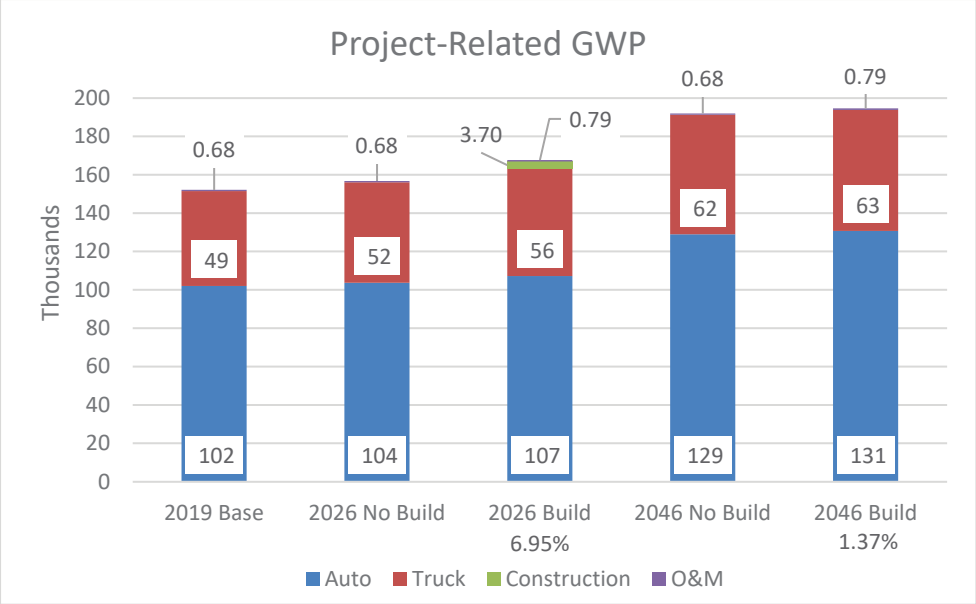
Table 9: GHG emissions (GWP) from construction, operations and maintenance

	No Build	Build
Materials (Total)	0	1,890
Transportation (Total)	0	249
Construction (Total)	0	1,557
Total Construction-Related Emissions (2026)	0	3,696
Annual O&M Emissions	676	788

Between the two major sources, vehicular emissions significantly outpace construction and operations and maintenance emissions, with CO_2 being the most critical of all GHGs to GWP. When combining vehicular and annualized infrastructure emissions into a total GWP, there is a 6.95% increase in GWP in the build alternative over the no build scenario for 2026. However, there is only a 1.37% GWP increase for 2046 (Figure 3).

[10] The Infrastructure Carbon Estimation tool provides outputs in metric tons of CO_2e, which is equivalent to GWP.

Figure 3: Annual project-related GWP, with percent increase in build alternative over no build



Disclosing and Providing Context for a Proposed Action's GHG Emissions and Climate Effects

Conversion of GHG emissions to social costs is accomplished by applying the Social Cost of Greenhouse Gas estimates provided by the Interagency Working Group on Social Cost of Greenhouse Gases (2021)[11]. Social costs account for real-world impacts of climate change, such as rising sea levels, increased wildfire and flooding activity, and droughts. However, it should be noted that social cost estimates are inherently conservative as they are unable to account for all types of societal damages, such as ocean acidification.

The guidance from the Interagency Working Group[11] provides values of social cost for the three GHGs in 2020 dollars per metric ton at a variety of discount rates. The discount rate of 3% has been chosen as it is in line with the USDOT's 2023 benefit-cost analysis guidance. The discount rate is used to adjust future impacts of GHG emissions to a current dollar value. As rates are provided on a five-year basis from 2020-2050, values have been interpolated between the five year-values to obtain costs for 2026 and 2046, as shown in Table 10.

Table 10: Social cost of GHGs at a 3% discount rate[11]. Units are 2020 dollars per metric ton of gas. Values in bold have been interpolated.

Emissions Year	CO_2 ($)	N_2O ($)	CH_4 ($)
2019	**50**	**17,400**	**1,460**
2020	51	18,000	1,500
2025	56	21,000	1,700
2026	**57.2**	**21,400**	**1,760**
2030	62	23,000	2,000
2035	67	25,000	2,200
2040	73	28,000	2,500
2045	79	30,000	2,800
2046	**80.2**	**30,600**	**2,860**
2050	85	33,000	3,100

Costs are determined for each GHG for automobiles and trucks. As the ICE tool only provides CO_2 emissions outputs, the CO_2 costs are applied to these values. Conversion from emissions to costs (see example in Table 11) gives similar results as the GWP analysis. Across all GHG sources, there is a 4.71% increase in the social cost of GHGs in 2026 for the build over no build scenarios. In 2046, the build alternative only exhibits a 1.35% increase in social cost over the no build alternative (Table 12).

[11] https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

Table 11: Example calculation for social cost of GHG (2046 build alternative for automobile emissions)

	2046 Build (Auto)	Method
CO_2 (kg)	129,993,468	
N_2O (kg)	2,150	
CH_4 (kg)	5,635	
CO_2 (metric ton)	129,993.468	Divide by 1,000
N_2O (metric ton)	2.150	Divide by 1,000
CH_4 (metric ton)	5.635	Divide by 1,000
CO_2 Cost	$ 10,425,476	Multiply by 80.2
N_2O Cost	$ 65,783	Multiply by 30,600
CH_4 Cost	$ 16,116	Multiply by 2,860
Total Cost	**$ 10,507,376**	**Sum costs**

Table 12: Social cost of GHGs (includes autos, trucks, O&M, and construction)

	Total Cost
2019 Base Year	$ 7,613,342
2026 No Build	$ 8,978,175
2026 Build	$ 9,601,840
2046 No Build	$ 15,400,446
2046 Build	$ 15,608,603

A. Reasonable Alternatives

This analysis proposes that emissions and social costs of GHGs will be compared between the build and no build alternatives. Comparisons between these alternatives are exhibited in the preceding sections. A comparative analysis suggests an annual 1.37% increase in global warming potential (GWP) and a 1.35% increase in the social cost of GHGs for 2046 when comparing the build to the no build alternative.

B. Baseline for Considering Environmental Effects

This analysis considers the baseline condition to be the no build alternative. As such, emissions are calculated as a net change between the build and no build alternatives.

C. Direct and Indirect Effects

Per NEPA guidance, direct effects are "reasonably foreseeable effects that are caused by the action and occur at the same time and place," while indirect effects are those "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable"[12]. Following this guidance, the direct emissions effects are those associated with construction and the base vehicular emissions. The indirect effects are the increase in vehicular emissions and roadway operations and maintenance emissions in the build alternative over the no build alternative.

[12] *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change,* section IV.E. https://www.federalregister.gov/d/2023-00158/p-149

As discussed in Section IV.A, construction emissions are allocated to 2026 in total. In that year, construction accounts for 2.20% of the total GWP (Figure 4). Direct vehicular emissions account for over 93% of total emissions. Indirect emissions (autos, trucks, and operations & maintenance) account for about 4% of emissions.

In 2046, all projected emissions will be from vehicles and operations and maintenance, as construction will have ended by that point (Figure 5). Direct emissions will comprise over 98% of all emissions, while indirect emissions will account for less than 2%.

Figure 4: Projected GWP in 2026 (build alternative)

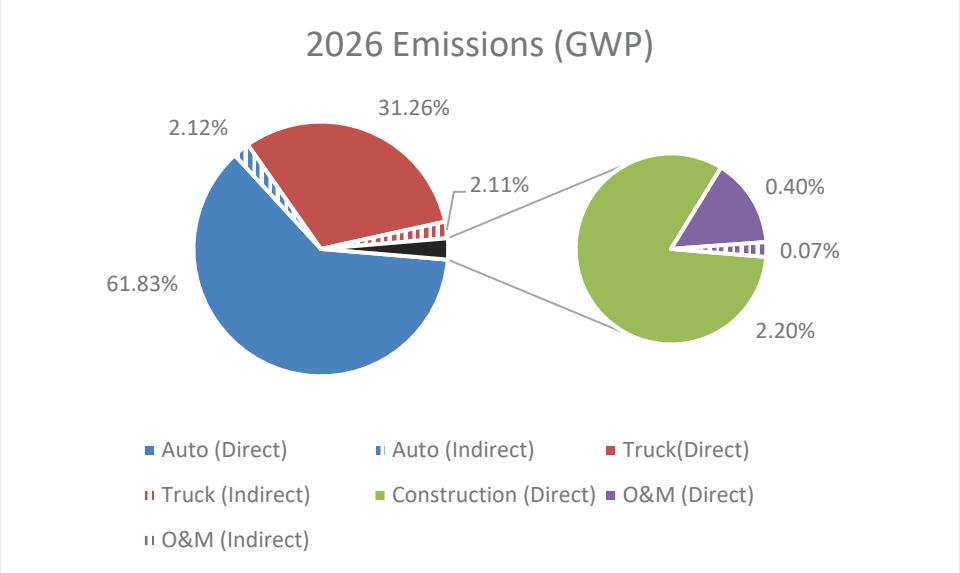
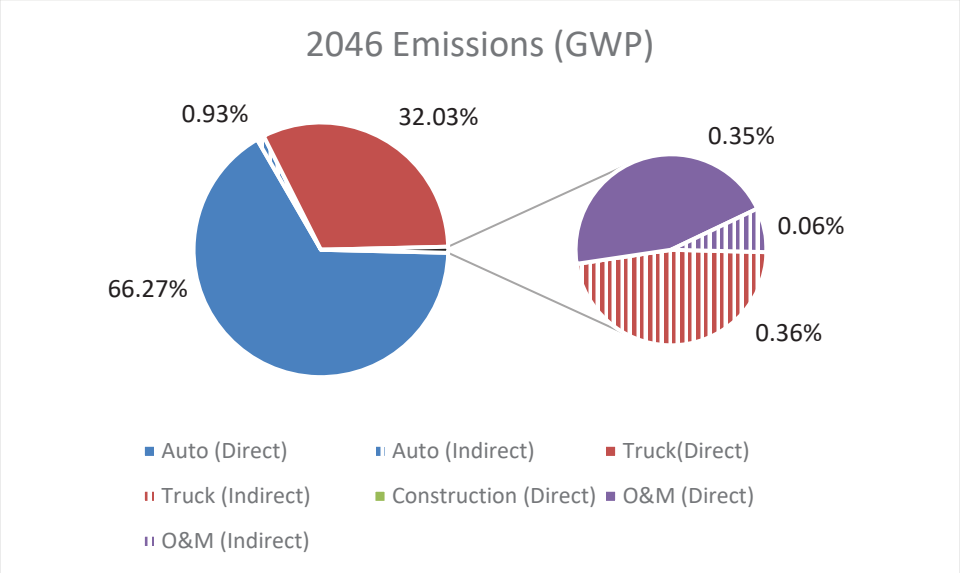


Figure 5: Projected GWP in 2046 (build alternative)



D. Cumulative Effects

Cumulative effects consider the impact of the proposed alternatives in combination with other past, present, or reasonably foreseeable actions and outcomes regarding emissions. Reasonably foreseeable emissions are accounted for by future year no build traffic forecasts. Travel forecasting models used account for projected population and employment, and travel activity which occurs as a result of this development. "Other reasonably foreseeable actions" are incorporated into the travel forecasting model output.

A substantial external impact on emissions trends is the anticipated improvements in US vehicle fuel efficiency and vehicle electrification. The preceding analysis has been performed using fuel efficiency values from the base year. The US Energy Information Administration (EIA) projects fleet fuel efficiency to steadily increase through 2050[13]. The EIA forecasts account for both improved combustion fuel efficiency and increased electrification rates. Projected equivalent miles-per-gallon (MPGe) is given in Table 13. As in Section IV.A, these values are combined with CO_2 emission rates per gallon to give emissions per mile. As the USEPA does not provide N_2O and CH_4 emissions rates per gallon, these per mile rates are assumed to improve by the same percentage as the CO_2 emission rate. Adjusted emissions rates are given in Table 14.

Table 13: EIA modeled fleet fuel efficiency (MPGe)

	2026	**2046**
Automobile	26.3	35.6
Truck	8.0	10.2

Table 14: Adjusted GHG emissions (g/mi)

	Auto			**Truck**		
	CO_2	**N_2O**	**CH_4**	**CO_2**	**N_2O**	**CH_4**
2019 (original)	399	0.0066	0.0173	1547	0.0048	0.0051
2026	334	0.0055	0.0145	1276	0.0040	0.0042
2046	247	0.0034	0.0089	1005	0.0026	0.0027

These values are applied to traffic data in the same way as in Section IV.A. As may be anticipated, the build alternative still results in more GHG emissions than the no build alternative in both 2026 and 2046. However, total emissions (as measured via GWP) are projected to decrease in all scenarios when compared to 2019 base year levels (Table 15). Thus, when the project is considered in conjunction with anticipated changes in vehicle emissions, total study area emissions are projected to decrease over the project period.

[13] US EIA. (2023). *Annual Energy Outlook 2023: Table 40: Light-Duty Vehicle Miles per Gallon by Technology Type; Case: Reference Case.* See entry under "Average Vehicle Stock Miles per Gallon"
US EIA. (2023). *Annual Energy Outlook 2023: Table 49: Freight Transportation Energy Use; Case: Reference Case.* See entry under "Average Fuel Efficiency"

Table 15: Projected change in GWP when compared to 2019 when considered improved vehicle efficiency

Scenario	Change in GWP
2019 Base	0.00%
2026 No Build	-14.15%
2026 Build	-7.78%
2046 No Build	-20.61%
2046 Build	-19.50%

E. Short- and Long-term Effects

Short- and long-term effects are quantified in the 2026 and 2046 forecasts in Sections IV.A and IV.B. The anticipated relative short-term emissions rates and costs (when compared to the no build baseline) are higher than in the long-range. The increase of 6.95% in 2026 outpaces that of 1.37% in 2046 (Table 16) for multiple reasons. Direct construction emissions play a factor in this increase, as they occur in 2026 and not 2046. In 2026, construction emissions account for 2.31% out of the 6.95% difference.

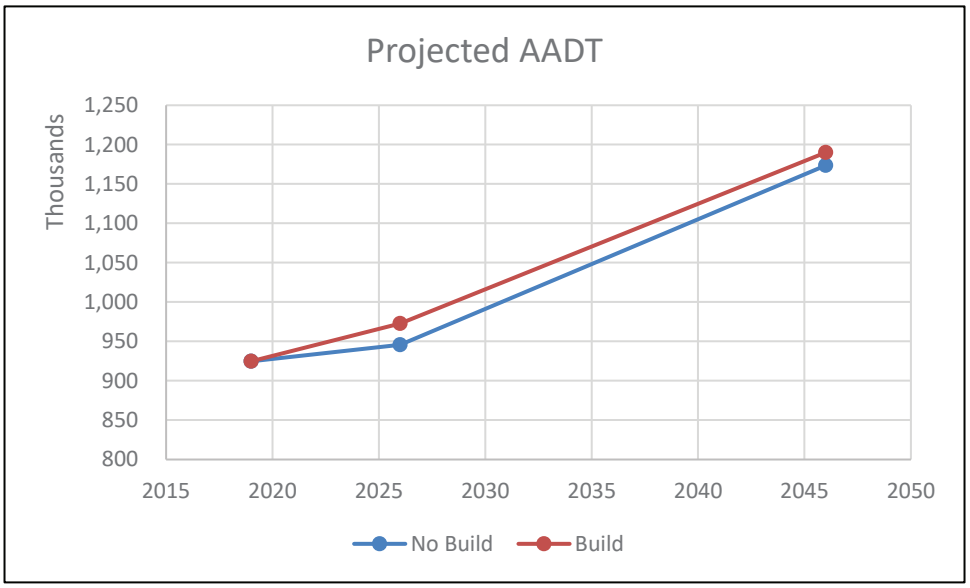
Table 16: Emissions increase of the build over the no build alternative

	Emissions (GWP)	Social Cost
In 2026	6.95%	6.95%
In 2046	1.37%	1.35%

Emissions from vehicular sources account for the majority of the remaining difference between the two alternatives. This difference is due to higher traffic volumes associated with the build alternative. It is anticipated traffic volumes across the study area will rise comparably between both alternatives in the long-run. However, the build alternative accelerates this traffic growth in the short-term (Figure 6). This increase in traffic volumes in the build alternative accounts for nearly all the remaining 4.59% increase in GWP for 2026 and the 1.37% increase in 2046. Annual emissions increases due to operations and maintenance are minimal.

Thus, while short term emissions increases are anticipated as a result of construction and near-term traffic growth in the build alternative, it is anticipated that these increases will subside in the long-run as the difference in traffic volumes between the build and no build alternatives becomes less pronounced. Additionally, as noted in Section IV.F, it is possible that improvements in vehicle fuel efficiency and electrification reduce total emissions under both alternatives when compared to a 2019 base year.

Figure 6: Projected total AADT in the study area



F. Mitigation

In alignment with federal requirements and guidelines established in the Bipartisan Infrastructure Law (BIL) and other federal policies, INDOT is developing a carbon reduction strategy (CRS) to support efforts to reduce carbon dioxide (CO_2) emissions from the transportation sector in Indiana. The CRS is being developed in consultation with Metropolitan Planning Organization (MPO) partners and FHWA. It is anticipated the CRS will identify different potential transportation projects and/or strategies that can support carbon reduction. These may include, but may not be limited to, electric vehicles/alternatives fuels, active transportation, transportation demand management, and other technology solutions.

Mitigation for stream, wetland, and floodway habitat impacts will be completed using the Indiana Department of Natural Resources (IDNR) In-Lieu Fee Mitigation Program. This program involves the restoration, establishment, enhancement and/or preservation of aquatic resources through funds paid to the IDNR to satisfy compensatory mitigation requirements for permits. Impacts to suitable bat habitat impacts beyond 100 feet from a road will be mitigated through payment to the Range-wide In-Lieu Fee Program, The Conservation Fund. The Conservation Fund creates consolidated landscape-level mitigation for multiple smaller impacts for bats. No GHG mitigation is anticipated for this project.

G. Special Considerations for Biological GHG Sources and Sinks

Neither the build nor no build alternatives anticipate substantial changes in land use within the study area that would interrupt biological processes that emit/reduce carbon. Thus, changes in emissions due to biological sources and sinks is determined to be negligible.

V. Considering the Effects of Climate Change on a Proposed Action

A. Affected Environment

The affected environment under the no-build scenario has an annual emissions rate of 152,126 GWP in 2019. Under the no build, this is anticipated to increase 3.05% to 156,762 in 2026. In 2046, the annual GWP is expected to increase 26.16% to 191,927 for the no build alternative.

The above values represent an emissions future that does not see substantial improvements in vehicle fuel efficiency over current values. However, fuel efficiency values from the US EIA (as detailed in Section IV.F) project increasing fuel efficiency across the US automobile and truck fleets through 2046. When these fuel efficiency improvements are applied to the analysis, this results in a -14.15% decrease in 2026 and a -20.61% decrease in total emissions in the no build case when compared to 2019. In the build scenario, this yields a -7.78% GWP decrease in 2026 and -19.50% decrease in 2046 over 2019.

B. Effects

INDOT will maintain I-64, I-265, and US 150 within the study area. Climate change could potentially impact I-64 and I-265 within the project area. Increased frequency and size of storm events could cause flooding. The addition of detention basins within the project area as part of the preferred alternative will help alleviate this compared to the existing condition. Extreme heat could result in damage to the pavement. An additional 21 acres (0.02 mile) of impervious surface will be added to the project area. The City of New Albany is approximately 15 square miles (9,600 acres). The additional impervious surface would be less than 0.5% of the total size of the city. Although the additional impervious surface could contribute to heat island effects, it would be a small percentage of the city size and other impervious sources. This project is not anticipated to have a significant effect on any heat island effect.

Additional roadway maintenance may be required to account for the effects of climate change. It is anticipated this would be required for the Build and No Build conditions.

C. Using Available Assessments and Scenarios to Assess Present and Future Impacts

A National Oceanic and Atmospheric Administration (NOAA) assessment of daily temperature forecasts in Floyd County[14] forecasts temperature trends under two scenarios: low and high future emissions. The low scenario predicts a future where emissions stop increasing by 2040 and reduce through 2100. The high scenario predicts a future where emissions continually increase through 2100. The NOAA tool compares temperature forecasts to an average from 1961-1990. The high forecast results in an average growth of 10.6° F (5.9° C) in 2100, while the low forecast yields a growth of 6.1° F (3.4° C) by 2100.

Both values are above global goals of limiting climate change to 1.5° and 3° C. Thus, to approach the global goal of 3° C in Floyd County, it is necessary to be nearer to the low temperature forecast. When considering both alternatives in combination with anticipated improvements in vehicle electrification and fuel efficiency, it is anticipated that project-related emissions will be lower than in 2019 in 2046. This finding aligns with NOAA's low scenarios, which projects emissions to stop increasing by 2040.

D. Resilience and Adaptation

The Improve 64 project includes stormwater detention to avoid increasing the rate at which water leaves the project area. Flows leaving the project area will match or be reduced (where not contributing to a stream) from the existing condition. This will minimize impacts from potential flooding related to increased impervious surface from the project.

New culverts will be sized in accordance with INDOT design standards which account for 100-year storm event. INDOT utilizes the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Volume 3 to determine precipitation rates for their standards. INDOT design standards are based on

[14] The NOAA Climate Explorer: https://crt-climate-explorer.nemac.org/climate_graphs/

historical precipitation events and do not account for projected rainfall events. The project does not include new bridges over waterways.

VI. Conclusion

This analysis compares the build and no build alternatives in terms of their GHG emissions and social costs. The analysis considers short-term (2026) annual effects and long-term (2046) annual effects. Short-term effects exhibit a 6.95% increase in GWP and social cost of GHG for the build alternative over the no build. Long-term effects indicate only a 1.37% and 1.35% increase for GWP and social cost, respectively. The majority of emissions impacts are due to vehicular emissions.

A secondary analysis was conducted to consider the cumulative effects of the project alternatives and projected improvement in vehicle fuel efficiency. While no build emissions are lower in this analysis, both the build and no build alternatives are anticipated to result in emissions that are substantially below 2019 levels.

Attachments:

Attachment A: Tables

GHG ANALYSIS

ATTACHMENT A: TABLES

Table A-1: Emissions and social cost results by source, alternative, and GHG

		CO2 (kg)	N2O (kg)	CH4 (kg)	CO2 GWP	N2O GWP	CH4 GPW	Total GWP
Auto	2019 Base	101,463,619	1,678	4,398	101,464	458	125	102,047
	2026 No Build	103,076,633	1,705	4,468	103,077	465	127	103,669
	2026 Build	106,606,558	1,763	4,621	106,607	481	132	107,220
	2046 No Build	128,198,224	2,120	5,557	128,198	579	158	128,935
	2046 Build	129,993,468	2,150	5,635	129,993	587	161	130,741
Truck	2019 Base	49,356,374	153	163	49,356	42	5	49,403
	2026 No Build	52,366,699	162	173	52,367	44	5	52,416
	2026 Build	55,901,483	173	184	55,901	47	5	55,954
	2046 No Build	62,256,738	193	205	62,257	53	6	62,315
	2046 Build	62,962,381	195	208	62,962	53	6	63,022
Construction-Related	2019 Base							-
	2026 No Build							-
	2026 Build							3,696
	2046 No Build							-
	2046 Build							-
O&M	2019 Base							676
	2026 No Build							676
	2026 Build							788
	2046 No Build							676
	2046 Build							788
Total	2019 Base	150,819,993	1,831	4,561	150,820	500	130	152,126
	2026 No Build	155,443,332	1,867	4,641	155,443	510	132	156,762
	2026 Build	162,508,041	1,936	4,806	162,508	529	137	167,658
	2046 No Build	190,454,962	2,313	5,762	190,455	632	164	191,927
	2046 Build	192,955,850	2,345	5,843	192,956	640	167	194,551

Table A-1: Emissions and social cost results by source, alternative, and GHG

		CO2 Cost ($)	N2O Cost ($)	CH4 Cost ($)	Total Cost ($)
Auto	2019 Base	5,073,181	29,196.56	6,421.51	5,108,799
	2026 No Build	5,895,983	36,479.27	7,864.07	5,940,327
	2026 Build	6,097,895	37,728.52	8,133.38	6,143,757
	2046 No Build	10,281,498	64,874.73	15,893.60	10,362,266
	2046 Build	10,425,476	65,783.21	16,116.17	10,507,376
Truck	2019 Base	2,467,819	2,664.72	237.57	2,470,721
	2026 No Build	2,995,375	3,477.19	303.85	2,999,156
	2026 Build	3,197,565	3,711.90	324.36	3,201,601
	2046 No Build	4,992,990	5,911.09	587.00	4,999,488
	2046 Build	5,049,583	5,978.08	593.66	5,056,155
Construction-Related	2019 Base	-			-
	2026 No Build	-			-
	2026 Build	211,409			211,409
	2046 No Build	-			-
	2046 Build	-			-
O&M	2019 Base	33,822			33,822
	2026 No Build	38,692			38,692
	2026 Build	45,072			45,072
	2046 No Build	38,692			38,692
	2046 Build	45,072			45,072
Total	2019 Base	7,541,000	31,861.28	6,659.08	7,613,342
	2026 No Build	8,891,359	39,956.46	8,167.91	8,978,175
	2026 Build	9,295,460	41,440.42	8,457.73	9,601,840
	2046 No Build	15,274,488	70,785.81	16,480.60	15,400,446
	2046 Build	15,475,059	71,761.29	16,709.83	15,608,603

Table A-2: Roadway Data

Segment ID	Segment	In Project Area	Length (mi)	Num Added Lanes	Original Lane-miles	Added lane-miles	Distance on Rocky/ Mountainous Terrain
1	Lanesville Rd to SR 64 Exit	FALSE	4.555	0	9.11	0	0
2	SR 64 Exit	FALSE	0.382	0	0.382	0	0
3	SR 64 Exit to SR 64 Entrance	FALSE	0.695	0	1.39	0	0
4	SR 64 Entrance	FALSE	0.328	0	0.656	0	0
5	SR 64 to US 150	FALSE	1.324	0	2.648	0	0
6	US 150 NB Exit	TRUE	0.563	0	0.563	0	0
7	US 150 Exit to US 150 Entrance	TRUE	0.389	1	0.778	0.389	0
8	US 150 SB Entrance	TRUE	0.783	0	0.783	0	0
9	US 150 to I-265	TRUE	1.479	1	2.958	1.479	1.05
10	Exit to EB I-265	TRUE	0.445	1	0.445	0.445	0.445
11	I-265 Exit to I-265 Entrance	TRUE	0.494	0	0.988	0	0.494
12	Entrance from WB I-265	TRUE	0.551	1	0.551	0.551	0.551
13	I-265 to Spring St	TRUE	1.149	1	3.447	0.33	0.343
14	Spring St Exit	TRUE	0.360	0	0.36	0	0
15	Spring St Exit to Spring St Entrance	TRUE	0.306	0	0.918	0	0
16	Spring St Entrance	TRUE	0.238	0	0.238	0	0
17	Spring St to ORX	FALSE	0.414	0	1.242	0	0
18	ORX to Spring St	FALSE	0.379	0	1.137	0	0
19	Spring St Exit	FALSE	0.176	0	0.176	0	0
20	Spring St Exit to Spring St Entrance	TRUE	0.260	0	0.52	0	0
21	Spring St Entrance	TRUE	0.326	0	0.326	0	0
22	Spring St to I-265	TRUE	1.205	1	3.615	0.47	0.318
23	Exit to EB I-265	TRUE	0.355	1	0.355	0.355	0.355
24	I-265 Exit to I-265 Entrance	TRUE	0.464	0	1.392	0	0.464
25	Entrance from WB I-265	TRUE	0.457	1	0.457	0.457	0.457
26	I-265 to US 150 NB	TRUE	1.698	1	5.094	1.698	1.105
27	US 150 Exit	TRUE	0.330	1	0.33	0.33	0
28	US 150 Exit to US 150 Entrance	TRUE	0.501	0	1.503	0	0
29	US 150 Entrance	FALSE	0.400	0	0.4	0	0

Table A-2: Roadway Data

Segment ID	Segment	In Project Area	Length (mi)	Num Added Lanes	Original Lane-miles	Added lane-miles	Distance on Rocky/ Mountainous Terrain
30	US 150 to SR 64	FALSE	1.048	0	3.144	0	0
31	SR 64 Exit	FALSE	0.334	0	0.668	0	0
32	SR 64 Exit to SR 64 Entrance	FALSE	0.659	0	1.318	0	0
33	SR 64 Entrance	FALSE	0.301	0	0.301	0	0
34	SR 64 Entrance to Lanesville Rd	FALSE	4.591	0	9.182	0	0
35	I-64 to Paoli Pike/State St	TRUE	0.386	1	1.158	0.386	0.29
36	Paoli Pike/State St Exit	TRUE	0.354	0	0.354	0	0
37	Paoli/State Exit to Entrance	TRUE	0.432	1	0.864	0.432	0
38	Entrance from Paoli Pike/ State St	TRUE	0.361	0	0.361	0	0
39	Paoli Pike/State St to Grant Line Rd	TRUE	1.762	1	3.524	0.57	0
40	Grant Line Rd Exit	FALSE	0.280	0	0.28	0	0
41	Grant Line Rd Exit to Entrance	FALSE	0.591	0	1.182	0	0
42	Grant Line Rd Exit to Entrance	FALSE	0.591	0	1.182	0	0
43	Entrance from Grant Line Rd	FALSE	0.339	0	0.339	0	0
44	Grant Line Rd to Paoli Pike/State St	TRUE	1.601	0	3.202	0	0
45	Paoli Pike/State St Exit	TRUE	0.469	0	0.469	0	0
46	Paoli/State Exit to Entrance	TRUE	0.320	0	0.64	0	0
47	Entrance from Paoli Pike/ State St	TRUE	0.417	0	0.417	0	0
48	Paoli Pike/State St to I-64	TRUE	0.499	1	0.998	0.499	0.07
49	Wesley Chapel UMC Driveway to I-64	TRUE	0.12	0	0.24	0	0
50	I-64 to Wesley Chapel UMC Driveway	TRUE	0.263	1	0.526	0.263	0

Table A-3: 2019 Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2019	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	14,239	23,673,405	9,447,840,892	156,244	409,550	9,448	42.65	11.67
2	SR 64 Exit	891	124,232	49,579,914	820	2,149	50	0.22	0.06
3	SR 64 Exit to SR 64 Entrance	13,348	3,386,054	1,351,343,329	22,348	58,579	1,351	6.10	1.67
4	SR 64 Entrance	9,998	1,196,961	477,696,078	7,900	20,707	478	2.16	0.59
5	SR 64 to US 150	23,346	11,282,188	4,502,618,649	74,462	195,182	4,503	20.33	5.56
6	US 150 NB Exit	2,153	442,431	176,570,084	2,920	7,654	177	0.80	0.22
7	US 150 Exit to US 150 Entrance	21,193	3,009,088	1,200,899,707	19,860	52,057	1,201	5.42	1.48
8	US 150 SB Entrance	9,699	2,771,926	1,106,250,350	18,295	47,954	1,106	4.99	1.37
9	US 150 to I-265	30,892	16,676,583	6,655,472,598	110,065	288,505	6,655	30.05	8.22
10	Exit to EB I-265	15,376	2,497,447	996,708,314	16,483	43,206	997	4.50	1.23
11	I-265 Exit to I-265 Entrance	15,516	2,797,690	1,116,532,629	18,465	48,400	1,117	5.04	1.38
12	Entrance from WB I-265	13,925	2,800,526	1,117,664,617	18,483	48,449	1,118	5.05	1.38
13	I-265 to Spring St	29,441	12,347,114	4,927,620,865	81,491	213,605	4,928	22.25	6.09
14	Spring St Exit	5,167	678,944	270,960,298	4,481	11,746	271	1.22	0.33
15	Spring St Exit to Spring St Entrance	24,274	2,711,163	1,082,000,530	17,894	46,903	1,082	4.88	1.34
16	Spring St Entrance	10,033	871,567	347,834,351	5,752	15,078	348	1.57	0.43
17	Spring St to ORX	34,307	5,184,131	2,068,939,462	34,215	89,685	2,069	9.34	2.56
18	ORX to Spring St	35,259	4,877,554	1,946,587,366	32,192	84,382	1,947	8.79	2.40
19	Spring St Exit	11,330	727,813	290,463,744	4,804	12,591	290	1.31	0.36
20	Spring St Exit to Spring St Entrance	23,946	2,272,514	906,939,837	14,999	39,314	907	4.09	1.12
21	Spring St Entrance	6,245	743,115	296,570,377	4,905	12,856	297	1.34	0.37
22	Spring St to I-265	29,943	13,169,680	5,255,899,554	86,920	227,835	5,256	23.73	6.49
23	Exit to EB I-265	14,722	1,907,580	761,297,824	12,590	33,001	761	3.44	0.94
24	I-265 Exit to I-265 Entrance	15,543	2,632,311	1,050,531,541	17,373	45,539	1,051	4.74	1.30
25	Entrance from WB I-265	15,161	2,528,903	1,009,262,046	16,691	43,750	1,009	4.56	1.25
26	I-265 to US 150 NB	30,569	18,945,749	7,561,076,244	125,042	327,761	7,561	34.14	9.34
27	US 150 Exit	9,892	1,191,491	475,513,386	7,864	20,613	476	2.15	0.59
28	US 150 Exit to US 150 Entrance	21,047	3,848,755	1,536,003,038	25,402	66,583	1,536	6.93	1.90

Table A-3: 2019 Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2019	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	2,834	413,764	165,129,451	2,731	7,158	165	0.75	0.20
30	US 150 to SR 64	23,511	8,993,428	3,589,195,245	59,357	155,586	3,589	16.20	4.43
31	SR 64 Exit	10,606	1,292,991	516,020,859	8,534	22,369	516	2.33	0.64
32	SR 64 Exit to SR 64 Entrance	13,257	3,188,790	1,272,617,067	21,046	55,166	1,273	5.75	1.57
33	SR 64 Entrance	982	107,939	43,077,407	712	1,867	43	0.19	0.05
34	SR 64 Entrance to Lanesville Rd	13,896	23,285,736	9,293,125,405	153,686	402,843	9,293	41.96	11.48
35	I-64 to Paoli Pike/State St	30,027	4,230,504	1,688,355,699	27,921	73,188	1,688	7.62	2.09
36	Paoli Pike/State St Exit	6,507	840,769	335,543,452	5,549	14,545	336	1.51	0.41
37	Paoli/State Exit to Entrance	23,520	3,708,634	1,480,081,955	24,477	64,159	1,480	6.68	1.83
38	Entrance from Paoli Pike/ State St	8,666	1,141,875	455,712,127	7,536	19,754	456	2.06	0.56
39	Paoli Pike/State St to Grant Line Rd	32,186	20,699,782	8,261,094,888	136,619	358,106	8,261	37.30	10.21
40	Grant Line Rd Exit	11,029	1,127,164	449,840,826	7,439	19,500	450	2.03	0.56
41	Grant Line Rd Exit to Entrance	21,157	4,563,882	1,821,403,918	30,122	78,955	1,821	8.22	2.25
42	Grant Line Rd Exit to Entrance	20,239	4,365,959	1,742,414,462	28,815	75,531	1,742	7.87	2.15
43	Entrance from Grant Line Rd	10,331	1,278,306	510,160,417	8,437	22,115	510	2.30	0.63
44	Grant Line Rd to Paoli Pike/State St	30,214	17,656,004	7,046,350,731	116,530	305,449	7,046	31.81	8.71
45	Paoli Pike/State St Exit	7,897	1,351,852	539,511,940	8,922	23,387	540	2.44	0.67
46	Paoli/State Exit to Entrance	22,659	2,646,553	1,056,215,101	17,467	45,785	1,056	4.77	1.30
47	Entrance from Paoli Pike/ State St	6,715	1,022,101	407,911,268	6,746	17,682	408	1.84	0.50
48	Paoli Pike/State St to I-64	29,202	5,318,706	2,122,647,320	35,103	92,014	2,123	9.58	2.62
49	Wesley Chapel UMC Driveway to I-64	12,533	548,945	219,079,119	3,623	9,497	219	0.99	0.27
50	I-64 to Wesley Chapel UMC Driveway	12,045	1,156,260	461,452,765	7,631	20,003	461	2.08	0.57

Table A-3: 2019 Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2019	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	2,706	4,498,928	6,959,705,207	21,595	22,945	6,960	5.90	0.65
2	SR 64 Exit	53	7,390	11,431,781	35	38	11	0.01	0.00
3	SR 64 Exit to SR 64 Entrance	2,653	673,000	1,041,110,258	3,230	3,432	1,041	0.88	0.10
4	SR 64 Entrance	616	73,748	114,085,179	354	376	114	0.10	0.01
5	SR 64 to US 150	3,269	1,579,777	2,443,867,054	7,583	8,057	2,444	2.07	0.23
6	US 150 NB Exit	80	16,440	25,431,563	79	84	25	0.02	0.00
7	US 150 Exit to US 150 Entrance	3,189	452,790	700,452,664	2,173	2,309	700	0.59	0.07
8	US 150 SB Entrance	435	124,321	192,320,549	597	634	192	0.16	0.02
9	US 150 to I-265	3,624	1,956,362	3,026,432,792	9,391	9,977	3,026	2.56	0.28
10	Exit to EB I-265	1,124	182,566	282,423,606	876	931	282	0.24	0.03
11	I-265 Exit to I-265 Entrance	2,500	450,775	697,335,265	2,164	2,299	697	0.59	0.07
12	Entrance from WB I-265	1,185	238,321	368,675,791	1,144	1,215	369	0.31	0.03
13	I-265 to Spring St	3,685	1,545,434	2,390,739,141	7,418	7,882	2,391	2.03	0.22
14	Spring St Exit	246	32,324	50,004,867	155	165	50	0.04	0.00
15	Spring St Exit to Spring St Entrance	3,439	384,102	594,194,015	1,844	1,959	594	0.50	0.06
16	Spring St Entrance	419	36,399	56,307,423	175	186	56	0.05	0.01
17	Spring St to ORX	3,858	582,982	901,856,076	2,798	2,973	902	0.76	0.08
18	ORX to Spring St	3,949	546,285	845,086,209	2,622	2,786	845	0.72	0.08
19	Spring St Exit	539	34,651	53,604,167	166	177	54	0.05	0.01
20	Spring St Exit to Spring St Entrance	3,393	321,957	498,057,263	1,545	1,642	498	0.42	0.05
21	Spring St Entrance	261	31,034	48,008,811	149	158	48	0.04	0.00
22	Spring St to I-265	3,902	1,716,197	2,654,904,985	8,238	8,753	2,655	2.25	0.25
23	Exit to EB I-265	1,076	139,446	215,718,554	669	711	216	0.18	0.02
24	I-265 Exit to I-265 Entrance	2,504	424,129	656,114,001	2,036	2,163	656	0.56	0.06
25	Entrance from WB I-265	1,290	215,206	332,917,833	1,033	1,098	333	0.28	0.03
26	I-265 to US 150 NB	3,929	2,435,076	3,766,989,292	11,688	12,419	3,767	3.19	0.35
27	US 150 Exit	392	47,216	73,042,340	227	241	73	0.06	0.01
28	US 150 Exit to US 150 Entrance	3,167	579,138	895,909,470	2,780	2,954	896	0.76	0.08

Table A-3: 2019 Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2019	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	81	11,826	18,294,464	57	60	18	0.02	0.00
30	US 150 to SR 64	3,618	1,383,957	2,140,940,098	6,643	7,058	2,141	1.81	0.20
31	SR 64 Exit	631	76,912	118,980,392	369	392	119	0.10	0.01
32	SR 64 Exit to SR 64 Entrance	2,635	633,792	980,457,486	3,042	3,232	980	0.83	0.09
33	SR 64 Entrance	61	6,650	10,287,909	32	34	10	0.01	0.00
34	SR 64 Entrance to Lanesville Rd	3,039	5,092,498	7,877,939,910	24,444	25,972	7,878	6.67	0.74
35	I-64 to Paoli Pike/State St	2,271	319,961	494,970,265	1,536	1,632	495	0.42	0.05
36	Paoli Pike/State St Exit	145	18,735	28,983,173	90	96	29	0.02	0.00
37	Paoli/State Exit to Entrance	2,126	335,228	518,587,063	1,609	1,710	519	0.44	0.05
38	Entrance from Paoli Pike/ State St	179	23,586	36,486,727	113	120	36	0.03	0.00
39	Paoli Pike/State St to Grant Line Rd	2,305	1,482,415	2,293,250,542	7,116	7,560	2,293	1.94	0.22
40	Grant Line Rd Exit	334	34,135	52,805,501	164	174	53	0.04	0.00
41	Grant Line Rd Exit to Entrance	1,971	425,174	657,731,704	2,041	2,168	658	0.56	0.06
42	Grant Line Rd Exit to Entrance	1,886	406,736	629,207,625	1,952	2,074	629	0.53	0.06
43	Entrance from Grant Line Rd	324	40,090	62,018,232	192	204	62	0.05	0.01
44	Grant Line Rd to Paoli Pike/State St	2,566	1,499,481	2,319,651,034	7,198	7,647	2,320	1.96	0.22
45	Paoli Pike/State St Exit	176	30,124	46,601,321	145	154	47	0.04	0.00
46	Paoli/State Exit to Entrance	2,048	239,225	370,073,755	1,148	1,220	370	0.31	0.03
47	Entrance from Paoli Pike/ State St	139	21,112	32,659,537	101	108	33	0.03	0.00
48	Paoli Pike/State St to I-64	2,359	429,656	664,665,531	2,062	2,191	665	0.56	0.06
49	Wesley Chapel UMC Driveway to I-64	516	22,601	34,962,753	108	115	35	0.03	0.00
50	I-64 to Wesley Chapel UMC Driveway	472	45,310	70,092,640	217	231	70	0.06	0.01

Table A-4: 2026 No Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2026 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	14,180	23,574,854	9,408,510,090	155,594	407,845	9,409	42.48	11.62
2	SR 64 Exit	904	126,017	50,292,401	832	2,180	50	0.23	0.06
3	SR 64 Exit to SR 64 Entrance	13,276	3,367,769	1,344,045,972	22,227	58,262	1,344	6.07	1.66
4	SR 64 Entrance	10,452	1,251,317	499,389,080	8,259	21,648	499	2.25	0.62
5	SR 64 to US 150	23,728	11,466,767	4,576,282,575	75,681	198,375	4,576	20.66	5.65
6	US 150 NB Exit	2,191	450,278	179,701,705	2,972	7,790	180	0.81	0.22
7	US 150 Exit to US 150 Entrance	21,537	3,057,897	1,220,378,892	20,182	52,902	1,220	5.51	1.51
8	US 150 SB Entrance	9,955	2,845,174	1,135,483,178	18,778	49,222	1,135	5.13	1.40
9	US 150 to I-265	31,492	17,000,515	6,784,751,125	112,203	294,109	6,785	30.63	8.38
10	Exit to EB I-265	15,652	2,542,238	1,014,584,155	16,779	43,981	1,015	4.58	1.25
11	I-265 Exit to I-265 Entrance	15,840	2,856,163	1,139,868,688	18,851	49,412	1,140	5.15	1.41
12	Entrance from WB I-265	14,238	2,863,428	1,142,768,087	18,899	49,537	1,143	5.16	1.41
13	I-265 to Spring St	30,078	12,614,286	5,034,246,711	83,254	218,227	5,034	22.73	6.22
14	Spring St Exit	5,304	696,919	278,133,869	4,600	12,057	278	1.26	0.34
15	Spring St Exit to Spring St Entrance	24,774	2,767,037	1,104,299,434	18,262	47,870	1,104	4.99	1.36
16	Spring St Entrance	10,091	876,609	349,846,600	5,786	15,165	350	1.58	0.43
17	Spring St to ORX	34,865	5,268,496	2,102,608,867	34,772	91,145	2,103	9.49	2.60
18	ORX to Spring St	35,792	4,951,234	1,975,992,446	32,678	85,656	1,976	8.92	2.44
19	Spring St Exit	11,480	737,483	294,322,823	4,867	12,758	294	1.33	0.36
20	Spring St Exit to Spring St Entrance	24,343	2,310,132	921,952,717	15,247	39,965	922	4.16	1.14
21	Spring St Entrance	6,552	779,649	311,150,978	5,146	13,488	311	1.40	0.38
22	Spring St to I-265	30,601	13,459,206	5,371,446,664	88,831	232,844	5,371	24.25	6.64
23	Exit to EB I-265	14,884	1,928,617	769,693,671	12,729	33,365	770	3.47	0.95
24	I-265 Exit to I-265 Entrance	15,994	2,708,670	1,081,005,481	17,877	46,860	1,081	4.88	1.34
25	Entrance from WB I-265	15,540	2,592,172	1,034,512,278	17,108	44,845	1,035	4.67	1.28
26	I-265 to US 150 NB	31,231	19,356,241	7,724,899,990	127,751	334,863	7,725	34.88	9.54
27	US 150 Exit	10,296	1,240,155	494,934,406	8,185	21,455	495	2.23	0.61

Table A-4: 2026 No Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2026 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
28	US 150 Exit to US 150 Entrance	21,414	3,915,857	1,562,782,802	25,845	67,744	1,563	7.06	1.93
29	US 150 Entrance	2,871	419,153	167,280,268	2,766	7,251	167	0.76	0.21
30	US 150 to SR 64	23,806	9,106,360	3,634,265,408	60,102	157,540	3,634	16.41	4.49
31	SR 64 Exit	10,772	1,313,192	524,082,833	8,667	22,718	524	2.37	0.65
32	SR 64 Exit to SR 64 Entrance	13,377	3,217,571	1,284,103,303	21,236	55,664	1,284	5.80	1.59
33	SR 64 Entrance	983	107,983	43,095,027	713	1,868	43	0.19	0.05
34	SR 64 Entrance to Lanesville Rd	13,972	23,412,352	9,343,656,697	154,522	405,034	9,344	42.18	11.54
35	I-64 to Paoli Pike/State St	30,560	4,305,666	1,718,352,198	28,417	74,488	1,718	7.76	2.12
36	Paoli Pike/State St Exit	6,574	849,444	339,005,394	5,606	14,695	339	1.53	0.42
37	Paoli/State Exit to Entrance	23,986	3,782,167	1,509,428,423	24,962	65,431	1,509	6.81	1.86
38	Entrance from Paoli Pike/ State St	8,836	1,164,237	464,636,586	7,684	20,141	465	2.10	0.57
39	Paoli Pike/State St to Grant Line Rd	32,822	21,108,849	8,424,349,705	139,318	365,183	8,424	38.03	10.41
40	Grant Line Rd Exit	11,150	1,139,544	454,781,559	7,521	19,714	455	2.05	0.56
41	Grant Line Rd Exit to Entrance	21,672	4,674,959	1,865,733,442	30,855	80,877	1,866	8.42	2.30
42	Grant Line Rd Exit to Entrance	20,699	4,465,086	1,781,975,421	29,470	77,246	1,782	8.05	2.20
43	Entrance from Grant Line Rd	10,488	1,297,752	517,921,065	8,565	22,451	518	2.34	0.64
44	Grant Line Rd to Paoli Pike/State St	30,771	17,981,237	7,176,148,151	118,676	311,075	7,176	32.40	8.87
45	Paoli Pike/State St Exit	8,072	1,381,880	551,495,720	9,120	23,907	551	2.49	0.68
46	Paoli/State Exit to Entrance	23,100	2,698,107	1,076,789,865	17,808	46,677	1,077	4.86	1.33
47	Entrance from Paoli Pike/ State St	6,936	1,055,649	421,299,934	6,967	18,263	421	1.90	0.52
48	Paoli Pike/State St to I-64	29,822	5,431,715	2,167,748,102	35,849	93,969	2,168	9.79	2.68
49	Wesley Chapel UMC Driveway to I-64	12,826	561,788	224,204,491	3,708	9,719	224	1.01	0.28
50	I-64 to Wesley Chapel UMC Driveway	12,487	1,198,708	478,393,636	7,911	20,738	478	2.16	0.59

Table A-4: 2026 No Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2026 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	2,854	4,745,448	7,341,064,426	22,778	24,202	7,341	6.22	0.69
2	SR 64 Exit	63	8,811	13,630,975	42	45	14	0.01	0.00
3	SR 64 Exit to SR 64 Entrance	2,791	708,027	1,095,296,737	3,399	3,611	1,095	0.93	0.10
4	SR 64 Entrance	682	81,646	126,303,701	392	416	126	0.11	0.01
5	SR 64 to US 150	3,473	1,678,388	2,596,415,355	8,056	8,560	2,596	2.20	0.24
6	US 150 NB Exit	114	23,388	36,181,076	112	119	36	0.03	0.00
7	US 150 Exit to US 150 Entrance	3,359	476,962	737,845,086	2,289	2,433	738	0.63	0.07
8	US 150 SB Entrance	449	128,237	198,378,646	616	654	198	0.17	0.02
9	US 150 to I-265	3,808	2,055,660	3,180,043,965	9,867	10,484	3,180	2.69	0.30
10	Exit to EB I-265	1,252	203,394	314,644,350	976	1,037	315	0.27	0.03
11	I-265 Exit to I-265 Entrance	2,556	460,820	712,874,204	2,212	2,350	713	0.60	0.07
12	Entrance from WB I-265	1,242	249,832	386,482,831	1,199	1,274	386	0.33	0.04
13	I-265 to Spring St	3,798	1,592,801	2,464,014,342	7,645	8,123	2,464	2.09	0.23
14	Spring St Exit	264	34,717	53,705,560	167	177	54	0.05	0.01
15	Spring St Exit to Spring St Entrance	3,534	394,683	610,562,970	1,894	2,013	611	0.52	0.06
16	Spring St Entrance	434	37,698	58,317,598	181	192	58	0.05	0.01
17	Spring St to ORX	3,968	599,559	927,499,000	2,878	3,058	927	0.79	0.09
18	ORX to Spring St	4,075	563,768	872,131,279	2,706	2,875	872	0.74	0.08
19	Spring St Exit	572	36,737	56,831,526	176	187	57	0.05	0.01
20	Spring St Exit to Spring St Entrance	3,472	329,511	509,744,162	1,582	1,681	510	0.43	0.05
21	Spring St Entrance	282	33,528	51,867,240	161	171	52	0.04	0.00
22	Spring St to I-265	4,048	1,780,291	2,754,055,705	8,545	9,079	2,754	2.33	0.26
23	Exit to EB I-265	1,191	154,301	238,698,548	741	787	239	0.20	0.02
24	I-265 Exit to I-265 Entrance	2,580	437,023	676,061,137	2,098	2,229	676	0.57	0.06
25	Entrance from WB I-265	1,356	226,165	349,870,843	1,086	1,153	350	0.30	0.03
26	I-265 to US 150 NB	4,239	2,627,000	4,063,890,118	12,610	13,398	4,064	3.44	0.38
27	US 150 Exit	420	50,588	78,257,563	243	258	78	0.07	0.01

Table A-4: 2026 No Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2026 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
28	US 150 Exit to US 150 Entrance	3,340	610,784	944,863,614	2,932	3,115	945	0.80	0.09
29	US 150 Entrance	89	13,007	20,120,985	62	66	20	0.02	0.00
30	US 150 to SR 64	3,908	1,494,799	2,312,409,509	7,175	7,623	2,312	1.96	0.22
31	SR 64 Exit	753	91,821	142,044,524	441	468	142	0.12	0.01
32	SR 64 Exit to SR 64 Entrance	2,812	676,450	1,046,447,954	3,247	3,450	1,046	0.89	0.10
33	SR 64 Entrance	64	7,046	10,899,440	34	36	11	0.01	0.00
34	SR 64 Entrance to Lanesville Rd	3,264	5,470,272	8,462,345,183	26,257	27,898	8,462	7.17	0.80
35	I-64 to Paoli Pike/State St	2,419	340,745	527,122,516	1,636	1,738	527	0.45	0.05
36	Paoli Pike/State St Exit	148	19,106	29,555,752	92	97	30	0.03	0.00
37	Paoli/State Exit to Entrance	2,271	358,037	553,872,188	1,719	1,826	554	0.47	0.05
38	Entrance from Paoli Pike/ State St	195	25,732	39,807,019	124	131	40	0.03	0.00
39	Paoli Pike/State St to Grant Line Rd	2,466	1,585,923	2,453,374,082	7,612	8,088	2,453	2.08	0.23
40	Grant Line Rd Exit	348	35,552	54,997,604	171	181	55	0.05	0.01
41	Grant Line Rd Exit to Entrance	2,118	456,901	706,812,526	2,193	2,330	707	0.60	0.07
42	Grant Line Rd Exit to Entrance	2,023	436,390	675,081,724	2,095	2,226	675	0.57	0.06
43	Entrance from Grant Line Rd	331	40,937	63,328,090	196	209	63	0.05	0.01
44	Grant Line Rd to Paoli Pike/State St	2,770	1,618,950	2,504,466,036	7,771	8,257	2,504	2.12	0.24
45	Paoli Pike/State St Exit	182	31,081	48,081,450	149	159	48	0.04	0.00
46	Paoli/State Exit to Entrance	2,187	255,415	395,119,073	1,226	1,303	395	0.33	0.04
47	Entrance from Paoli Pike/ State St	153	23,332	36,094,218	112	119	36	0.03	0.00
48	Paoli Pike/State St to I-64	2,554	465,088	719,476,574	2,232	2,372	719	0.61	0.07
49	Wesley Chapel UMC Driveway to I-64	538	23,555	36,439,153	113	120	36	0.03	0.00
50	I-64 to Wesley Chapel UMC Driveway	534	51,242	79,270,546	246	261	79	0.07	0.01

Table A-5: 2026 Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2026 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	14,705	24,448,901	9,757,334,203	161,363	422,966	9,757	44.05	12.05
2	SR 64 Exit	926	129,049	51,502,221	852	2,233	52	0.23	0.06
3	SR 64 Exit to SR 64 Entrance	13,780	3,495,615	1,395,068,298	23,071	60,474	1,395	6.30	1.72
4	SR 64 Entrance	11,248	1,346,669	537,443,158	8,888	23,297	537	2.43	0.66
5	SR 64 to US 150	25,028	12,095,215	4,827,090,476	79,828	209,247	4,827	21.79	5.96
6	US 150 NB Exit	2,081	427,698	170,690,276	2,823	7,399	171	0.77	0.21
7	US 150 Exit to US 150 Entrance	22,947	3,258,141	1,300,294,290	21,504	56,366	1,300	5.87	1.61
8	US 150 SB Entrance	11,206	3,202,640	1,278,144,648	21,137	55,406	1,278	5.77	1.58
9	US 150 to I-265	34,153	18,437,067	7,358,065,651	121,685	318,961	7,358	33.22	9.09
10	Exit to EB I-265	16,814	2,730,969	1,089,904,974	18,024	47,246	1,090	4.92	1.35
11	I-265 Exit to I-265 Entrance	17,339	3,126,472	1,247,746,596	20,635	54,088	1,248	5.63	1.54
12	Entrance from WB I-265	13,124	2,639,383	1,053,353,954	17,420	45,661	1,053	4.76	1.30
13	I-265 to Spring St	30,463	12,775,801	5,098,705,873	84,320	221,021	5,099	23.02	6.30
14	Spring St Exit	5,577	732,833	292,467,160	4,837	12,678	292	1.32	0.36
15	Spring St Exit to Spring St Entrance	24,886	2,779,524	1,109,282,807	18,345	48,086	1,109	5.01	1.37
16	Spring St Entrance	10,146	881,403	351,759,883	5,817	15,248	352	1.59	0.43
17	Spring St to ORX	35,032	5,293,729	2,112,679,224	34,939	91,582	2,113	9.54	2.61
18	ORX to Spring St	35,834	4,957,102	1,978,334,195	32,717	85,758	1,978	8.93	2.44
19	Spring St Exit	11,842	760,721	303,596,717	5,021	13,160	304	1.37	0.38
20	Spring St Exit to Spring St Entrance	24,109	2,287,963	913,105,367	15,101	39,582	913	4.12	1.13
21	Spring St Entrance	6,914	822,661	328,316,597	5,430	14,232	328	1.48	0.41
22	Spring St to I-265	30,628	13,470,741	5,376,050,366	88,907	233,044	5,376	24.27	6.64
23	Exit to EB I-265	13,372	1,732,666	691,491,247	11,436	29,975	691	3.12	0.85
24	I-265 Exit to I-265 Entrance	17,233	2,918,633	1,164,799,952	19,263	50,492	1,165	5.26	1.44
25	Entrance from WB I-265	16,795	2,801,414	1,118,018,831	18,489	48,464	1,118	5.05	1.38
26	I-265 to US 150 NB	33,097	20,512,387	8,186,307,154	135,382	354,864	8,186	36.96	10.11
27	US 150 Exit	10,717	1,290,851	515,166,780	8,520	22,332	515	2.33	0.64
28	US 150 Exit to US 150 Entrance	22,977	4,201,746	1,676,878,582	27,732	72,690	1,677	7.57	2.07

Table A-5: 2026 Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2026 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	2,884	421,130	168,069,047	2,779	7,286	168	0.76	0.21
30	US 150 to SR 64	25,264	9,664,109	3,856,857,875	63,783	167,189	3,857	17.41	4.76
31	SR 64 Exit	11,287	1,375,955	549,131,100	9,081	23,804	549	2.48	0.68
32	SR 64 Exit to SR 64 Entrance	14,335	3,448,151	1,376,125,599	22,758	59,653	1,376	6.21	1.70
33	SR 64 Entrance	953	104,667	41,771,728	691	1,811	42	0.19	0.05
34	SR 64 Entrance to Lanesville Rd	14,826	24,843,697	9,914,893,701	163,968	429,796	9,915	44.76	12.25
35	I-64 to Paoli Pike/State St	30,572	4,307,302	1,719,005,132	28,428	74,516	1,719	7.76	2.12
36	Paoli Pike/State St Exit	6,524	842,947	336,412,394	5,563	14,583	336	1.52	0.42
37	Paoli/State Exit to Entrance	24,048	3,791,927	1,513,323,506	25,027	65,600	1,513	6.83	1.87
38	Entrance from Paoli Pike/ State St	9,214	1,214,026	484,506,829	8,013	21,003	485	2.19	0.60
39	Paoli Pike/State St to Grant Line Rd	33,262	21,391,670	8,537,220,993	141,185	370,076	8,537	38.54	10.55
40	Grant Line Rd Exit	10,746	1,098,221	438,289,820	7,248	18,999	438	1.98	0.54
41	Grant Line Rd Exit to Entrance	22,253	4,800,389	1,915,791,477	31,683	83,047	1,916	8.65	2.37
42	Grant Line Rd Exit to Entrance	21,228	4,579,299	1,827,556,673	30,223	79,222	1,828	8.25	2.26
43	Entrance from Grant Line Rd	10,002	1,237,658	493,938,200	8,169	21,411	494	2.23	0.61
44	Grant Line Rd to Paoli Pike/State St	30,927	18,072,376	7,212,521,023	119,278	312,652	7,213	32.56	8.91
45	Paoli Pike/State St Exit	8,614	1,474,538	588,474,887	9,732	25,510	588	2.66	0.73
46	Paoli/State Exit to Entrance	22,834	2,667,027	1,064,386,046	17,602	46,140	1,064	4.81	1.31
47	Entrance from Paoli Pike/ State St	6,825	1,038,768	414,562,843	6,856	17,971	415	1.87	0.51
48	Paoli Pike/State St to I-64	29,351	5,345,916	2,133,506,348	35,283	92,484	2,134	9.63	2.64
49	Wesley Chapel UMC Driveway to I-64	14,091	617,165	246,304,951	4,073	10,677	246	1.11	0.30
50	I-64 to Wesley Chapel UMC Driveway	12,798	1,228,564	490,308,622	8,109	21,254	490	2.21	0.61

Table A-5: 2026 Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2026 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	3,038	5,050,167	7,812,455,365	24,241	25,756	7,812	6.62	0.73
2	SR 64 Exit	71	9,963	15,412,251	48	51	15	0.01	0.00
3	SR 64 Exit to SR 64 Entrance	2,966	752,426	1,163,980,568	3,612	3,837	1,164	0.99	0.11
4	SR 64 Entrance	748	89,493	138,442,364	430	456	138	0.12	0.01
5	SR 64 to US 150	3,714	1,794,644	2,776,259,274	8,614	9,153	2,776	2.35	0.26
6	US 150 NB Exit	97	19,870	30,738,877	95	101	31	0.03	0.00
7	US 150 Exit to US 150 Entrance	3,617	513,549	794,444,665	2,465	2,619	794	0.67	0.07
8	US 150 SB Entrance	545	155,737	240,919,952	748	794	241	0.20	0.02
9	US 150 to I-265	4,162	2,246,711	3,475,594,567	10,784	11,458	3,476	2.94	0.33
10	Exit to EB I-265	1,730	281,040	434,760,391	1,349	1,433	435	0.37	0.04
11	I-265 Exit to I-265 Entrance	2,432	438,437	678,248,602	2,104	2,236	678	0.57	0.06
12	Entrance from WB I-265	1,023	205,790	318,351,545	988	1,050	318	0.27	0.03
13	I-265 to Spring St	3,455	1,448,900	2,241,404,140	6,955	7,389	2,241	1.90	0.21
14	Spring St Exit	279	36,645	56,688,656	176	187	57	0.05	0.01
15	Spring St Exit to Spring St Entrance	3,176	354,721	548,742,116	1,703	1,809	549	0.46	0.05
16	Spring St Entrance	438	38,029	58,829,995	183	194	59	0.05	0.01
17	Spring St to ORX	3,614	546,068	844,750,334	2,621	2,785	845	0.72	0.08
18	ORX to Spring St	3,786	523,731	810,196,098	2,514	2,671	810	0.69	0.08
19	Spring St Exit	592	38,039	58,845,888	183	194	59	0.05	0.01
20	Spring St Exit to Spring St Entrance	3,077	291,988	451,696,689	1,402	1,489	452	0.38	0.04
21	Spring St Entrance	298	35,495	54,909,229	170	181	55	0.05	0.01
22	Spring St to I-265	3,770	1,658,359	2,565,431,295	7,960	8,458	2,565	2.17	0.24
23	Exit to EB I-265	1,376	178,306	275,834,143	856	909	276	0.23	0.03
24	I-265 Exit to I-265 Entrance	2,417	409,291	633,160,564	1,965	2,087	633	0.54	0.06
25	Entrance from WB I-265	1,309	218,424	337,894,989	1,048	1,114	338	0.29	0.03
26	I-265 to US 150 NB	4,657	2,886,410	4,465,188,236	13,855	14,721	4,465	3.78	0.42
27	US 150 Exit	438	52,769	81,632,119	253	269	82	0.07	0.01
28	US 150 Exit to US 150 Entrance	3,622	662,280	1,024,527,489	3,179	3,378	1,025	0.87	0.10

Table A-5: 2026 Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2026 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	96	13,950	21,580,646	67	71	22	0.02	0.00
30	US 150 to SR 64	4,315	1,650,451	2,553,196,925	7,922	8,417	2,553	2.16	0.24
31	SR 64 Exit	871	106,227	164,329,731	510	542	164	0.14	0.02
32	SR 64 Exit to SR 64 Entrance	3,086	742,210	1,148,175,654	3,563	3,785	1,148	0.97	0.11
33	SR 64 Entrance	63	6,956	10,760,164	33	35	11	0.01	0.00
34	SR 64 Entrance to Lanesville Rd	3,611	6,051,460	9,361,425,635	29,047	30,862	9,361	7.93	0.88
35	I-64 to Paoli Pike/State St	2,720	383,208	592,810,743	1,839	1,954	593	0.50	0.06
36	Paoli Pike/State St Exit	147	19,013	29,412,745	91	97	29	0.02	0.00
37	Paoli/State Exit to Entrance	2,573	405,672	627,563,063	1,947	2,069	628	0.53	0.06
38	Entrance from Paoli Pike/ State St	201	26,541	41,058,514	127	135	41	0.03	0.00
39	Paoli Pike/State St to Grant Line Rd	2,774	1,784,163	2,760,045,733	8,564	9,099	2,760	2.34	0.26
40	Grant Line Rd Exit	299	30,578	47,304,006	147	156	47	0.04	0.00
41	Grant Line Rd Exit to Entrance	2,738	590,545	913,555,062	2,835	3,012	914	0.77	0.09
42	Grant Line Rd Exit to Entrance	2,612	563,346	871,479,840	2,704	2,873	871	0.74	0.08
43	Entrance from Grant Line Rd	243	30,007	46,419,477	144	153	46	0.04	0.00
44	Grant Line Rd to Paoli Pike/State St	3,158	1,845,705	2,855,249,528	8,859	9,413	2,855	2.42	0.27
45	Paoli Pike/State St Exit	194	33,259	51,450,726	160	170	51	0.04	0.00
46	Paoli/State Exit to Entrance	2,443	285,327	441,392,316	1,370	1,455	441	0.37	0.04
47	Entrance from Paoli Pike/ State St	149	22,710	35,131,257	109	116	35	0.03	0.00
48	Paoli Pike/State St to I-64	2,900	528,120	816,985,958	2,535	2,693	817	0.69	0.08
49	Wesley Chapel UMC Driveway to I-64	640	28,053	43,396,792	135	143	43	0.04	0.00
50	I-64 to Wesley Chapel UMC Driveway	535	51,338	79,417,694	246	262	79	0.07	0.01

Table A-6: 2046 No Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2046 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	16,984	28,237,194	11,269,207,427	186,365	488,503	11,269	50.88	13.92
2	SR 64 Exit	1,114	155,288	61,974,137	1,025	2,686	62	0.28	0.08
3	SR 64 Exit to SR 64 Entrance	15,870	4,025,892	1,606,696,975	26,571	69,648	1,607	7.25	1.98
4	SR 64 Entrance	13,762	1,647,530	657,514,413	10,874	28,502	658	2.97	0.81
5	SR 64 to US 150	29,632	14,319,867	5,714,928,589	94,511	247,734	5,715	25.80	7.06
6	US 150 NB Exit	2,842	583,938	233,044,472	3,854	10,102	233	1.05	0.29
7	US 150 Exit to US 150 Entrance	26,790	3,803,805	1,518,063,933	25,105	65,806	1,518	6.85	1.88
8	US 150 SB Entrance	12,565	3,591,056	1,433,157,935	23,701	62,125	1,433	6.47	1.77
9	US 150 to I-265	39,355	21,245,388	8,478,841,029	140,220	367,545	8,479	38.28	10.48
10	Exit to EB I-265	19,529	3,171,993	1,265,913,561	20,935	54,875	1,266	5.72	1.56
11	I-265 Exit to I-265 Entrance	19,826	3,574,892	1,426,706,872	23,594	61,846	1,427	6.44	1.76
12	Entrance from WB I-265	17,947	3,609,458	1,440,501,901	23,822	62,444	1,441	6.50	1.78
13	I-265 to Spring St	37,774	15,841,681	6,322,270,940	104,555	274,061	6,322	28.54	7.81
14	Spring St Exit	6,892	905,603	361,418,098	5,977	15,667	361	1.63	0.45
15	Spring St Exit to Spring St Entrance	30,882	3,449,170	1,376,532,570	22,765	59,671	1,377	6.21	1.70
16	Spring St Entrance	10,822	940,134	375,198,742	6,205	16,264	375	1.69	0.46
17	Spring St to ORX	41,704	6,301,883	2,515,024,230	41,592	109,023	2,515	11.35	3.11
18	ORX to Spring St	42,486	5,877,362	2,345,601,687	38,791	101,678	2,346	10.59	2.90
19	Spring St Exit	13,396	860,551	343,438,245	5,680	14,888	343	1.55	0.42
20	Spring St Exit to Spring St Entrance	29,300	2,780,574	1,109,701,859	18,352	48,104	1,110	5.01	1.37
21	Spring St Entrance	8,891	1,057,983	422,231,236	6,983	18,303	422	1.91	0.52
22	Spring St to I-265	37,724	16,591,816	6,621,643,110	109,506	287,038	6,622	29.90	8.18
23	Exit to EB I-265	16,680	2,161,256	862,537,528	14,264	37,390	863	3.89	1.07
24	I-265 Exit to I-265 Entrance	21,198	3,590,033	1,432,749,349	23,694	62,108	1,433	6.47	1.77
25	Entrance from WB I-265	21,208	3,537,574	1,411,813,450	23,348	61,200	1,412	6.37	1.74
26	I-265 to US 150 NB	41,784	25,896,470	10,335,045,759	170,917	448,009	10,335	46.66	12.77
27	US 150 Exit	14,782	1,780,497	710,580,208	11,751	30,803	711	3.21	0.88
28	US 150 Exit to US 150 Entrance	27,683	5,062,181	2,020,270,365	33,410	87,576	2,020	9.12	2.50

Table A-6: 2046 No Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2046 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	3,328	485,883	193,911,355	3,207	8,406	194	0.88	0.24
30	US 150 to SR 64	30,330	11,601,801	4,630,173,431	76,572	200,711	4,630	20.90	5.72
31	SR 64 Exit	14,529	1,771,244	706,887,519	11,690	30,643	707	3.19	0.87
32	SR 64 Exit to SR 64 Entrance	16,058	3,862,509	1,541,492,206	25,493	66,821	1,541	6.96	1.90
33	SR 64 Entrance	1,023	112,422	44,866,597	742	1,945	45	0.20	0.06
34	SR 64 Entrance to Lanesville Rd	16,430	27,532,483	10,987,963,629	181,714	476,312	10,988	49.61	13.57
35	I-64 to Paoli Pike/State St	36,362	5,122,983	2,044,535,870	33,812	88,628	2,045	9.23	2.53
36	Paoli Pike/State St Exit	7,286	941,397	375,703,155	6,213	16,286	376	1.70	0.46
37	Paoli/State Exit to Entrance	29,076	4,584,670	1,829,700,016	30,259	79,315	1,830	8.26	2.26
38	Entrance from Paoli Pike/ State St	10,728	1,413,597	564,153,892	9,330	24,455	564	2.55	0.70
39	Paoli Pike/State St to Grant Line Rd	39,804	25,599,118	10,216,375,308	168,954	442,865	10,216	46.12	12.62
40	Grant Line Rd Exit	12,509	1,278,424	510,207,200	8,438	22,117	510	2.30	0.63
41	Grant Line Rd Exit to Entrance	27,295	5,887,924	2,349,816,767	38,860	101,861	2,350	10.61	2.90
42	Grant Line Rd Exit to Entrance	27,609	5,955,671	2,376,854,161	39,307	103,033	2,377	10.73	2.94
43	Entrance from Grant Line Rd	12,203	1,509,981	602,619,886	9,966	26,123	603	2.72	0.74
44	Grant Line Rd to Paoli Pike/State St	39,169	22,888,776	9,134,702,588	151,066	395,976	9,135	41.24	11.29
45	Paoli Pike/State St Exit	9,953	1,703,739	679,946,688	11,245	29,475	680	3.07	0.84
46	Paoli/State Exit to Entrance	29,811	3,481,956	1,389,617,010	22,981	60,238	1,390	6.27	1.72
47	Entrance from Paoli Pike/ State St	9,382	1,427,915	569,867,984	9,424	24,703	570	2.57	0.70
48	Paoli Pike/State St to I-64	38,840	7,074,154	2,823,230,409	46,689	122,383	2,823	12.75	3.49
49	Wesley Chapel UMC Driveway to I-64	15,893	696,118	277,814,469	4,594	12,043	278	1.25	0.34
50	I-64 to Wesley Chapel UMC Driveway	17,624	1,691,783	675,175,362	11,166	29,268	675	3.05	0.83

Table A-6: 2046 No Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2046 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	3,335	5,544,667	8,577,432,474	26,614	28,278	8,577	7.27	0.81
2	SR 64 Exit	98	13,701	21,194,859	66	70	21	0.02	0.00
3	SR 64 Exit to SR 64 Entrance	3,237	821,076	1,270,179,741	3,941	4,187	1,270	1.08	0.12
4	SR 64 Entrance	870	104,213	161,213,766	500	531	161	0.14	0.02
5	SR 64 to US 150	4,107	1,984,843	3,070,491,226	9,527	10,123	3,070	2.60	0.29
6	US 150 NB Exit	217	44,671	69,104,516	214	228	69	0.06	0.01
7	US 150 Exit to US 150 Entrance	3,890	552,295	854,383,560	2,651	2,817	854	0.72	0.08
8	US 150 SB Entrance	488	139,426	215,687,496	669	711	216	0.18	0.02
9	US 150 to I-265	4,378	2,363,217	3,655,824,329	11,343	12,052	3,656	3.10	0.34
10	Exit to EB I-265	1,649	267,844	414,346,043	1,286	1,366	414	0.35	0.04
11	I-265 Exit to I-265 Entrance	2,729	492,000	761,109,268	2,362	2,509	761	0.64	0.07
12	Entrance from WB I-265	1,406	282,721	437,360,090	1,357	1,442	437	0.37	0.04
13	I-265 to Spring St	4,134	1,733,905	2,682,299,124	8,323	8,843	2,682	2.27	0.25
14	Spring St Exit	319	41,922	64,852,011	201	214	65	0.05	0.01
15	Spring St Exit to Spring St Entrance	3,815	426,137	659,221,772	2,045	2,173	659	0.56	0.06
16	Spring St Entrance	477	41,411	64,060,955	199	211	64	0.05	0.01
17	Spring St to ORX	4,292	648,573	1,003,322,042	3,113	3,308	1,003	0.85	0.09
18	ORX to Spring St	4,450	615,530	952,205,798	2,955	3,139	952	0.81	0.09
19	Spring St Exit	620	39,836	61,625,748	191	203	62	0.05	0.01
20	Spring St Exit to Spring St Entrance	3,620	343,534	531,436,482	1,649	1,752	531	0.45	0.05
21	Spring St Entrance	392	46,602	72,091,223	224	238	72	0.06	0.01
22	Spring St to I-265	4,479	1,970,118	3,047,712,887	9,457	10,048	3,048	2.58	0.29
23	Exit to EB I-265	1,408	182,497	282,317,073	876	931	282	0.24	0.03
24	I-265 Exit to I-265 Entrance	2,917	494,084	764,332,764	2,372	2,520	764	0.65	0.07
25	Entrance from WB I-265	1,661	277,090	428,649,804	1,330	1,413	429	0.36	0.04
26	I-265 to US 150 NB	5,200	3,222,804	4,985,579,614	15,469	16,436	4,986	4.22	0.47
27	US 150 Exit	500	60,220	93,158,200	289	307	93	0.08	0.01
28	US 150 Exit to US 150 Entrance	4,019	735,005	1,137,031,022	3,528	3,749	1,137	0.96	0.11

Table A-6: 2046 No Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2046 No Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	114	16,649	25,756,014	80	85	26	0.02	0.00
30	US 150 to SR 64	4,814	1,841,482	2,848,716,191	8,839	9,392	2,849	2.41	0.27
31	SR 64 Exit	1,282	156,275	241,752,158	750	797	242	0.20	0.02
32	SR 64 Exit to SR 64 Entrance	3,275	787,754	1,218,631,891	3,781	4,018	1,219	1.03	0.11
33	SR 64 Entrance	65	7,111	11,000,691	34	36	11	0.01	0.00
34	SR 64 Entrance to Lanesville Rd	3,991	6,687,293	10,345,039,806	32,099	34,105	10,345	8.76	0.97
35	I-64 to Paoli Pike/State St	2,904	409,204	633,026,068	1,964	2,087	633	0.54	0.06
36	Paoli Pike/State St Exit	156	20,183	31,223,097	97	103	31	0.03	0.00
37	Paoli/State Exit to Entrance	2,748	433,339	670,361,644	2,080	2,210	670	0.57	0.06
38	Entrance from Paoli Pike/ State St	242	31,865	49,293,568	153	163	49	0.04	0.00
39	Paoli Pike/State St to Grant Line Rd	2,990	1,922,987	2,974,802,828	9,230	9,807	2,975	2.52	0.28
40	Grant Line Rd Exit	388	39,650	61,337,183	190	202	61	0.05	0.01
41	Grant Line Rd Exit to Entrance	2,602	561,308	868,326,145	2,694	2,863	868	0.74	0.08
42	Grant Line Rd Exit to Entrance	2,632	567,766	878,317,254	2,725	2,896	878	0.74	0.08
43	Entrance from Grant Line Rd	351	43,388	67,119,455	208	221	67	0.06	0.01
44	Grant Line Rd to Paoli Pike/State St	3,626	2,119,124	3,278,220,238	10,172	10,808	3,278	2.78	0.31
45	Paoli Pike/State St Exit	213	36,528	56,507,488	175	186	57	0.05	0.01
46	Paoli/State Exit to Entrance	2,818	329,111	509,124,958	1,580	1,678	509	0.43	0.05
47	Entrance from Paoli Pike/ State St	211	32,187	49,792,843	154	164	50	0.04	0.00
48	Paoli Pike/State St to I-64	3,382	615,950	952,856,489	2,957	3,141	953	0.81	0.09
49	Wesley Chapel UMC Driveway to I-64	602	26,363	40,782,359	127	134	41	0.03	0.00
50	I-64 to Wesley Chapel UMC Driveway	717	68,861	106,525,769	331	351	107	0.09	0.01

Table A-7: 2046 Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2046 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	17,022	28,300,336	11,294,406,987	186,782	489,596	11,294	50.99	13.95
2	SR 64 Exit	1,114	155,288	61,974,117	1,025	2,686	62	0.28	0.08
3	SR 64 Exit to SR 64 Entrance	15,908	4,035,527	1,610,541,950	26,634	69,815	1,611	7.27	1.99
4	SR 64 Entrance	14,214	1,701,645	679,111,092	11,231	29,438	679	3.07	0.84
5	SR 64 to US 150	30,122	14,556,659	5,809,430,242	96,074	251,830	5,809	26.23	7.18
6	US 150 NB Exit	2,348	482,486	192,555,760	3,184	8,347	193	0.87	0.24
7	US 150 Exit to US 150 Entrance	27,774	3,943,474	1,573,804,474	26,027	68,222	1,574	7.11	1.94
8	US 150 SB Entrance	14,511	4,147,311	1,655,154,174	27,372	71,748	1,655	7.47	2.04
9	US 150 to I-265	42,285	22,827,120	9,110,095,945	150,659	394,909	9,110	41.13	11.25
10	Exit to EB I-265	20,850	3,386,544	1,351,539,083	22,351	58,587	1,352	6.10	1.67
11	I-265 Exit to I-265 Entrance	21,435	3,865,029	1,542,498,040	25,509	66,865	1,542	6.96	1.91
12	Entrance from WB I-265	16,985	3,415,903	1,363,255,906	22,545	59,095	1,363	6.15	1.68
13	I-265 to Spring St	38,420	16,112,895	6,430,509,850	106,345	278,753	6,431	29.03	7.94
14	Spring St Exit	7,148	939,257	374,848,770	6,199	16,249	375	1.69	0.46
15	Spring St Exit to Spring St Entrance	31,272	3,492,794	1,393,942,526	23,052	60,425	1,394	6.29	1.72
16	Spring St Entrance	10,742	933,143	372,408,759	6,159	16,143	372	1.68	0.46
17	Spring St to ORX	42,014	6,348,743	2,533,725,713	41,902	109,833	2,534	11.44	3.13
18	ORX to Spring St	42,687	5,905,165	2,356,697,670	38,974	102,159	2,357	10.64	2.91
19	Spring St Exit	13,435	863,089	344,451,168	5,696	14,931	344	1.56	0.43
20	Spring St Exit to Spring St Entrance	29,497	2,799,270	1,117,163,305	18,475	48,427	1,117	5.04	1.38
21	Spring St Entrance	8,922	1,061,608	423,678,291	7,007	18,366	424	1.91	0.52
22	Spring St to I-265	37,925	16,680,517	6,657,042,611	110,091	288,573	6,657	30.05	8.22
23	Exit to EB I-265	16,495	2,137,276	852,967,312	14,106	36,975	853	3.85	1.05
24	I-265 Exit to I-265 Entrance	21,669	3,669,860	1,464,607,900	24,221	63,489	1,465	6.61	1.81
25	Entrance from WB I-265	21,475	3,582,202	1,429,624,171	23,643	61,972	1,430	6.45	1.77
26	I-265 to US 150 NB	42,442	26,304,089	10,497,722,780	173,607	455,061	10,498	47.39	12.97
27	US 150 Exit	15,160	1,826,077	728,770,854	12,052	31,591	729	3.29	0.90
28	US 150 Exit to US 150 Entrance	27,969	5,114,505	2,041,152,311	33,756	88,481	2,041	9.22	2.52

Table A-7: 2046 Build Emissions Full Results

			LDV						
Segment ID	Segment	LDV AADT 2046 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	3,328	485,882	193,911,286	3,207	8,406	194	0.88	0.24
30	US 150 to SR 64	30,609	11,708,630	4,672,807,888	77,277	202,559	4,673	21.10	5.77
31	SR 64 Exit	14,668	1,788,160	713,638,285	11,802	30,935	714	3.22	0.88
32	SR 64 Exit to SR 64 Entrance	16,177	3,891,192	1,552,939,418	25,682	67,318	1,553	7.01	1.92
33	SR 64 Entrance	1,025	112,598	44,936,776	743	1,948	45	0.20	0.06
34	SR 64 Entrance to Lanesville Rd	16,565	27,758,960	11,078,348,727	183,209	480,230	11,078	50.02	13.69
35	I-64 to Paoli Pike/State St	37,521	5,286,305	2,109,716,217	34,890	91,453	2,110	9.52	2.61
36	Paoli Pike/State St Exit	7,512	970,600	387,357,701	6,406	16,791	387	1.75	0.48
37	Paoli/State Exit to Entrance	30,009	4,731,818	1,888,425,473	31,230	81,860	1,888	8.53	2.33
38	Entrance from Paoli Pike/ State St	10,415	1,372,326	547,682,938	9,057	23,741	548	2.47	0.68
39	Paoli Pike/State St to Grant Line Rd	40,424	25,997,851	10,375,506,189	171,586	449,763	10,376	46.84	12.82
40	Grant Line Rd Exit	12,508	1,278,330	510,169,920	8,437	22,115	510	2.30	0.63
41	Grant Line Rd Exit to Entrance	27,735	5,982,765	2,387,667,312	39,486	103,502	2,388	10.78	2.95
42	Grant Line Rd Exit to Entrance	27,170	5,861,071	2,339,100,095	38,683	101,397	2,339	10.56	2.89
43	Entrance from Grant Line Rd	11,789	1,458,657	582,136,741	9,627	25,235	582	2.63	0.72
44	Grant Line Rd to Paoli Pike/State St	38,523	22,511,607	8,984,177,596	148,577	389,451	8,984	40.56	11.10
45	Paoli Pike/State St Exit	9,905	1,695,670	676,726,436	11,191	29,335	677	3.06	0.84
46	Paoli/State Exit to Entrance	29,176	3,407,750	1,360,002,003	22,491	58,954	1,360	6.14	1.68
47	Entrance from Paoli Pike/ State St	9,339	1,421,411	567,272,223	9,381	24,590	567	2.56	0.70
48	Paoli Pike/State St to I-64	38,172	6,952,470	2,774,667,544	45,886	120,278	2,775	12.53	3.43
49	Wesley Chapel UMC Driveway to I-64	17,839	781,368	311,836,861	5,157	13,518	312	1.41	0.39
50	I-64 to Wesley Chapel UMC Driveway	17,508	1,680,717	670,758,846	11,093	29,076	671	3.03	0.83

Table A-7: 2046 Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2046 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
1	Lanesville Rd to SR 64 Exit	3,352	5,572,967	8,621,210,508	26,750	28,422	8,621	7.30	0.81
2	SR 64 Exit	98	13,701	21,194,937	66	70	21	0.02	0.00
3	SR 64 Exit to SR 64 Entrance	3,254	825,394	1,276,859,234	3,962	4,210	1,277	1.08	0.12
4	SR 64 Entrance	875	104,810	162,137,856	503	535	162	0.14	0.02
5	SR 64 to US 150	4,129	1,995,479	3,086,946,067	9,578	10,177	3,087	2.61	0.29
6	US 150 NB Exit	120	24,676	38,172,560	118	126	38	0.03	0.00
7	US 150 Exit to US 150 Entrance	4,009	569,236	880,590,271	2,732	2,903	881	0.75	0.08
8	US 150 SB Entrance	587	167,622	259,305,796	805	855	259	0.22	0.02
9	US 150 to I-265	4,596	2,480,885	3,837,853,848	11,908	12,653	3,838	3.25	0.36
10	Exit to EB I-265	1,798	292,057	451,803,329	1,402	1,489	452	0.38	0.04
11	I-265 Exit to I-265 Entrance	2,798	504,423	780,327,054	2,421	2,573	780	0.66	0.07
12	Entrance from WB I-265	1,348	271,138	419,442,447	1,301	1,383	419	0.36	0.04
13	I-265 to Spring St	4,146	1,738,647	2,689,634,330	8,346	8,867	2,690	2.28	0.25
14	Spring St Exit	326	42,827	66,252,072	206	218	66	0.06	0.01
15	Spring St Exit to Spring St Entrance	3,820	426,631	659,985,221	2,048	2,176	660	0.56	0.06
16	Spring St Entrance	472	41,018	63,452,835	197	209	63	0.05	0.01
17	Spring St to ORX	4,292	648,556	1,003,297,121	3,113	3,308	1,003	0.85	0.09
18	ORX to Spring St	4,461	617,054	954,563,185	2,962	3,147	955	0.81	0.09
19	Spring St Exit	613	39,354	60,879,495	189	201	61	0.05	0.01
20	Spring St Exit to Spring St Entrance	3,603	341,920	528,939,505	1,641	1,744	529	0.45	0.05
21	Spring St Entrance	392	46,664	72,188,390	224	238	72	0.06	0.01
22	Spring St to I-265	4,489	1,974,221	3,054,059,685	9,476	10,069	3,054	2.59	0.29
23	Exit to EB I-265	1,422	184,320	285,136,757	885	940	285	0.24	0.03
24	I-265 Exit to I-265 Entrance	2,828	478,952	740,923,578	2,299	2,443	741	0.63	0.07
25	Entrance from WB I-265	1,705	284,338	439,862,434	1,365	1,450	440	0.37	0.04
26	I-265 to US 150 NB	5,235	3,244,685	5,019,429,865	15,574	16,548	5,019	4.25	0.47
27	US 150 Exit	511	61,495	95,130,344	295	314	95	0.08	0.01
28	US 150 Exit to US 150 Entrance	4,037	738,273	1,142,085,244	3,544	3,765	1,142	0.97	0.11

Table A-7: 2046 Build Emissions Full Results

		Truck							
Segment ID	Segment	Truck AADT 2046 Build	Annual VMT (mi)	Annual CO2 (g)	Annual N2O (g)	Annual CH4 (g)	CO2 GWP	N2O GWP	CH4 GWP
29	US 150 Entrance	114	16,650	25,756,281	80	85	26	0.02	0.00
30	US 150 to SR 64	4,839	1,850,939	2,863,346,105	8,885	9,440	2,863	2.43	0.27
31	SR 64 Exit	1,294	157,768	244,061,864	757	805	244	0.21	0.02
32	SR 64 Exit to SR 64 Entrance	3,309	795,873	1,231,191,175	3,820	4,059	1,231	1.04	0.12
33	SR 64 Entrance	63	6,935	10,728,661	33	35	11	0.01	0.00
34	SR 64 Entrance to Lanesville Rd	4,009	6,717,200	10,391,304,918	32,243	34,258	10,391	8.80	0.98
35	I-64 to Paoli Pike/State St	3,044	428,898	663,492,175	2,059	2,187	663	0.56	0.06
36	Paoli Pike/State St Exit	164	21,216	32,820,197	102	108	33	0.03	0.00
37	Paoli/State Exit to Entrance	2,880	454,120	702,509,425	2,180	2,316	703	0.60	0.07
38	Entrance from Paoli Pike/ State St	221	29,126	45,057,459	140	149	45	0.04	0.00
39	Paoli Pike/State St to Grant Line Rd	3,101	1,994,382	3,085,248,132	9,573	10,171	3,085	2.61	0.29
40	Grant Line Rd Exit	389	39,743	61,481,686	191	203	61	0.05	0.01
41	Grant Line Rd Exit to Entrance	2,893	624,154	965,546,621	2,996	3,183	966	0.82	0.09
42	Grant Line Rd Exit to Entrance	2,835	611,458	945,906,568	2,935	3,118	946	0.80	0.09
43	Entrance from Grant Line Rd	304	37,670	58,274,926	181	192	58	0.05	0.01
44	Grant Line Rd to Paoli Pike/State St	3,575	2,088,991	3,231,605,833	10,027	10,654	3,232	2.74	0.30
45	Paoli Pike/State St Exit	217	37,065	57,337,946	178	189	57	0.05	0.01
46	Paoli/State Exit to Entrance	2,800	327,047	505,931,655	1,570	1,668	506	0.43	0.05
47	Entrance from Paoli Pike/ State St	198	30,168	46,669,054	145	154	47	0.04	0.00
48	Paoli Pike/State St to I-64	3,341	608,500	941,331,568	2,921	3,103	941	0.80	0.09
49	Wesley Chapel UMC Driveway to I-64	701	30,684	47,467,236	147	156	47	0.04	0.00
50	I-64 to Wesley Chapel UMC Driveway	631	60,536	93,647,943	291	309	94	0.08	0.01