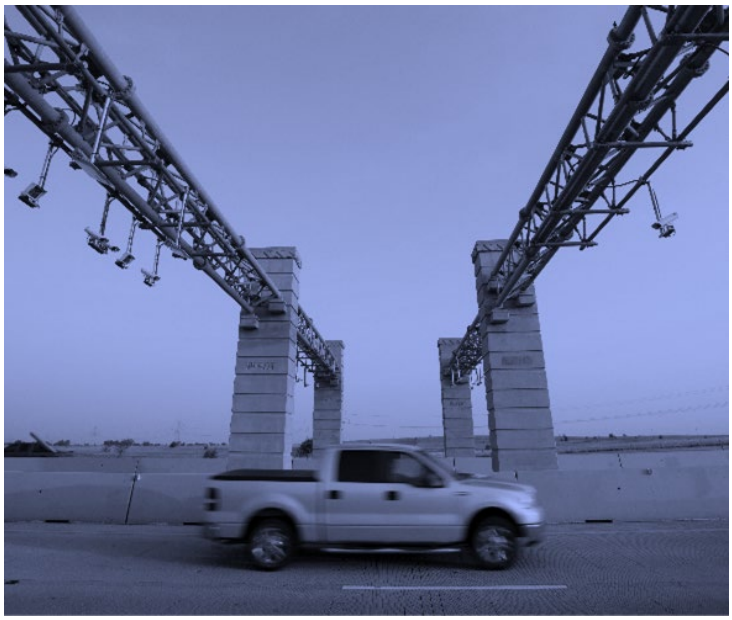
DRAFT



Michigan Statewide Tolling Strategic Implementation Plan

Appendix B. Traffic & Revenue Study

IN ACCORDANCE WITH
PUBLIC ACT 140 of 2020
AND PUBLIC ACT 73 OF 2022

MDOT

HNTB

CDM Smith

December 21, 2022

Contents

Tables

Figures

Executive Summary

This Step 2 Statewide Traffic & Revenue Study report summarizes the assumptions, methodology, and results for the traffic and revenue (T&R) analysis process conducted to support the State of Michigan Tolling and Managed Lanes Feasibility Study. This report builds upon the Phase 1 screening process in which tolling was analyzed on all 31 controlled access roadways in the state of Michigan. A total of 17 corridors were screened out as a result of the Phase 1 analysis, retaining 14 corridors and 1,538 centerline miles of highway. The retained facilities were studied further in the Phase 2 analysis. Study corridors were split into three tiers; corridors within the 'Tier 1' category, with an assumed deployment of five to seven years, were the focus of this Step 2 analysis to support the implementation plan. As such, the toll model was refined to simulate the proposed toll rates and tolling concepts by location for each corridor.

In Table ES 1-1, I-69, I-196, I-696, and M-14 Tier 1 corridors were each considered singular, independent segments based on distance and geographic location. I-75 was split between "I-75 North" (between I-675 and US-127) and "I-75 South" (between the Ohio border and I-275) since these segments are not continuous. I-275 was split between the "I-275 North" section, assumed to be tolled using the Value Pricing Pilot Program (between Eureka Road and the I-96/I-696/M-5 interchange), and the "I-275 South" section, assumed to be tolled using the Section 129 Bridge Program (between I-75 and Eureka Road). I-75 South and I-275 roadways were combined as these segments were adjacent, covering shorter distances, and both assumed the Section 129 Bridge Program for tolling. The I-94 corridor between the Indiana Border and US-24/Telegraph Road was split into six segments with termini at the US-131, I-69, US-127 (northeast of Jackson), and M-14 interchanges. This supported the phasing analysis, as it was assumed that construction and tolling on I-94 would occur over time.

Step 2 gross revenue estimates in 2020$, ranked by top-grossing toll segments and gross revenue per mile, are presented in Table ES 1-2**.** Total gross toll revenue for the entire system is estimated to be $806 million and $909 million for the years 2030 and 2045, respectively. I-696 is the top grossing toll segment by both total expected revenue and gross revenue per mile, with total annual gross revenue exceeding $121 million and over $4 million a mile in 2045. I-275 (north) is the second-highest grossing toll segment per mile at just under $4 million per mile in 2045. M-14 is the shortest toll segment analyzed at just over five miles but is expected to be the third highest grossing toll segment per mile with $3.7 million per mile in 2045.

CDM Smith analyzed the potential implementation of a low-income user discount as part of its traffic and revenue estimates for the implementation of tolling across the state of Michigan. Eligibility for the program was limited to users at or below 1.5 times the federal poverty rate. This metric was analyzed on a zonal basis for input into the model. It was assumed that 50 percent of eligible users would utilize the discount program due to additional barriers such as sign-up and frequency of use. Approximately 6 percent of passenger car customers would benefit from low-income discounts.

To account for the impact of Covid-19 on future traffic estimates, CDM Smith prepared a comparison of traffic counts between 2022 and 2019 based on select permanent count recorders in proximity to

the project corridors. For the passenger car analysis, routes/segments were grouped into recreational and non-recreational categories. Recreational routes/corridors typically exhibited positive traffic growth (+2.5%) between 2019-2022, whereas non-recreational routes presented significant negative growth (-8.0%). For commercial vehicles, the median change between 2019-2022 was +11.5%. The actual percent change between 2019-2022 was then compared to the growth in the statewide model for the same corridor. This allowed for the re-benchmarking of the model output for 2022 (interpolated between model years 2019 and 2030) to match the observed performance. For future impacts, there was generally a negative adjustment applied to passenger car forecasts, whereas commercial traffic forecasts were adjusted upwards.

The percent traffic diversion associated with each of the toll segments analyzed can be found in Table ES 1-3. Traffic diversion is defined as the percent of the traffic that leaves the route upon commencement of tolling when compared to the condition without tolling. The unit of measurement for traffic is Vehicle Miles Traveled (VMT). In 2030, total traffic diversion rates of 7 and 18 percent are observed. By 2045, diversion rates between 9 to 17 percent are seen. We noted slight increases in diversion rates on the I-94 corridor in 2045 on Segments 1 through 5, which may be attributable to the open barrier toll collection system. The I-94 corridor is estimated to see significantly higher growth rates in commercial traffic, which may dampen the short-distance passenger car movements from using the roadway, resulting in slightly higher diversion rates. In general, diversion is dependent on existing traffic levels, segment distance, availability of alternate routes and types of the tolling collection system, which may capture all or partial movements on the roadway.

An estimate of the share of Michigan residents and non-resident traffic and revenue by toll corridor and segment was conducted. In total, Michigan residents represented approximately 91 percent of the potential tolled traffic for all eight roadways. The shares range from 56 percent to 99 percent by route, with routes at or near the state border showing the lowest Michigan resident shares for passenger cars. I-94 Segment 1 near the Indiana border is estimated to represent 56 percent of traffic from Michigan in 2030 and increases to 92 percent traveling eastward at Segment 6. Urban corridors of I-275 and I-696 maintain a high percentage of Michigan drivers facilitating a high share of local trips in the metro-Detroit area.

Table ES 1-1: Roadways Studied in the Step 2 Traffic and Revenue Analysis

Route	Segment	Model Distance (mi)	Starting Location	Ending Location
69		93.4	I-94, Marshall	I-75, Flint
75 North		94.1	I-675, Saginaw	US-127, Higgins Lake
75 South / 275 South		34.6	Ohio Border	Eureka Rd, Romulus
94	Segment 1	33.8	Indiana Border	I-196, Benton Harbor
94	Segment 2	39.4	I-196, Benton Harbor	US-131, Portage
94	Segment 3	34.6	US-131, Portage	I-69, Marshall
94	Segment 4	30.2	I-69, Marshall	US-127, Jackson
94	Segment 5	32.3	US-127, Jackson	M-14, Ann Arbor
94	Segment 6	30.9	M-14, Ann Arbor	US-24, Taylor
196		63.8	I-94, Benton Harbor	M-6, near Hudsonville
275 North		23.1	Eureka Rd, Romulus	I-96/I-696, Novi
696		28.9	I-96/I-275, Novi	I-94, St.Clair Shores
14		5.3	I-94, Ann Arbor	US-23, Ann Arbor

Table ES 1-2: Total Annual Gross Revenue by Toll Segment (in thousands of constant 2020$)[1]

2030

Route	Ranking by Total Rev.	Annual Gross Revenue			Route	Rank by Total Rev. per Mile	Annual Gross Revenue per Mile		
		Passenger Car	Commercial Vehicle	Total			Passenger Car	Commercial Vehicle	Total
I-696	1	$ 98,560	$ 19,964	$ 118,524	I-696	1	$ 3,409	$ 690	$ 4,099
I-69	2	45,618	43,862	89,480	I-275 North	2	2,996	801	3,797
I-275 North	3	69,108	18,467	87,575	M-14	3	2,401	820	3,221
I-94 Segment 3	4	28,527	38,529	67,056	I-94 Segment 6	4	1,456	676	2,133
I-94 Segment 6	5	44,988	20,900	65,888	I-94 Segment 3	5	826	1,115	1,941
I-94 Segment 5	6	28,041	30,604	58,645	I-94 Segment 5	6	868	947	1,815
I-94 Segment 1	7	23,282	35,347	58,629	I-94 Segment 1	7	690	1,047	1,737
I-75 South I-275 South	8	25,543	31,246	56,789	I-75 South I-275 South	8	739	904	1,642
I-94 Segment 2	9	24,570	31,651	56,221	I-94 Segment 2	9	623	802	1,425
I-196	10	27,890	27,931	55,821	I-94 Segment 4	10	500	688	1,188
I-75 North	11	27,260	11,794	39,054	I-69	11	489	470	958
I-94 Segment 4	12	15,093	20,753	35,846	I-196	12	437	438	875
M-14	13	12,839	4,383	17,222	I-75 North	13	290	125	415
	Total	$ 471,319	$ 335,431	$ 806,750					

2045

Route	Ranking by Total Rev.	Annual Gross Revenue			Route	Rank by Total Rev. per Mile	Annual Gross Revenue per Mile		
		Passenger Car	Commercial Vehicle	Total			Passenger Car	Commercial Vehicle	Total
I-696	1	$ 100,348	$ 20,917	$ 121,265	I-696	1	$ 3,470	$ 723	$ 4,194
I-69	2	46,776	57,016	103,792	I-275 North	2	3,115	855	3,971
I-275 North	3	71,863	19,723	91,586	M-14	3	2,523	1,177	3,700
I-94 Segment 3	4	29,513	46,993	76,506	I-94 Segment 6	4	1,514	713	2,227
I-94 Segment 1	7	24,138	47,907	72,045	I-94 Segment 3	5	854	1,360	2,214
I-94 Segment 6	5	46,779	22,019	68,798	I-94 Segment 1	6	715	1,419	2,134
I-94 Segment 2	9	26,196	41,941	68,137	I-94 Segment 5	7	881	1,122	2,003
I-196	10	29,837	35,803	65,640	I-75 South I-275 South	8	754	1,085	1,839
I-94 Segment 5	6	28,468	36,259	64,727	I-94 Segment 5	9	664	1,063	1,727
I-75 South I-275 South	8	26,062	37,524	63,586	I-94 Segment 4	10	508	896	1,404
I-75 North	11	29,005	21,781	50,786	I-69	11	501	611	1,112
I-94 Segment 4	12	15,330	27,054	42,384	I-196	12	468	561	1,029
M-14	13	13,490	6,293	19,783	I-75 North	13	308	232	540
	Total	$ 487,805	$ 421,230	$ 909,035					

[1]Gross revenue estimates do not account for any costs, such as toll collection and roadway maintenance, required to operate a toll facility.

Table ES 1-3: Model Diversion by Toll Segment

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
69	93.4	-11%	-12%	-12%	-12%	-11%	-11%
75 North	94.1	-10%	-8%	-9%	-10%	-5%	-9%
75 South 275 South	34.6	-11%	-8%	-10%	-10%	-7%	-9%
94 Segment 1	33.8	-7%	-8%	-7%	-15%	-9%	-13%
94 Segment 2	39.4	-14%	-12%	-14%	-20%	-12%	-17%
94 Segment 3	34.6	-10%	-11%	-11%	-14%	-12%	-13%
94 Segment 4	30.2	-10%	-11%	-11%	-15%	-11%	-14%
94 Segment 5	32.3	-7%	-8%	-7%	-9%	-9%	-9%
94 Segment 6	30.9	-7%	-7%	-7%	-7%	-6%	-7%
196	63.8	-6%	-8%	-7%	-8%	-10%	-9%
275 North	23.1	-11%	-12%	-11%	-11%	-11%	-11%
696	28.9	-13%	-11%	-13%	-13%	-10%	-12%
14	5.3	-18%	-19%	-18%	-17%	-18%	-17%

1. Introduction

This Step 2 Statewide Traffic & Revenue Study report summarizes the assumptions, methodology, and results for the initial traffic and revenue (T&R) analysis process conducted to support the State of Michigan Tolling and Managed Lanes Feasibility Study. This report builds upon the Phase 1 screening process in which tolling was analyzed on all 31 controlled access roadways in the state of Michigan. A total of 17 corridors were screened out, as a result of the Phase 1 analysis, retaining 14 corridors and 1,538 centerline miles of highway. The retained facilities were studied further in the Phase 2 analysis. Study corridors were split into three tiers; corridors within the 'Tier 1' category, with an assumed deployment of five to seven years, were the focus of this Step 2 analysis to support the implementation plan. As such, the toll model was refined to simulate the proposed toll rates and tolling concepts by location for each corridor.

1.1. Study Purpose

The purpose of the Step 2 Statewide T&R analysis is to provide MDOT with toll revenue estimates on all Interstate and all other limited-access highways in Michigan. Step 2 includes an analysis of traffic, revenue, potential diversion, the impact of low-income discounts, and adjustments to future forecasts resulting from the Covid-19 Pandemic. The results supported the implementation plan for eight project corridors consisting of 13 tolling segments.

1.2. Study Corridors

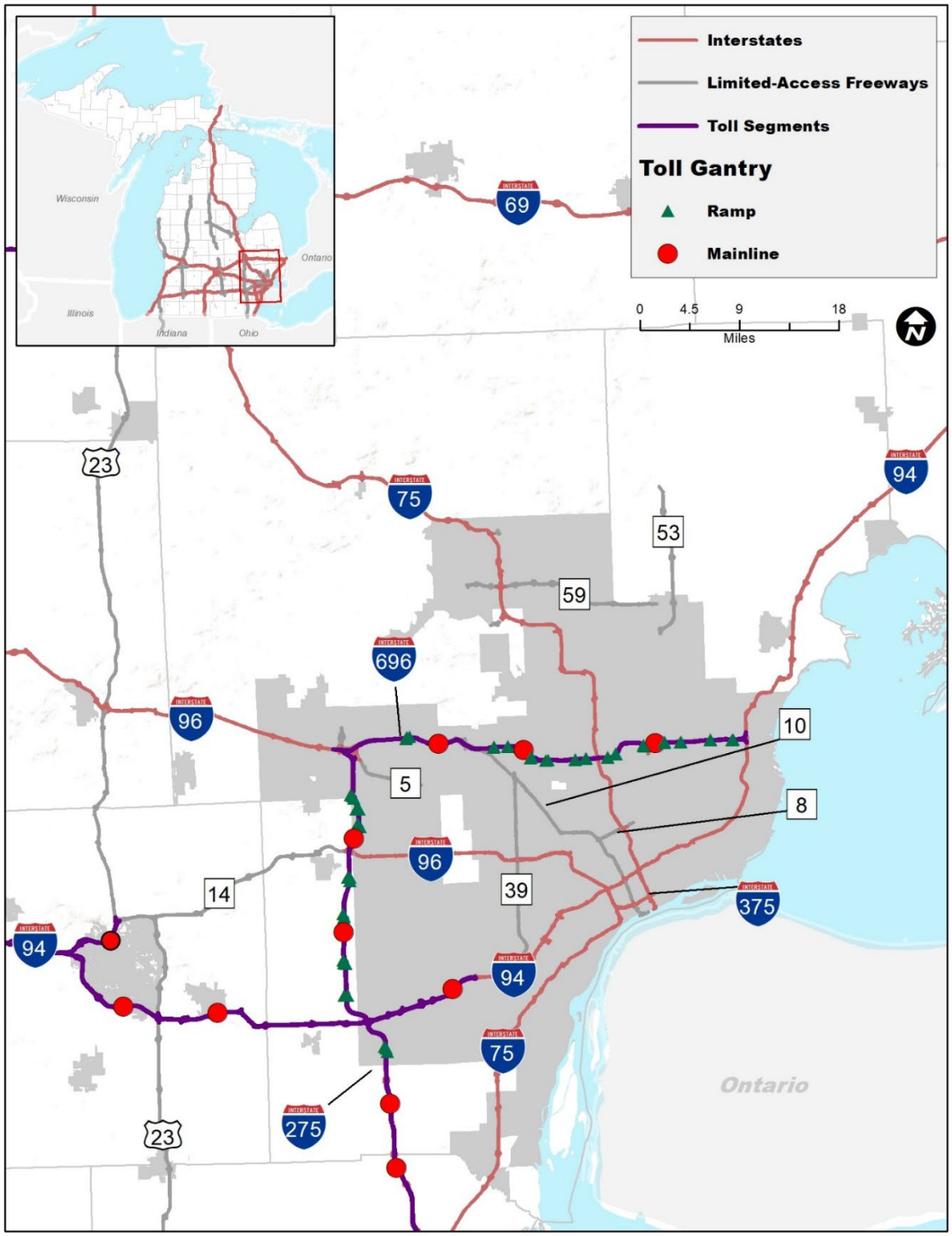
The Step 2 analysis examined eight limited-access highways across the state, broken up into 13 tolling segments. All corridors analyzed were required to have no at-grade intersections. The highways examined in this study are shown in Figure 1-1 and for Michigan statewide and Southeastern Michigan, respectively, with Interstate routes in red and other limited-access highways in Michigan in grey. Existing toll facilities in Michigan or nearby states are shown in green. There are currently four tolled international crossing bridges or tunnels between Michigan and Ontario, Canada, with a fifth, the Gordie Howe International Bridge, currently under construction. There are also two other non-international toll bridges in the state, the Mackinac Bridge and Grosse Isle Bridge, with others under development in Bay City. While Michigan does not currently have any toll roads, the Indiana Toll Road and the Ohio Turnpike are located close to Michigan. A list of the roadways analyzed in the Step 2 study is presented in Table 1-1.

I-69, I-196, I-696, and M-14 Tier 1 corridors were each considered singular, independent segments based on distance and geography. I-75 was split between "I-75 North" (between I-675 and US-127) and "I-75 South" (between the Ohio border and I-275) since these segments are not continuous. I-275 was split between the "I-275 North" section, assumed to be tolled using the Value Pricing Pilot Program (between Eureka Road and the I-96/I-696/M-5 interchange), and the "I-275 South" section, assumed to be tolled using the Section 129 Bridge Program (between I-75 and Eureka Road). I-75 South and I-275 roadways were combined as these segments were adjacent, covering shorter distances, and both assumed

the Section 129 Bridge Program for tolling. The I-94 corridor between the Indiana Border and US-24/Telegraph Road was split into six segments with termini at the US-131, I-69, US-127 (northeast of Jackson), and M-14 interchanges. This supported the phasing analysis, as it was assumed that construction and tolling on I-94 would occur over time.

Figure 1-1: Toll Segments and Gantry Locations

Figure 1-2: Toll Segments and Gantry Locations in Southeastern Michigan



Note: The Gordie Howe Bridge is currently under construction and will directly connect I-75 in Michigan to HWY 401 in Ontario

Table 1-1: Roadways Studied in the Step 2 Traffic and Revenue Analysis

Route	Segment	Model Distance (mi)	Starting Location	Ending Location
69		93.4	I-94, Marshall	I-75, Flint
75 North		94.1	I-675, Saginaw	US-127, Higgins Lake
75 South / 275 South		34.6	Ohio Border	Eureka Rd, Romulus
94	Segment 1	33.8	Indiana Border	I-196, Benton Harbor
94	Segment 2	39.4	I-196, Benton Harbor	US-131, Portage
94	Segment 3	34.6	US-131, Portage	I-69, Marshall
94	Segment 4	30.2	I-69, Marshall	US-127, Jackson
94	Segment 5	32.3	US-127, Jackson	M-14, Ann Arbor
94	Segment 6	30.9	M-14, Ann Arbor	US-24, Taylor
196		63.8	I-94, Benton Harbor	M-6, near Hudsonville
275 North		23.1	Eureka Rd, Romulus	I-96/I-696, Novi
696		28.9	I-96/I-275, Novi	I-94, St.Clair Shores
14		5.3	I-94, Ann Arbor	US-23, Ann Arbor

1.3. Report Structure

This report is organized into three remaining Sections and one appendix:

Section 2, **Existing Conditions and Assumptions**, details historical traffic growth on Michigan roadways and summarizes the study assumptions.

Section 3, **Traffic and Revenue Model**, summarizes the modeling approach and the calibration results.

Section 4, **Step 2 Results**, details the traffic, revenue, and diversions.

Appendix A, **Diversion Maps**

2. Existing Conditions and Assumptions

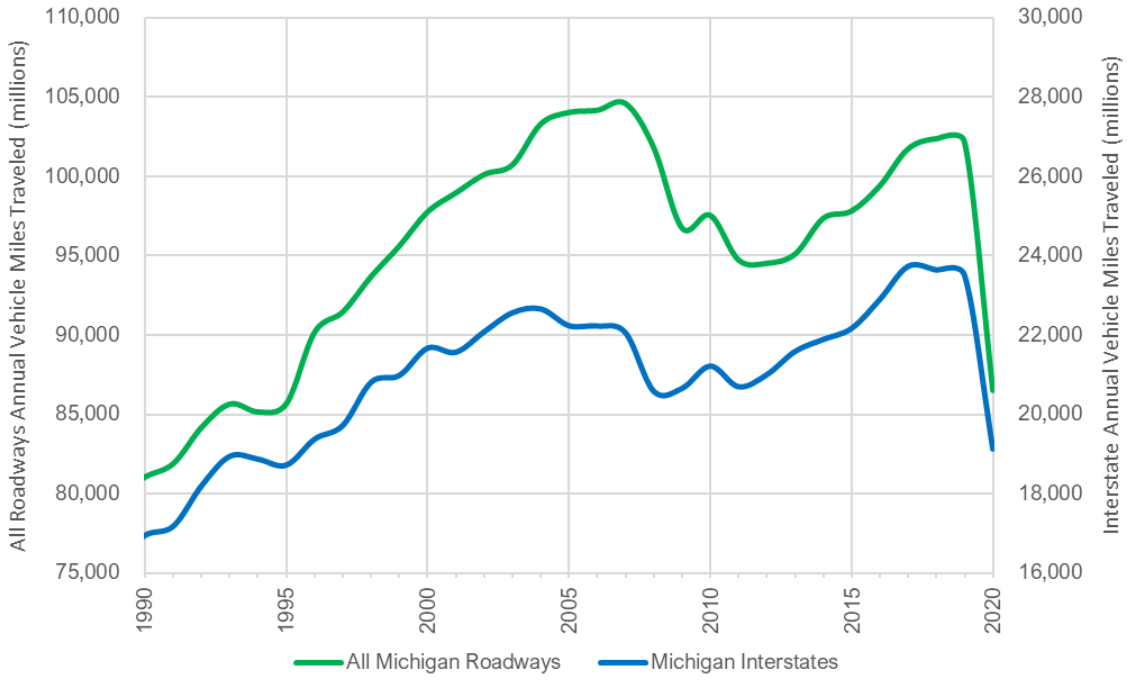
This Section details historical traffic growth on Michigan roadways and summarizes the study assumptions.

2.1. Historical Traffic Growth

Figure 2-1 illustrates historical annual vehicle miles traveled (VMT) on Michigan roadways from 1990 through 2020, based on data provided in the Federal Highway Administration (FHWA) Highway Statistics publication. VMT on all Michigan roadways is shown in green, and Interstate VMT is shown in blue. The average annual percent change of VMT for groups of years between general points of inflection in the chart is presented in tabular format in Table 2-1. Michigan saw steady traffic growth from 1990 to 2004, averaging 1.7 percent annually for total (on all roadways) VMT and 2.1 percent for Interstate VMT. Between 2004 and 2007, the average change was slightly positive for total VMT and negative for Interstate VMT. 2007 through 2011 saw annual declines of 2.4 percent per year across the state and declines of 1.6 percent per year for Interstate VMT due to the Great Recession. Traffic levels have since rebounded, increasing by 1.2 percent per year from 2011 to 2017 for total VMT and 2.3 percent per year for Interstate VMT. Between 2017 and 2019, VMT was steady at slightly below peak 2007 volumes for total and higher than the previous peak 2007 volumes for Interstates.

It is important to note that nearly all roadways across the nation saw drastic declines in traffic volumes from March to May 2020 due to the COVID-19 pandemic, and Michigan was no exception. With state-mandated stay-at-home orders and a swift shift to work-from-home procedures for many jobs beginning in March 2020, traffic volumes on many roadways fell quickly. Volumes have since gradually recovered to around 10 to 15 percent lower than pre-pandemic levels as early 2021. As discussed in more detail later in this report, because the future analysis year of 2030 is several years in the future, the study model was calibrated to pre-pandemic 2019 traffic levels.

Figure 2-1: Historical Annual Vehicle Miles Traveled in Michigan



Source: Federal Highway Administration Highway Statistics

Table 2-1: Average Annual Percent Change in Historical Annual Vehicle Miles Traveled between Inflection Years

Roadway Type	1990 - 2004	2004 - 2007	2007 - 2011	2011 - 2017	2017 - 2019
Interstate	2.1%	-0.9%	-1.6%	2.3%	-0.5%
Total	1.7%	0.4%	-2.4%	1.2%	0.2%

2.1.1. COVID-19 Impact

An important detail to be considered in this analysis are the traffic impacts of the COVID-19 pandemic, which have had extreme traffic impacts on the state from March 2020 onwards. Table 2-2 estimates Covid impacts at select continuous count stations across the state for all traffic for all travel days, while Table 2-3 presents the exact data for commercial vehicles (CVs). Count locations depended on data availability ranging from January 2018 to June 2022, shown in Figure 2-2. It should be noted that the percent traffic impacts cited may not all be attributable to Covid-19 and that other factors such as construction activity, weather, and special events in the roadway corridor may also have impacted comparative performance. Overall, traffic at these locations was approximately 9 percent lower in 2022 than in 2019/2020. However, there are several routes, such as I-196, I-75 north, and I-94 west, where traffic increased over this period. This positive growth is likely a result of increased recreational traffic in the later stages and following the pandemic as a function of pent-up demand. A 12 percent increase in commercial traffic was also observed, likely attributable to a need to replenish depleted stocks of goods and later to an increased share in online shopping and delivery.

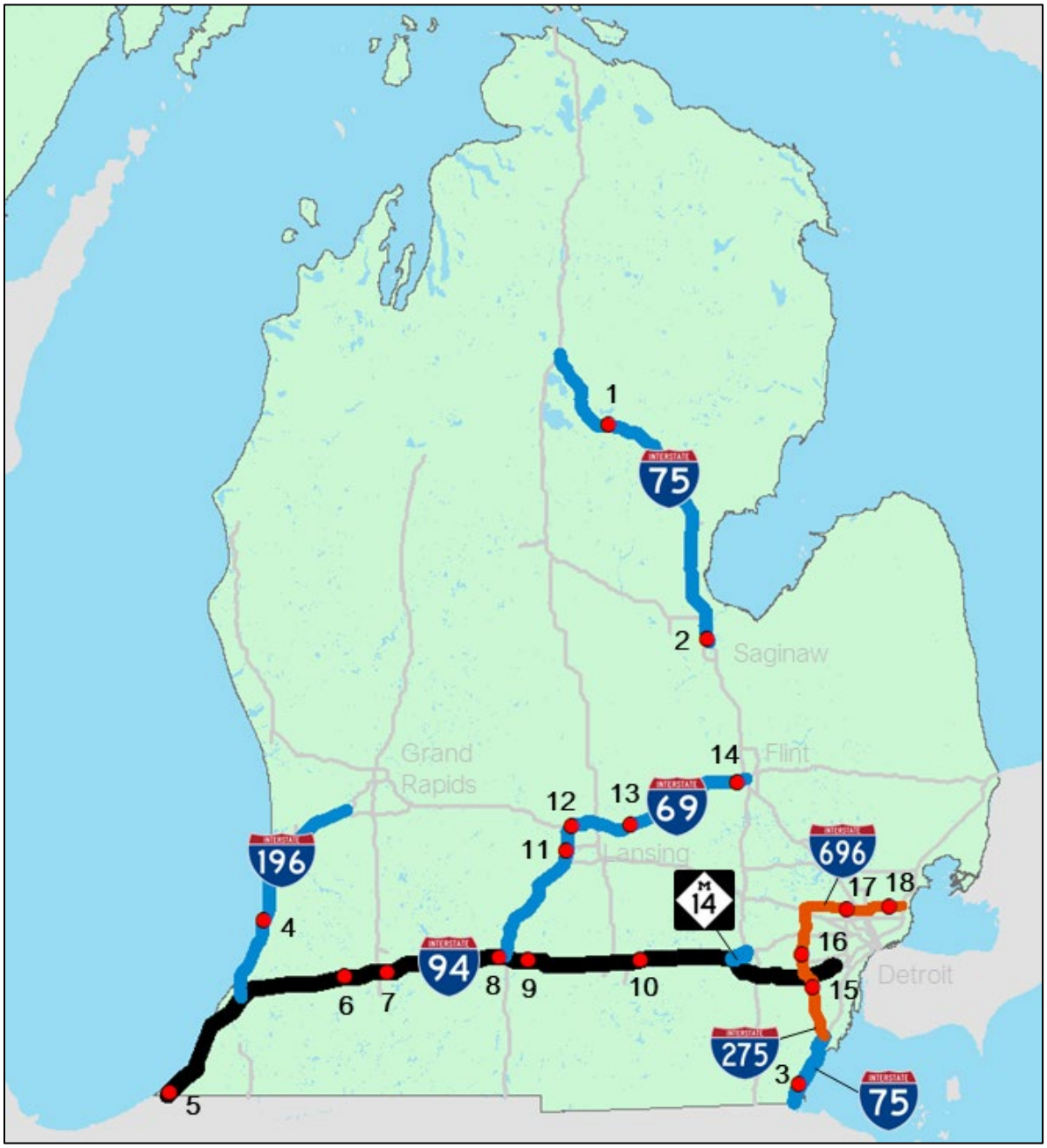
Table 2-2: COVID-19 Impacts by Roadway

ID	Roadway	Location	Percent Traffic Impact
			Daily
1	I-75	EAST OF N I 75/W M 55 Ramp	4%
2	I-75	NORTH OF N I 675/N I 75 RAMP	-4%
3	I-75	SW OF Luna Pier Rd	-5%
4	I-196	NORTH OF N Shore Dr	1%
5	I-94	SW OF Wilson Rd	4%
6	I-94	WEST OF E I 94/N Main RAMP	-5%
7	I-94	EAST OF E I 94/ Oakland RAMP	-10%
8	I-94	EAST OF Verona Rd	-16%
9	I-94	WEST OF 22 1/2 Mile/E I 94 RAMP	-8%
10	I-94	EAST OF Whipple Rd	-6%
11	I-96	SOUTH OF W Mt Hope Hwy	-10%
12	I-69	AT LOWELL RD OVERPASS	-8%
13	I-69	EAST OF Woodbury/E I 69 RAMP	-6%
14	I-69	SW OF Linden Rd	-12%
15	I-275	AT PENNSYLVANIA RD OVERPASS	-17%
16	I-275	.13 MI S OF CHERRY HILL RD OVERPASS	-7%
17	I-696	400 FT N OF LINCOLN RD	-22%
18	I-696	AT SCHOENHERR (W OF M-97 GROSBECK)	-2%
Total			**-9%**

Table 2-3: COVID-19 Commercial Vehicle Impacts by Roadway

ID	Roadway	Location	Percent Traffic Impact
			Daily
1	I-75	EAST OF N I 75/W M 55 Ramp	37%
4	I-196	NORTH OF N Shore Dr	13%
6	I-94	WEST OF E I 94/N Main RAMP	10%
8	I-94	EAST OF Verona Rd	10%
9	I-94	WEST OF 22 1/2 Mile/E I 94 RAMP	8%
10	I-94	EAST OF Whipple Rd	14%
13	I-69	EAST OF Woodbury/E I 69 RAMP	28%
14	I-69	SW OF Linden Rd	0%
15	I-275	AT PENNSYLVANIA RD OVERPASS	7%
Total			12%

Figure 2-2: Continuous Count Stations Utilized for COVID-19 Impacts Analysis



2.2. Key Assumptions

The key assumptions this study was built upon are detailed in Table 2-4 through Table 2-6. The study team agreed upon these assumptions, which were considered reasonable for the Step 2 traffic and revenue analysis. The assumptions are grouped by tolling and operation assumptions, model input assumptions, and other study assumptions. Several study assumptions are discussed in more detail in subsequent sub-sections of this Section.

Table 2-4: Step 2 Tolling and Operations Assumptions

Assumption	Assumption Details
Tolled Corridors	Eight highways comprising of 13 segments
Tolling Hours	24 hours a day, seven days a week.
Analysis Years	2030, 2045
Toll Collection Methods	For Step 2 T&R, it was assumed all vehicles have a transponder. Alternate payment types will be considered in the toll operations analysis.
Eligible Tolled Traffic	Assume all vehicles pay a toll with higher toll rates for larger vehicles.
Discount Programs	Low-Income users at 1.5x the federal poverty rate eligible for no-cost usage of tolled routes. Assumed a program adoption rate of 50 percent for eligble households.
Vehicle Classes	Three vehicle classes were assumed for Step 2 T&R: Passenger cars (PC) corresponding to FHWA classes 1 to 4, single unit trucks (SUT) corresponding to FHWA classes 5 to 7, and multi unit trucks (MUT) corresponding to FHWA classes 8 to 13.
Passenger Car Toll Rates	Toll rates in accordance with Table 2-8 (Toll rates shown in constant 2020$). These rates are similar the lowest PC transponder per mile rates in the country, the PC transponder rates on the Ohio Turnpike, and the PC transponder rates on the Indiana Toll Road, respectively.
Commercial Vehicle Toll Rates	SUTs and MUTs were assumed to have toll rates at 1.5x and 4x multipliers, respectively, compared to PCs.
Toll Rate Increases	Toll rates were assumed to increase annually at the rate of inflation. However, because the modeling was peformed in constant 2020$ (see more detail on this in the Model Input Assumptions below), inflation between 2020 and 2030, and 2030 and 2045 was not applied for the toll rates in the future year model analysis.
Toll Rates on Other Toll Facilities	Toll rates on other toll facilities important to the study were accounted for using time penalties, an artificial delay added to the travel time of a facility in an attempt to mimic the toll cost in accordance with appropriate value of time. These are the Mackinac Bridge, International Bridge, Blue Water Bridge, Windsor Tunnel, Ambassador Bridge, Gordie Howe International Bridge (future years only), Ohio Turnpike, and Indiana Toll Road.

Table 2-5: Step 2 Model Input Assumptions

Assumption	Assumption Details
Model	The latest Michigan Statewide Model was used as a basis for developing the study model. The model was converted from its native TransCAD platform to CUBE which is the standard software CDM Smith uses for T&R analysis.
Model Calibration Approach	The model was calibrated to a 2019 base year using PC, SUT, and MUT average weekday daily traffic (AWDT) estimates. AWDT was calculated between major interchanges for all limited-access highways for use in calibration.
Model Trip Tables	PC, SUT, and MUT trip tables for the AM (7:00 AM-9:00 AM), midday (9:00 AM-3:00 PM), PM (3:00 PM-6:00 PM), and overnight time (6:00 PM-7:00 AM) periods were used for the Step 2 T&R. The PC trip table was split using an estimate of Michigan resident and non-residents for each origin-destination pair.
Resident versus Non-Resident	The split of the PC trip table into Michigan resident and non-resident trips was made using an analysis process that relied mostly on zonal AirSage cellular data that was obtained during the Michigan Statewide Model development. The AirSage data was supplemented by data from cross-border survey data between the U.S. and Canada.
Trip Table Growth	The trip table growth to the 2030 and 2045 analysis years were based on the inherent growth in the latest Michigan Statewide Model.
Highway Improvements	The 2030 and 2045 analysis years included assumed highway improvements related to the Gordie Howe International Bridge project, and the US 31 Extension to I-94 project in soutwestern Michigan.For I-94, a new general-purpose lane is assumed: between I-196 and US31, between Sprinkle Road (Kalamazoo) and I-69, and peak shoulder lanes between M-14 and US-23.
Inflation	An inflation rate was not assumed for the modeling. All modeling was performed in 2020$. Inflation will be applied during the financial analysis part of the overall study.
Value of Time (VOT)	PC VOT for the study was estimated based on on a weighted average VOT by county in Michigan. The weighting used the number of origins and VOT corresponding to a specific county and number of destinations and VOT corresponding to a specific county for all trips in the trip table. The county-level Michigan VOT was estimated using a standard CDM Smith VOT estimation methodology that considers county-level household income, number of hours worked, number of households, and overall VOT perception weighting by trip type. The overall average Michigan PC VOT for all counties was $0.22/minute. The VOT for SUT at $0.40 per minute and MUT at $0.80 per minute was assumed to be the same for all trips and was based on commercial vehicle VOT used by CDM Smith in similar studies. (All VOTs in 2020$.)
Real increase in VOT	No increase in VOT above inflation was assumed. This is sometimes assumed in T&R studies in urban areas with significant real income growth over time.
Vehicle Operating Cost (VOC)	Assumed $0.19 per mile for PC, $0.51 per mile for SUT, and $0.67 per mile for MUT (all for 2030/2045 in 2020$) based on a standard CDM Smith VOC analysis methodology.
Input Transponder Market Penetration Rate	For Step 2 T&R it was assumed all vehicles have a transponder. Specific transponder adoption rates will be considered in the toll operations analysis.

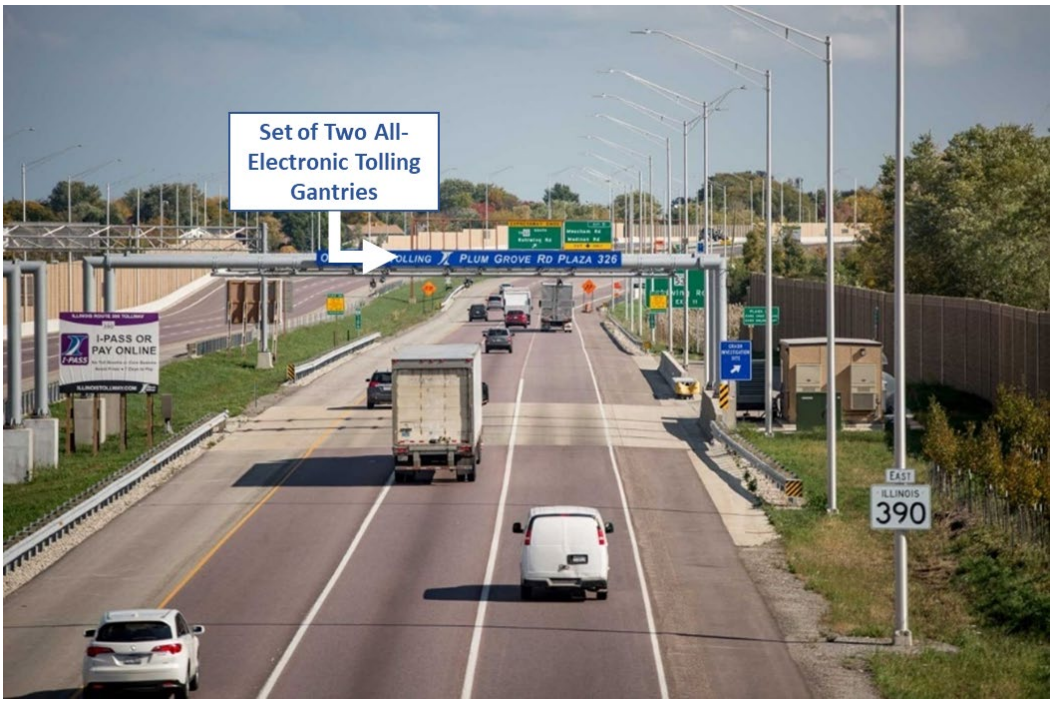
Table 2-6: Step 2 Other Study Assumptions

Assumption	Assumption Details
Gross Revenue	Gross toll revenue was estimated. Net revenue, which will consider tolling and roadway costs, will be analyzed later in the study.
Revenue Adjustments	No adjustments for leakage, fines, fees, or other income were applied.
Annualization Factors	Annualization factors by class were applied to convert the average weekday (assumed to be Monday through Thursday) model results to annual results. These were calculated using data from continuous traffic count stations in Michigan and provided in Table 2-10.
Ramp Up Factors	No ramp up factors were applied.
Long-Term Trends	• No major recession at the local or national level will occur to significantly disrupt the long-range pattern of future growth in traffic and revenue. • Over the long term, motor fuel will remain in adequate supply, with no unexpected or substantial increases in fuel prices other than those due to seasonal or inflationary causes, throughout the forecast period.
Acts of God	• No natural disasters will occur that could significantly alter travel patterns in and through the area. • No local, regional, or national emergency will arise that would abnormally restrict the use of motor vehicles.

2.2.1. Toll Collection Method

It is assumed that all-electronic tolling (AET) would be utilized for any new tolling projects in Michigan. AET's most common payment method is using an electronic toll collection transponder to pay tolls. Users would add funds or connect a payment method to debit tolls as they pass under high-speed toll gantries automatically. Under these assumptions, cash would not be accepted, and toll booths requiring stopping to pay tolls would not be used. An AET collection system, as pictured in Figure 2-3, allows vehicles to travel at normal highway speeds while passing under overhead toll gantries, removing the need for drivers to stop and potentially queue at a toll booth. For the Step 2 T&R analysis, it was assumed that all drivers would have a transponder for payment. The toll operational analysis for this study will consider alternate AET payment types, such as using license plate recognition technology to issue invoices to drivers without a transponder.

Figure 2-3: Example of All-Electronic Tolling Collection System



Source: Illinois State Toll Highway Authority

2.2.2. Vehicle Classes and Toll Rates

The Step 2 T&R analysis utilized the FHWA vehicle classification system for the assumed toll rate classes. Table 2-7 details the 13 classes recognized by the FHWA and the classes used for this study. Passenger Car (PC) was assumed to be FHWA classes 1 through 4, Single-Unit Truck (SUT) was assumed to be classes 5 through 7, and Multi-Unit Truck (MUT) was assumed for the remaining FHWA classes. The FHWA vehicle classes were utilized as the best available classification data widely available in Michigan for the Step 2 analysis.

The study classes were given an assumed toll multiplier for the base toll rate, with SUT being 1.5x the PC toll rate and MUT being 4x the PC toll rate. Urban corridors of I-275 and I-696 were also subject to a 1.25x peak period toll multiplier to account for required peak and off-peak rates associated with the federal tolling program assumed for these corridors. The toll rates by gantry location are shown in Table 2-8. These rates are similar to the lowest PC transponder per mile rates in the country, the PC transponder rates on the Ohio Turnpike, and the PC transponder rates on the Indiana Toll Road, respectively.

Table 2-7: Vehicle Classification

FHWA Class	Description	Image	Study Class
Class 1	Motorcycles		Passenger Car (PC)
Class 2	Passenger Cars and Light Trailers		
Class 3	Four Tire, Single Unit Vehicles		
Class 4	Buses		
Class 5	Two Axle, Six Tire, Single Unit Vehicles		Single-Unit Truck (SUT)
Class 6	Three Axles, Single Unit Vehicles		
Class 7	Four or More Axle, Single Unit Vehicles		
Class 8	Four or Less Axle, Single Trailer Vehicles		Multi-Unit Truck (MUT)
Class 9	5-Axle Tractor Semitrailer Vehicles		
Class 10	Six or More Axle, Single Trailer Vehicles		
Class 11	Five or Less Axle, Multi-Trailer Vehicles		
Class 12	Six Axle, Multi-Trailer Vehicles		
Class 13	Seven or More Axle, Multi-Trailer Vehicles		

Source: Federal Highway Administration

Table 2-8: Toll Rates (2020$) Vehicle Classification

Route	Gantry Type	Location	Toll Rate (2020$)		
			Passenger Car	Single-Unit Truck	Multi-Unit Truck
I-69	Mainline	Stine Rd	$ 1.22	$ 1.83	$ 4.88
	Mainline	Lansing Rd	0.56	0.84	2.24
	Mainline	Billwood Hwy	0.68	1.02	2.72
	Mainline	Wood Rd	0.83	1.25	3.32
	Mainline	Colby Lake Rd	0.80	1.20	3.20
	Mainline	Shiawassee River	0.67	1.01	2.68
	Mainline	Railroad Bridge	0.89	1.34	3.56
I-75 North	Mainline	South Kawkawlin River	0.77	1.16	3.08
	Mainline	North Kawkawlin River	0.65	0.98	2.60
	Mainline	South Pine River	0.67	1.01	2.68
	Mainline	North Pine River	0.86	1.29	3.44
	Mainline	Ski Park Rd	1.22	1.83	4.88
	Mainline	Russel Lake Rd	0.98	1.47	3.92
	Mainline	Old US 27	0.51	0.77	2.04
I-75 South / I-275 South	Mainline	River Raisin	1.22	1.83	4.88
	Mainline	Railroad Bridge	0.52	0.78	2.08
	Mainline	Huron River	0.35	0.53	1.40
I-94 Seg 1	Mainline	Sawyer Rd (prev. East Rd)	1.03	1.55	4.12
	Mainline	Puetz Rd N. of Stevensville	1.01	1.52	4.04
I-94 Seg 2	Mainline	Pine Creek S. of Hartford	0.87	1.31	3.48
	Mainline	Brush Creek S. of Lawrence	0.42	0.63	1.68
	Mainline	S. Branch Paw Paw River	0.44	0.66	1.76
	Mainline	Railroad Bridge by Mattawan	0.63	0.95	2.52
I-94 Seg 3	Mainline	Railroad Bridge by Columbia Ave	1.41	2.12	5.64
	Mainline	North Branch of Kalamazoo River	0.65	0.98	2.60
I-94 Seg 4	Mainline	Rice Creek	0.86	1.29	3.44
	Mainline	Sandstone Creek	1.16	1.74	4.64
I-94 Seg 5	Mainline	Dancer Rd	1.75	2.63	7.00
I-94 Seg 6	Mainline	Railroad Bridge by State St	0.55	0.83	2.20
	Mainline	Huron River Bridge	0.70	1.05	2.80
	Mainline	Ecorse Rd	0.61	0.92	2.44
I-196	Mainline	Paw Paw River	0.70	1.05	2.80
	Mainline	Black River	0.66	0.99	2.64
	Mainline	71st St	0.51	0.77	2.04
	Mainline	Kalamazoo River	0.81	1.22	3.24
	Mainline	Ottogan St	1.18	1.77	4.72

Table 2-8 (Continued): Toll Rates by Vehicle Classification

Route	Gantry Type	Location	Toll Rate (2020$)		
			Passenger Car	Single-Unit Truck	Multi-Unit Truck
I-275 North [1]	Ramp	Eureka Rd Ramp	$ 0.25	$ 0.38	$ 1.00
	Ramp	Ecorse Rd Ramp	0.25	0.38	1.00
	Ramp	Michigan Ave Ramp	0.29	0.44	1.16
	Mainline	Cherry Hill Rd	0.89	1.34	3.56
	Ramp	Ford Rd Ramp	0.26	0.39	1.04
	Ramp	Ann Arbor Rd Ramp	0.25	0.38	1.00
	Mainline	Five Mile Rd	0.46	0.69	1.84
	Ramp	Six Mile Rd Ramp	0.35	0.53	1.40
	Ramp	7 Mile Rd Ramp	0.29	0.44	1.16
	Ramp	Eight Mile Rd Ramp	0.25	0.38	1.00
I-696 [1]	Ramp	Orchard Lake Rd Ramp	0.31	0.47	1.24
	Mainline	Inkster Rd	0.55	0.83	2.20
	Ramp	Central Park Blvd Ramp	0.25	0.38	1.00
	Ramp	Southfield Rd Ramp	0.25	0.38	1.00
	Mainline	Meadowood Rd	0.56	0.84	2.24
	Ramp	Greenfield Rd Ramp	0.26	0.39	1.04
	Ramp	Coolidge Hwy Ramp	0.25	0.38	1.00
	Ramp	Woodward Ave Ramp	0.25	0.38	1.00
	Ramp	Mohawk Ave Ramp	0.25	0.38	1.00
	Ramp	Couzens Ave Ramp	0.25	0.38	1.00
	Ramp	Dequindre Rd Ramp	0.25	0.38	1.00
	Ramp	Mound Rd Ramp	0.25	0.38	1.00
	Mainline	E of Mound Rd	0.62	0.93	2.48
	Ramp	M-53 Ramp	0.31	0.47	1.24
	Ramp	Hoover Rd Ramp	0.25	0.38	1.00
	Ramp	Groesbeck Hwy Ramp	0.25	0.38	1.00
	Ramp	Gratiot Ave Ramp	0.25	0.38	1.00
M-14	Mainline	Huron	0.75	1.13	3.00

[1]Tolls on I-275 and I-696 subject to a 1.25 peak-period multiplier.

2.2.3. Roadway Improvements

Upcoming roadway improvements that add significant new capacity or create new routes have the potential to alter future traffic patterns and impact revenue potential in a T&R study. Therefore, it is important to include the most recent significant planned roadway improvements in the travel demand model. Major improvements included the US-31 Extension, the Gordie Howe International Crossing, and widening improvements on I-94. For I-94, a new general-purpose lane is assumed: between I-196 and US-31, between Sprinkle Road (Kalamazoo) and I-69, and peak shoulder lanes between M-14 and US-23.

US-31

US-31 in southwestern Michigan is a 4-lane divided highway running approximately 24.5 miles from the Michigan-Indiana border near South Bend, Indiana, to E Napier Avenue in Benton Township, Michigan. In November 2022, the roadway was extended approximately 2.4 miles to I-94 near Business I-94 in Benton Harbor. A full interchange with I-94 opened just south of the I-94/I-196 interchange, replacing the existing interchange between I-94/Business I-94.

Gordie Howe International Crossing

Currently, two international vehicular crossings are between Detroit and Windsor, Ontario. The Detroit-Windsor Tunnel connects downtown Detroit to downtown Windsor, and the Ambassador Bridge connects Detroit to Windsor via I-75 in Michigan and Huron Church Road in Ontario. Construction is ongoing on a third crossing, the Gordie Howe International Bridge between I-75 in Michigan, and Highway 401 in Ontario, located south of the existing Ambassador Bridge. The new bridge will include six vehicular travel lanes across the Detroit River, with additional customs lanes at the United States and Canadian points of entry. The Gordie Howe Bridge is expected to reduce border crossing wait times upon its completion in 2024 and reduce travel by providing a direct, highway-to-highway connection.

I-94 Widening

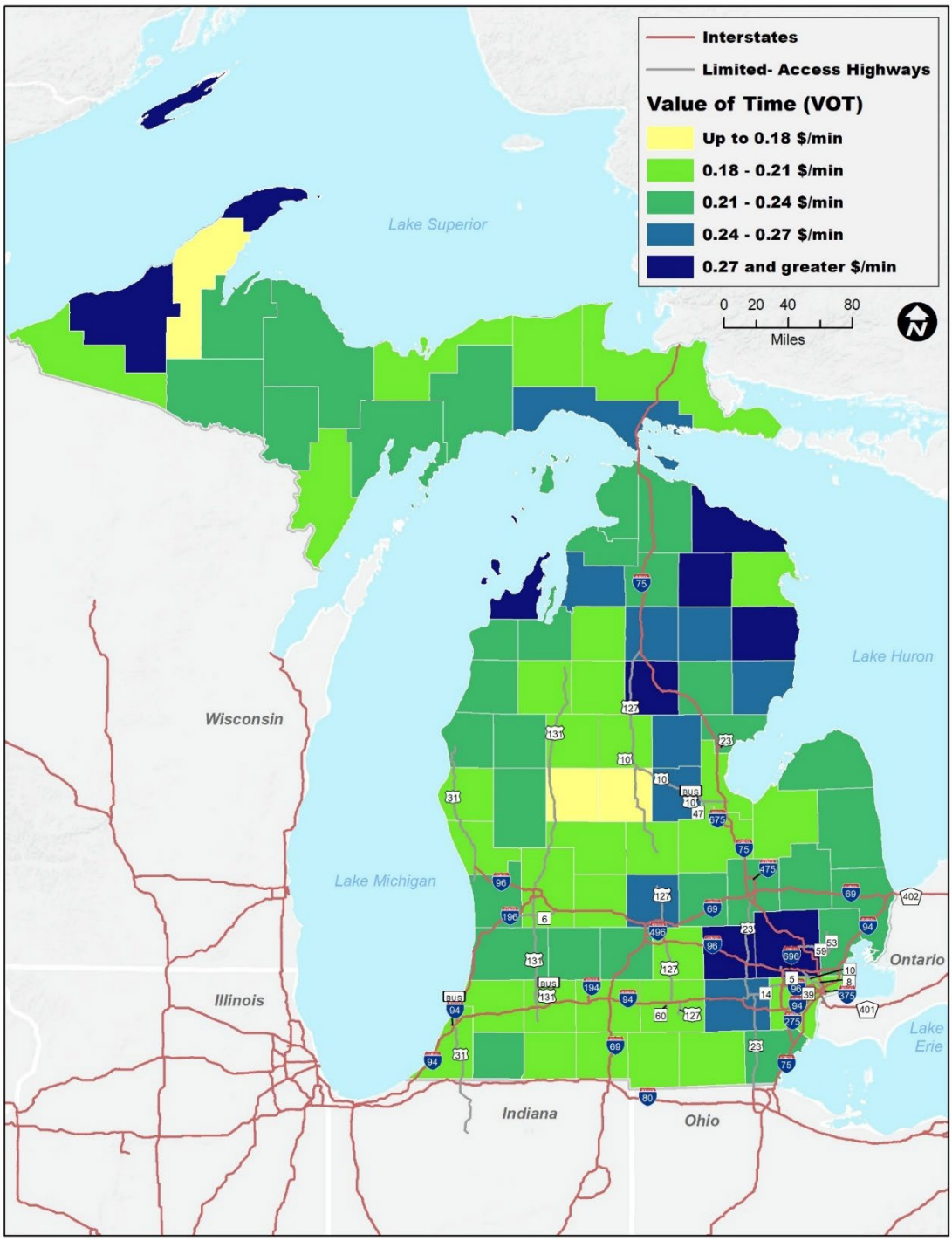
For I-94, a new general-purpose lane is assumed: between I-196 and US-31, between Sprinkle Road (Kalamazoo) and I-69, and peak shoulder lanes between M-14 and US-23.

2.2.4. Value of Time (VOT)

Value of time (VOT) measures how much an individual is willing to pay for a given time saving and is an integral input to the travel demand modeling process. The higher the value of time, the higher likelihood that a user would choose to use a tolled route over a free route. For this study, VOT was calculated for passenger cars at the county level for the 83 counties in Michigan using a standard CDM Smith methodology that uses income and hours worked data from the U.S. Census Bureau and weighting factors by assumed trip type. Average passenger car VOT values were also calculated for neighboring states and Ontario trips, including external origins and/or destinations. Each county-level passenger car VOT value was then applied at the trip matrix level, weighted by the number of trips produced and attracted by each location. Passenger car VOT estimated for each Michigan county in 2020$ is presented in Figure 2-4. Note that the highest passenger car VOT is estimated in highly populated counties with higher incomes and some less-populated counties with a significant share of seasonal and tourist employment and relatively older permanent residents. The statewide average VOT for passenger cars was $0.22 per minute ($13.20 per hour) in 2020$.

VOT for commercial vehicles was applied globally for all commercial vehicle trips. A VOT of $0.40 per minute ($24.00 per hour) was assumed for single-unit trucks and $0.80 per minute ($48.00 per hour) for multi-unit trucks (all in 2020$). These values are similar to those typically used by CDM Smith on other T&R studies.

Figure 2-4: Michigan Passenger Car Value of Time in 2020 Dollars by County



2.2.5. Vehicle Operation Costs (VOC)

Vehicle Operating Costs (VOC) is the direct cost of vehicle ownership in dollars per mile. Using standard methodologies also used in other T&R studies, CDM Smith calculated VOC for 2030 in 2020$ for PCs at $0.19 per mile, with SUT and MUT valued at $0.51 and $0.67,

respectively. The VOC calculation considers the price of fuel and fuel efficiency to consider fuel-based operating costs, the price of tires, and other maintenance costs. Future estimated changes in fuel efficiency out to 2030 are considered in the estimate. Vehicle purchase costs, insurance costs, and costs for permits or licenses are not included. These data sources are the Energy Information Administration, American Automobile Association, the American Trucking Research Institute, and the National Household Travel Survey. VOC values for this study are presented in Table 2-9.

Table 2-9: Vehicle Operation Costs (VOC) by Vehicle Type in 2020 Dollars

Vehicle Type	VOC per Mile	VOC Factor vs. Passenger Car
Passenger Car	$0.19	1.0x
Single-Unit Truck	$0.51	2.7x
Multi-Unit Truck	$0.67	3.5x

2.2.6. Annualization Factors

Average weekday daily revenue from the T&R analysis results was "annualized" in Step 2 based on data from continuous count data received from MDOT. The annualization process utilizes "annualization factors," calculated by dividing the total annual traffic by average weekday daily traffic at the different available continuous count locations. The average weekday in this study was based on average Monday-to-Thursday traffic. Passenger car traffic has much higher annualization factors than commercial vehicles, given that passenger cars usually have higher weekend versus weekday traffic than commercial vehicles. Also, routes or route segments that serve high levels of weekend tourist or vacationing traffic typically have higher annualization factors than routes or route segments that serve more weekday, commuter-based traffic. Annualization factors greater than 365 indicate higher average weekend (Friday to Sunday) traffic than weekdays (Monday to Thursday).

Annualization factors were assumed and applied for each route segment and vehicle class based on continuous count data from that segment or a similar segment. Annualization factors by vehicle class and averaged by the route are shown in Table 2-10.

Table 2-10: Annualization Factors by Toll Location and Vehicle Type

Route	Gantry Type	Location	Annualization Rate		
			Passenger Car	Single-Unit Truck	Multi-Unit Truck
I-69	Mainline	Stine Rd	397	317	317
	Mainline	Lansing Rd	397	317	317
	Mainline	Billwood Hwy	397	317	317
	Mainline	Wood Rd	373	297	297
	Mainline	Colby Lake Rd	373	297	297
	Mainline	Shiawassee River	373	297	297
	Mainline	Railroad Bridge	373	297	297
I-75 North	Mainline	South Kawkawlin River	443	327	290
	Mainline	North Kawkawlin River	443	327	290
	Mainline	South Pine River	443	327	290
	Mainline	North Pine River	443	327	290
	Mainline	Ski Park Rd	443	327	290
	Mainline	Russel Lake Rd	443	327	290
	Mainline	Old US 27	443	327	290
I-75 South / I-275 South	Mainline	River Raisin	360	307	296
	Mainline	Railroad Bridge	344	288	285
	Mainline	Huron River	344	288	285
I-94 Seg 1	Mainline	Sawyer Rd (prev. East Rd)	397	306	299
	Mainline	Puetz Rd N. of Stevensville	397	306	299
I-94 Seg 2	Mainline	Pine Creek S. of Hartford	397	306	299
	Mainline	Brush Creek S. of Lawrence	397	306	299
	Mainline	S. Branch Paw Paw River	397	306	299
	Mainline	Railroad Bridge by Mattawan	397	306	299
I-94 Seg 3	Mainline	Railroad Bridge by Columbia Ave	362	245	266
	Mainline	North Branch of Kalamazoo River	362	245	266
I-94 Seg 4	Mainline	Rice Creek	411	319	300
	Mainline	Sandstone Creek	382	301	296
I-94 Seg 5	Mainline	Dancer Rd	382	301	296
I-94 Seg 6	Mainline	Railroad Bridge by State St	344	288	285
	Mainline	Huron River Bridge	344	288	285
	Mainline	Ecorse Rd	344	288	285
I-196	Mainline	Paw Paw River	418	310	293
	Mainline	Black River	418	310	293
	Mainline	71st St	418	310	293
	Mainline	Kalamazoo River	418	310	293
	Mainline	Ottogan St	356	288	285

Table 2-10 (Continued): Annualization Factors by Toll Location and Vehicle Type

Route	Gantry Type	Location	Annualization Rate		
			Passenger Car	Single-Unit Truck	Multi-Unit Truck
I-275 North	Ramp	Eureka Rd Ramp	344	288	285
	Ramp	Ecorse Rd Ramp	344	288	285
	Ramp	Michigan Ave Ramp	344	288	285
	Mainline	Cherry Hill Rd	344	288	285
	Ramp	Ford Rd Ramp	344	288	285
	Ramp	Ann Arbor Rd Ramp	344	288	285
	Mainline	Five Mile Rd	344	288	285
	Ramp	Six Mile Rd Ramp	344	288	285
	Ramp	7 Mile Rd Ramp	344	288	285
	Ramp	Eight Mile Rd Ramp	344	288	285
I-696	Ramp	Orchard Lake Rd Ramp	334	293	286
	Mainline	Inkster Rd	334	293	286
	Ramp	Central Park Blvd Ramp	334	293	286
	Ramp	Southfield Rd Ramp	334	293	286
	Mainline	Meadowood Rd	334	293	286
	Ramp	Greenfield Rd Ramp	334	293	286
	Ramp	Coolidge Hwy Ramp	334	293	286
	Ramp	Woodward Ave Ramp	334	293	286
	Ramp	Mohawk Ave Ramp	334	293	286
	Ramp	Couzens Ave Ramp	334	293	286
	Ramp	Dequindre Rd Ramp	334	293	286
	Ramp	Mound Rd Ramp	334	293	286
	Mainline	E of Mound Rd	334	293	286
	Ramp	M-53 Ramp	334	293	286
	Ramp	Hoover Rd Ramp	334	293	286
	Ramp	Groesbeck Hwy Ramp	334	293	286
	Ramp	Gratiot Ave Ramp	334	293	286
M-14	Mainline	Huron	352	308	291

3. Traffic & Revenue Model

The foundation for the tolling model was the latest Michigan Statewide Model (December 2020). CDM Smith conducted the development of the tolling study model. Tolling study team member Resource Systems Group supported mobilization with the Michigan Statewide Model and the production of various inputs for the tolling study model. This Section summarizes the toll modeling approach and the calibration results.

3.1. Model Development

The model includes the entire contiguous United States and parts of North America. The most refined network and zonal detail are focused on Michigan and the immediate surrounding areas of Wisconsin, Illinois, Indiana, Ohio, and Ontario. A total of 4,792 zones are included in the model, with 4,431 zones in Michigan. Figure 3-1 shows the entire network coverage area of the Michigan Statewide Model. Figure 3-2 shows Michigan and the surrounding area in detail, with limited-access highways in purple.

Figure 3-1: Full Michigan Statewide Model Network Coverage

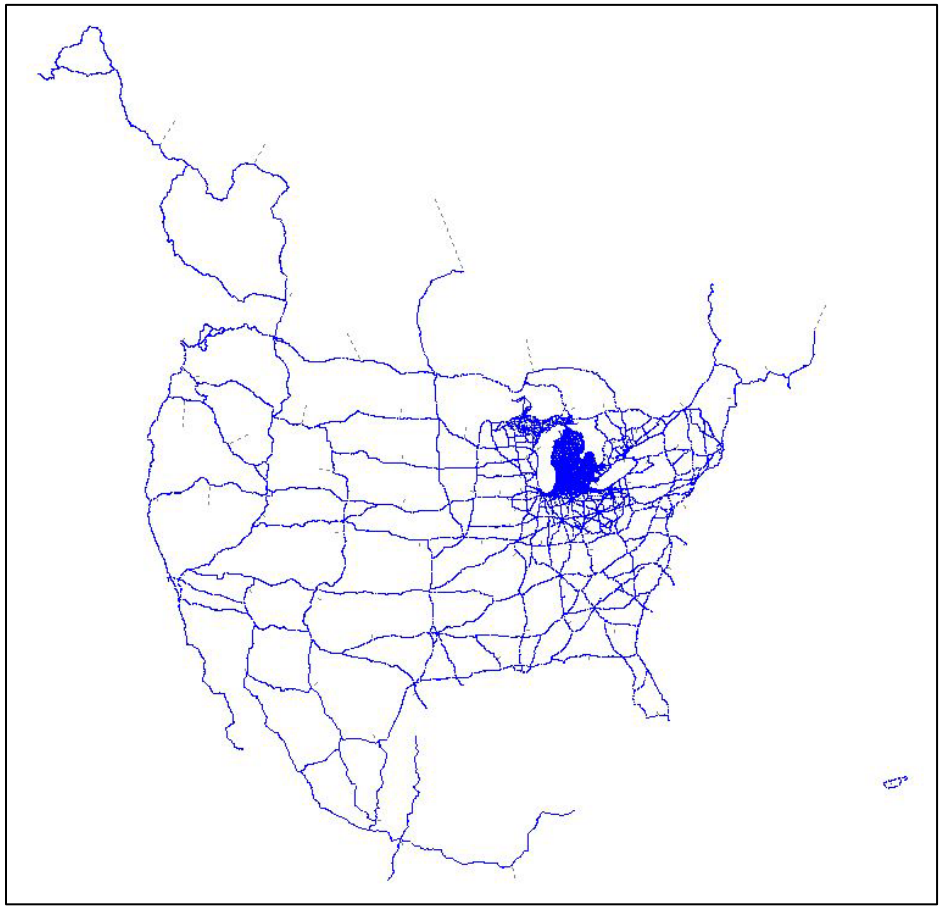
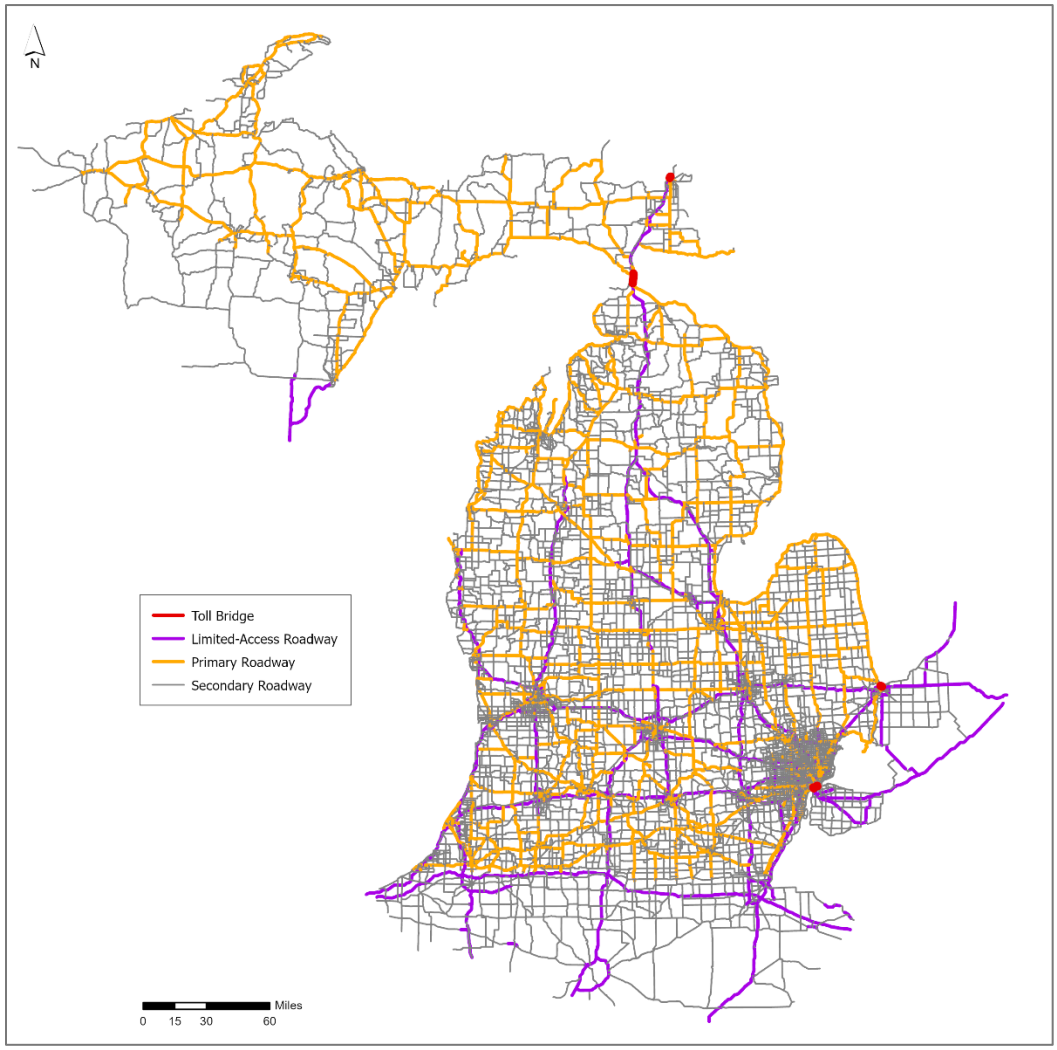


Figure 3-2: Michigan and Surrounding Area Network Coverage in the Michigan Statewide Model

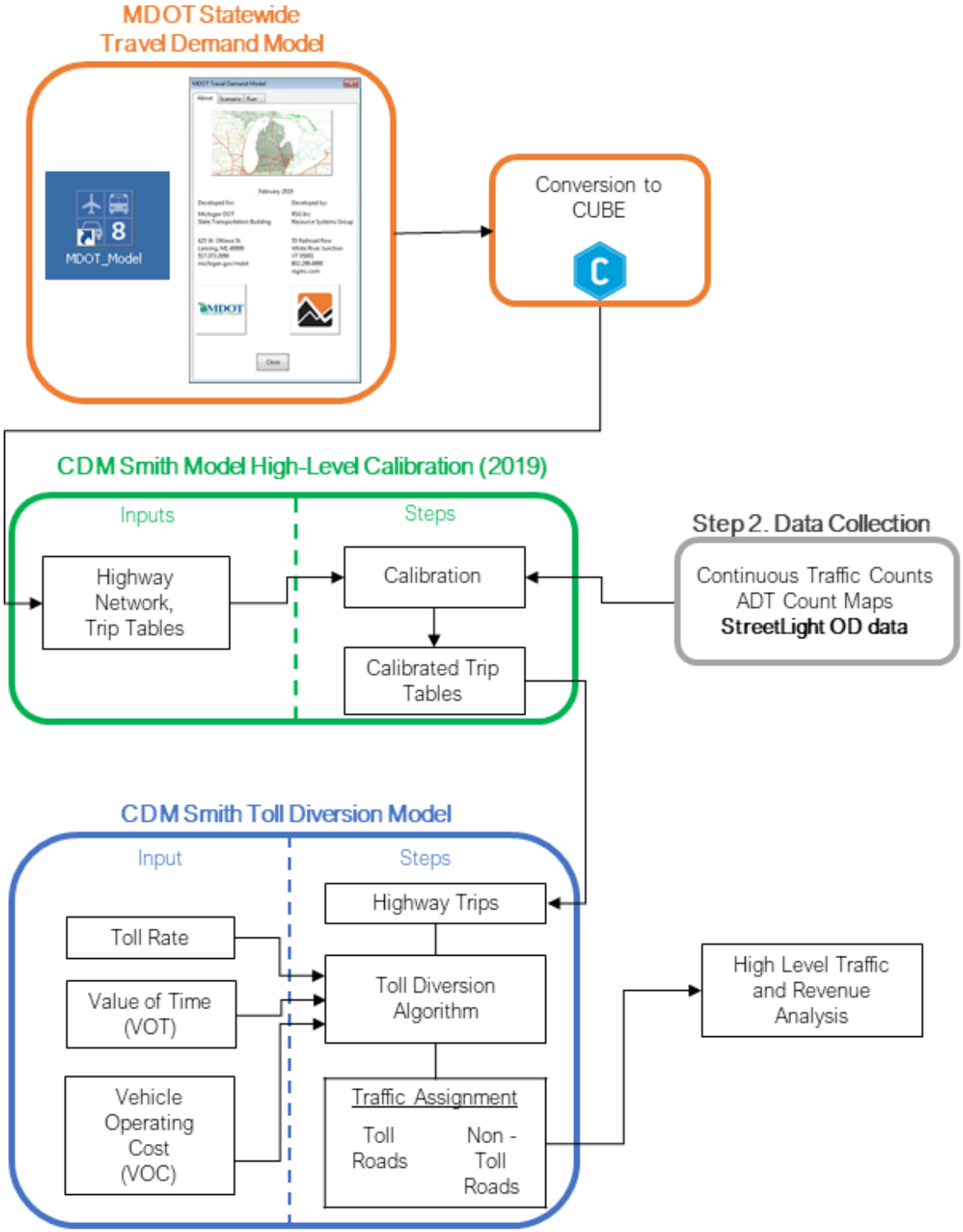


3.2. Overall Modeling Methodology

Figure 3-3 provides an overview of the modeling process. After obtaining the Michigan Statewide Model in its native TransCAD platform, the model was converted to CUBE; the standard software CDM Smith uses for T&R analysis. The orange boxes represent obtaining the statewide model and this conversion process. The incorporation of traffic counts and StreetLight Origin-Destination (O-D) datasets were the most significant inputs to the model calibration process in Step 2. The resulting calibrated trip tables were then used in the Step 2 CDM Smith toll diversion model process.

The model input assumptions noted previously in Section 2, including toll rates, VOT, and VOC, were used as inputs to the toll diversion process. In subsequent sections, several parts of the overall model process are discussed in more detail.

Figure 3-3: Step 2 Michigan Tolling Study Modeling Process



3.3. Conversion to CUBE

As shown previously, the Michigan Statewide Model was converted from its native TransCAD platform to CUBE; the standard software CDM Smith uses for T&R analysis. Upon completion of this conversion, the base model was run in CUBE, and several checks were performed to validate that the model results closely matched those from the TransCAD model. For example, Table 3-1 compares the total model average daily vehicle miles traveled for the CUBE model results to the TransCAD results. The comparison is shown for 2015, which corresponds to the base year used in the development of the Michigan Statewide Model. (Note that a more recent base year of 2019 was developed and used specifically for this study after the model conversion process from TransCAD to CUBE.) The comparison is broken down by facility type. Passenger car results showed only a -0.1 percent difference at a total level and were 1.0 percent higher for Interstates and freeways. Commercial vehicles were 2.8 percent higher and 2.4 percent for Interstates and freeways. These results were reasonable according to typical modeling industry standards to use as an input to the model calibration process.

Table 3-1: Comparison of Total Model Average Daily Vehicle Miles Traveled for 2015

Facility Type	Passenger Car	Single Unit Truck	Multi Unit Truck	Total
		VMT(000)		
Michigan Statewide Model TransCAD Results				
Interstate / Freeway (including ramps)	85,050	781	6,227	92,058
Principal Arterial	76,015	1,580	2,044	79,639
Minor Arterial	28,255	741	345	29,341
Other	21,325	463	221	22,009
Total	210,645	3,565	8,838	223,048
Percentage Difference: CUBE Results vs. TransCAD				
Interstate / Freeway (including ramps)	1.0%	8.6%	1.6%	1.1%
Principal Arterial	-2.5%	0.2%	0.3%	-2.4%
Minor Arterial	0.5%	1.1%	7.9%	0.6%
Other	4.0%	14.0%	30.1%	4.5%
Total	-0.1%	4.0%	2.3%	0.1%
Michigan Statewide Model CUBE Results				
Interstate / Freeway (including ramps)	85,875	848	6,329	93,052
Principal Arterial	74,080	1,583	2,050	77,713
Minor Arterial	28,398	749	372	29,520
Other	22,183	528	288	22,999
Total	210,537	3,708	9,039	223,285

3.4. 2019 Model Calibration

3.4.1. Calibration Process

A model calibration was conducted to verify that the model reasonably replicated recent traffic count data. The level of calibration performed was appropriate for a "high-level" T&R analysis, as was assumed for Step 2 of this study. The year 2019 was used for calibration as the most recent full calendar year before COVID-19 impacted traffic levels. Pre-COVID-19 traffic levels were used for calibration, given that significant traffic recovery has already been observed since the large losses from March to May 2020. Section 3.4 discusses the post-processing adjustments made to account for the post-Covid conditions.

An origin-destination matrix estimation (ODME) process was utilized for the calibration. ODME uses an input seed matrix and target volumes. An algorithm adjusts the seed matrix to best match target volumes in a series of assignment iterations. The seed matrices in the ODME process were interpolated statewide model 2019 trip tables. The count targets for the ODME process were determined at average annual weekday daily traffic (AAWDT) levels at most mainline segments, based on the four time periods in the model. The AAWDTs used in the ODME process were estimated using the following methodology:

1. The 2019 average annual daily traffic (AADT) for three different classes, passenger cars, single-unit trucks, and multi-unit trucks, was provided by MDOT in a mapped format aligned with the statewide model network links.
2. CDM Smith reviewed this data and identified locations on mainline segments of limited-access highways across the state suitable for use in the calibration process. Over 700 locations were used.
3. MDOT also provided data from continuous traffic count stations across the state. CDM Smith used this data to calculate AADT to AWDT conversion factors by vehicle class applied to the AADT data. The factors were applied by route and route segment by determining the AADT to AWDT factor that would best apply to a given location based on a review of all the available factor locations.
4. The resulting AWDT volumes by class at the over 700 locations were used in the ODME process.

A visualization of the AWDT (total of both directions) used as the target volume input to the ODME process is provided in Figure 3-4 for Michigan statewide and Figure 3-5 for Southeastern Michigan. The AWDT is presented on a scale with lower volumes in green, transitioning to the highest volumes in red. The highest weekday volumes throughout the state are found near the state's large urban centers. The Detroit metro region includes bi-directional average weekday volumes of over 140,000 on several highway segments. The lowest highway volumes in the State can be found in northern lower Michigan and the Upper Peninsula.

Figure 3-4: 2019 Average Weekday Daily Traffic on Michigan Limited-Access Highways

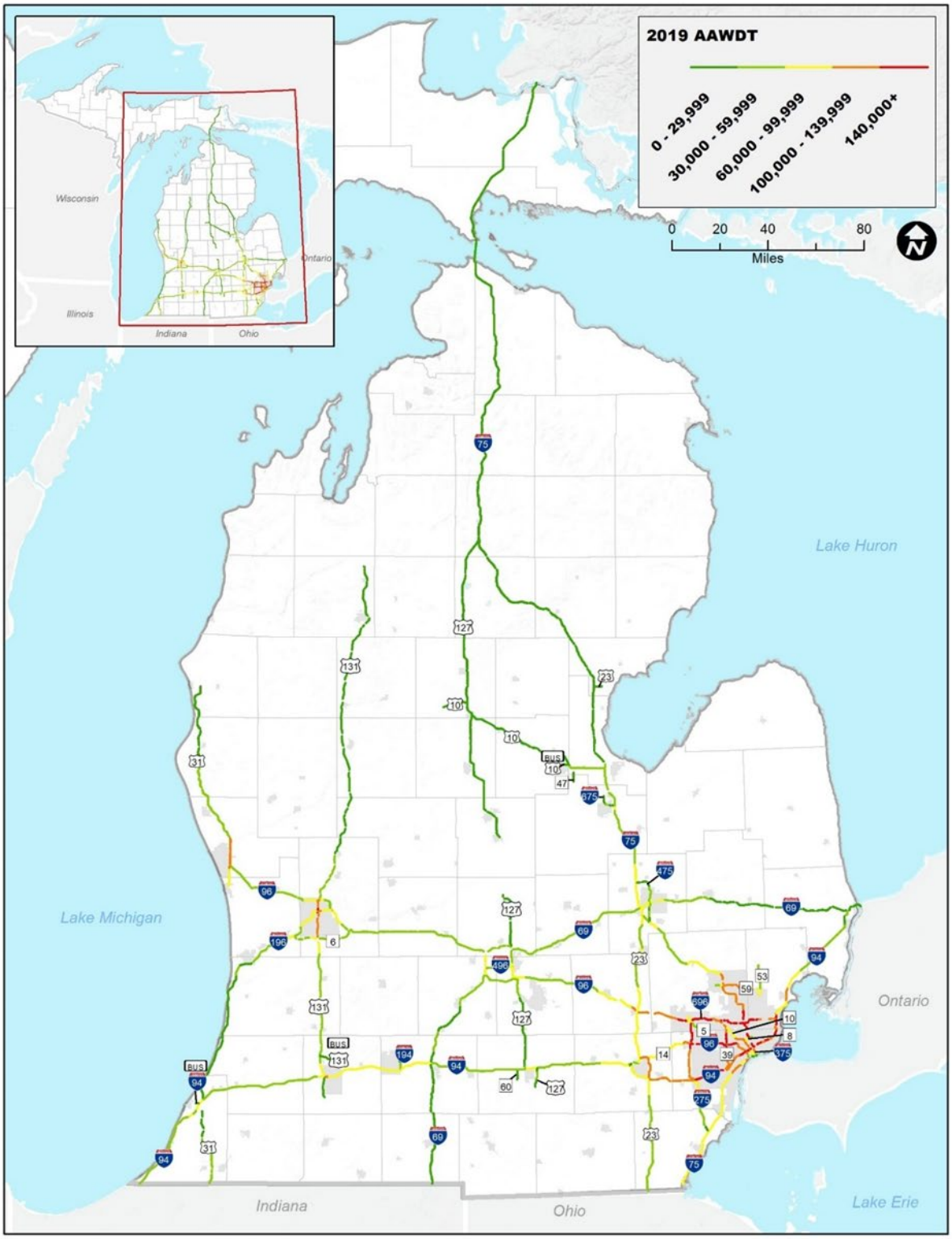
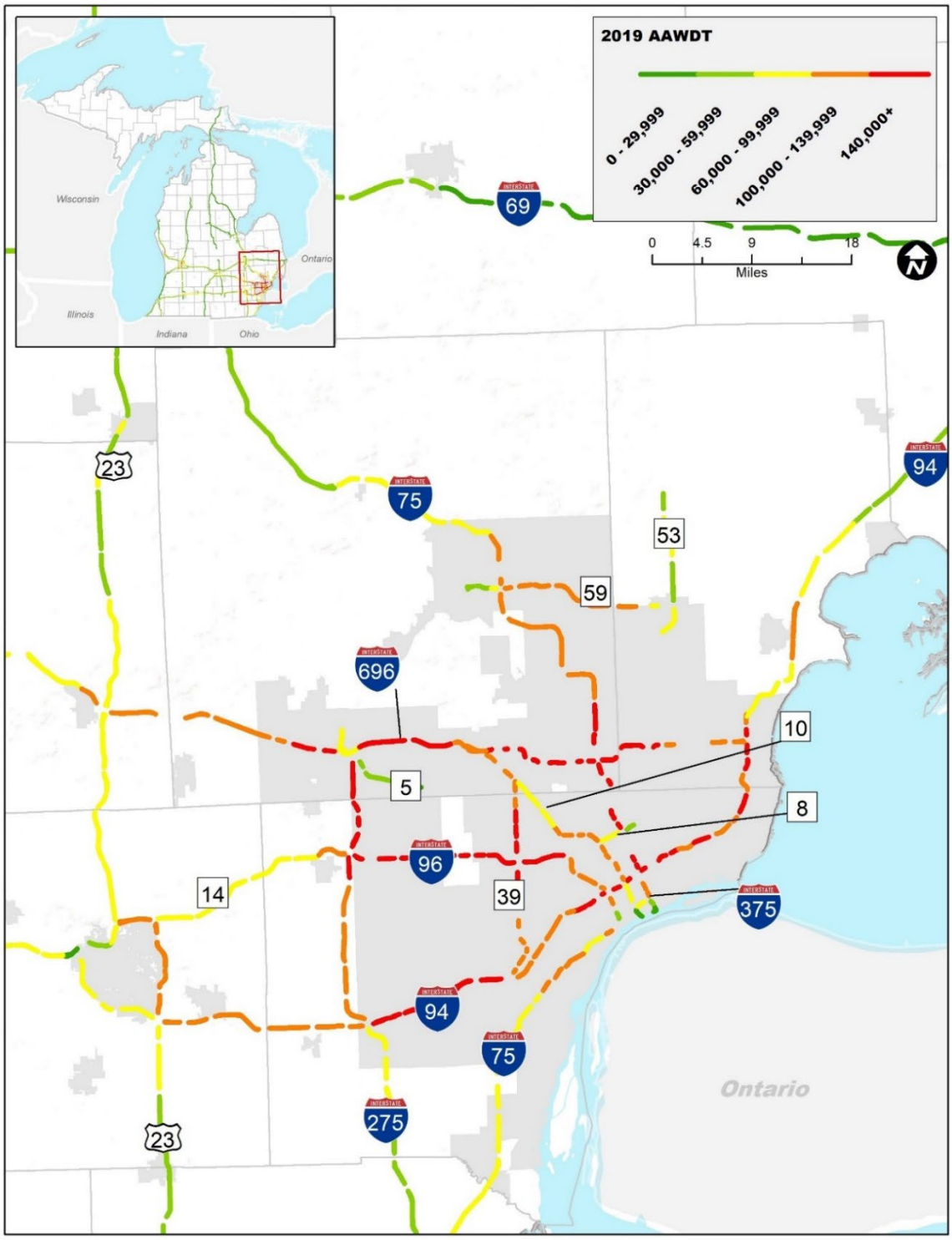


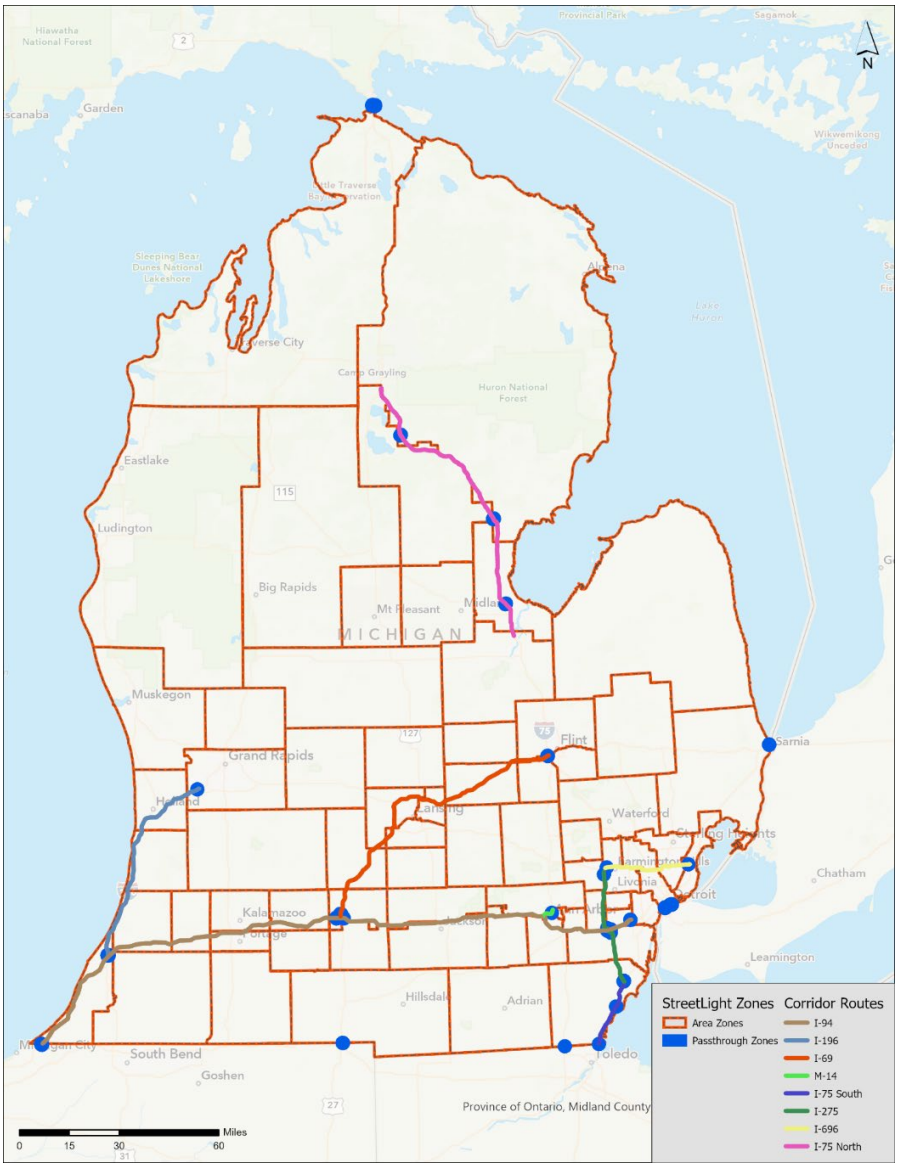
Figure 3-5: 2019 Average Weekday Daily Traffic on Southeastern Michigan Limited-Access Highways



3.4.2. StreetLight O-D Adjustments

StreetLight O-D data was utilized to further validate and adjust to observed trip pattern distributions. StreetLight uses Location-Based Services (LBS) data for personal devices (All Vehicles) and Navigation GPS data for commercial trucks (heavy and medium-duty) to provide aggregated observed trip movements by user-defined traffic analysis zones and select roadway links. Compared to the ODME process, where the model is adjusted to match traffic counts, the StreetLight O-D was used to adjust to observed trip patterns. A total of 100 zones were obtained from the vendor. Of those zones, 72 were area zones, and 28 were pass-through zones (Figure 3-6). Aggregating TAZs defined area-type zones. This process allowed for the comparison and adjustment of two datasets. The passthrough zones were based on key locations along the study routes and at external points of entry.

Figure 3-6: StreetLight Zones



The first step in implementing StreetLight data was to compare O-D patterns between the Model and StreetLight for the area-type zones. The comparison of major O-D movements is shown in Figure 3-7 and Figure 3-8. No significant discrepancies were found by comparing the two datasets.

In the second step, the O-D distribution from passthrough zones was incorporated into the model's trip tables. A set of trip tables corresponding to passthrough zones was extracted using a select link model run. These select link trip tables were adjusted using the O-D pattern from passthrough zones. The adjusted, select link trip tables were then incorporated into the full model. After adjustments, a new trip length distribution was calculated. Figure 3-9 compares a trip length distribution before and after StreetLight passthrough O-D adjustments. The StreetLight adjustments decreased the number of shorter trips (5 to 15 minutes) and increased the number of longer trips (25 to 50 minutes).

Figure 3-7: Area Zones O-D Pattern Statewide

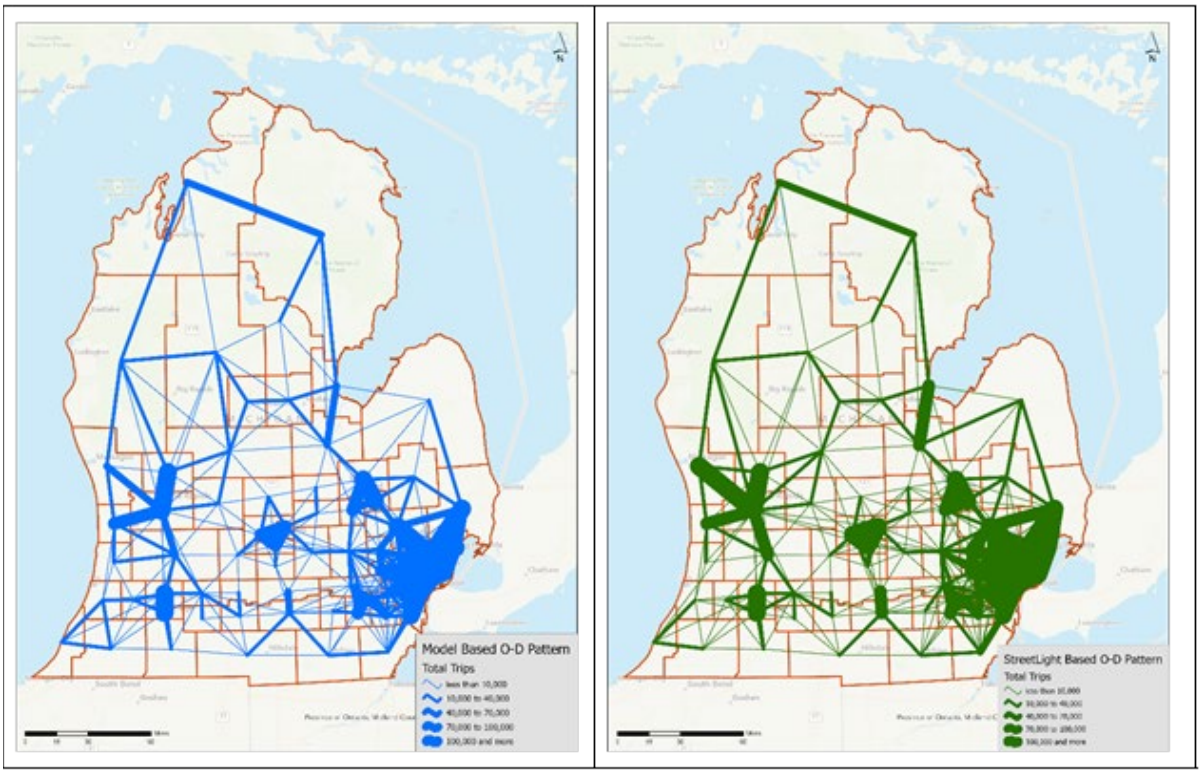


Figure 3-8: Area Zones O-D Pattern for Detroit

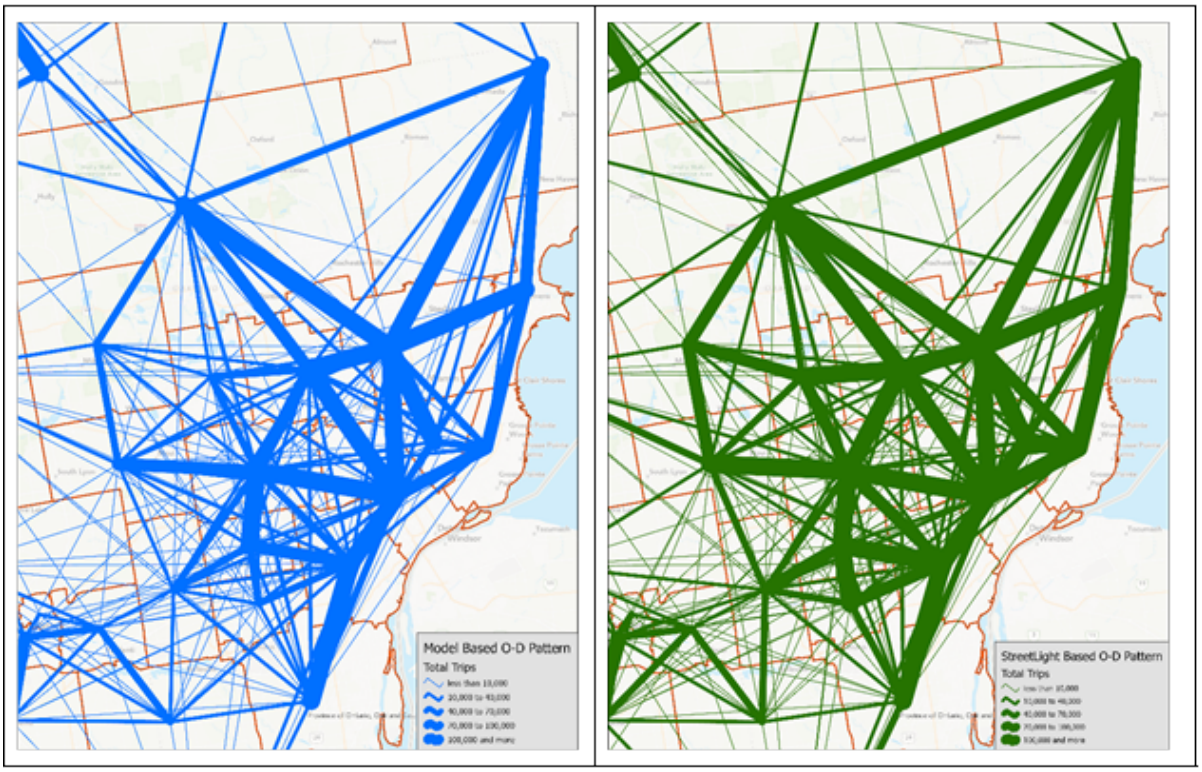
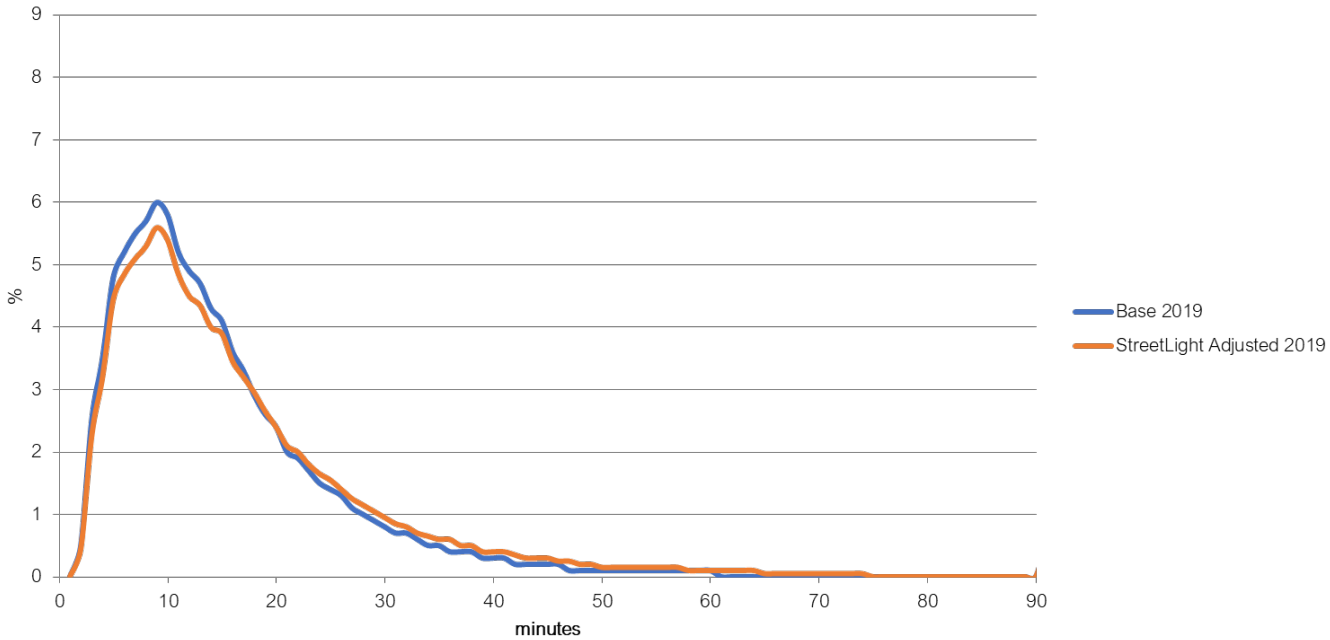


Figure 3-9: Trip Length Distribution



3.4.3. Calibration Results

After ODME and StreetLight processes were completed, the final calibration results were summarized and compared to counts to verify that the two calibration processes did not cause underlying model issues. Table 3-2 presents the calibration results for all routes in the study. The "Number of Count Locations" in the third column is the mainline segments on limited-access highways described previously in the calibration AWDT estimation methodology. The total sum of all the AWDT volumes at all the count locations is provided in the "Sum of Counts at All Locations" columns. The final four columns show the absolute and percent differences between the base model and actual AWDT (before ODME) and the absolute and percent differences between the calibrated model and actual AWDT. The general improvement between the differences in the base model vs. actual and the calibrated model vs. actual results from the ODME process. In general, for nearly all corridors, the model results fell within 5 percent of actual counts. The only exceptions were the I-94 Segment 1 and I-75 North, where model and count variances were -8 and -16 percent, respectively. The study team determined these calibration results appropriate for the Step 2 T&R analysis.

Table 3-2: Interstate and U.S. Route 2019 Calibration Results

Route	Model Distance (mi)	Number of Count Locations	Sum of Counts at All Locations			Difference Base Model vs. Actual		Difference Calibrated Model vs. Actual	
			Actual	Base Model	Calibrated Model				
I-69	93.4	54	1,097,737	1,003,195	1,069,954	-94,542	-9%	-27,783	-3%
I-75 North	94.1	34	373,374	406,483	314,547	33,108	9%	-58,828	-16%
I-75 South / I-275 South	34.6	28	1,210,459	1,172,717	1,208,660	-37,742	-3%	-1,799	0%
I-94 Segment 1	33.8	22	580,877	733,868	535,096	152,991	26%	-45,781	-8%
I-94 Segment 2	39.4	18	408,308	506,415	407,383	98,107	24%	-925	0%
I-94 Segment 3	34.6	28	1,091,567	1,086,420	1,093,310	-5,147	0%	1,743	0%
I-94 Segment 4	30.2	26	470,170	620,275	447,547	150,105	32%	-22,623	-5%
I-94 Segment 5	32.3	28	835,839	888,435	836,593	52,596	6%	754	0%
I-94 Segment 6	30.9	32	1,974,011	1,793,210	2,035,648	-180,801	-9%	61,637	3%
I-196	63.8	36	535,616	512,577	520,555	-23,039	-4%	-15,061	-3%
I-275 North	23.1	14	378,946	283,006	377,528	-95,940	-25%	-1,418	0%
I-696	28.9	42	3,261,083	3,537,895	3,307,952	276,812	8%	46,869	1%
M-14	5.3	8	217,061	247,631	227,522	30,570	14%	10,461	5%
Total	**544.3**	**370**	**12,435,048**	**12,792,125**	**12,382,293**	**357,077**	**3%**	**-52,755**	**0%**

3.5. Future Year Model Development

The future year networks for the 2030 and 2045 models included the assumed future network improvements documented previously in this report. Base 2030 and 2045 trip tables for the toll study were developed, assuming the future network improvements were in place. The base trip tables were then adjusted by applying the same differences between the base and adjusted (calibrated) 2019 model trip tables on an absolute difference basis.

Table 3-3 shows the resulting average weekday VMT for the 2019 and toll-free 2030 model results by facility type and class. The average annual percent change is also shown. The overall average annual percent growth of 0.4 percent is similar to recent observed historical growth trends, as discussed in Section 2.

3.6. Toll Diversion and Traffic and Revenue Analysis

CDM Smith applied a toll diversion assignment process for the different tolling scenarios within the CUBE study model. The process includes an iterative equilibrium-based assignment process that builds tolled and toll-free paths between various origins and destinations and determines the market share of toll trips. A cost ratio approach is used to determine the market share of trips. This equation is shown in Figure 3-10.

The results of the toll diversion assignment were exported to excel, where a post-processing adjustment was applied to the results to account for any remaining differences between the estimated actual 2019 AWDT volumes and 2019 AWDT calibrated model results. Following this adjustment, the average weekday gross toll revenue was calculated using the assumed toll rates. Finally, the annual gross toll revenue was computed using the assumed annualization factors.

Table 3-3: Average Weekday Vehicle Miles Traveled, 2019 to 2030 Toll-Free Model (in millions)

Facility Type	Passenger Car	Commercial Vehicle	Total
2019 Model Results			
Interstate / Freeway (including ramps)	83.11	9.17	92.28
Principal Arterial	74.50	3.94	78.45
Minor Arterial	28.88	1.23	30.11
Other	47.36	1.97	49.34
Total	233.86	16.31	250.16
2030 Toll-Free Model Results			
Interstate / Freeway (including ramps)	85.84	10.77	96.61
Principal Arterial	77.31	4.24	81.55
Minor Arterial	30.27	1.29	31.57
Other	49.56	2.07	51.63
Total	242.99	18.37	261.36
2019 to 2030 Average Annual Percent Change			
Interstate / Freeway (including ramps)	0.3%	1.5%	0.4%
Principal Arterial	0.3%	0.7%	0.4%
Minor Arterial	0.4%	0.5%	0.4%
Other	0.4%	0.4%	0.4%
Total	0.3%	1.1%	0.4%

Figure 3-10: Cost Ratio Equation from Toll Assignment

$$CR = \frac{Toll\ Path\ Cost}{Free\ Path\ Cost}$$

$$CR = \frac{VOT * Tt + OC * Dt + Toll}{VOT * Tf + OC * Df}$$

where,

CR = Cost Ratio
VOT = Value of Time
Tt = Travel Time on Toll Path
Dt = Distance traveled on Toll Path
Tf = Travel Time on Free Path
Df = Distance traveled on Free Path
$Toll$ = Toll Cost
OC = Vehicle Operating Cost

3.7. Low-Income User Discount Analysis

CDM Smith analyzed the potential implementation of a low-income user discount as part of its traffic and revenue estimates for the implementation of tolling across the state of Michigan.

Eligibility for the program was limited to users at or below 1.5 times the federal poverty rate. This metric was analyzed on a zonal basis for input into the model. It was assumed that roughly 50 percent of eligible users would utilize the discount program due to additional barriers such as sign-up and frequency of use. The percentage of low-income discount users by tolling segment is presented in Table 3-4.

Table 3-4: Portion of Low-Income Discount Users on Tolled Roadways

Route	Model Distance (mi)	Percent of PC Users with Low-Income Discount Transactions		Percent of All Users with Low-Income Discount Transactions	
		2030	2045	2030	2045
69	93.4	6%	6%	4%	4%
75 North	94.1	6%	6%	5%	4%
75 South 275 South	34.6	5%	5%	4%	4%
94 Segment 1	33.8	3%	3%	2%	2%
94 Segment 2	39.4	5%	5%	4%	3%
94 Segment 3	34.6	6%	6%	4%	4%
94 Segment 4	30.2	6%	6%	4%	4%
94 Segment 5	32.3	6%	6%	4%	4%
94 Segment 6	30.9	6%	6%	6%	6%
196	63.8	5%	5%	4%	3%
275 North	23.1	5%	5%	5%	5%
696	28.9	7%	7%	6%	6%
14	5.3	6%	6%	5%	5%
Weighted Average	**544.3**	**6%**	**6%**	**5%**	**5%**

3.8. Covid-19 Adjustments to Traffic

To account for the impact of Covid-19 on future traffic estimates, CDM Smith prepared a comparison of traffic counts between 2022 and 2019 based on select permanent count recorders in proximity to the project corridors. This was presented in Section 2.11 and summarized in Tables 2-2 and 2-3. For passenger car analysis, we grouped routes/segments into recreational and non-recreational categories. Recreational routes/corridors typically exhibited positive traffic growth (+2.5%) between 2019-2022, whereas non-recreational routes

presented significant negative growth (-8.0%). For each of these groupings, we determined the median change between 2019-2022. For commercial vehicles, we similarly determined the median change between 2019-2022 (+11.5%). We elected to use the median values to account for the wide variations observed, as it was unclear whether the singular cause for the impact was related to Covid-19 recovery or other factors such as construction activity, weather, or special events. The actual percent change between 2019-2022 was then compared to the growth in the statewide model for the same corridor. This allowed us to re-benchmark the model output for 2022 (interpolated between model years 2019 and 2030) to match the observed performance.

There is considerable uncertainty about how Covid-19 will impact future travel behavior and trends. We have seen much higher participation in work-from-home/telecommuting in many professional service types of jobs, impacting work commute travel. Similarly, a significant boost in commercial vehicle growth and travel during and after the Pandemic from the acceleration of e-commerce/goods movements. As such, we have taken the impacts observed in 2022 and applied 50 and 25 percent of that impact for the years 2030 and 2045, respectively.

Table 3-5 presents the summary of adjustments applied to the 2030 and 2045 traffic profiles to account for the change in travel behavior post-Covid-19. This was applied to the traffic assignment output from the Michigan Statewide Model as part of the post-processing adjustment.

Table 3-5: Post-Processing Model Adjustment for Covid-19

Route	Model Distance (mi)	2030		2045	
		Passenger Car	Commercial Vehicle	Passenger Car	Commercial Vehicle
69	93.4	-5%	3%	-2%	0%
75 North	94.1	0%	0%	0%	-2%
75 South 275 South	34.6	-4%	5%	-2%	2%
94 Segment 1	33.8	-1%	3%	-1%	0%
94 Segment 2	39.4	-5%	3%	-3%	0%
94 Segment 3	34.6	-5%	4%	-3%	1%
94 Segment 4	30.2	-5%	4%	-3%	1%
94 Segment 5	32.3	-4%	5%	-2%	2%
94 Segment 6	30.9	-4%	6%	-2%	3%
196	63.8	0%	3%	0%	0%
275 North	23.1	-4%	5%	-2%	3%
696	28.9	-4%	6%	-2%	3%
14	5.3	-5%	2%	-2%	0%

4. Step 2 Results

This section summarizes the Step 2 T&R analysis conducted for model years 2030 and 2045. A total of eight corridors were analyzed and broken into a total of 13 tolling segments.

4.1. 2030 and 2045 Traffic and Revenue Results

Step 2, high-level 2030 and 2045 T&R results are broken down for the 13 toll segments, by class, and for each of the three toll rate scenarios as follows:

1. Table 4-1 presents the estimated average weekday vehicle miles traveled estimates. This shows the total travel for all vehicles by route for an average weekday.
2. Table 4-2 presents the estimated average weekday daily traffic for both travel directions. These results are calculated as the average weekday vehicle miles traveled for the route divided by route centerline mileage. This shows the amount of traffic for an average bi-directional cross-section of the route.
3. Table 4-3 presents the estimated gross toll revenue (in 2020$). Gross revenue estimates do not account for any costs, such as toll collection and roadway maintenance, required to operate a toll facility.
4. Table 4-4 presents the estimated annual gross toll revenue per mile (in 2020$). This is the total annual revenue divided by the route centerline mileage.

4.2. Diversion

Traffic diversion is defined as the percent of the traffic that leaves the route upon commencement of tolling when compared to the condition without tolling. The unit of measurement for traffic is VMT. The percent traffic diversion associated with each of the toll segments analyzed can be found in Table 4-5. In 2030, total traffic diversion rates of 7 and 18 percent are observed. By 2045, diversion rates between 7 to 17 percent are seen. We noted slight increases in diversion rates on the I-94 corridor in 2045 on Segments 1 through 5, which may be attributable to the open barrier toll collection system. The I-94 corridor is estimated to see significantly higher growth rates in commercial traffic, which may dampen the short-distance passenger car movements from using the roadway, resulting in slightly higher diversion rates. In general, diversion is dependent on existing traffic levels, segment distance, and availability of alternate routes and types of tolling collection systems, which may capture all or partial movements on the roadway. Appendix A presents select 2030 traffic diversion maps resulting from tolling the project corridors.

Table 4-1: Average Weekday Vehicle Miles Traveled (000's)

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	93.4	2,406	709	3,115	2,410	917	3,327
I-75 North	94.1	1,236	212	1,447	1,299	368	1,667
I-75 South I-275 South	34.6	1,213	507	1,720	1,207	607	1,814
I-94 Segment 1	33.8	1,190	557	1,747	1,295	752	2,047
I-94 Segment 2	39.4	1,190	508	1,698	1,239	666	1,905
I-94 Segment 3	34.6	1,848	683	2,531	1,866	836	2,703
I-94 Segment 4	30.2	699	325	1,024	688	412	1,100
I-94 Segment 5	32.3	1,463	434	1,896	1,444	538	1,982
I-94 Segment 6	30.9	2,815	405	3,220	2,845	430	3,275
I-196	63.8	1,360	539	1,900	1,465	670	2,135
I-275 North	23.1	2,308	248	2,557	2,341	266	2,608
I-696	28.9	3,569	242	3,811	3,565	258	3,823
M-14	5.3	183	31	214	187	42	229
Total	544.3	21,480	5,401	26,881	21,852	6,762	28,615

Table 4-2: Average Weekday Daily Traffic (000's) - Total of both directions

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	93.4	25.8	7.6	33.4	25.8	9.8	35.6
I-75 North	94.1	13.1	2.3	15.4	13.8	3.9	17.7
I-75 South I-275 South	34.6	35.1	14.7	49.7	34.9	17.6	52.4
I-94 Segment 1	33.8	35.2	16.5	51.7	38.4	22.3	60.6
I-94 Segment 2	39.4	30.2	12.9	43.1	31.4	16.9	48.3
I-94 Segment 3	34.6	53.5	19.8	73.3	54.0	24.2	78.2
I-94 Segment 4	30.2	23.2	10.8	33.9	22.8	13.7	36.5
I-94 Segment 5	32.3	45.3	13.4	58.7	44.7	16.6	61.3
I-94 Segment 6	30.9	91.1	13.1	104.2	92.1	13.9	106.0
I-196	63.8	21.3	8.5	29.8	23.0	10.5	33.5
I-275 North	23.1	100.1	10.8	110.8	101.5	11.5	113.0
I-696	28.9	123.4	8.4	131.8	123.3	8.9	132.2
M-14	5.3	34.2	5.9	40.1	34.9	7.8	42.8

Table 4-3: Total Annual Gross Revenue by Toll Segment (000's) in 2020$

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	93.4	$ 45,618	$ 43,862	$ 89,480	$ 46,776	$ 57,016	$ 103,792
I-75 North	94.1	27,260	11,794	39,054	29,005	21,781	50,786
I-75 South / I-275 South	34.6	25,543	31,246	56,789	26,062	37,524	63,586
I-94 Segment 1	33.8	23,282	35,347	58,629	24,138	47,907	72,045
I-94 Segment 2	39.4	24,570	31,651	56,221	26,196	41,941	68,137
I-94 Segment 3	34.6	28,527	38,529	67,056	29,513	46,993	76,506
I-94 Segment 4	30.2	15,093	20,753	35,846	15,330	27,054	42,384
I-94 Segment 5	32.3	28,041	30,604	58,645	28,468	36,259	64,727
I-94 Segment 6	30.9	44,988	20,900	65,888	46,779	22,019	68,798
I-196	63.8	27,890	27,931	55,821	29,837	35,803	65,640
I-275 North	23.1	69,108	18,467	87,575	71,863	19,723	91,586
I-696	28.9	98,560	19,964	118,524	100,348	20,917	121,265
M-14	5.3	12,839	4,383	17,222	13,490	6,293	19,783
Total	**544.3**	**$ 471,319**	**$ 335,431**	**$ 806,750**	**$ 487,805**	**$ 421,230**	**$ 909,035**

Table 4-4: Annual Gross Revenue Per Mile (000's) in 2020$

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	93.4	$ 489	$ 470	$ 958	$ 501	$ 611	$ 1,112
I-75 North	94.1	290	125	415	308	232	540
I-75 South / I-275 South	34.6	739	904	1,642	754	1,085	1,839
I-94 Segment 1	33.8	690	1,047	1,737	715	1,419	2,134
I-94 Segment 2	39.4	623	802	1,425	664	1,063	1,727
I-94 Segment 3	34.6	826	1,115	1,941	854	1,360	2,214
I-94 Segment 4	30.2	500	688	1,188	508	896	1,404
I-94 Segment 5	32.3	868	947	1,815	881	1,122	2,003
I-94 Segment 6	30.9	1,456	676	2,133	1,514	713	2,227
I-196	63.8	437	438	875	468	561	1,029
I-275 North	23.1	2,996	801	3,797	3,115	855	3,971
I-696	28.9	3,409	690	4,099	3,470	723	4,194
M-14	5.3	2,401	820	3,221	2,523	1,177	3,700

Table 4-5: Model Diversion Results

Route	Model Distance (mi)	2030			2045		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
69	93.4	-11%	-12%	-12%	-12%	-11%	-11%
75 North	94.1	-10%	-8%	-9%	-10%	-5%	-9%
75 South 275 South	34.6	-11%	-8%	-10%	-10%	-7%	-9%
94 Segment 1	33.8	-7%	-8%	-7%	-15%	-9%	-13%
94 Segment 2	39.4	-14%	-12%	-14%	-20%	-12%	-17%
94 Segment 3	34.6	-10%	-11%	-11%	-14%	-12%	-13%
94 Segment 4	30.2	-10%	-11%	-11%	-15%	-11%	-14%
94 Segment 5	32.3	-7%	-8%	-7%	-9%	-9%	-9%
94 Segment 6	30.9	-7%	-7%	-7%	-7%	-6%	-7%
196	63.8	-6%	-8%	-7%	-8%	-10%	-9%
275 North	23.1	-11%	-12%	-11%	-11%	-11%	-11%
696	28.9	-13%	-11%	-13%	-13%	-10%	-12%
14	5.3	-18%	-19%	-18%	-17%	-18%	-17%

4.3. Michigan Resident Share

As listed previously in the model input assumptions table in Section 2, an estimate of the share of Michigan residents versus non-residents for passenger cars was made and built into the study model. The model input estimate was made using previously obtained AirSage travel data in collaboration with tolling study partner Resource Systems Group. Table 4-6 shows the resulting share of Michigan residents for traffic and revenue by toll segment. In total, Michigan residents represented approximately 91 percent of the potential tolled traffic for all eight roadways. The shares ranged from 56 percent to 99 percent by route, with routes at or near the state border showing the lowest Michigan resident shares for passenger cars. I-94 Segment 1 near the Indiana border is estimated to represent 56 percent of traffic from Michigan in 2030 and increases to 92 percent traveling eastward at Segment 6. Urban corridors of I-275 and I-696 maintain a high percentage of Michigan drivers facilitating a high share of local trips in the metro-Detroit area.

Table 4-6: Share of Passenger Car Traffic and Revenue for Michigan Residents

Route	Model Distance (mi)	Percent Michigan Resident by Total Transactions	
		2030	2040
I-69	93.4	90%	89%
I-75 North	94.1	81%	81%
I-75 South / I-275 South	34.6	85%	85%
I-94 Segment 1	33.8	56%	54%
I-94 Segment 2	39.4	76%	74%
I-94 Segment 3	34.6	83%	81%
I-94 Segment 4	30.2	84%	80%
I-94 Segment 5	32.3	90%	88%
I-94 Segment 6	30.9	92%	91%
I-196	63.8	83%	83%
I-275 North	23.1	96%	95%
I-696	28.9	99%	99%
M-14	5.3	95%	94%
Weighted Average	544.3	91%	91%

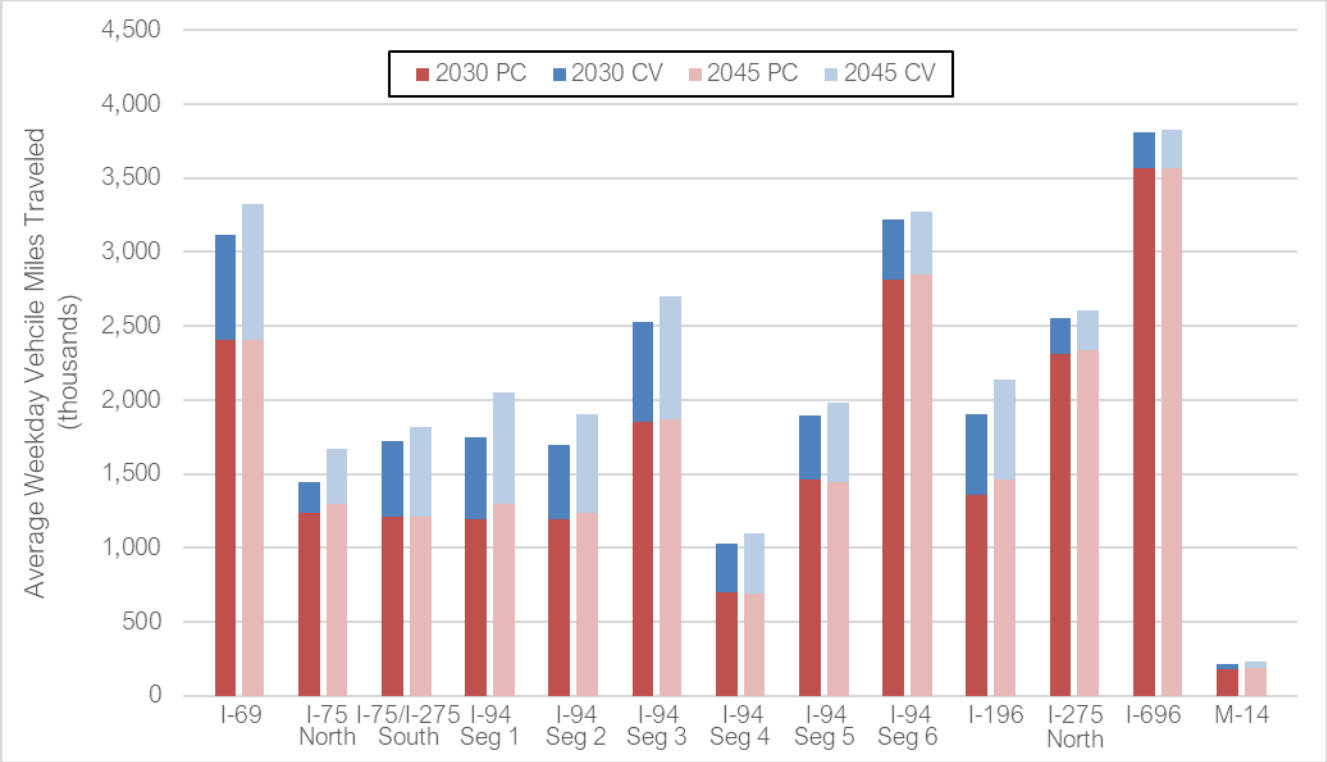
4.4. Results Summaries

This section provides graphs and ranking summaries for the 2030 and 2045 model results, including graphs for average weekday vehicle miles traveled, average weekday daily traffic, annual gross revenue, annual gross revenue per mile, diversion, percent non-resident, and percent low-income users in Figure 4-1 to Figure 4-7. The results are intended to show the relative differences between different toll segments. Passenger car (PC) and commercial vehicle (CV) breakdowns are provided where applicable.

Table 4-7 provides a ranking of the tolling segments in terms of total annual gross revenue and total annual gross revenue per mile for both the 2030 and 2045 model results. The top-grossing tolling segments remained unchanged from 2030 to 2045, with I-696, I-69, I-275 (North), and I-94 Segment 3 rounding out the top four in both years. The top-grossing tolling segments per mile for 2030 and 2045 were the urban freeway corridors of I-696 and I-275 (North), followed by the 5-mile corridor of M-14 and I-94 Segment 6 (Ann Arbor to Detroit). The per-mile high-gross of the M-14 corridor results from relatively few alternative routes available to cross the Huron River in Ann Arbor.

Complete traffic and revenue streams for all eight corridor/13 tolling segments analyzed from 2028 to 2068 are presented in Table 4-8 to Table 4-20.

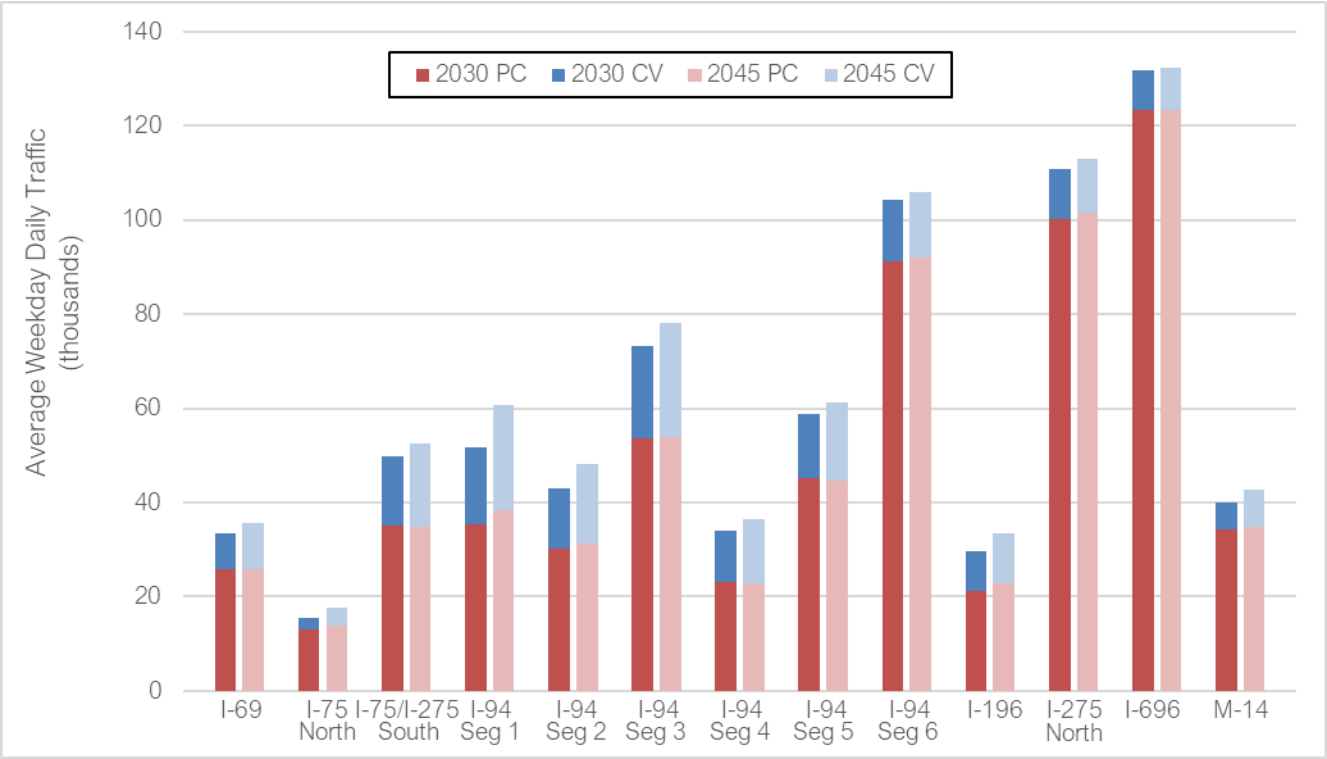
Figure 4-1: Average Weekday Vehicle Miles Traveled by Route



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

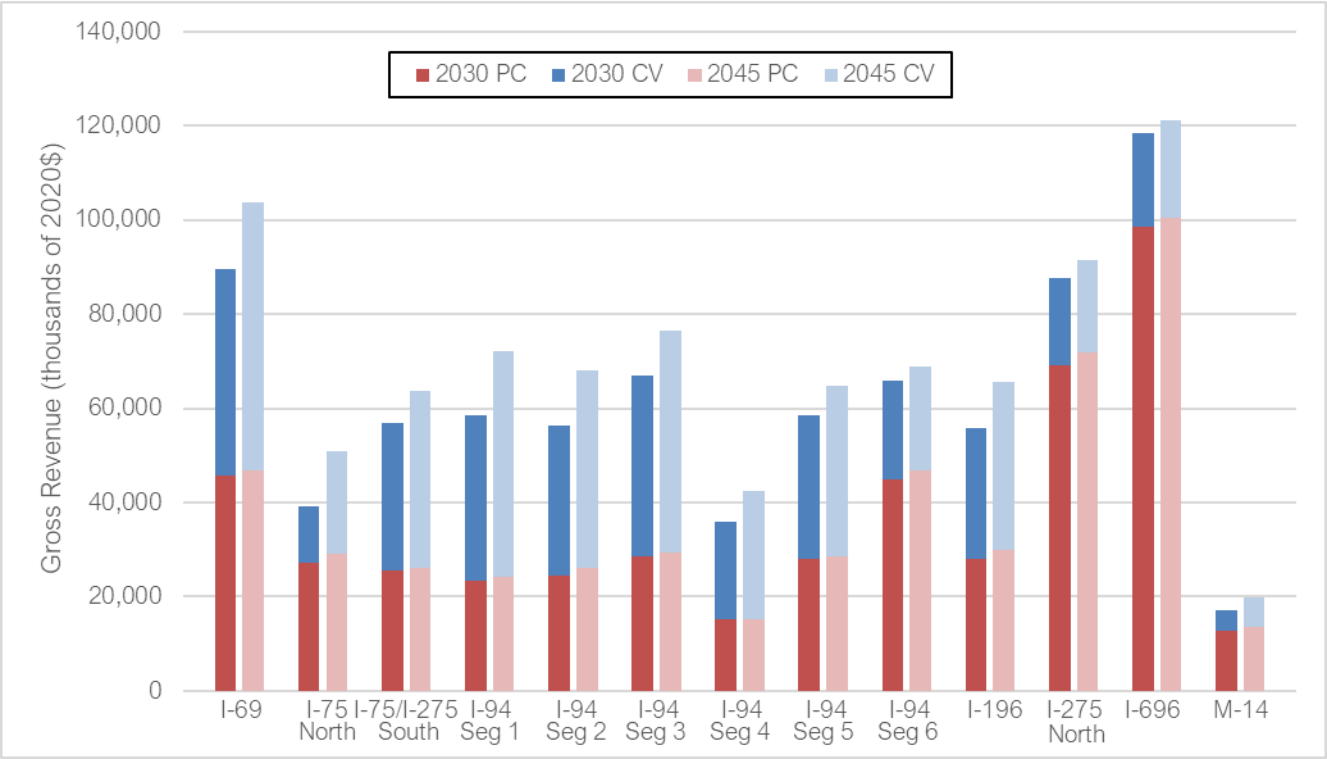
Figure 4-2: Average Weekday Daily Traffic by Route



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

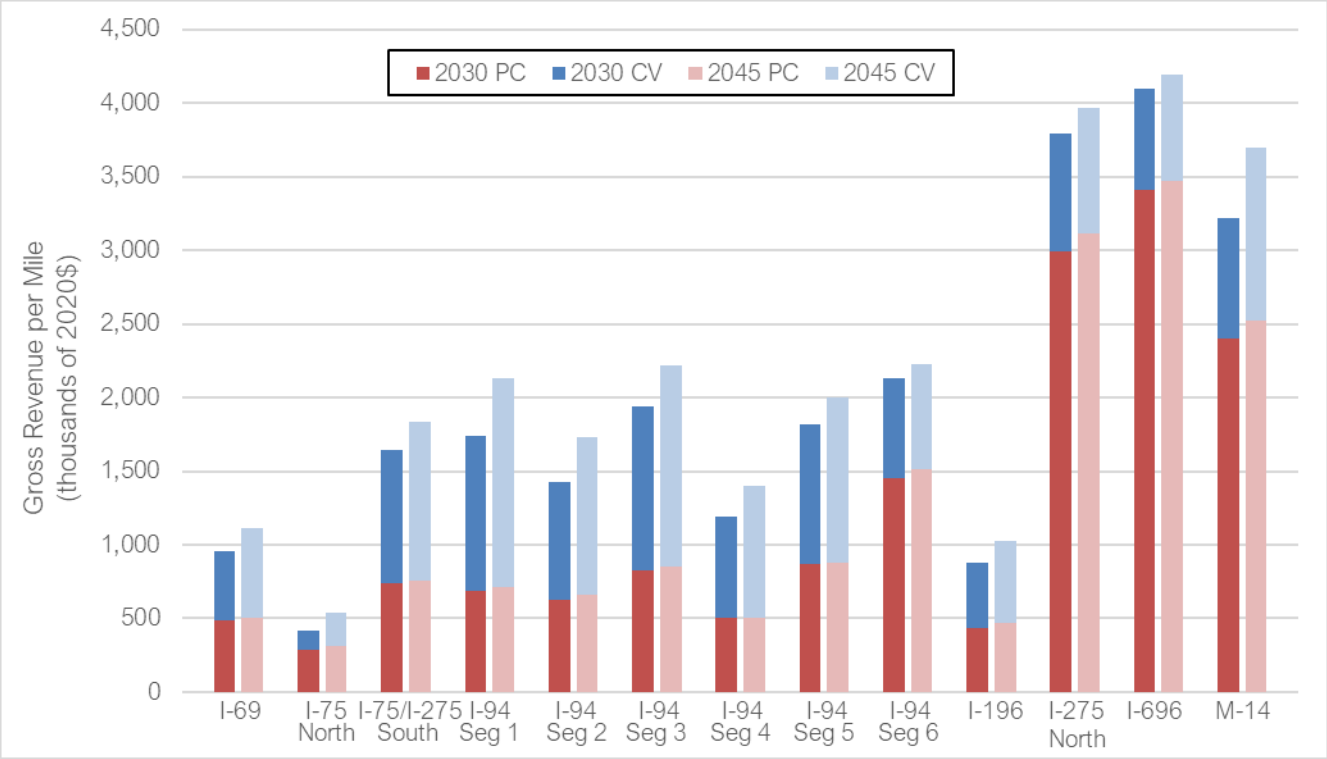
Figure 4-3: Annual Gross Revenue by Route



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

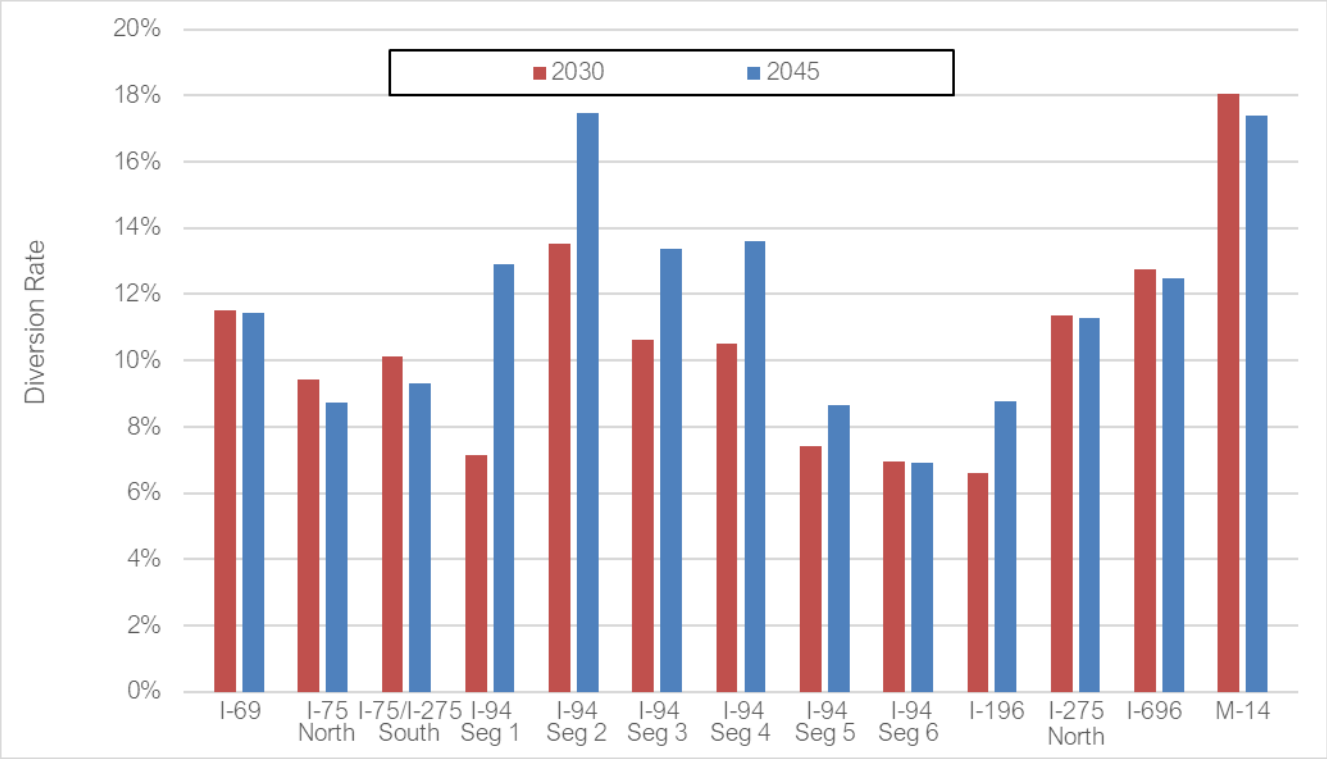
Figure 4-4: Annual Gross Revenue Per Mile by Route



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

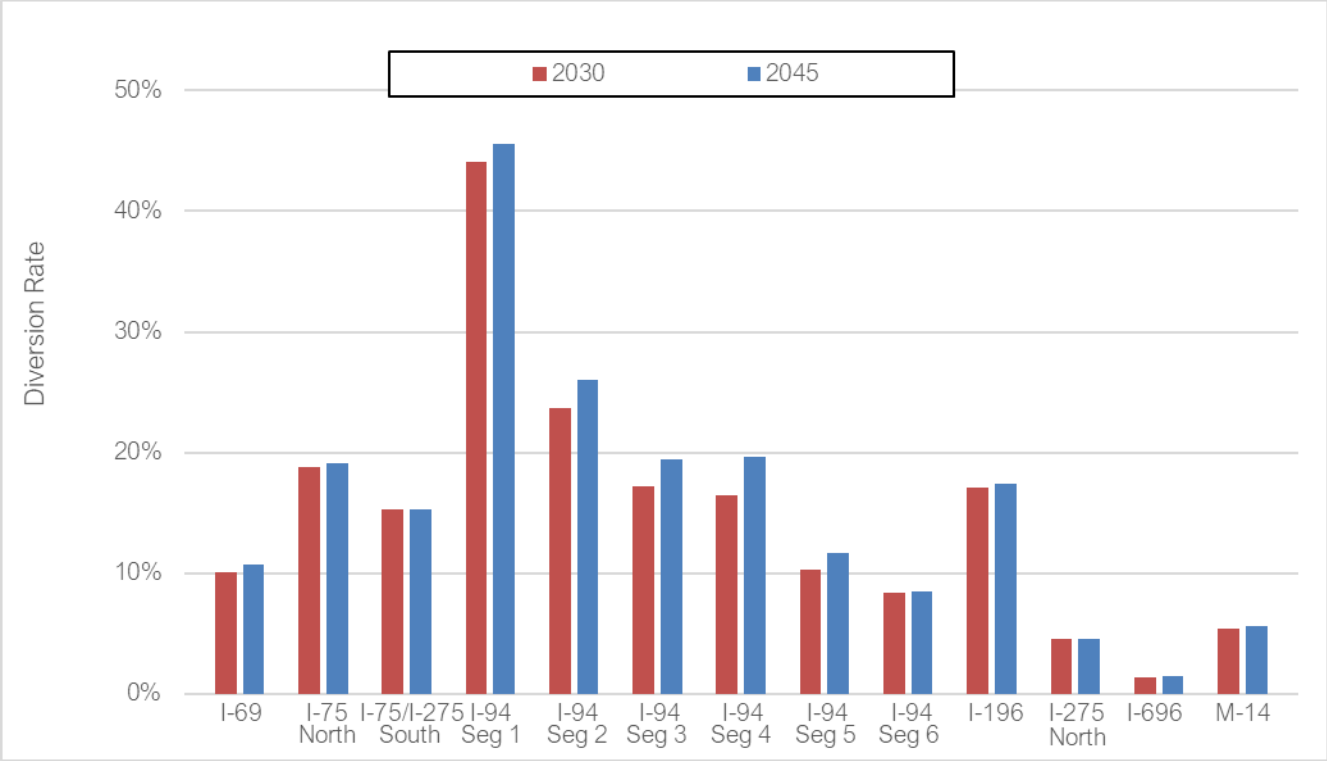
Figure 4-5: Diversion Rate by Route



Note: Route Descriptions are provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

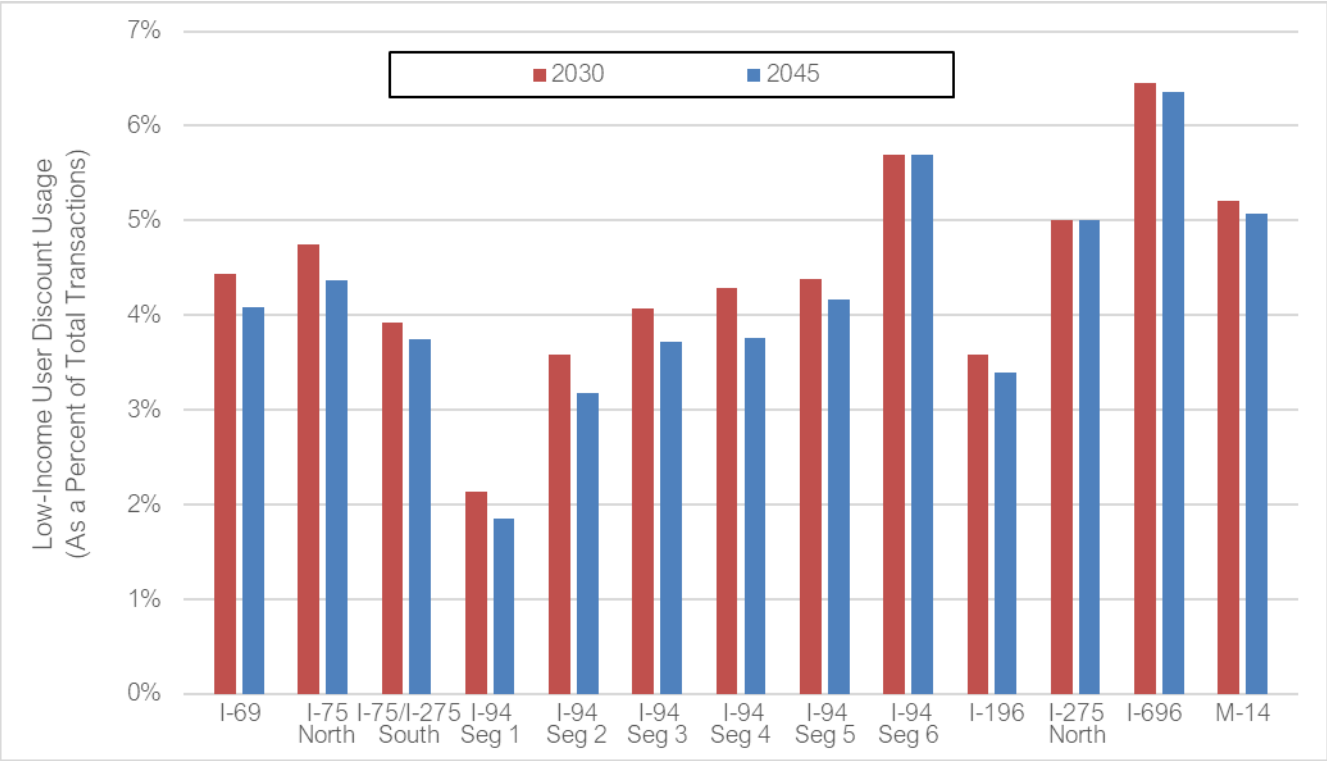
Figure 4-6: Share of Passenger Car Non-Resident by Route



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

Figure 4-7: Corridor Share of Low-Income Users



Note: Route Descriptions provided below:

Route	Segment	Starting Location	Ending Location
I-69		I-94, Marshall	I-75, Flint
I-75(North)		I-675, Saginaw	US-127, Higgins Lake
I-75/I275 (South)		Ohio Border	Eureka Rd, Romulus
I-94	Segment 1	Indiana Border	I-196, Benton Harbor
I-94	Segment 2	I-196, Benton Harbor	US-131, Portage
I-94	Segment 3	US-131, Portage	I-69, Marshall
I-94	Segment 4	I-69, Marshall	US-127, Jackson
I-94	Segment 5	US-127, Jackson	M-14, Ann Arbor
I-94	Segment 6	M-14, Ann Arbor	US-24, Taylor
I-196		I-94, Benton Harbor	M-6, near Hudsonville
I-275 (North)		Eureka Rd, Romulus	I-96/I-696, Novi
I-696		I-96/I-275, Novi	I-94, St.Clair Shores
M-14		I-94, Ann Arbor	US-23, Ann Arbor

Table 4-7: Total Annual Gross Revenue by Toll Segment (in thousands of constant 2020$)[1]

2030

Route	Ranking by Total Rev.	Annual Gross Revenue			Route	Rank by Total Rev. per Mile	Annual Gross Revenue per Mile		
		Passenger Car	Commercial Vehicle	Total			Passenger Car	Commercial Vehicle	Total
696	1	$ 98,560	$ 19,964	$ 118,524	696	1	$ 3,409	$ 690	$ 4,099
69	2	45,618	43,862	89,480	275 North	2	2,996	801	3,797
275 North	3	69,108	18,467	87,575	14	3	2,401	820	3,221
94 Segment 3	4	28,527	38,529	67,056	94 Segment 6	4	1,456	676	2,133
94 Segment 6	5	44,988	20,900	65,888	94 Segment 3	5	826	1,115	1,941
94 Segment 5	6	28,041	30,604	58,645	94 Segment 5	6	868	947	1,815
94 Segment 1	7	23,282	35,347	58,629	94 Segment 1	7	690	1,047	1,737
75 South 275 South	8	25,543	31,246	56,789	75 South 275 South	8	739	904	1,642
94 Segment 2	9	24,570	31,651	56,221	94 Segment 2	9	623	802	1,425
196	10	27,890	27,931	55,821	94 Segment 4	10	500	688	1,188
75 North	11	27,260	11,794	39,054	69	11	489	470	958
94 Segment 4	12	15,093	20,753	35,846	196	12	437	438	875
14	13	12,839	4,383	17,222	75 North	13	290	125	415
	Total	$ 471,319	$ 335,431	$ 806,750					

2045

Route	Ranking by Total Rev.	Annual Gross Revenue			Route	Rank by Total Rev. per Mile	Annual Gross Revenue per Mile		
		Passenger Car	Commercial Vehicle	Total			Passenger Car	Commercial Vehicle	Total
696	1	$ 100,348	$ 20,917	$ 121,265	696	1	$ 3,470	$ 723	$ 4,194
69	2	46,776	57,016	103,792	275 North	2	3,115	855	3,971
275 North	3	71,863	19,723	91,586	14	3	2,523	1,177	3,700
94 Segment 3	4	29,513	46,993	76,506	94 Segment 6	4	1,514	713	2,227
94 Segment 1	7	24,138	47,907	72,045	94 Segment 3	5	854	1,360	2,214
94 Segment 6	5	46,779	22,019	68,798	94 Segment 1	6	715	1,419	2,134
94 Segment 2	9	26,196	41,941	68,137	94 Segment 5	7	881	1,122	2,003
196	10	29,837	35,803	65,640	75 South 275 South	8	754	1,085	1,839
94 Segment 5	6	28,468	36,259	64,727	94 Segment 5	9	664	1,063	1,727
75 South 275 South	8	26,062	37,524	63,586	94 Segment 4	10	508	896	1,404
75 North	11	29,005	21,781	50,786	69	11	501	611	1,112
94 Segment 4	12	15,330	27,054	42,384	196	12	468	561	1,029
14	13	13,490	6,293	19,783	75 North	13	308	232	540
	Total	$ 487,805	$ 421,230	$ 909,035					

Table 4-8: I-69 Traffic and Revenue Stream

Year	Transactions (thousands)	Revenue (thousands 2020$)
2028	73,944	$ 87,572
2029	74,307	88,526
2030	74,670	89,480
2031	75,033	90,434
2032	75,396	91,388
2033	75,759	92,342
2034	76,122	93,296
2035	76,486	94,251
2036	76,849	95,205
2037	77,212	96,159
2038	77,575	97,113
2039	77,938	98,067
2040	78,301	99,021
2041	78,664	99,975
2042	79,027	100,929
2043	79,390	101,883
2044	79,753	102,837
2045	80,116	103,792
2046	80,455	104,721
2047	80,796	105,658
2048	81,138	106,603
2049	81,481	107,557
2050	81,826	108,519
2051	82,134	109,382
2052	82,443	110,252
2053	82,754	111,129
2054	83,065	112,012
2055	83,378	112,903
2056	83,652	113,689
2057	83,928	114,480
2058	84,204	115,276
2059	84,482	116,079
2060	84,760	116,886
2061	84,999	117,583
2062	85,239	118,285
2063	85,479	118,990
2064	85,721	119,700
2065	85,963	120,414
2066	86,165	121,012
2067	86,368	121,614
2068	86,571	122,218

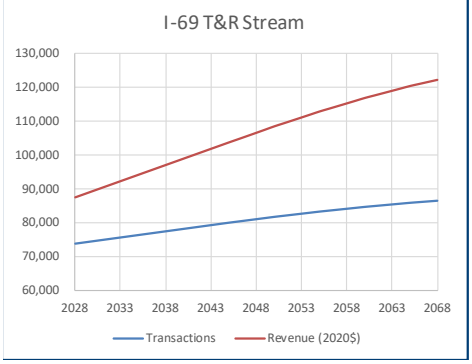


Table 4-9: I-75 North Traffic and Revenue Stream

Year	75 North Transactions (thousands)	Revenue (thousands 2020$)
2028	39,863	$ 37,490
2029	40,239	38,272
2030	40,615	39,054
2031	40,991	39,836
2032	41,367	40,618
2033	41,743	41,400
2034	42,119	42,182
2035	42,495	42,965
2036	42,871	43,747
2037	43,247	44,529
2038	43,623	45,311
2039	43,999	46,093
2040	44,375	46,875
2041	44,751	47,657
2042	45,127	48,439
2043	45,503	49,221
2044	45,879	50,003
2045	46,255	50,786
2046	46,617	51,594
2047	46,983	52,414
2048	47,351	53,247
2049	47,722	54,094
2050	48,096	54,954
2051	48,431	55,730
2052	48,768	56,518
2053	49,108	57,317
2054	49,450	58,127
2055	49,794	58,948
2056	50,098	59,677
2057	50,403	60,415
2058	50,710	61,162
2059	51,019	61,919
2060	51,330	62,684
2061	51,598	63,349
2062	51,868	64,020
2063	52,139	64,699
2064	52,411	65,385
2065	52,685	66,078
2066	52,914	66,661
2067	53,145	67,250
2068	53,376	67,844

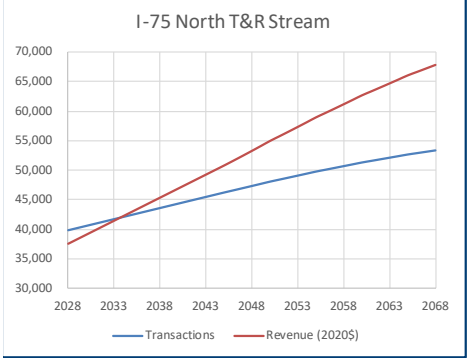


Table 4-10: I-75 / I-275 South Traffic and Revenue Stream

Year	75 / 275 South Transactions (thousands)	Revenue (thousands 2020$)
2028	48,066	$ 55,883
2029	48,244	56,336
2030	48,422	56,789
2031	48,600	57,242
2032	48,778	57,695
2033	48,956	58,148
2034	49,134	58,601
2035	49,312	59,055
2036	49,489	59,508
2037	49,667	59,961
2038	49,845	60,414
2039	50,023	60,867
2040	50,201	61,320
2041	50,379	61,773
2042	50,557	62,226
2043	50,735	62,679
2044	50,913	63,132
2045	51,091	63,586
2046	51,256	64,019
2047	51,421	64,455
2048	51,587	64,894
2049	51,753	65,336
2050	51,920	65,780
2051	52,069	66,178
2052	52,218	66,579
2053	52,368	66,982
2054	52,518	67,387
2055	52,669	67,795
2056	52,801	68,154
2057	52,933	68,515
2058	53,066	68,878
2059	53,199	69,243
2060	53,333	69,609
2061	53,447	69,925
2062	53,562	70,243
2063	53,677	70,561
2064	53,793	70,882
2065	53,908	71,203
2066	54,005	71,473
2067	54,102	71,743
2068	54,199	72,015

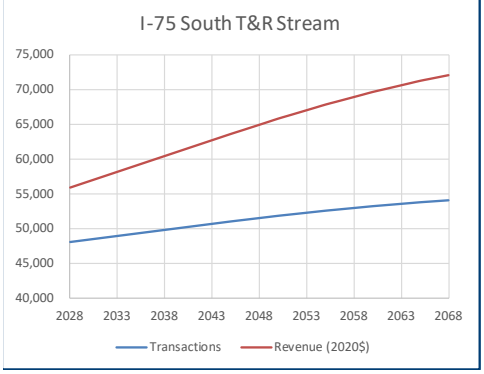


Table 4-11: I-94 Segment 1 Traffic and Revenue Stream

Year	94 Seg 1 Transactions (thousands)	Revenue (thousands 2020$)
2028	32,100	$ 56,840
2029	32,361	57,735
2030	32,621	58,629
2031	32,882	59,523
2032	33,142	60,418
2033	33,403	61,312
2034	33,663	62,207
2035	33,924	63,101
2036	34,184	63,995
2037	34,445	64,890
2038	34,705	65,784
2039	34,966	66,679
2040	35,226	67,573
2041	35,487	68,467
2042	35,747	69,362
2043	36,008	70,256
2044	36,268	71,151
2045	36,529	72,045
2046	36,778	72,942
2047	37,029	73,850
2048	37,281	74,769
2049	37,535	75,700
2050	37,791	76,643
2051	38,020	77,491
2052	38,250	78,348
2053	38,482	79,215
2054	38,715	80,092
2055	38,949	80,978
2056	39,156	81,762
2057	39,363	82,554
2058	39,572	83,353
2059	39,781	84,160
2060	39,992	84,975
2061	40,174	85,680
2062	40,357	86,392
2063	40,540	87,109
2064	40,724	87,831
2065	40,909	88,560
2066	41,064	89,173
2067	41,219	89,790
2068	41,376	90,411

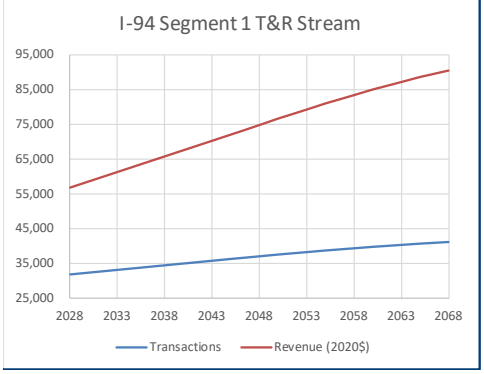


Table 4-12: I-94 Segment 2 Traffic and Revenue Stream

Year	94 Seg 2 Transactions (thousands)	Revenue (thousands 2020$)
2028	57,878	$ 54,632
2029	58,355	55,427
2030	58,831	56,221
2031	59,308	57,015
2032	59,784	57,810
2033	60,261	58,604
2034	60,737	59,399
2035	61,214	60,193
2036	61,690	60,987
2037	62,167	61,782
2038	62,643	62,576
2039	63,120	63,371
2040	63,596	64,165
2041	64,073	64,959
2042	64,549	65,754
2043	65,026	66,548
2044	65,502	67,343
2045	65,978	68,137
2046	66,434	68,928
2047	66,892	69,728
2048	67,354	70,537
2049	67,819	71,356
2050	68,288	72,185
2051	68,707	72,929
2052	69,129	73,682
2053	69,553	74,442
2054	69,980	75,210
2055	70,409	75,986
2056	70,788	76,672
2057	71,168	77,364
2058	71,550	78,063
2059	71,934	78,768
2060	72,321	79,479
2061	72,654	80,094
2062	72,988	80,714
2063	73,324	81,338
2064	73,662	81,968
2065	74,001	82,602
2066	74,285	83,135
2067	74,570	83,671
2068	74,856	84,211

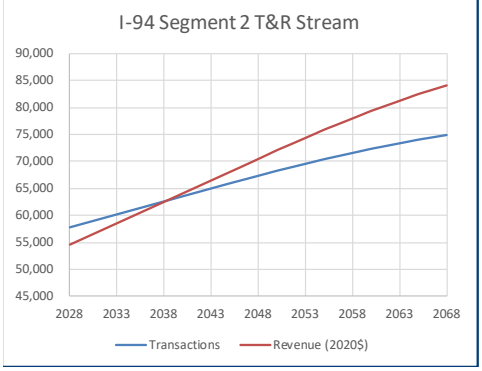


Table 4-13: I-94 Segment 3 Traffic and Revenue Stream

Year	94 Seg 3 Transactions (thousands)	Revenue (thousands 2020$)
2028	38,768	$ 65,796
2029	38,974	66,426
2030	39,180	67,056
2031	39,386	67,686
2032	39,592	68,316
2033	39,798	68,946
2034	40,004	69,576
2035	40,210	70,206
2036	40,415	70,836
2037	40,621	71,466
2038	40,827	72,096
2039	41,033	72,726
2040	41,239	73,356
2041	41,445	73,986
2042	41,651	74,616
2043	41,857	75,246
2044	42,063	75,876
2045	42,269	76,506
2046	42,462	77,114
2047	42,656	77,727
2048	42,850	78,344
2049	43,046	78,967
2050	43,243	79,594
2051	43,418	80,156
2052	43,594	80,722
2053	43,771	81,292
2054	43,949	81,867
2055	44,127	82,445
2056	44,284	82,954
2057	44,441	83,467
2058	44,599	83,983
2059	44,757	84,502
2060	44,916	85,024
2061	45,053	85,474
2062	45,190	85,927
2063	45,327	86,382
2064	45,465	86,840
2065	45,604	87,300
2066	45,719	87,685
2067	45,835	88,072
2068	45,951	88,461

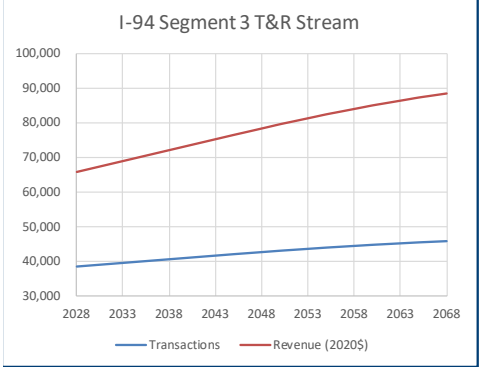


Table 4-14: I-94 Segment 4 Traffic and Revenue Stream

Year	I-94 Seg 4 Transactions (thousands)	I-94 Seg 4 Revenue (thousands 2020$)
2028	21,378	$ 34,974
2029	21,495	35,410
2030	21,611	35,846
2031	21,727	36,282
2032	21,844	36,718
2033	21,960	37,154
2034	22,077	37,590
2035	22,193	38,026
2036	22,309	38,461
2037	22,426	38,897
2038	22,542	39,333
2039	22,659	39,769
2040	22,775	40,205
2041	22,891	40,641
2042	23,008	41,077
2043	23,124	41,513
2044	23,241	41,949
2045	23,357	42,384
2046	23,466	42,812
2047	23,576	43,245
2048	23,686	43,682
2049	23,797	44,124
2050	23,908	44,570
2051	24,007	44,971
2052	24,107	45,375
2053	24,207	45,782
2054	24,308	46,194
2055	24,409	46,609
2056	24,498	46,975
2057	24,587	47,345
2058	24,676	47,717
2059	24,766	48,092
2060	24,856	48,470
2061	24,933	48,797
2062	25,011	49,126
2063	25,089	49,457
2064	25,167	49,790
2065	25,245	50,125
2066	25,311	50,407
2067	25,377	50,690
2068	25,443	50,975

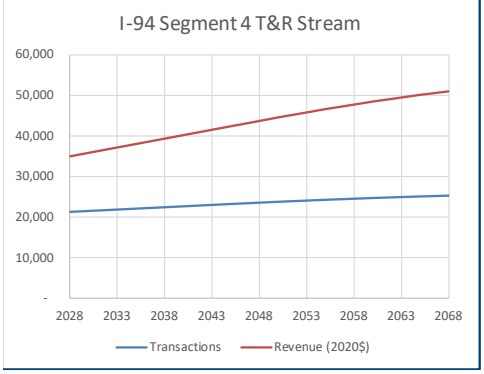


Table 4-15: I-94 Segment 5 Traffic and Revenue Stream

Year	94 Seg 5 Transactions (thousands)	Revenue (thousands 2020$)
2028	21,469	$ 57,834
2029	21,539	58,240
2030	21,610	58,645
2031	21,681	59,051
2032	21,751	59,456
2033	21,822	59,862
2034	21,893	60,267
2035	21,964	60,673
2036	22,034	61,078
2037	22,105	61,484
2038	22,176	61,889
2039	22,246	62,295
2040	22,317	62,700
2041	22,388	63,106
2042	22,458	63,511
2043	22,529	63,917
2044	22,600	64,322
2045	22,671	64,727
2046	22,736	65,112
2047	22,802	65,498
2048	22,868	65,887
2049	22,933	66,279
2050	23,000	66,673
2051	23,058	67,025
2052	23,117	67,378
2053	23,177	67,734
2054	23,236	68,092
2055	23,295	68,451
2056	23,348	68,768
2057	23,400	69,085
2058	23,452	69,404
2059	23,505	69,725
2060	23,558	70,047
2061	23,603	70,325
2062	23,648	70,603
2063	23,693	70,883
2064	23,739	71,163
2065	23,785	71,445
2066	23,823	71,681
2067	23,861	71,918
2068	23,899	72,155

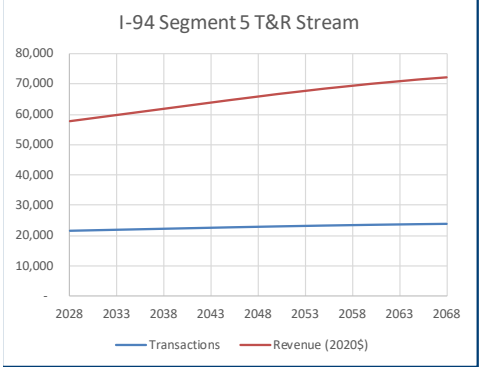


Table 4-16: I-94 Segment 6 Traffic and Revenue Stream

Year	I-94 Seg 6 Transactions (thousands)	I-94 Seg 6 Revenue (thousands 2020$)
2028	85,369	$ 65,500
2029	85,604	65,694
2030	85,839	65,888
2031	86,074	66,082
2032	86,309	66,276
2033	86,545	66,470
2034	86,780	66,664
2035	87,015	66,858
2036	87,250	67,052
2037	87,485	67,246
2038	87,721	67,440
2039	87,956	67,634
2040	88,191	67,828
2041	88,426	68,022
2042	88,661	68,216
2043	88,897	68,410
2044	89,132	68,604
2045	89,367	68,798
2046	89,583	68,977
2047	89,800	69,156
2048	90,017	69,335
2049	90,235	69,516
2050	90,454	69,696
2051	90,648	69,857
2052	90,843	70,018
2053	91,039	70,180
2054	91,234	70,342
2055	91,431	70,504
2056	91,603	70,647
2057	91,775	70,789
2058	91,948	70,932
2059	92,121	71,076
2060	92,294	71,219
2061	92,443	71,343
2062	92,592	71,466
2063	92,742	71,590
2064	92,891	71,714
2065	93,041	71,838
2066	93,166	71,941
2067	93,292	72,045
2068	93,417	72,149

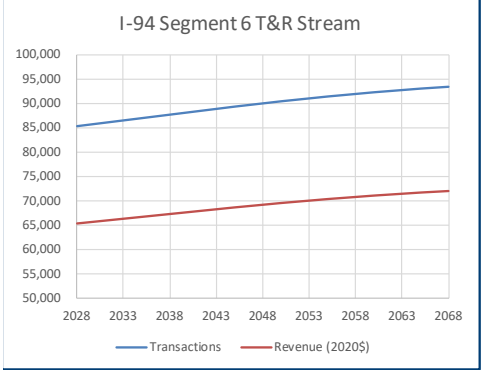


Table 4-17: I-196 Traffic and Revenue Stream

Year	Transactions (thousands)	Revenue (thousands 2020$)
2028	47,064	$ 54,512
2029	47,420	55,166
2030	47,776	55,821
2031	48,132	56,476
2032	48,488	57,130
2033	48,844	57,785
2034	49,200	58,439
2035	49,557	59,094
2036	49,913	59,749
2037	50,269	60,403
2038	50,625	61,058
2039	50,981	61,712
2040	51,337	62,367
2041	51,693	63,022
2042	52,049	63,676
2043	52,405	64,331
2044	52,761	64,985
2045	53,118	65,640
2046	53,457	66,282
2047	53,798	66,930
2048	54,142	67,584
2049	54,487	68,244
2050	54,835	68,911
2051	55,146	69,510
2052	55,459	70,114
2053	55,773	70,723
2054	56,090	71,338
2055	56,408	71,958
2056	56,688	72,505
2057	56,969	73,056
2058	57,252	73,611
2059	57,536	74,171
2060	57,822	74,735
2061	58,068	75,222
2062	58,315	75,712
2063	58,563	76,206
2064	58,812	76,702
2065	59,062	77,202
2066	59,272	77,621
2067	59,482	78,043
2068	59,693	78,466

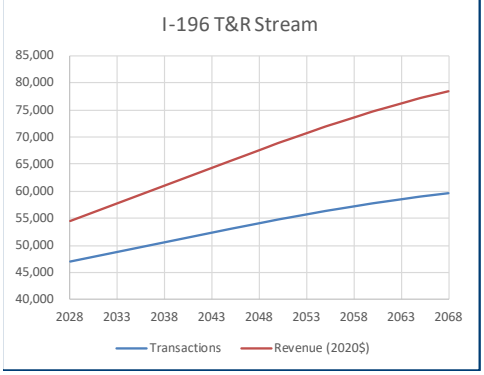


Table 4-18: I-275 North Traffic and Revenue Stream

Year	Transactions (thousands)	Revenue (thousands 2020$)
2028	143,894	$ 87,040
2029	144,296	87,308
2030	144,698	87,575
2031	145,100	87,842
2032	145,502	88,110
2033	145,904	88,377
2034	146,306	88,645
2035	146,709	88,912
2036	147,111	89,179
2037	147,513	89,447
2038	147,915	89,714
2039	148,317	89,982
2040	148,719	90,249
2041	149,121	90,516
2042	149,523	90,784
2043	149,925	91,051
2044	150,327	91,319
2045	150,729	91,586
2046	151,099	91,833
2047	151,470	92,080
2048	151,841	92,327
2049	152,214	92,576
2050	152,587	92,825
2051	152,920	93,047
2052	153,253	93,270
2053	153,588	93,493
2054	153,922	93,716
2055	154,258	93,941
2056	154,553	94,137
2057	154,847	94,334
2058	155,143	94,532
2059	155,439	94,729
2060	155,736	94,928
2061	155,990	95,098
2062	156,245	95,269
2063	156,501	95,440
2064	156,757	95,611
2065	157,013	95,782
2066	157,227	95,925
2067	157,442	96,069
2068	157,656	96,212

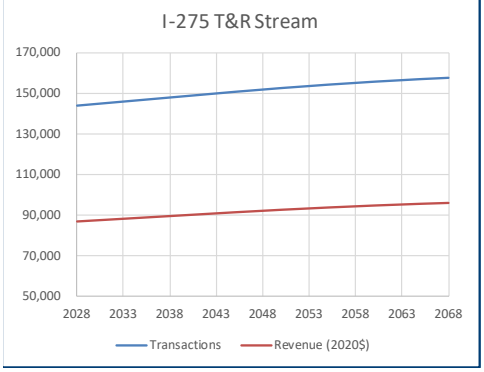


Table 4-19: I-696 Traffic and Revenue Stream

Year	Transactions (thousands)	Revenue (thousands 2020$)
2028	220,363	$ 118,159
2029	220,623	118,341
2030	220,882	118,524
2031	221,141	118,707
2032	221,401	118,889
2033	221,660	119,072
2034	221,920	119,255
2035	222,179	119,438
2036	222,438	119,620
2037	222,698	119,803
2038	222,957	119,986
2039	223,217	120,168
2040	223,476	120,351
2041	223,735	120,534
2042	223,995	120,716
2043	224,254	120,899
2044	224,514	121,082
2045	224,773	121,265
2046	225,009	121,432
2047	225,245	121,598
2048	225,481	121,765
2049	225,717	121,932
2050	225,954	122,100
2051	226,164	122,249
2052	226,375	122,398
2053	226,586	122,547
2054	226,797	122,697
2055	227,008	122,847
2056	227,194	122,978
2057	227,379	123,109
2058	227,564	123,240
2059	227,750	123,372
2060	227,936	123,504
2061	228,095	123,617
2062	228,254	123,730
2063	228,414	123,843
2064	228,573	123,956
2065	228,733	124,070
2066	228,866	124,164
2067	229,000	124,259
2068	229,133	124,354

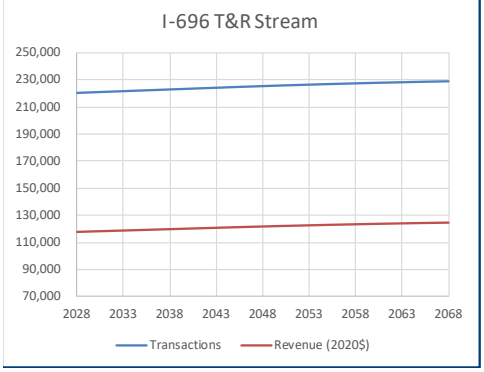
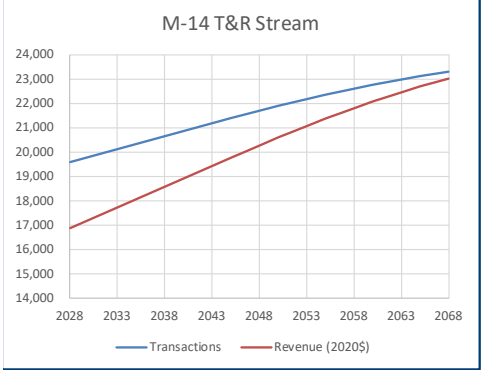


Table 4-20: M-14 Traffic and Revenue Stream

Year	Transactions (thousands)	Revenue (thousands 2020$)
2028	19,595	$ 16,881
2029	19,701	17,051
2030	19,807	17,222
2031	19,913	17,393
2032	20,019	17,563
2033	20,125	17,734
2034	20,231	17,905
2035	20,337	18,076
2036	20,442	18,246
2037	20,548	18,417
2038	20,654	18,588
2039	20,760	18,758
2040	20,866	18,929
2041	20,972	19,100
2042	21,078	19,270
2043	21,184	19,441
2044	21,290	19,612
2045	21,396	19,783
2046	21,495	19,948
2047	21,595	20,115
2048	21,695	20,283
2049	21,796	20,453
2050	21,897	20,624
2051	21,988	20,777
2052	22,078	20,931
2053	22,169	21,087
2054	22,261	21,243
2055	22,353	21,401
2056	22,434	21,540
2057	22,515	21,680
2058	22,596	21,821
2059	22,677	21,963
2060	22,759	22,105
2061	22,830	22,229
2062	22,900	22,352
2063	22,971	22,477
2064	23,042	22,602
2065	23,114	22,728
2066	23,173	22,834
2067	23,233	22,940
2068	23,293	23,046



4.5. Disclaimer

CDM Smith used currently accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of the information provided (both written and oral) by MDOT. CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

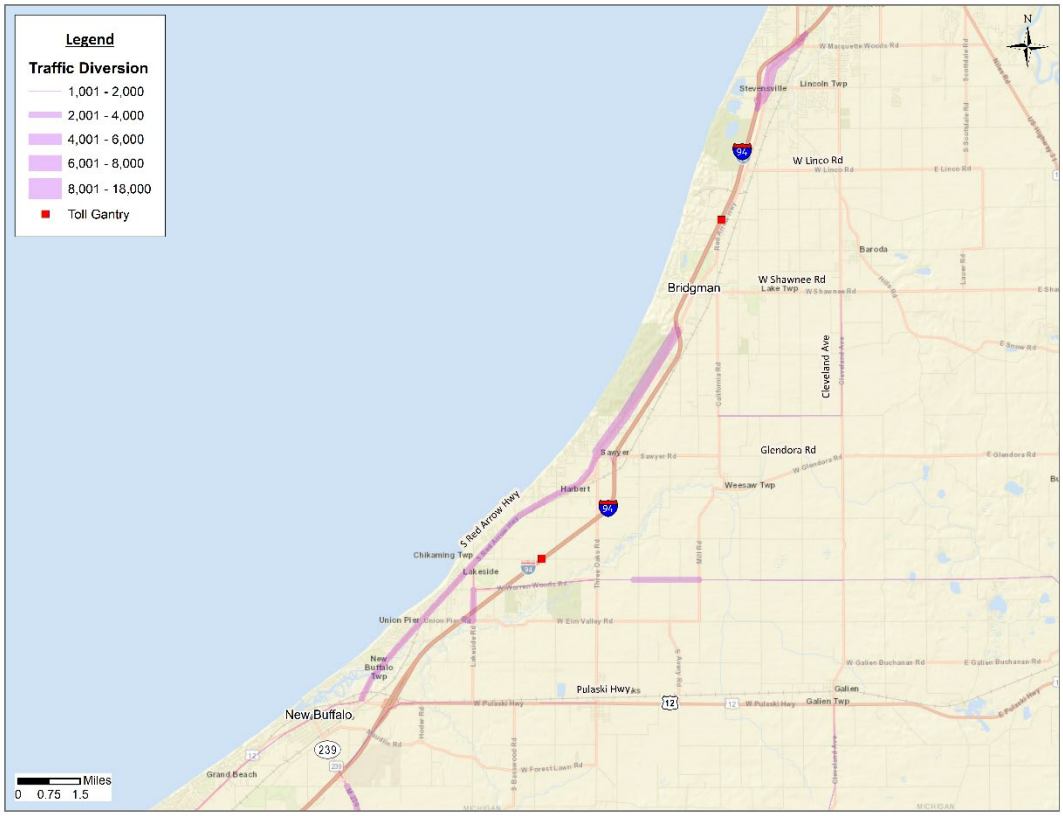
All estimates and projections reported herein are based on CDM Smith's experience and judgment and a review of information obtained from multiple agencies, including MDOT. These estimates and projections may not be indicative of actual or future values and are therefore, subject to substantial uncertainty. Certain variables, such as future developments, economic cycles, global pandemics, and impacts related to advances in automotive technology, etc., cannot be predicted with certainty and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential im-provements to the regional transportation network.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to MDOT and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to MDOT with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to MDOT. MDOT should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.

Traffic and Revenue Appendix A**. Estimated Toll Diversions Maps Year 2030**

Figure A-1: Estimated Diversion Impacts I-94 Segment 1



Segment:

- Indiana Border to I-196, Benton Harbor

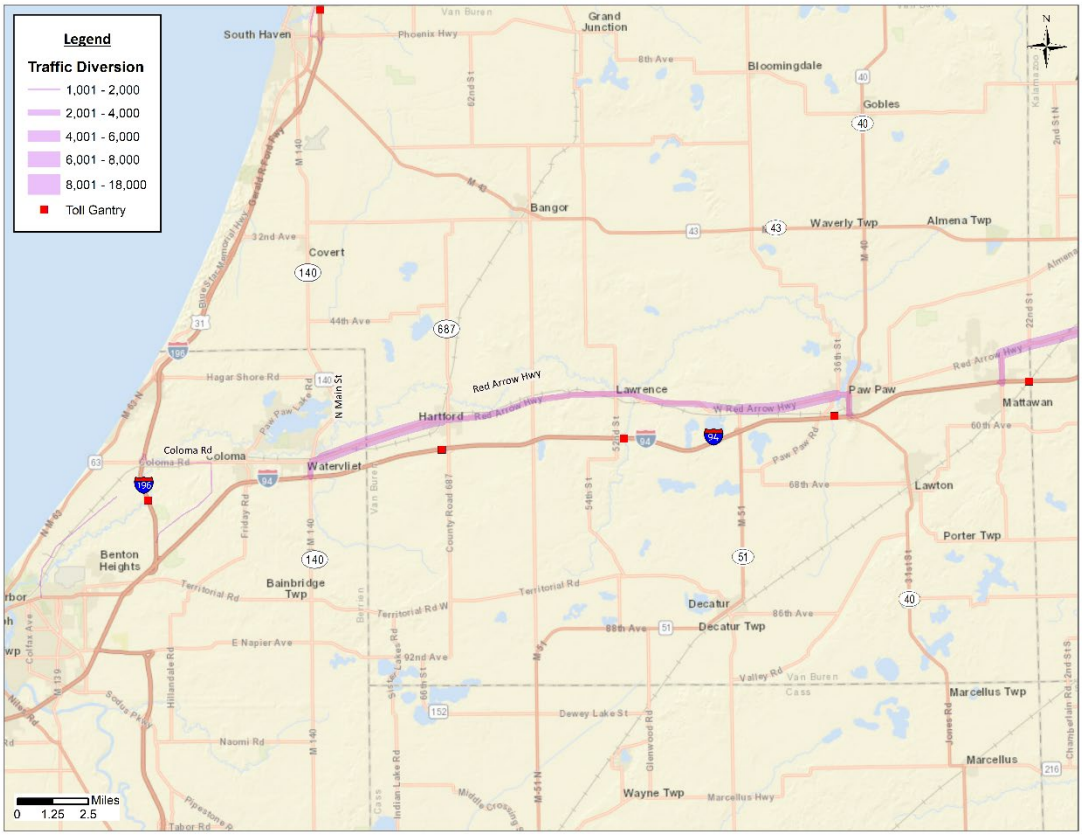
Diversion:

- -7%

Impacted Routes:

- Red Arrow Hwy.
- Brownstown Rd

Figure A-2: Estimated Diversion Impacts 2030 Segment 2



Segment:

- I-196 (Benton Harbor) to US-131 (Portage)

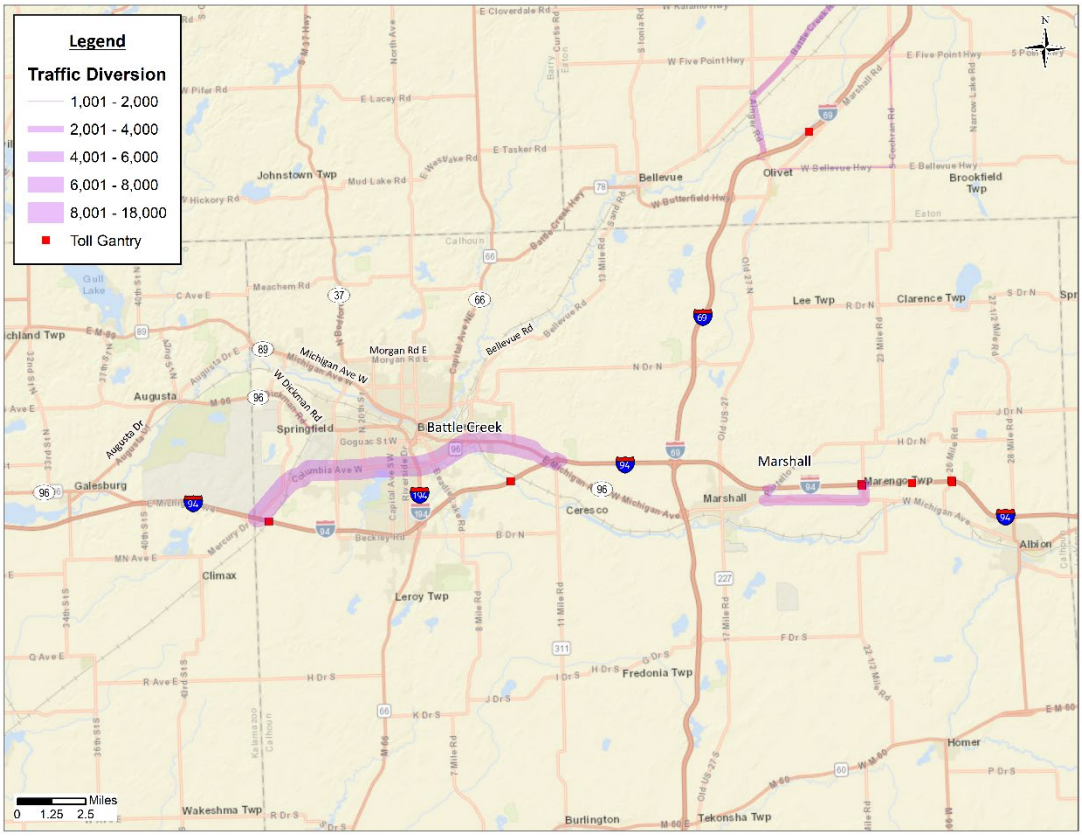
Diversion:

- -14%

Impacted Routes:

- Red Arrow Hwy.

Figure A-3: Estimated Diversion Impacts 2030 I-94 Segments 3 and 4



Segment:

- US-131 (Portage) to I-69 (Marshall); and I-69 (Marshall) to US-127 (Jackson)

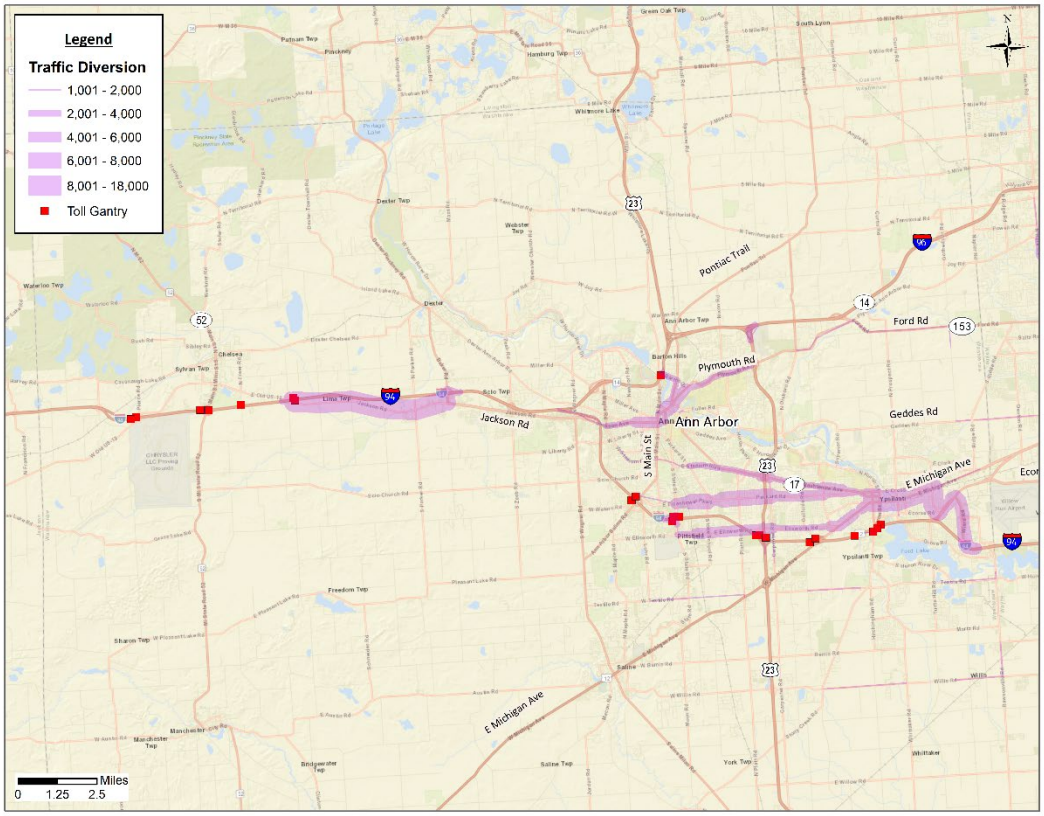
Diversion:

- -11%

Impacted Routes:

- Columbia Ave. (I-94 Business)
- Michigan Ave.

Figure A-4: Estimated Diversion Impacts I-94 Segments 5 and 6; and M-14



Segments:

- I-94:US-127 (Jackson) to M-14 (Ann Arbor)
- I-94: M-14 (Ann Arbor) to US-24 (Taylor)
- M-14: I-94 (Ann Arbor) to US-23 (Ann Arbor)

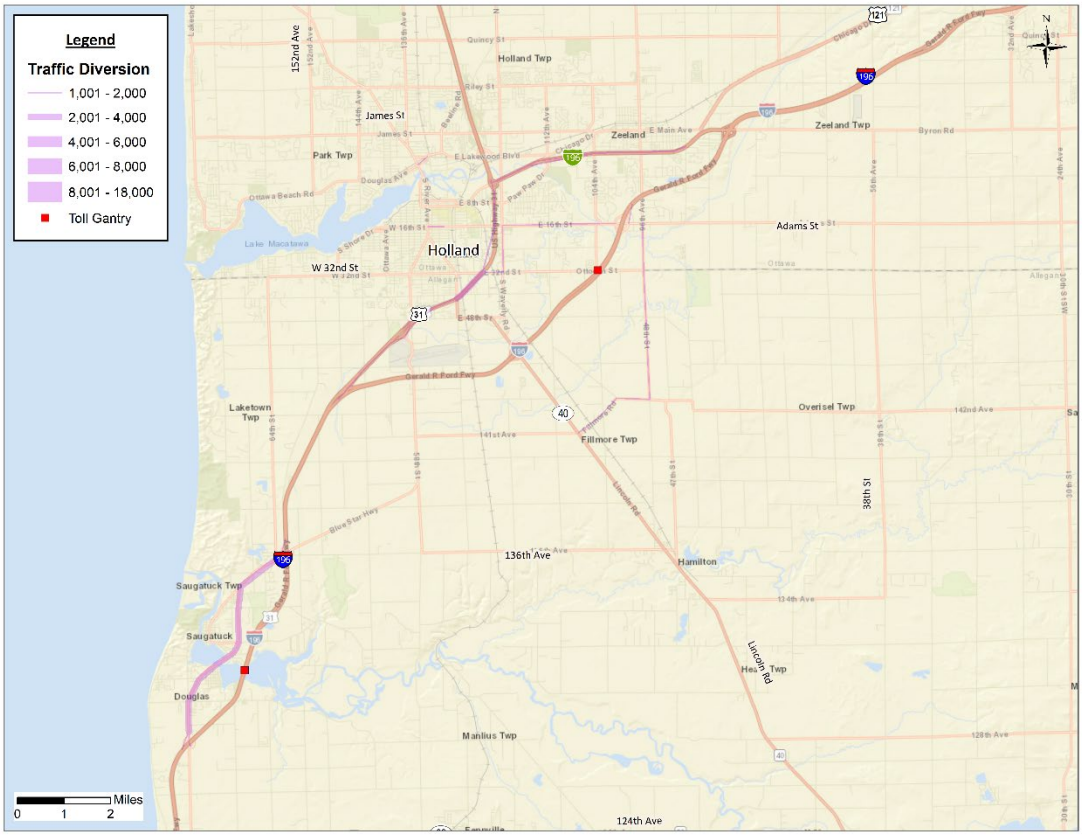
Diversion:

- I-94: -7%
- M-14: -18%

Impacted Routes:

- Cavanaugh Lake Rd.
- Jackson Rd.
- Huron St.
- Stadium Blvd.
- Eisenhower Pkwy.
- Michigan Ave.
- Ward Rd.

Figure A-5: Estimated Diversion Impacts 2030 I-196



Segment:

- I-94 (Benton Harbor) to M-6 (near Hudsonville)

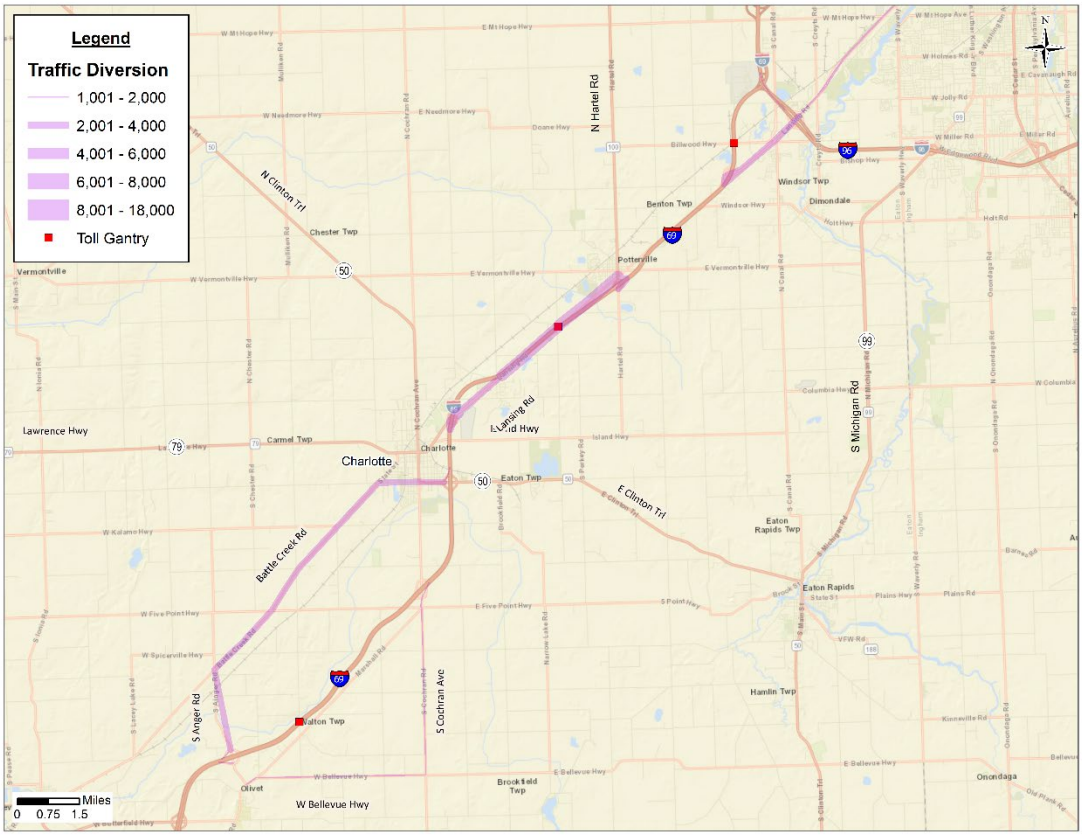
Diversion:

- -7%

Impacted Routes:

- A-2 / Blue Star Hwy.
- US 31 / I-196 Business
- 48th St.

Figure A-6: Estimated Diversion Impacts 2030 I-69



Segment:

- I-94 (Marshall) to I-75 (Flint)

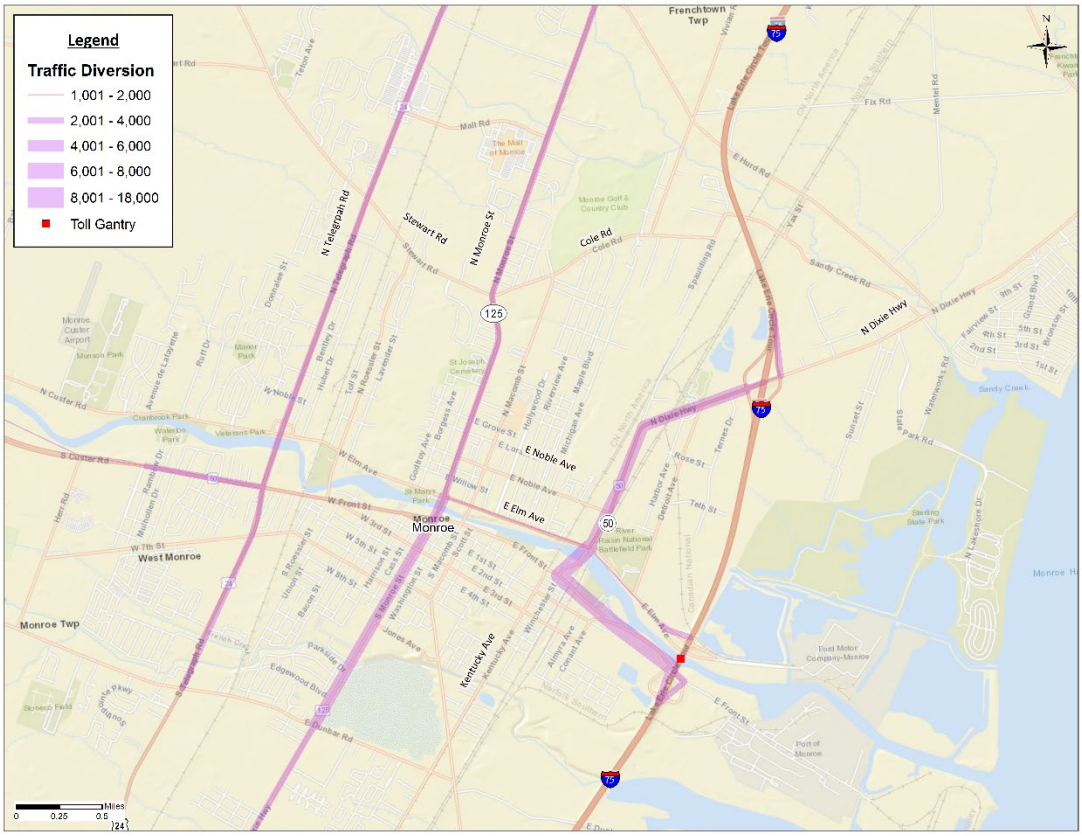
Diversion:

- -12%

Impacted Routes:

- Ainger Rd
- Battle Creek Rd.
- Shepherd St.
- Lansing Rd.

Figure A-7: Estimated Diversion Impacts 2030 I-275/I-75 South



Segment:

- I-75 over River Raisin

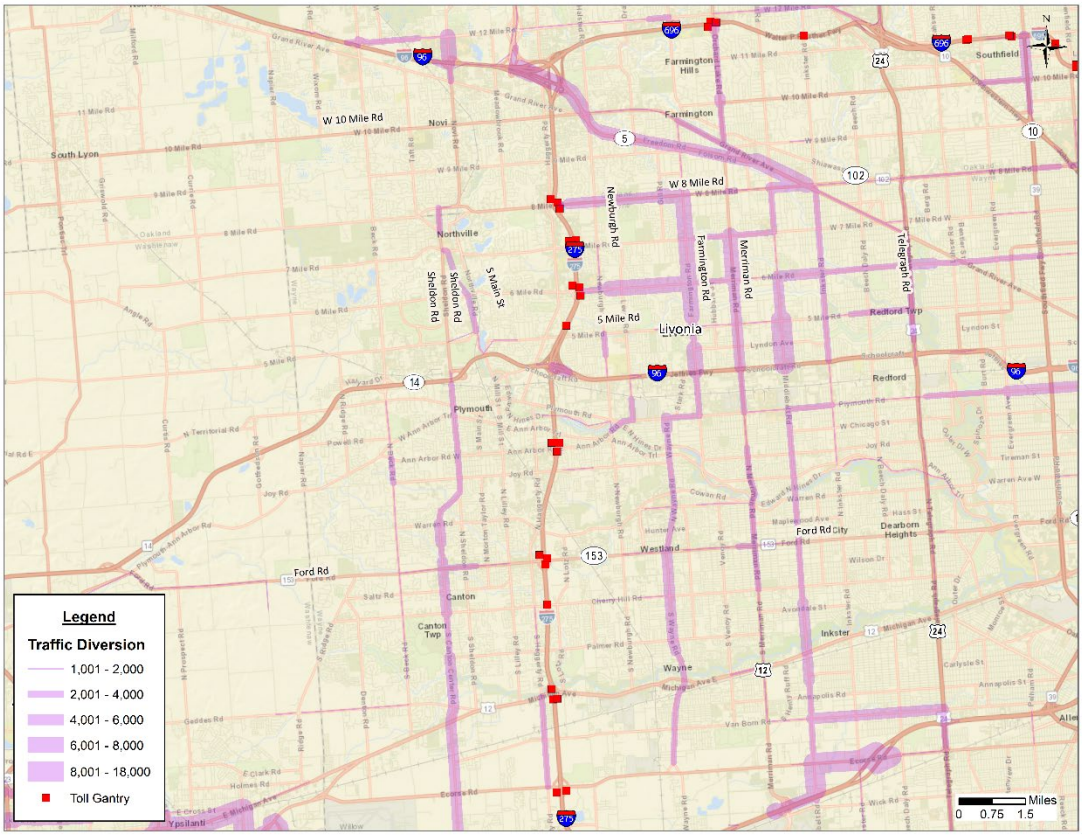
Diversion:

- -10%

Impacted Routes:

- Front St. / Dixie Hwy.
- Monroe St.
- US 24 (Telegraph Rd.)

Figure A-8: Estimated Diversion Impacts 2030 I-275N



Segment:

- Eureka Road (Romulus) to I-96/I-696 (Novi)

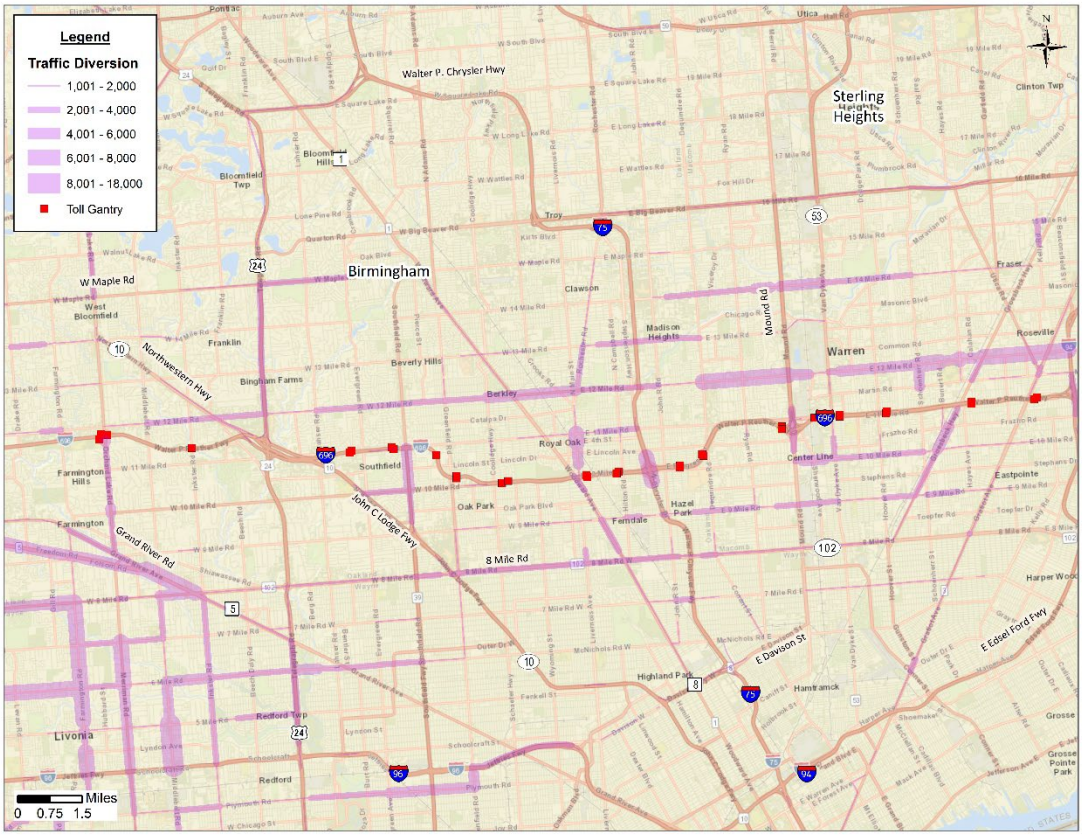
Diversion:

- -11%

Impacted Routes:

- Sheldon Rd. / Canton Center Rd
- Farmington Rd. / Wayne Rd.
- Merriman Rd
- Middlebelt Rd.

Figure A-9: Estimated Diversion Impacts 2030 I-696



Segment:

- I-696/I-275 (Novi) to I-94 (St. Charles Shores)

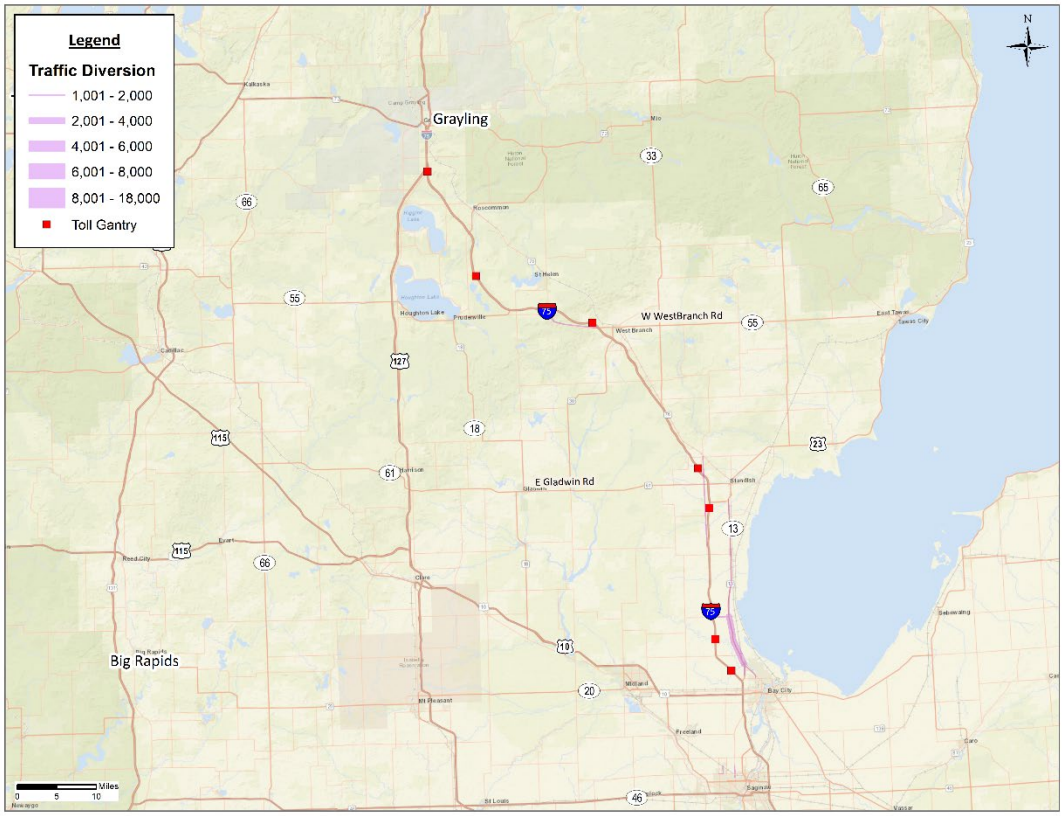
Diversion:

- -13%

Impacted Routes:

- 12 Mile Rd.
- 8 Mile Rd.
- 14 Mile Rd
- 9 Mile Rd.

Figure A-10: Estimated Diversion Impacts 2030 I-75 North



Segment:

- I-675 (Saginaw) to US-127 (Higgins Lake)

Diversion:

- -9%

Impacted Routes:

- M-13
- Branch Rd. (Old M-55)