APPENDIX B
TRAFFIC FORECASTING MEMORANDUM

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WIS 23 Limited Scope – Supplemental Draft Environmental Impact Statement
Forecast Documentation Memorandum

April 6, 2018

Introduction

This memorandum describes in detail the mainline traffic forecast information for the WIS 23 project in northeast Wisconsin (from US 151 to County Highway P, in Fond du Lac and Sheboygan Counties) and is intended to define and/or document the inputs, tools and products employed to obtain forecast results satisfying requirements of the National Environmental Protection Act (NEPA). Forecast reports, and supporting technical detail, are found in attached worksheets within **Attachment A**.

The years for the WIS 23 forecast analysis are 2020, 2030 and 2040. The selection of these years reflect standard WisDOT practice to forecast for the estimated year of construction (EYC), anticipated open-to-traffic (OTY) year, as well as OTY + 10 years and OTY + 20 years. For the WIS 23 project, the EYC and OTY are the same (year 2020).

Forecast Tools

The transportation tools used to develop the traffic forecasts for the WIS 23 Limited Scope – Supplemental Draft Environmental Impact Statement (LS-SDEIS) include:

- **Traffic Counts**[1]: Traffic counts are fundamental inputs to any traffic forecasting exercise, and are used in this NEPA analysis. Counts employed in this effort include short-term (48-hour) counts taken during June and July 2017 along the STH 23 mainline as well as turning movement counts (taken during July and August 2017 from 6:00 a.m. – 9:00 a.m. and from 3:00 p.m. – 6:00 p.m.) and short-term vehicle classification counts. As 2017 daily, seasonal and axle factors were not available during WIS 23 forecast development, the 2017 short-term counts were factored using adopted 2016 values.

- **The Northeast Travel Demand Model (NERTDM)**[2]**:** The NERTDM is a traditional, four-step travel demand model built upon pre-2010 base year Metropolitan Planning Organization (MPO) travel demand models in the Northeast Region (**Green Bay, Fox Cities, Oshkosh, Fond du Lac and Sheboygan**). In 2010, a new model was developed that merged the existing MPO models and added large rural areas that were not previously included in MPO models. The traffic forecasting and long-range planning model spans portions of 14 counties and five MPOs. The NERTDM base year is 2010 (and was validated using 2009-2011 short-term traffic count data) and its horizon year is 2045[3].

[1] Traffic counts collected for the WIS 23 forecasting effort were done in accordance with WisDOT procedures. These procedures have been documented in a memo to the project file.

[2] See Chapter 9, Section 20.1 of the WisDOT Transportation Planning Manual (May, 2018) for more information on the NERTDM.

[3] Since the design year for the project is 2040, and the NERTDM horizon year is 2045, interpolation was necessary to determine NERTDM 2040 forecast results for the WIS 23 forecast effort. The interpolation process is described later in this memorandum.

WisDOT and the MPOs represented in the NERTDM share a model user agreement through a memorandum of understanding (MOU) that documents the cooperative approach shared between those MPOs and WisDOT regarding NERTDM development and maintenance[4].

NERTDM output from version 8 (catalog date December 8, 2016) run from September 2017 through April 2018 was used in this forecast effort[5].

NERTDM Socioeconomic Data

Household and employment data are the two most fundamental inputs to the NERTDM. Without this information, neither current nor future traffic can be estimated. Together, household and employment data are often referred to as *socioeconomic data*.

Simply stated, households and employment generate a large part of a given area's observed vehicle traffic.

Vehicle trips are composed of:

- trip *productions* - the beginning of home-based trips or nonhome-based trips, and
- trip *attractions* - the end of home-based trips or nonhome-based trips.

These are calculated for each traffic analysis zone (TAZ) - the basic geographic unit within a travel demand model. A TDM's socioeconomic data is combined by TAZ.

The socioeconomic data used as direct inputs to the NERTDM were derived as follows:

- *Households:* During NERTDM development, base-year (2010) household estimates were derived from 2010 U.S. Census block-level estimates that were grouped to the TAZ level. Future-year (2045) values were derived from county, municipal and minor civil division (MCD) household estimates published (in 2014) by the Wisconsin Department of Administration (DOA) – Demographic Services Center[6] and separated to the TAZ level in collaboration with MPO staff, using local planning documents including comprehensive plans, phasing plans and neighborhood plans in addition to other locally-driven, recently-updated documents.

  The DOA household projections obtained for this effort were available in five-year increments, with the last increment covering the years 2035 – 2040. Given the horizon year of the NERTDM is 2045, after separation to the TAZ level, the data were then extrapolated to the year 2045 (the future year of the NERTDM) using the same growth rate observed from 2035 – 2040[7].

[4] A copy of the NERTDM MOU has been placed in the WIS 23 LS-SDEIS project file, and is available upon request.

[5] Changes to NERTDM version 8 inputs, including socioeconomic inputs, were made for the NEPA analysis presented in this memorandum. NERTDM version 8a incorporates these changes. The changes, and the resulting differences in key measures of error between NERTDM versions 8 and 8a can be found in **Attachment C: Technical Documentation – NERTDM Version 8 and 8a.**

[6] Details on the projection methodologies employed by the Demographic Services Center can be found at: https://doa.wi.gov/Pages/LocalGovtsGrants/Population_Projections.aspx

[7] After discussion with DOA, ECWRPC and BLRPC staff, it was decided that carrying forward the rate projected from 2035 – 2040 (to 2045) would best capture the growth anticipated within the future land use plans of communities within the study corridor.

Results of these efforts were reviewed and approved by staff of the East Central Wisconsin Regional Planning Commission (ECWRPC – the MPO for Fond du Lac County) and Bay-Lake Regional Planning Commission (BLRPC – the MPO for Sheboygan County).

- *Employment:* During NERTDM development, base year (2010) address-level employment data from the Wisconsin Department of Workforce Development and ESRI Business Analyst were used to combine TAZ-level employment estimates. Future year (2045) values were determined primarily from Woods & Poole Economics, Inc. (WP). WP data listed future business growth by sector using the North American Industry Classification System (NAICS). Future NAICS growth rates were referenced and assigned to TAZs to match retail, service and other employment control totals as given by WP.

  Initial future control totals were calculated at the county and Metropolitan Statistical Area (MSA) level, and used to identify sector growth. These future control totals were then separated to the TAZ level with future land use data (from adopted comprehensive plans) using GIS analysis, and by collaboration with MPO staff.

  WP projections were available through 2040 in five-year increments. Given that the horizon year of the NERTDM is 2045, after separation to the TAZ level, the data were then extrapolated to the year 2045 (the future year of the NERTDM) using the same growth rate observed from 2035 - 2040[8].

  Results of these efforts were reviewed and approved by the respective staff of ECWRPC and BLRPC.

Application of Forecasting Methodology

This section describes the tools and procedures employed by the WisDOT – Traffic Forecasting Section (TFS) to develop traffic forecast volumes.

Wisconsin DOT (WisDOT) Planning Scenario Typology and Forecast Interpolation Methodology

WisDOT used version 8a of the NERTDM to develop forecasts for the WIS 23 project. As previously noted, the original NERTDM version (having a base year of 2010 and a future year of 2045) was developed in coordination with the ECWRPC, BLRPC and other MPOs within the northeastern Wisconsin region.

[8] After discussion with DOA, ECWRPC and BLRPC staff, it was decided that carrying forward the rate projected from 2035 – 2040 (to 2045) would best capture the growth anticipated within the future land use plans of communities within the study corridor.

The scenarios developed within the NERTDM to produce forecasts are categorized as follows:

Categorization of scenarios developed in NERTDM for WIS 23 project forecasts		**Scenario Type**		
		Existing (E)	Future Existing + Committed (E+C)	Future Existing + Committed + Planned (E+C+P)
Year	2010	Base		
	2045		No-Build, Build	Build + MPO LRTP Projects

The Existing (E) scenario reflects socioeconomic and highway network conditions as they were in 2010 (base conditions).

The Existing + Committed (E+C) scenario considers projected socioeconomic conditions per the MPO/RPC long-range plan(s), as well as highway network characteristics as they would exist if:

- Projects since 2010 have been completed, and
- Projects programmed by WisDOT for construction in its six-year work program ("committed" projects) have been completed.

The WIS 23 project is a committed project. The no-build and three build alternatives have been modeled in the future E+C scenario for this analysis.

Other than the WIS 23 project, an overpass installation at USH 151 @ CTH V (Rienzi Rd.) is the only ECWRPC committed project not yet built that is represented in the NERTDM future E+C network. All BLRPC committed projects except for the WIS 23 project are either built at this time, or not suitable for representation in the future NERTDM E+C network.

The Existing + Committed + Planned (E+C+P) scenario considers the same conditions as the No-Build scenario, plus any future projects in MPO/RPC long-range plans falling outside WisDOT's six-year programming window.

While there are no projects in the ECWRPC LRTP suitable for representation in the future NERTDM E+C+P network, there are seven in the BLRPC LRTP:

- South Taylor Drive (CTH EE/Weeden Creek Road – CTH V): New 4-lane facility (local project).
- South 18th Street (CTH EE/Weeden Creek Road – CTH V): New 2-lane facility (local project).
- CTH TT (CTH PP – STH 28): New 2-lane facility.
- STH 42 (CTH Y – CTH A): Reconstruction from 2 to 4 lanes.
- I-43 @ CTH FF: New full interchange (service interchange).
- I-43 @ CTH PP/Lower Falls Rd./Indiana Ave: New half interchange (service interchange).
- STH 23 (STH 67 – STH 32): Various projects (from corridor preservation and freeway designation study).

Although forecasts were developed for 2020, 2030, and 2040, WisDOT did not explicitly develop socioeconomic datasets or highway networks for the NERTDM that reflect expected socioeconomic or roadway characteristics specifically for these years[9]. The interpolation process employed to obtain forecast year values is described here.

WIS 23 forecasts were developed by the following process on a site-by-site basis at WisDOT traffic count locations along the project corridor:

1) Obtain the most recent traffic count data at that location.
2) Obtain the Base, No-Build, and Build NERTDM assignments at that location.
3) Interpolate between the Base assignment (2010 volume) and the No-Build assignment (2045 volume) to estimate an assignment that corresponds to the traffic count data in step 1.
    a. This interpolated assignment is referred to as the Count Year Assignment.
4) Compare the traffic count data in step 1 to the Count Year Assignment and calculate an adjustment to match the Count Year Assignment to the traffic count data using the methods outlined later in this forecast memorandum.
5) Apply the adjustment calculated in step 4 to the No-Build and Build assignments (2045 volume).
6) Interpolate between the traffic count from step 1 and the adjusted assignment calculated in step 5 to obtain interim (2020 and 2030) and design year (2040) forecasts.

No-Build Forecast Development

The WisDOT TFS no-build forecast procedure is illustrated here in describing portions of its main forecasting tool, an MS-Excel workbook referred to as the **TAFIS-TDM Project Level Forecast Workbook[10]**. Procedures to adjust raw model assignments based on traffic count values are also detailed[11].

Forecast Data Calculation Worksheet Walk-Through (No-Build Alternative Shown)

The next three pages feature a walk-through of the Forecast Data Calculation Worksheet. The No-Build Alternative is shown. The worksheet is broken into three parts with the Forecast Data Calculation Worksheet Field definitions shown with the appropriate columns. (The entire worksheet can be found in **Attachment A**.)

[9] For the WIS 23 forecasts described here, socioeconomic data for 2010 and 2045 were utilized. Similarly, a 2010 base highway network, as well as 2045 networks for each of the three build scenarios were built. 2020, 2030 and 2040 forecast values were obtained through the interpolation process described above.

[10] The TAFIS – TDM Project Level Forecast Workbook developed for the WIS 23 NEPA analysis can be found in **Attachment A**. The TDM referred to in the title of the workbook, the TAFIS – **TDM Project Level Forecast Workbook** – used for the WIS 23 forecast – is the NERTDM. The workbook title is kept generic (TDM) because the workbook is also used in conjunction with the other travel demand models WisDOT manages to produce forecasts outside northeast Wisconsin. **The Traffic Analysis Forecasting Information System**, or TAFIS, is a regression-based analysis tool used in WisDOT's internal project screening methodology. As such, it appears in the title of the referenced forecasting tool, even though TAFIS was not used in this NEPA forecasting analysis.

[11] These procedures are also described in the WisDOT Transportation Planning Manual (May, 2018) – Chapter 9, Section 10.4.c.

No-Build

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Forecast Year 1	TRADAS ID	Road Name	COUNT	Count Year	# Lanes	Seasonal Factor	Functional Class	Last Class Count
2020	201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	2017	4	2	14	
Forecast Year 2	200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	2017	4	2	14	
2030	201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	2017	2	4	2	6/27/2017
Forecast Year 3	206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	2017	2	4	2	6/27/2017
	200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	2017	2	4	2	6/27/2017
Forecast Year 4	200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	2017	2	4	2	6/27/2017
	201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	2017	2	4	2	6/27/2017
Forecast Year 5	590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	2017	2	4	2	6/27/2017
	591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	2017	2	4	2	6/24/2014
Forecast Year 6	591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	2017	2	4	2	
	590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	2017	2	4	2	
Forecast Year 7								
	201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	2011	2	2	17	
Final Forecast Year	201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	2011	2	2	17	
2040								
	200126	CTH W NORTH OF STH 23	1,247	2011	2	4	7	10/27/2003
	201411	CTH W SOUTH OF STH 23	726	2011	2		7	
Model Base Year								
2010	200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	2011	2	4	7	
Model Future Year	200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	2011	2	4	7	
2045								
	591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	2011	2	4	8	
	591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	2011	2	4	8	
Get Data								
	590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	2011	2	4	7	
	591408	CTH A SOUTH OF STH 23	688	2011	2	4	7	
Finalize Forecast								
	590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	2011	2	4	7	

TRADAS = WisDOT's database for roadway vehicle data. When TRADAS is referenced in the Worksheet field definitions, that information has been pulled from the TRADAS database.

TRADAS ID = Six-digit identifier for count site.

Road Name = count site location description.

COUNT = Annual Average Daily Traffic (AADT) at count site.

Count Year = Year in which COUNT was taken.

 # Lanes = Number of lanes of roadway facility where count site is located.

Seasonal Factor = Grouping for seasonal factor applied to count for AADT calculation:

- 1 = Urban Interstate
- 2 = Urban – Other
- 3 = Rural – Interstate
- 4 = Rural – Other
- 5 = Tourist/Recreational – Interstate
- 6 = Tourist /Recreational - Other

Functional Class = Functional classification of roadway upon which COUNT was taken:

- 1 = Rural Interstate
- 2 = Rural Principal Arterial
- 6 = Rural Minor Arterial
- 7 = Rural Major Collector
- 8 = Rural Local
- 11 = Urban Interstate
- 12 = Urban Freeway / Expressway
- 14 = Urban Principal Arterial
- 16 = Urban Minor Arterial
- 17 = Urban Collector
- 19 = Urban Local

Last Class Count = Date of last classification count taken at count site (blank if none).

Base Year Assignment	Future Year Assignment	Count Year Assignment	Model Growth Rate	% Method	ABS Method
9338	15051	10,481	1.39%	19,082	17,858
8425	11054	8,951	0.75%	14,171	13,578
8661	10178	8,964	0.53%	8,391	8,604
8339	9281	8,527	0.34%	7,966	8,073
8615	9269	8,746	0.23%	7,854	7,934
7656	7919	7,709	0.10%	7,125	7,146
7656	7919	7,709	0.10%	6,939	6,965
8263	8446	8,300	0.07%	6,806	6,835
8006	8141	8,033	0.05%	7,879	7,882
8179	8505	8,244	0.11%	8,711	8,705
8283	8602	8,347	0.10%	9,724	9,691
440	939	454	2.68%	1,101	1,017
402	997	419	2.42%	1,674	1,282
981	1084	984	0.27%	1,374	1,347
512	513	512	0.00%	727	727
1327	1482	1,331	0.35%	1,375	1,386
824	1011	829	0.56%	1,371	1,307
365	396	366	0.37%	195	211
6	7	6	0.24%	343	296
1573	1832	1,580	0.72%	876	1,007
1368	1745	1,379	1.17%	871	1,054
2267	2642	2,278	0.53%	2,129	2,199

Base Year Assignment = Model assignment from specified base year of NERTDM.
Future Year Assignment = Model assignment from specified future year of NERTDM.

Count Year Assignment = Linear interpolation of the base year assignment and future year assignment to the count year for that count site.

Model Growth Rate = Linear growth rate (as % of count) from the count year (and traffic count volume) to the adjusted model future year assignment.
(*See next three entries below for explanation of adjusted model future year assignment*).

% Method (Ratio assignment adjustment – from *NCHRP 255*) = Adjustment to account for the relative difference between the interpolated count year assignment and the count year volume:
*Forecast = (Count / Count Year Assignment) * Future Assignment*

ABS Method (Absolute difference assignment adjustment – from *NCHRP 255*) = Adjustment to account for the absolute difference between the interpolated count year assignment and the count year volume:
Forecast = (Count - Count Year Assignment) + Future Assignment

Suggested Method	Model 2045 Volume	Model 2040 Volume	Unadjusted 2040 TDM Assignment
AVERAGE	18,470	17,544	14235
AVERAGE	13,875	13,446	10678
AVERAGE	8,498	8,300	9961
AVERAGE	8,019	7,894	9146
AVERAGE	7,894	7,807	9176
AVERAGE	7,136	7,100	7881
AVERAGE	6,952	6,916	7881
AVERAGE	6,820	6,797	8420
AVERAGE	7,880	7,861	8122
AVERAGE	8,708	8,661	8458
AVERAGE	9,708	9,659	8556
ABSOLUTE	1,017	946	868
ABSOLUTE	1,282	1,197	912
		-	
AVERAGE	1,361	1,344	1069
AVERAGE	727	727	513
		-	
AVERAGE	1,381	1,359	1460
AVERAGE	1,339	1,308	984
		-	
AVERAGE	203	200	392
AVERAGE	319	316	7
		-	
AVERAGE	942	914	1795
AVERAGE	963	922	1691
		-	
AVERAGE	2,164	2,116	2588

Suggested Method: Suggested assignment adjustment.

Model [Future Model Year] Volume = Adjusted future-year assignment (specified horizon year of NERTDM)

Model [Future Forecast Year] Volume = Interpolated adjusted future-year assignment (or TAFIS residual if in a non-NERTDM area - Specified horizon year of forecast).

Unadjusted [Future Forecast Year] TDM Assignment = Interpolated value of the base year and future year NERTDM assignments to the future forecast year (Used in build scenario forecasts). The field title uses TDM as a shortened label for the NERTDM for the WIS 23 forecast.

NERTDM Assignment Adjustments and Selection of Adjustment Methodology

The rationale behind adjusting NERTDM assignments (or any travel demand model assignment) is that there is usually a difference (or "discrepancy") between a NERTDM base-year assignment and an observed traffic volume or traffic count. This discrepancy propagates from the base-year assignment to the forecast-year assignment, including the count-year assignment. To mitigate the effects this discrepancy has on forecast values, adjustment procedures have been developed.

The NERTDM assignment adjustment procedures used in the WisDOT TAFIS - TDM Project Level Forecast Workbook (and for the WIS 23 forecast analysis) is described on page 50 of NCHRP Report 255[12]:

- **Difference Method:** ***Forecast*** *= (Count – Count Year Assignment) + Future Assignment*
- **Ratio Method:** ***Forecast*** *= (Count / Count Year Assignment) * Future Assignment*
- **Average**: ***Forecast*** *= (Ratio + Difference) / 2*

The report details two specific issues that arise with these methods:

- The difference method can produce negative values when the base year assignment is greater than the count and the future year assignment is less than the base year assignment; and
- The ratio method can produce unreasonably large values when the count is greater than the base year assignment and the future year assignment is greater than the base year assignment

In the end, the report recommends averaging the approaches in most cases. Consequently, averaging the approaches was used for count sites along WIS 23 evaluated in this study.

[12] National Cooperative Highway Research Program (NCHRP) Report #255: *Highway Traffic Data for Urbanized Area Project Planning and Design.*

Results Summary (No-Build Scenario Shown)

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	13,843	15,693						17,544	1.39%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	11,732	12,589						13,446	0.75%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,509	7,905						8,300	0.53%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,394	7,644						7,894	0.34%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,462	7,635						7,807	0.23%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	6,957	7,028						7,100	0.10%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	6,775	6,846						6,916	0.10%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,702	6,750						6,797	0.07%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,786	7,823						7,861	0.05%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,472	8,566						8,661	0.11%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,465	9,562						9,659	0.10%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	661	803						946	2.68%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	857	1,027						1,197	2.42%	
										-		
200126	CTH W NORTH OF STH 23	1,247	1,277	1,311						1,344	0.27%	
201411	CTH W SOUTH OF STH 23	726	726	727						727	0.00%	
										-		
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,274	1,317						1,359	0.35%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,182	1,245						1,308	0.56%	
										-		
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	187	193						200	0.37%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
										-		
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	805	860						914	0.72%	
591408	CTH A SOUTH OF STH 23	688	761	841						922	1.17%	
										-		
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,922	2,019						2,116	0.53%	

As values are entered into (or calculated within) the forecast data calculation worksheet, the **Results** tab of the TAFIS-TDM Project Level Forecast Workbook (shown above) is populated. The Results tab provides space for forecast notes necessary for complete forecast documentation and archiving.

*Complete forecast data calculation, manual regression and results worksheets, as well as the forecast report for the WIS 23 no-build scenario can be found in **Attachment A**.*

Build Forecast Development

This section describes the NERTDM network edits performed to represent the base condition, as well as the four future alternatives under study. It also describes the calculation procedures involved in the development of build forecasts for the four future alternatives.

Scenario Network Coding

To reiterate, the base year of the NERTDM is 2010 and the horizon year is 2045. The forecast years for the WIS 23 forecast analysis are 2020, 2030 and 2040.

2010 Base

In the summer of 2016, a right-in, right-out, left-in (RI/RO/LI) diversion treatment was installed at the intersection of WIS 23 with CTH K. Traffic counts for the WIS 23 forecast were taken in the summer of 2017, so the 2010 base network was re-coded reflecting this current configuration. (Base year validation of the NERTDM was conducted using the previous, full-access configuration of CTH K that existed when 2010 traffic counts were taken).

2040 No-Build

For the 2040 no-build alternative, the only improvement assumed along the study corridor is the RI/RO/LI diversion treatment at CTH K described above.

Build Alternatives[13]

Build alternative forecasts, based on the build scenario network configurations described below, use model output based on east- and westbound jug handle treatments assumed at CTH K for each build scenario.

A diagram of the jug handle access treatment at CTH K, proposed for all build alternatives, is shown on the following page.

2040 Passing Lanes

A total of four passing lanes is assumed:

- Eastbound – Tower Road to Seven Hills Road
- Westbound – Triple T Road to Log Tavern Road
- Eastbound – CTH G to CTH U
- Westbound – CTH T to Spring Valley Road

[13] The build alternatives considered in the WIS 23 forecast analysis originated from the 2014 WIS 23 Limited Scope – Supplemental Final Environmental Impact Statement and Record of Decision (LS – SFEIS/ROD). The ROD was vacated.

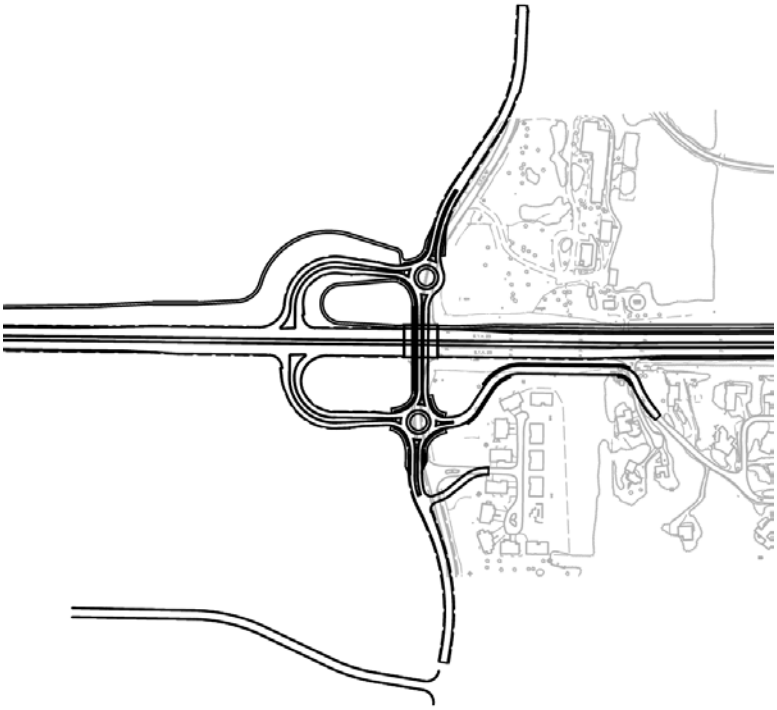
2040 Hybrid

- 4-lane widening: CTH UU to CTH G
- Diamond interchange at CTH UU
- Diamond interchange at CTH G
- Passing lanes: Eastbound – CTH G to CTH U, Westbound – CTH T to Spring Valley Road

2040 Four-Lane Build

- 4-lane widening: CTH UU to CTH P
- Diamond interchange at CTH UU
- Diamond interchange at CTH G

Jug-Handle Treatment at CTH K proposed for all Build Scenarios



Build Forecast Calculations

To develop WIS 23 build scenario forecasts, adjustments were made to the *final no-build forecast value* at each TRADAS site based on a comparison of the *unadjusted no-build and build forecast year NERTDM assignments* for that TRADAS site.

For build forecasts, the forecast is based on either the ratio or difference of the *forecast year unadjusted NERTDM no-build and build assignments* (or the average of the ratio and difference assignment values).

***Example**: Build Forecast Adjustment*

No-Build Forecast = 10,000 AADT
Unadjusted No-Build Forecast Year NERTDM Assignment = 7,500 AADT
Unadjusted Build Forecast Year NERTDM Assignment = 9,000 AADT

Difference Adjustment:
Build Forecast = No-Build Forecast+ (Build TDM-No-Build TDM)
= 10,000+(9,000-7,500)
= 10,000+1,500
= 11,500 AADT

Ratio Adjustment:
Build Forecast = No-Build Forecast* (Build TDM/No-Build TDM)
=10,000*(9,000/7,500)
=10,000*1.2
=12,000 AADT

Average:
Build Forecast = (Difference-Adjusted TDM Forecast + Ratio-Adjusted TDM Forecast) /2

By applying the incremental growth observed in any number of build alternatives to the same no-build forecast, this method ensures that no-build and build forecasts can be compared consistently relative to observed counts in the model base year.

The calculation worksheet used to develop build scenario forecast values is shown on the following page.

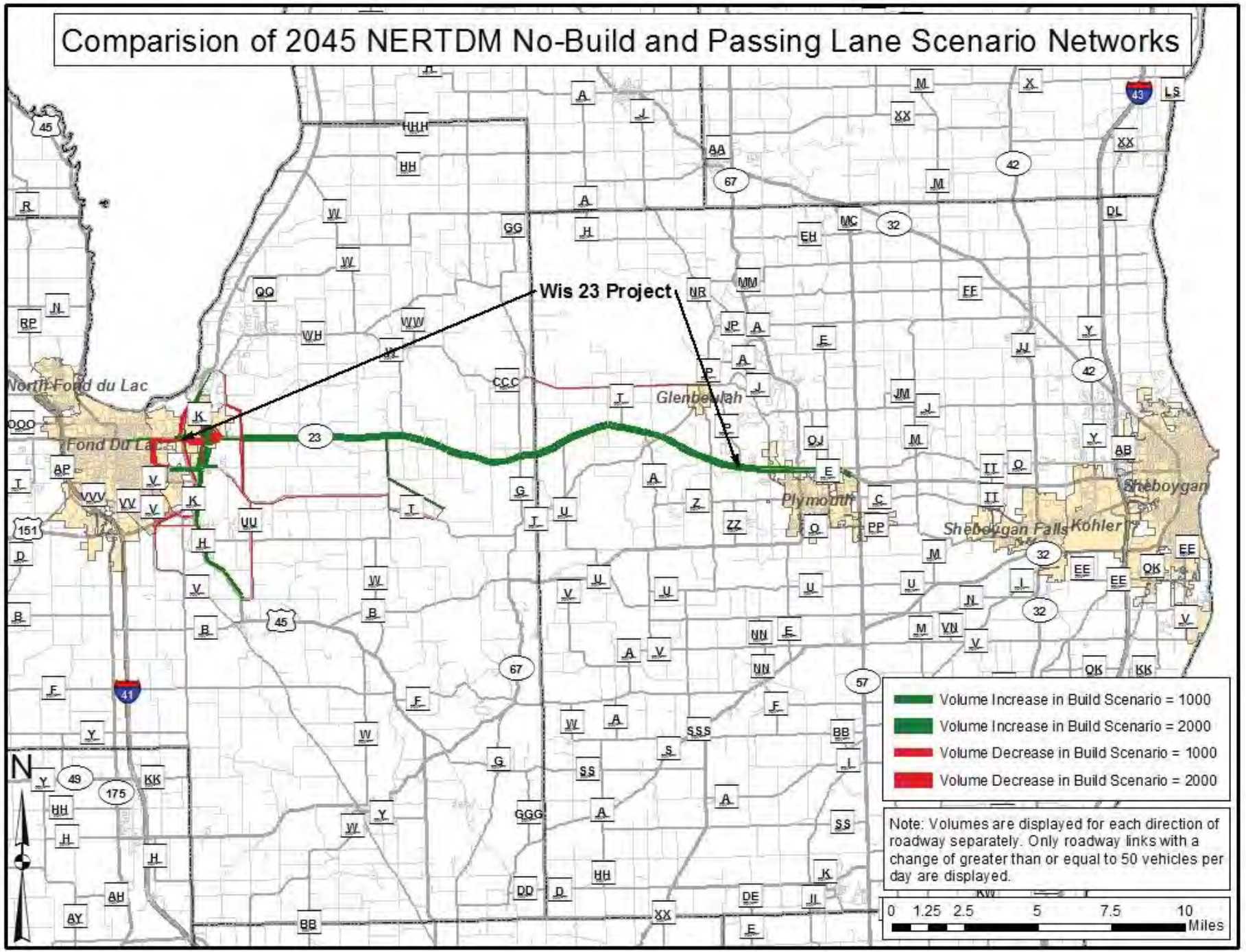
Build Scenario Calculator (Passing Lane Scenario Shown)

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	13671	-564	16,980	0.960	16,849	16,915
200219	13,446	10678	9840	-838	12,608	0.921	12,391	12,499
201147	8,300	9961	10200	239	8,539	1.024	8,499	8,519
206104	7,894	9146	9392	245	8,140	1.027	8,106	8,123
200222	7,807	9176	9377	201	8,009	1.022	7,979	7,994
200224	7,100	7881	8097	215	7,315	1.027	7,294	7,304
201153	6,916	7881	8097	215	7,132	1.027	7,105	7,118
590118	6,797	8420	8686	267	7,063	1.032	7,012	7,038
591421	7,861	8122	8357	236	8,097	1.029	8,090	8,093
591422	8,661	8458	8643	184	8,845	1.022	8,849	8,847
590195	9,659	8556	8736	180	9,839	1.021	9,862	9,851
201022	946	868	785	-83	863	0.904	855	859
201021	1,197	912	737	-175	1,022	0.808	967	994
200126	1,344	1069	1073	3	1,348	1.003	1,349	1,348
201411	727	513	512	-1	726	0.998	726	726
200399	1,359	1460	1514	54	1,413	1.037	1,410	1,412
200397	1,308	984	1019	34	1,342	1.035	1,353	1,348
591126	200	392	421	29	229	1.074	215	222
591406	316	7	7	0	316	1.000	316	316
590193	914	1795	1828	33	947	1.018	931	939
591408	922	1691	1673	-18	904	0.989	912	908
590196	2,116	2588	2553	-35	2,081	0.986	2,087	2,084

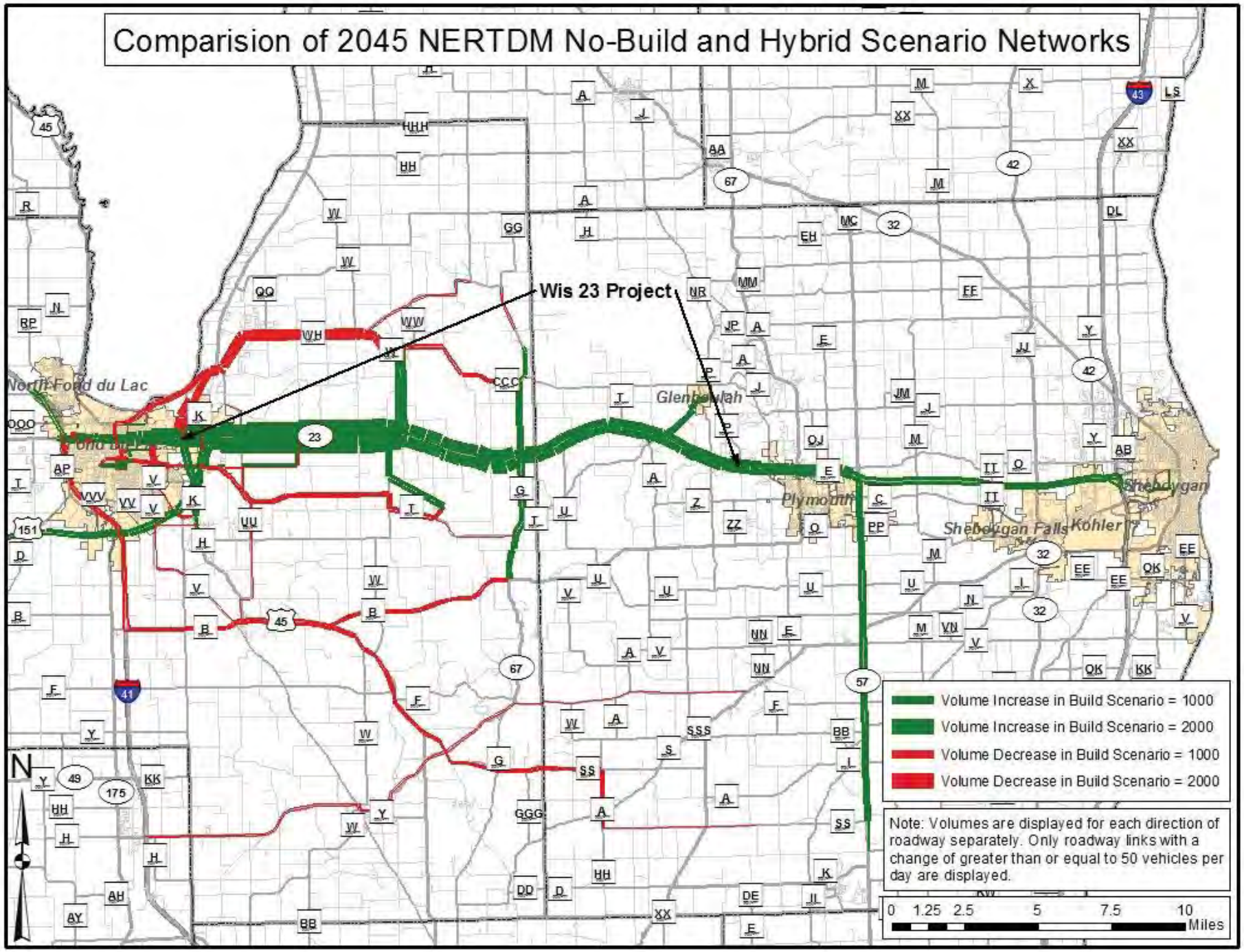
*Complete build calculation and results worksheets, as well as forecast reports for all WIS 23 build scenarios can be found in **Attachment A**.*

Corridor Diversion Analysis

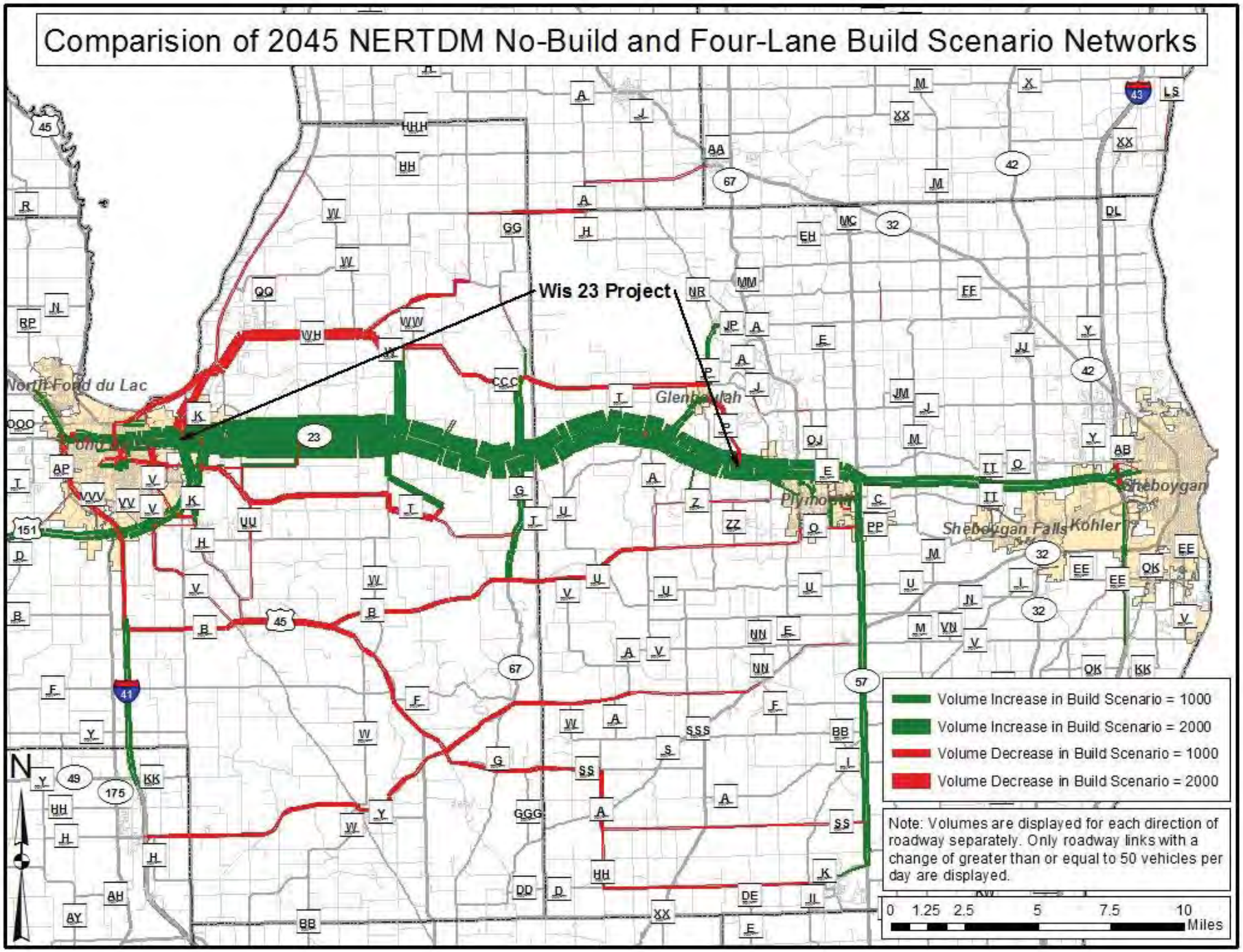
The following three figures depict comparisons of total model assigned volume between the no-build and each of the three build scenarios. Put another way, they illustrate the anticipated shift in traffic within the WIS 23 corridor given the presence of each of the build alternatives.


Comparision of 2045 NERTDM No-Build and Passing Lane Scenario Networks
Wis 23 Project
North Fond du Lac
Fond Du Lac
Glenbeulah
Plymouth
Sheboygan Falls
Kohler
Sheboygan
Volume Increase in Build Scenario = 1000
Volume Increase in Build Scenario = 2000
Volume Decrease in Build Scenario = 1000
Volume Decrease in Build Scenario = 2000
Note: Volumes are displayed for each direction of roadway separately. Only roadway links with a change of greater than or equal to 50 vehicles per day are displayed.
0 1.25 2.5 5 7.5 10
Miles
N

B-16


Comparision of 2045 NERTDM No-Build and Hybrid Scenario Networks
Wis 23 Project
North Fond du Lac
Glenbeulah
Plymouth
Sheboygan Falls
Kohler
Sheboygan
Volume Increase in Build Scenario = 1000
Volume Increase in Build Scenario = 2000
Volume Decrease in Build Scenario = 1000
Volume Decrease in Build Scenario = 2000
Note: Volumes are displayed for each direction of roadway separately. Only roadway links with a change of greater than or equal to 50 vehicles per day are displayed.
0 1.25 2.5 5 7.5 10
Miles
N

B-17


Comparision of 2045 NERTDM No-Build and Four-Lane Build Scenario Networks
Wis 23 Project
North Fond du Lac
Glenbeulah
Plymouth
Sheboygan
Sheboygan Falls
Kohler
Volume Increase in Build Scenario = 1000
Volume Increase in Build Scenario = 2000
Volume Decrease in Build Scenario = 1000
Volume Decrease in Build Scenario = 2000
Note: Volumes are displayed for each direction of roadway separately. Only roadway links with a change of greater than or equal to 50 vehicles per day are displayed.
0 1.25 2.5 5 7.5 10
Miles
N

B-18

Attachment A

Forecast Calculations and Reports (NERTDM Only)

NO-BUILD
NERTDM Only

Forecast Year 1	TRADAS ID	Road Name	COUNT	Count Year	# Lanes	Seasonal Factor	Functional Class	Last Class Count	Base Year Assignment	Future Year Assignment	Count Year Assignment	Model Growth Rate	% Method	ABS Method	Suggested Method	Model 2045 Volume	Model 2040 Volume	Unadjusted 2040 TDM Assignment
2020	201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	2017	4	2	14		9338	15051	10,481	1.39%	19,082	17,858	AVERAGE	18,470	17,544	14235
Forecast Year 2	200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	2017	4	2	14		8425	11054	8,951	0.75%	14,171	13,578	AVERAGE	13,875	13,446	10678
2030	201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	2017	2	4	2	6/27/2017	8661	10178	8,964	0.53%	8,391	8,604	AVERAGE	8,498	8,300	9961
Forecast Year 3	206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	2017	2	4	2	6/27/2017	8339	9281	8,527	0.34%	7,966	8,073	AVERAGE	8,019	7,894	9146
	200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	2017	2	4	2	6/27/2017	8615	9269	8,746	0.23%	7,854	7,934	AVERAGE	7,894	7,807	9176
Forecast Year 4	200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	2017	2	4	2	6/27/2017	7656	7919	7,709	0.10%	7,125	7,146	AVERAGE	7,136	7,100	7881
	201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	2017	2	4	2	6/27/2017	7656	7919	7,709	0.10%	6,939	6,965	AVERAGE	6,952	6,916	7881
Forecast Year 5	590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	2017	2	4	2	6/27/2017	8263	8446	8,300	0.07%	6,806	6,835	AVERAGE	6,820	6,797	8420
	591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	2017	2	4	2	6/24/2014	8006	8141	8,033	0.05%	7,879	7,882	AVERAGE	7,880	7,861	8122
Forecast Year 6	591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	2017	2	4	2		8179	8505	8,244	0.11%	8,711	8,705	AVERAGE	8,708	8,661	8458
	590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	2017	2	4	2		8283	8602	8,347	0.10%	9,724	9,691	AVERAGE	9,708	9,659	8556
Forecast Year 7																		
	201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	2011	2	2	17		440	939	454	2.68%	1,101	1,017	ABSOLUTE	1,017	946	868
Final Forecast Year	201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	2011	2	2	17		402	997	419	2.42%	1,674	1,282	ABSOLUTE	1,282	1,197	912
2040																	-	
	200126	CTH W NORTH OF STH 23	1,247	2011	2	4	7	10/27/2003	981	1084	984	0.27%	1,374	1,347	AVERAGE	1,361	1,344	1069
	201411	CTH W SOUTH OF STH 23	726	2011	2		7		512	513	512	0.00%	727	727	AVERAGE	727	727	513
Model Base Year																	-	
2010	200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	2011	2	4	7		1327	1482	1,331	0.35%	1,375	1,386	AVERAGE	1,381	1,359	1460
Model Future Year	200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	2011	2	4	7		824	1011	829	0.56%	1,371	1,307	AVERAGE	1,339	1,308	984
2045																	-	
	591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	2011	2	4	8		365	396	366	0.37%	195	211	AVERAGE	203	200	392
	591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	2011	2	4	8		6	7	6	0.24%	343	296	AVERAGE	319	316	7
																	-	
	590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	2011	2	4	7		1573	1832	1,580	0.72%	876	1,007	AVERAGE	942	914	1795
	591408	CTH A SOUTH OF STH 23	688	2011	2	4	7		1368	1745	1,379	1.17%	871	1,054	AVERAGE	963	922	1691
																	-	
	590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	2011	2	4	7		2267	2642	2,278	0.53%	2,129	2,199	AVERAGE	2,164	2,116	2588

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NO-BUILD
NERTDM Only

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	13,843	15,693						17,544	1.39%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	11,732	12,589						13,446	0.75%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,509	7,905						8,300	0.53%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,394	7,644						7,894	0.34%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,462	7,635						7,807	0.23%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	6,957	7,028						7,100	0.10%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	6,775	6,846						6,916	0.10%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,702	6,750						6,797	0.07%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,786	7,823						7,861	0.05%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,472	8,566						8,661	0.11%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,465	9,562						9,659	0.10%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	661	803						946	2.68%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	857	1,027						1,197	2.42%	
										-		
200126	CTH W NORTH OF STH 23	1,247	1,277	1,311						1,344	0.27%	
201411	CTH W SOUTH OF STH 23	726	726	727						727	0.00%	
										-		
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,274	1,317						1,359	0.35%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,182	1,245						1,308	0.56%	
										-		
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	187	193						200	0.37%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
										-		
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	805	860						914	0.72%	
591408	CTH A SOUTH OF STH 23	688	761	841						922	1.17%	
										-		
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,922	2,019						2,116	0.53%	

WisDOT TRAFFIC FORECAST REPORT

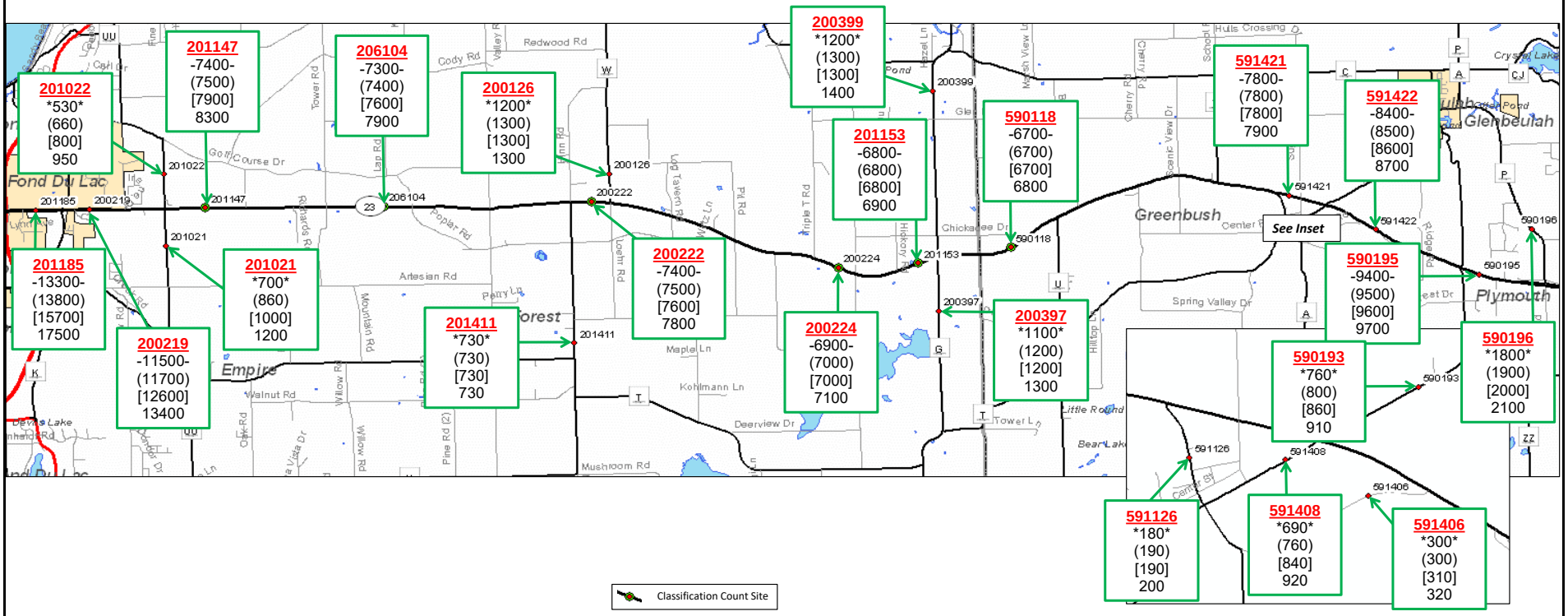
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (No-Build Alternative - NERTDM Only)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Site(s)	Route(s)	Design Values (%) Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	Truck Classification AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	8300	0.53%	9.3	10.0	10.7	12.4	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		7890	0.34%	9.3	10.0	10.7	12.4	60/40	21.6	11.6	1880	12.1	3.3	2.1	8.0	0.2	25.7%
200222		7810	0.23%	9.3	10.0	10.7	12.5	60/40	19.6	10.5	1730	9.8	2.7	2.2	8.4	0.2	23.3%



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Site(s)	Route(s)	Full Vehicle Classification MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
+000+	2005 Count	000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH UU, STH 23 is functionally classified as an Urban Principal Arterial (14) for count purposes. From CTH UU to CTH P, STH 23 is functionally classified as a Rural Principal Arterial (2) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. With the exception of the STH 23 Majors project (Four-Lane Build Alternative), roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model were assumed to be in place for the purposes of developing this forecast.

PASSING LANES
NERTDM Only

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	13671	-564	16,980	0.960	16,849	16,915
200219	13,446	10678	9840	-838	12,608	0.921	12,391	12,499
201147	8,300	9961	10200	239	8,539	1.024	8,499	8,519
206104	7,894	9146	9392	245	8,140	1.027	8,106	8,123
200222	7,807	9176	9377	201	8,009	1.022	7,979	7,994
200224	7,100	7881	8097	215	7,315	1.027	7,294	7,304
201153	6,916	7881	8097	215	7,132	1.027	7,105	7,118
590118	6,797	8420	8686	267	7,063	1.032	7,012	7,038
591421	7,861	8122	8357	236	8,097	1.029	8,090	8,093
591422	8,661	8458	8643	184	8,845	1.022	8,849	8,847
590195	9,659	8556	8736	180	9,839	1.021	9,862	9,851
201022	946	868	785	-83	863	0.904	855	859
201021	1,197	912	737	-175	1,022	0.808	967	994
200126	1,344	1069	1073	3	1,348	1.003	1,349	1,348
201411	727	513	512	-1	726	0.998	726	726
200399	1,359	1460	1514	54	1,413	1.037	1,410	1,412
200397	1,308	984	1019	34	1,342	1.035	1,353	1,348
591126	200	392	421	29	229	1.074	215	222
591406	316	7	7	0	316	1.000	316	316
590193	914	1795	1828	33	947	1.018	931	939
591408	922	1691	1673	-18	904	0.989	912	908
590196	2,116	2588	2553	-35	2,081	0.986	2,087	2,084

PASSING LANES
NERTDM Only

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	13,760	15,338						16,915	1.19%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	11,609	12,054						12,499	0.39%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,538	8,028						8,519	0.66%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,424	7,773						8,123	0.48%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,487	7,740						7,994	0.34%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	6,984	7,144						7,304	0.23%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	6,802	6,960						7,118	0.23%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,734	6,886						7,038	0.23%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,816	7,955						8,093	0.18%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,496	8,672						8,847	0.21%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,490	9,670						9,851	0.19%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	634	746						859	2.11%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	794	894						994	1.43%	
200126	CTH W NORTH OF STH 23	1,247	1,279	1,313						1,348	0.28%	
201411	CTH W SOUTH OF STH 23	726	726	726						726	0.00%	
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,290	1,351						1,412	0.49%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,194	1,271						1,348	0.68%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	193	208						222	0.79%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	812	876						939	0.84%	
591408	CTH A SOUTH OF STH 23	688	756	832						908	1.10%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,912	1,998						2,084	0.47%	

WisDOT TRAFFIC FORECAST REPORT

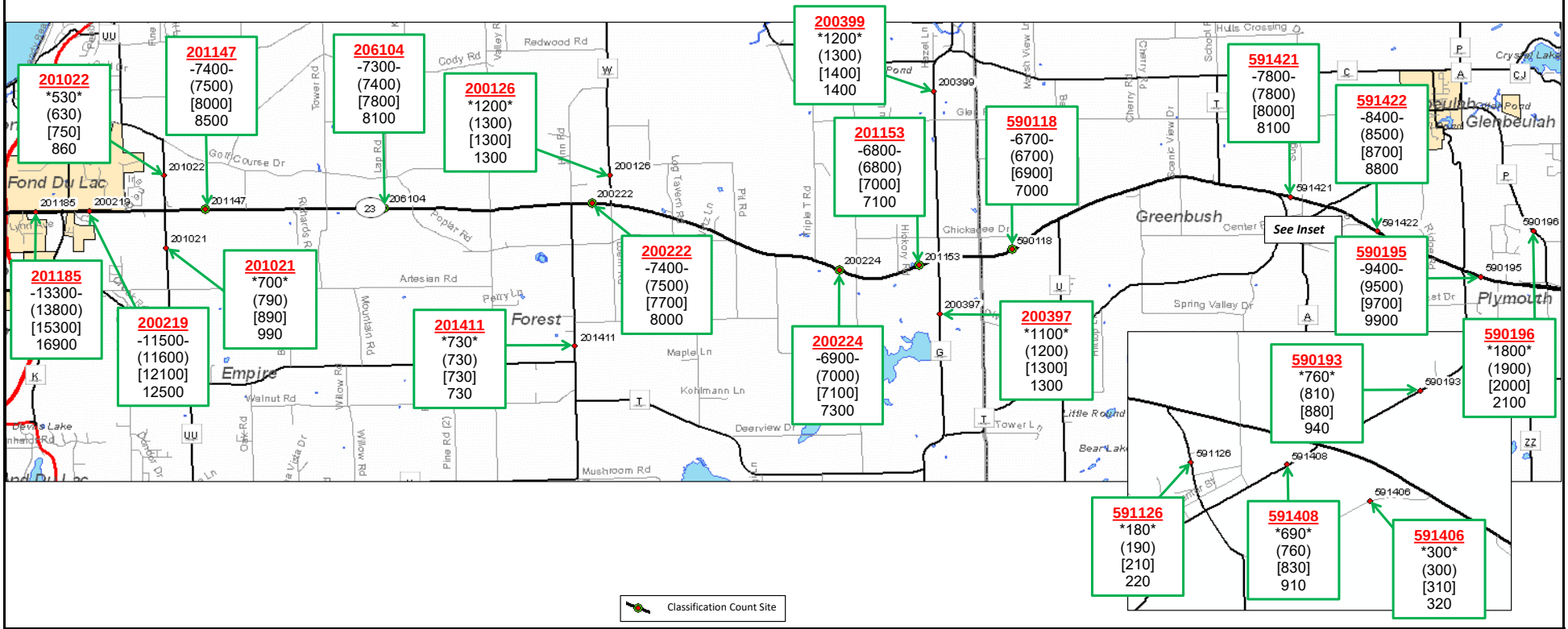
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Passing Lanes Alternative - NERTDM Only)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
		Design Values (%)									Truck Classification						
201147	STH 23	8520	0.66%	9.3	10.0	10.7	12.4	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		8120	0.48%	9.3	10.0	10.7	12.4	60/40	20.6	11.0	1790	10.1	2.8	2.3	9.0	0.2	24.5%
200222		7990	0.34%	9.3	10.0	10.7	12.5	60/40	18.7	10.0	1650	7.5	2.1	2.6	9.9	0.2	22.3%



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Full Vehicle Classification

Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
		000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH UU, STH 23 is functionally classified as an Urban Principal Arterial ([14] - in the STH 23 Majors - Passing Lanes Alternative) for count purposes. From CTH UU to CTH P, STH 23 is functionally classified as a Rural Principal Arterial ([2] in the STH 23 Majors - Passing Lanes Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (in addition to the STH 23 Majors Project - Passing Lanes Alternative) were assumed to be in place for the purposes of developing this forecast.

HYBRID
NERTDM Only

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	16543	2,308	19,853	1.162	20,389	20,121
200219	13,446	10678	12592	1,914	15,360	1.179	15,856	15,608
201147	8,300	9961	12942	2,981	11,281	1.299	10,784	11,032
206104	7,894	9146	12271	3,124	11,019	1.342	10,591	10,805
200222	7,807	9176	11855	2,679	10,487	1.292	10,087	10,287
200224	7,100	7881	9892	2,011	9,111	1.255	8,911	9,011
201153	6,916	7881	9892	2,011	8,927	1.255	8,681	8,804
590118	6,797	8420	9652	1,233	8,029	1.146	7,792	7,911
591421	7,861	8122	9254	1,132	8,994	1.139	8,957	8,976
591422	8,661	8458	9427	969	9,629	1.115	9,652	9,641
590195	9,659	8556	9470	914	10,573	1.107	10,691	10,632
201022	946	868	843	-25	921	0.971	919	920
201021	1,197	912	880	-32	1,165	0.965	1,155	1,160
200126	1,344	1069	1779	710	2,054	1.664	2,236	2,145
201411	727	513	479	-34	693	0.933	678	686
200399	1,359	1460	1690	230	1,589	1.157	1,573	1,581
200397	1,308	984	1265	281	1,589	1.286	1,681	1,635
591126	200	392	470	78	278	1.199	240	259
591406	316	7	7	0	316	1.000	316	316
590193	914	1795	1946	151	1,065	1.084	991	1,028
591408	922	1691	1690	-1	921	0.999	922	922
590196	2,116	2588	2570	-19	2,097	0.993	2,100	2,099

HYBRID
NERTDM Only

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	14,179	17,150						20,121	2.24%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	12,014	13,811						15,608	1.57%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,866	9,449						11,032	2.14%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,774	9,289						10,805	2.07%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,786	9,036						10,287	1.69%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,206	8,109						9,011	1.30%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	7,022	7,913						8,804	1.32%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,848	7,379						7,911	0.79%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,931	8,453						8,976	0.67%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,600	9,120						9,641	0.62%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,592	10,112						10,632	0.55%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	653	786						920	2.51%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	845	1,003						1,160	2.24%	
200126	CTH W NORTH OF STH 23	1,247	1,526	1,836						2,145	2.48%	
201411	CTH W SOUTH OF STH 23	726	713	700						686	-0.19%	Negative GR (-0.19% for 686; on report, 2020 forecast value set at 624 & grown at 0.5%; 2030=655, 2040=686)
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,343	1,462						1,581	0.96%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,283	1,459						1,635	1.56%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	205	232						259	1.49%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	840	934						1,028	1.24%	
591408	CTH A SOUTH OF STH 23	688	761	841						922	1.17%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,917	2,008						2,099	0.49%	

WisDOT TRAFFIC FORECAST REPORT

PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Hybrid Alternative - NERTDM Only)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
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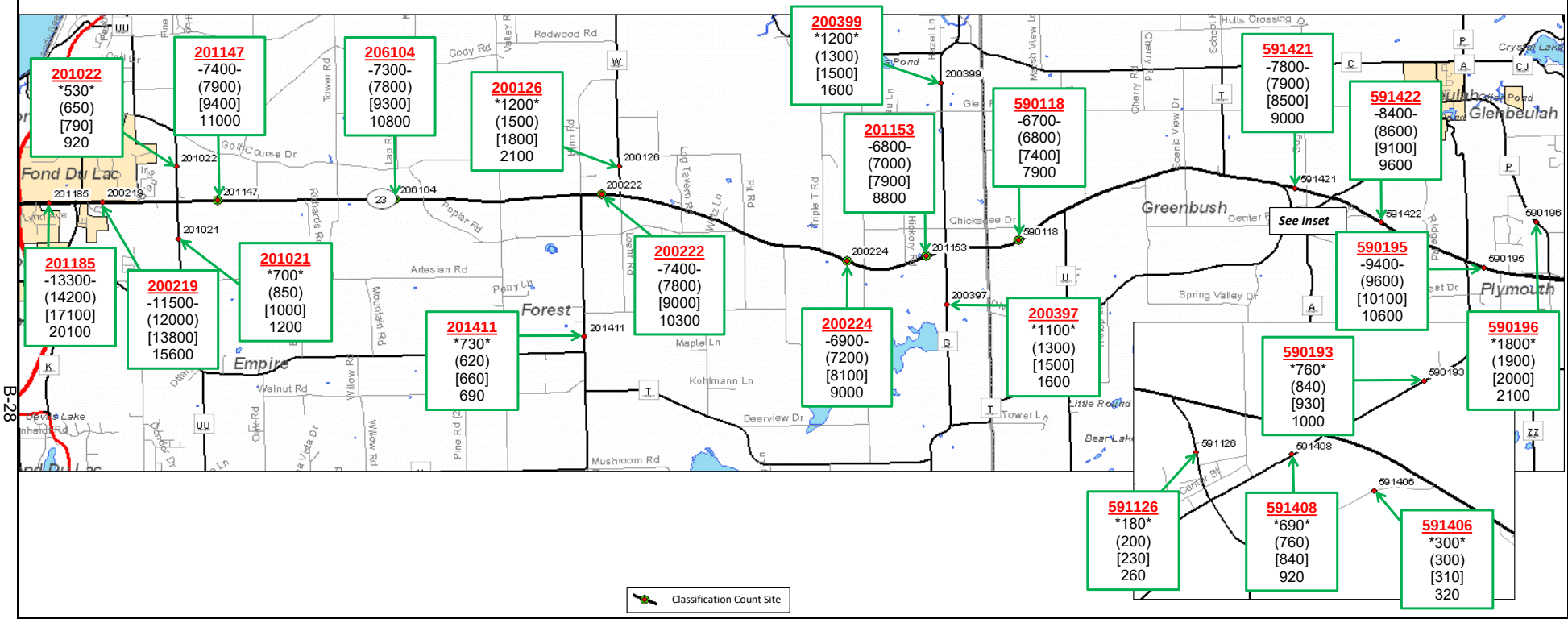
Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Design Values (%)											Truck Classification						
Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	11030	2.14%	10.0	11.2	12.2	14.9	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		10800	2.07%	10.0	11.2	12.2	14.9	60/40	20.6	11.0	1790	10.1	2.8	2.3	9.0	0.2	24.5%
200222		10290	1.69%	10.0	11.2	12.3	15.0	60/40	18.7	10.0	1650	7.5	2.1	2.6	9.9	0.2	22.3%



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Full Vehicle Classification																
Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
		000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH G, STH 23 is functionally classified as an expressway ([4] in the STH 23 Majors - Hybrid Alternative) for count purposes. From CTH G to CTH P, STH 23 is functionally classified as a Rural Principal Arterial ([2] in the STH 23 Majors - Hybrid Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (in addition to the STH 23 Majors Project - Hybrid Alternative) were assumed to be in place for the purposes of developing this forecast.

FOUR-LANE BUILD
NERTDM Only

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	17442	3,207	20,752	1.225	21,497	21,125
200219	13,446	10678	13535	2,857	16,303	1.268	17,044	16,673
201147	8,300	9961	13930	3,969	12,269	1.398	11,607	11,938
206104	7,894	9146	13265	4,119	12,013	1.450	11,449	11,731
200222	7,807	9176	12872	3,696	11,503	1.403	10,952	11,228
200224	7,100	7881	11043	3,161	10,261	1.401	9,947	10,104
201153	6,916	7881	11043	3,161	10,078	1.401	9,690	9,884
590118	6,797	8420	11388	2,968	9,765	1.353	9,193	9,479
591421	7,861	8122	11160	3,039	10,900	1.374	10,803	10,851
591422	8,661	8458	11013	2,554	11,215	1.302	11,276	11,245
590195	9,659	8556	11076	2,519	12,178	1.294	12,503	12,341
201022	946	868	878	10	956	1.012	957	957
201021	1,197	912	884	-28	1,168	0.969	1,159	1,164
200126	1,344	1069	1796	727	2,071	1.680	2,258	2,164
201411	727	513	484	-29	698	0.943	686	692
200399	1,359	1460	1890	430	1,790	1.295	1,760	1,775
200397	1,308	984	1361	376	1,684	1.382	1,807	1,746
591126	200	392	313	-79	121	0.799	160	140
591406	316	7	3	-4	312	0.375	118	215
590193	914	1795	2044	249	1,164	1.139	1,041	1,102
591408	922	1691	1917	225	1,148	1.133	1,045	1,096
590196	2,116	2588	2371	-218	1,898	0.916	1,938	1,918

FOUR-LANE BUILD
NERTDM Only

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	14,310	17,717						21,125	2.56%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	12,153	14,413						16,673	1.97%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,984	9,961						11,938	2.67%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,895	9,813						11,731	2.62%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,908	9,568						11,228	2.24%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,349	8,727						10,104	1.99%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	7,162	8,523						9,884	2.01%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	7,052	8,266						9,479	1.81%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	8,175	9,513						10,851	1.72%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,809	10,027						11,245	1.44%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,815	11,078						12,341	1.34%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	664	810						957	2.75%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	846	1,005						1,164	2.26%	
200126	CTH W NORTH OF STH 23	1,247	1,532	1,848						2,164	2.54%	
201411	CTH W SOUTH OF STH 23	726	715	704						692	-0.16%	Negative GR (-0.16% for 692; on report, 2020 forecast value set at 629 & grown at 0.5%; 2030=660, 2040=692; 0% assumed for TM forecast)
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,403	1,589						1,775	1.50%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,318	1,532						1,746	1.90%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	168	154						140	-0.77%	Negative GR (-0.77% for 140; on report, 2020 forecast value set at 127 & grown at 0.5%; 2030=133, 2040=140)
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	270	243						215	-0.94%	Negative GR (-0.94% for 215; on report, 2020 forecast value set at 195 & grown at 0.5%; 2030=205, 2040=214)
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	863	983						1,102	1.58%	
591408	CTH A SOUTH OF STH 23	688	815	956						1,096	2.05%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,861	1,889						1,918	0.16%	

WisDOT TRAFFIC FORECAST REPORT

PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Four-Lane Build Alternative - NERTDM Only)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
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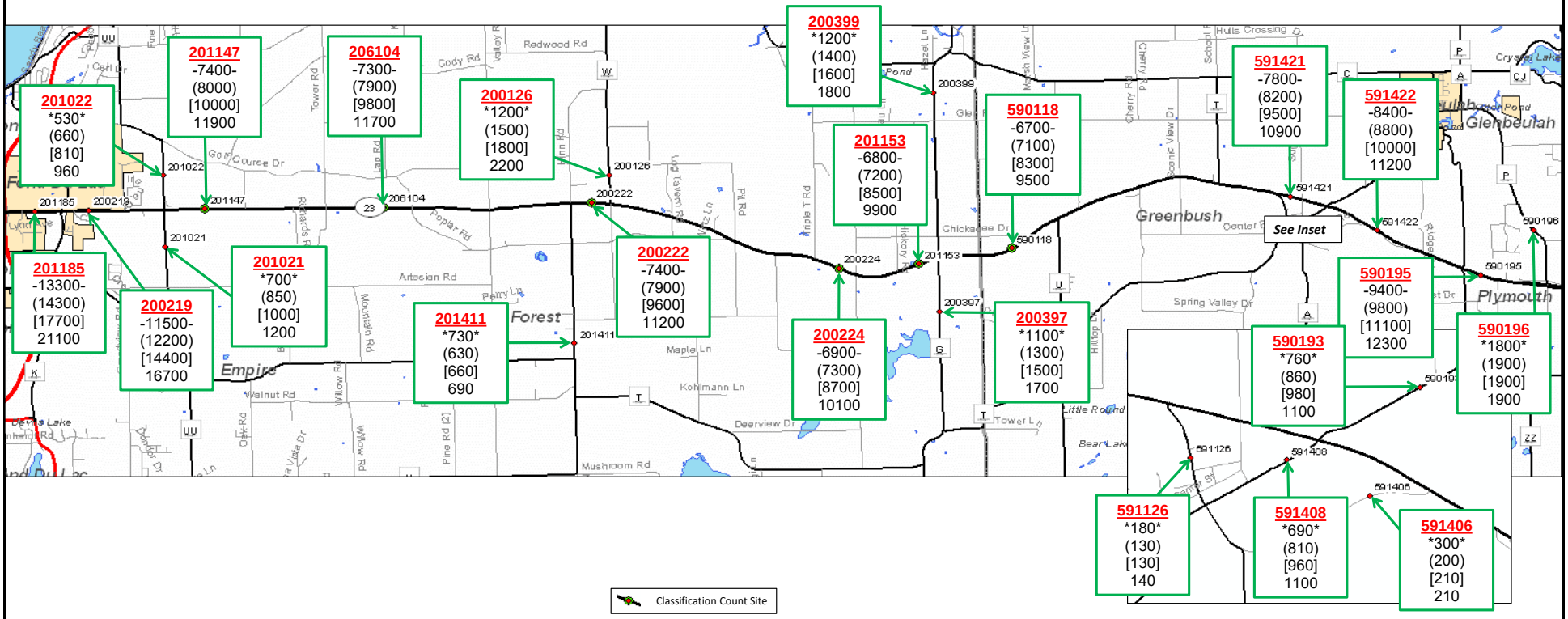
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Design Values (%)											Truck Classification						
Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	11940	2.67%	9.9	11.1	12.1	14.8	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		11730	2.62%	9.9	11.1	12.1	14.8	60/40	21.6	11.6	1880	12.1	3.3	2.1	8.0	0.2	25.7%
200222		11230	2.24%	10.0	11.2	12.2	14.8	60/40	19.6	10.5	1730	9.8	2.7	2.2	8.4	0.2	23.3%



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Full Vehicle Classification																
Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
+000+	2005 Count	000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH P, STH 23 is functionally classified as an expressway (in the STH 23 Majors - Four-Lane Build Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (including the STH 23 Majors Project - Four-Lane Build) were assumed to be in place for the purposes of developing this forecast.

ALTERNATIVES SUMMARY
NERTDM Only

TRADAS ID	LOCATION	No-Build 2040 Forecast	Passing Lane 2040 Forecast	Hybrid 2040 Forecast	4-Lane Build 2040 Forecast
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	17,500	16,900	20,100	21,100
200219	STH 23 EAST OF CTH K FOND DU LAC	13,400	12,500	15,600	16,700
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,900	8,100	10,800	11,700
200222	STH 23 WEST OF CTH W TO THE NORTH	7,800	8,000	10,300	11,200
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	7,100	7,300	9,000	10,100
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,800	7,000	7,900	9,500
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,700	9,900	10,600	12,300

Attachment B

Forecast Calculations and Reports (TAFIS Incorporated)

TAFIS Use in WisDOT Forecasts

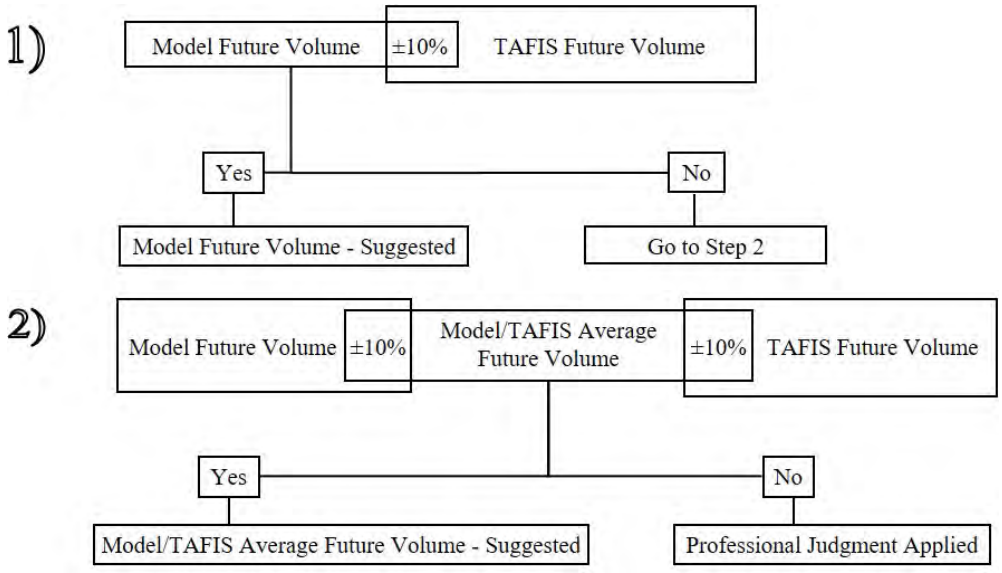
The Traffic Analysis Forecasting Information System (TAFIS), developed in 2001, is an automated procedure and SAS®-based computer program used in creating no-build roadway traffic forecasts on Wisconsin's 11,800 miles of state trunk highway system. TAFIS operates on the statistical principle of *regression,* i.e., projecting future roadway traffic volumes using historic counts within the last 20 years to create a best-fit, statistically significant projection[1].

TAFIS output from a run performed August 21, 2017 was used in the analysis and incorporated into the results described in this Appendix.

The NERTDM-TAFIS Comparison Procedure for No-Build Forecasts

The NERTDM-TAFIS comparison is used to develop forecast estimates for initial project evaluation per standard WisDOT procedures. The following figure depicts the framework for identifying the suggested future no-build forecasted traffic volume.

(The TDM-TAFIS comparison used for no-build forecasts is also described in the WisDOT Transportation Planning Manual (May, 2018) – Chapter 9, Section 10.5.)



[1] The traffic forecasting analysis developed for and presented in the main body of the WIS 23 LS-SDEIS used an updated version of the NERTDM and recent traffic counts to develop consistent forecasts for the no-build alternative and each of the build alternatives. Per WisDOT Traffic Forecasting Section policy (as detailed in the May, 2018 Transportation Planning Manual), a separate forecasting analysis was conducted based on TAFIS and regression modeling to establish the reasonableness of the no-build forecast .

The results of this separate analysis can be found in this Attachment, and are presented here to compare the no-build results prepared for the formal NEPA study (presented in **Attachment A** of this Appendix) to those derived from WisDOT's internal screening process. Forecast values from the two analyses are consistent.

Or in other words, the NERTDM-TAFIS comparison for WisDOT no-build forecasts follows the guidelines below –

- If the travel demand model future volume is within ±10% (between 90%-110%) of the TAFIS future volume, the model future volume is suggested.

- If the travel demand model future volume is NOT within ±10% (less than 90% or higher than 110%) of the TAFIS future volume, but the average of the TAFIS and model future volumes is within ±10% (between 90%-110%) of both the TAFIS and model volumes, the average of the TAFIS and travel demand model future volumes is suggested.

- If both the travel demand model future volume and TAFIS/model average future volume are not within ±10% (less than 90% or more than 110%) of the TAFIS future volume, professional judgment is used to determine an appropriate forecasted volume.

The framework for checking whether the TDM and TAFIS results are within 10% of one another or whether their average is within 10% of both is intended as a starting point for a critical assessment of model and regression results. WisDOT does not intend this framework to be interpreted as a policy – rather, this is a rule of thumb. It is not meant to be a rationale for why a method or result is considered valid or reasonable.

Factors that contribute to the use of 10% as the trigger within this framework include that 10% is representative of the variation in daily traffic volumes observed at continuous count sites and that when a traffic count is collected, if the AADT differs by 20% or more from the previous AADT at the same location, it is flagged for review (thus one might consider that a difference of between 10% and 20% may warrant review, and a difference of 10% or less would likely not warrant review).

A motivation for considering the average of the TDM and TAFIS results is that the average of two samples from the same distribution is closer to the mean of the distribution than either sample in most cases. The implicit assumption is that the TDM and TAFIS are estimating the same measure. Thus, TAFIS is only considered in the development of No-Build forecasts as a regression model cannot reasonably estimate the impacts of changes in land use. The forecaster should review, assess, and think critically about all data and decisions during the forecast development process. Comparing the TDM, TAFIS, and the average of the two methods is intended to help forecasters prioritize and conduct their work efficiently, not to prescribe a specific forecast development process or method.

Since the availability and complexity of data varies among traffic count sites, and each count site and segment of roadway has unique characteristics, deviations from this framework may occur and are acceptable. When this occurs, the justifications for these decisions are documented to explain the deviation.

WisDOT keeps a record of each forecast report developed. This record, including the TAFIS-TDM Project Level Forecast Workbook, contains specific information about inputs, forecasting protocols, and outputs; including comparisons (where applicable) of TAFIS and the travel demand model. Situations where there may not be a high degree of confidence in comparing the results in this specific way are not limited to and may include:

- TAFIS forecasts with Southeast Wisconsin Regional Planning Commission travel demand model results in all locations in Southeast Wisconsin.
- TAFIS forecasts with microsimulation models, turning movement or build forecasts.
- TAFIS forecasts with the draft statewide travel demand model, travel demand models completed outside of the WisDOT modeling process or other types of subarea travel demand models.
- TAFIS forecasts that have a low degree of confidence due to a small number of historical traffic counts available or the type of TAFIS model.

When developing forecasts using TAFIS, the following six columns are utilized in the TAFIS-TDM Project Level Forecast Workbook:

TAFIS Most Recent Count Year	TAFIS Model	TAFIS Count Year Forecast	TAFIS 2040 Volume	TAFIS Residual	TAFIS / Model Average
2014		12,425	12,461	13,323	15,003
2017	1.1	11,490	13,110	13,095	**13,446**
2017		8,484	**9,744**	8,651	**9,022**
2017	1.1	8,230	**8,840**	7,929	**8,367**
2017	1.1	8,410	9,410	8,410	8,609
2017	1.1	7,720	8,870	8,086	7,985
2017		7,602	8,825	7,977	7,871
2017	1.1	7,060	**7,870**	7,498	**7,333**
2014		7,584	8,013	8,203	**7,861**
2017		7,978	8,856	9,322	**8,661**
2014		8,871	9,889	10,454	**9,659**

TAFIS Most Recent Count Year = Most recent AADT of count site recorded in TAFIS system.
TAFIS Model = Number of TAFIS model for count site.
TAFIS Count Year Forecast = TAFIS model estimated value for count year.
TAFIS [Future Forecast Year] Volume = TAFIS model forecast value for specified forecast year.

TAFIS Residual = Applies the difference between the count and count year TAFIS forecast to the future year TAFIS forecast:
TAFIS Residual = (Count-TAFIS Count Year Forecast) + TAFIS horizon year forecast

TAFIS / Model Average = Average of Model [Future Forecast Year] Volume and TAFIS [Future Forecast Year] Volume.

Manual Regression *(worksheet for site 201147 – no-build scenario shown)*

Manual (as opposed to the automated TAFIS procedure) regressions are employed in developing no-build traffic forecasts – and have been used in the WIS 23 forecasting effort. Manual regressions are typically calculated when:

- A count site is not on the State Trunk Highway Network (STN)
- The TAFIS model for a given count site is based on a count history that exhibits high variation in year-to-year traffic volume (For example, due to one or more roadway construction projects in the area diverting traffic to the given count site, or variation at a given count site due to random chance).
- The TAFIS model for a given count site has not incorporated the most recent count, or other counts. For example, there is normally a lag between the time a new count is taken at a given count site, and when that count is incorporated into that site's TAFIS model. In cases where this lag is evident at a given count site where that site is part of a forecast in development, a manual regression is performed for that site.

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Forecast Year 1	TRADAS ID	Road Name	COUNT	Count Year	# Lanes	Seasonal Factor	Functional Class	Last Class Count	Base Year Assignment	Future Year Assignment	TAFIS Most Recent Count Year	TAFIS Model	TAFIS Count Year Forecast	TAFIS 2040 Volume	TAFIS Residual	Count Year Assignment	Model Growth Rate	% Method	ABS Method	Suggested Method	Model 2045 Volume	Model 2040 Volume	TAFIS / Model Average	Unadjusted 2040 TDM Assignment
2020	201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	2017	4	2	14		9338	15051	2014		12,425	12,461	13,323	10,481	1.39%	19,082	17,858	AVERAGE	18,470	17,544	15,003	14235
Forecast Year 2	200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	2017	4	2	14		8425	11054	2017	1.1	11,490	13,110	13,095	8,951	0.75%	14,171	13,578	AVERAGE	13,875	**13,446**	**13,446**	10678
2030	201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	2017	2	4	2	6/27/2017	8661	10178	2017		8,484	**9,744**	8,651	8,964	0.53%	8,391	8,604	AVERAGE	8,498	**8,300**	**9,022**	9961
Forecast Year 3	206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	2017	2	4	2	6/27/2017	8339	9281	2017	1.1	8,230	**8,840**	7,929	8,527	0.34%	7,966	8,073	AVERAGE	8,019	**7,894**	**8,367**	9146
	200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	2017	2	4	2	6/27/2017	8615	9269	2017	1.1	8,410	9,410	8,410	8,746	0.23%	7,854	7,934	AVERAGE	7,894	7,807	8,609	9176
Forecast Year 4	200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	2017	2	4	2	6/27/2017	7656	7919	2017	1.1	7,720	8,870	8,086	7,709	0.10%	7,125	7,146	AVERAGE	7,136	7,100	7,985	7881
	201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	2017	2	4	2	6/27/2017	7656	7919	2017		7,602	8,825	7,977	7,709	0.10%	6,939	6,965	AVERAGE	6,952	6,916	7,871	7881
Forecast Year 5	590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	2017	2	4	2	6/27/2017	8263	8446	2017	1.1	7,060	**7,870**	7,498	8,300	0.07%	6,806	6,835	AVERAGE	6,820	**6,797**	**7,333**	8420
	591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	2017	2	4	2	6/24/2014	8006	8141	2014		7,584	8,013	8,203	8,033	0.05%	7,879	7,882	AVERAGE	7,880	**7,861**	**7,861**	8122
Forecast Year 6	591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	2017	2	4	2		8179	8505	2017		7,978	8,856	9,322	8,244	0.11%	8,711	8,705	AVERAGE	8,708	**8,661**	**8,661**	8458
	590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	2017	2	4	2		8283	8602	2014		8,871	9,889	10,454	8,347	0.10%	9,724	9,691	AVERAGE	9,708	**9,659**	**9,659**	8556
Forecast Year 7																								
	201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	2011	2	2	17		440	939						454	2.68%	1,101	1,017	ABSOLUTE	1,017	**946**	**946**	868
Final Forecast Year	201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	2011	2	2	17		402	997						419	2.42%	1,674	1,282	ABSOLUTE	1,282	**1,197**		912
2040																								
	200126	CTH W NORTH OF STH 23	1,247	2011	2	4	7	10/27/2003	981	1084						984	0.27%	1,374	1,347	AVERAGE	1,361	**1,344**		1069
	201411	CTH W SOUTH OF STH 23	726	2011	2		7		512	513						512	0.00%	727	727	AVERAGE	727	**727**		513
Model Base Year																								
2010	200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	2011	2	4	7		1327	1482			1,196	1,351	1,391	1,331	0.35%	1,375	1,386	AVERAGE	1,381	**1,359**	**1,359**	1460
Model Future Year	200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	2011	2	4	7		824	1011			1,043	1,259	1,341	829	0.56%	1,371	1,307	AVERAGE	1,339	**1,308**	**1,308**	984
2045																								
	591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	2011	2	4	8		365	396						366	0.37%	195	211	AVERAGE	203	**200**		392
	591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	2011	2	4	8		6	7						6	0.24%	343	296	AVERAGE	319	**316**		7
	590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	2011	2	4	7		1573	1832						1,580	0.72%	876	1,007	AVERAGE	942	**914**		1795
	591408	CTH A SOUTH OF STH 23	688	2011	2	4	7		1368	1745						1,379	1.17%	871	1,054	AVERAGE	963	**922**		1691
	590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	2011	2	4	7		2267	2642			1,703	2,222	2,354	2,278	0.53%	2,129	2,199	AVERAGE	2,164	**2,116**	**2,116**	2588

= Regression not significant.
= Significant regression.
= Insufficient count history to perform regression.
XXXXXX = 2017 Count not accepted by "new" TAFIS (Regression performed).
XXXXXX = Non-TAFIS site on TAFIS link (Regression performed).

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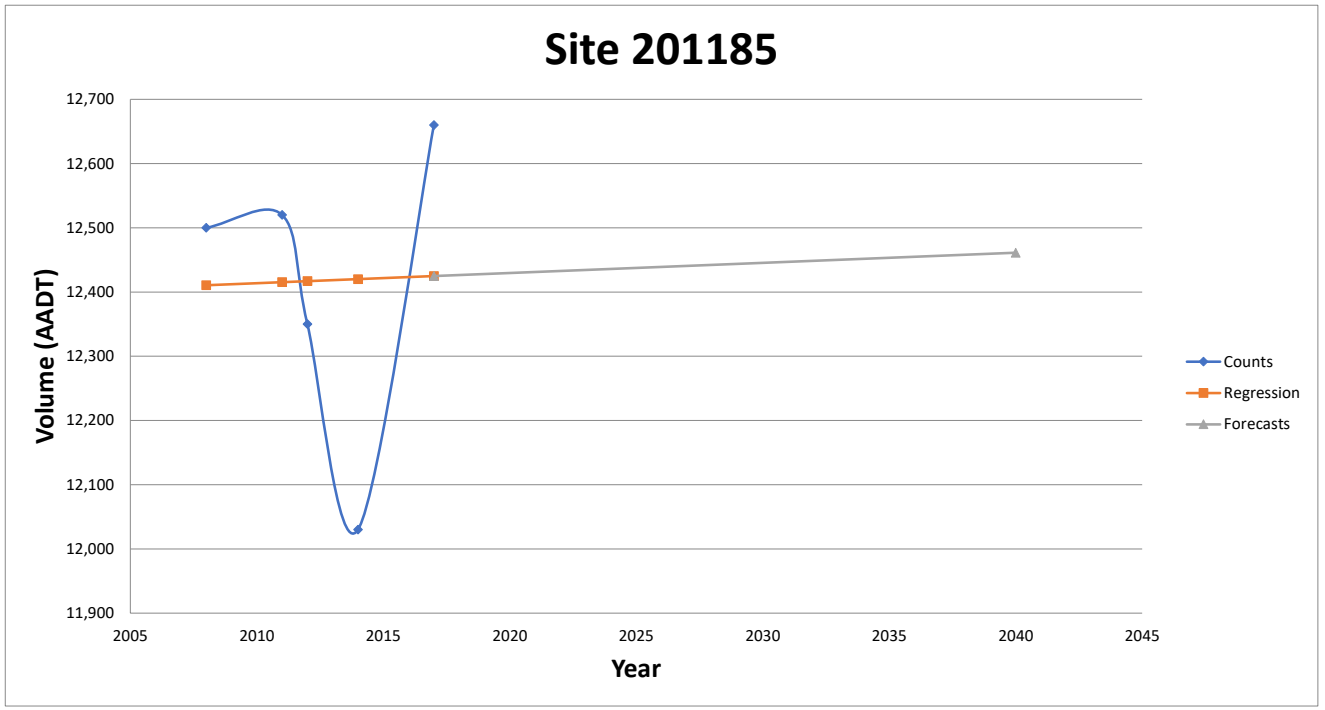
Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	13,843	15,693						17,544	1.39%	Model 4.2. Performed manual regression to include preliminary 2017 count. Yields non-significant regression. **10% check warning message** - TDM Forecast value used (Committed projects limiting access at CTH T and CTH V @ USH 151 affecting access pattern).
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	11,732	12,589						13,446	0.75%	Model 1.1. TDM value used (was within +/- 10% of TAFIS).
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,603	8,313						9,022	0.96%	Non-TAFIS site on TAFIS link, therefore performed manual regression. Yields significant regression. TDM/manual regression average used (was within +/- 10% of both TDM and manual regression).
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,456	7,912						8,367	0.62%	Model 1.1. TDM/TAFIS average used (was within +/- 10% of both TDM and TAFIS)
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,567	8,088						8,609	0.70%	Model 1.1. - **10% check warning message** - TDM /TAFIS Average value used (Average value used for site 206104, and yields growth rate consistent with surrounding sites).
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,073	7,529						7,985	0.66%	Model 1.1. - **10% check warning message** - TDM /TAFIS Average value used (Average value used for surrounding sites, and yields growth rate consistent with surrounding sites).
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	6,900	7,385						7,871	0.72%	Non-TAFIS site on TAFIS link, therefore performed manual regression. Yields significant regression. **10% check warning message** - TDM/manual regression average value used (Average value used for surrounding sites, and yields growth rate consistent with surrounding sites)..
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,772	7,053						7,333	0.42%	Model 1.1. TDM/TAFIS average used (was within +/- 10% of both TDM and TAFIS)
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,786	7,823						7,861	0.05%	Model 2.1. Performed manual regression to include preliminary 2017 count. Does not yield significant regression. TDM value used due to non-significant manual regression result.
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,472	8,566						8,661	0.11%	Non-TAFIS site on TAFIS link, therefore performed manual regression. Only 4 counts at site (5 needed for TAFIS model 1.1) - Does not yield signifcant regression. TDM value used due to non-significant manual regression result.
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,465	9,562						9,659	0.10%	Model 1.2. Performed manual regression to include 2017 count. Used same Model 1.2 outlier replacement value for 1999 as TAFIS. Yields significant regression. TDM value used (was within +/- 10% of manual regression).
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	661	803						946	2.68%	Manual regression not significant; negative slope. Only 4 counts in 20-year history. 2011 (most recent) count 670 lower than 2003 count - cause of neg. slope. TDM used.
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	857	1,027						1,197	2.42%	Manual regression not significant; negative slope. Only 4 counts in 20-year history. 2011 (most recent) count 400 lower than 2003 count - cause of neg. slope. TDM used.
200126	CTH W NORTH OF STH 23	1,247	1,277	1,311						1,344	0.27%	Manual regression not significant. Only 4 counts in 20-year history. 2011 (most recent) count 450 lower than 2003 count. TDM used.
201411	CTH W SOUTH OF STH 23	726	726	727						727	0.00%	Manual regression not significant; negative slope. 2011 (most recent) count 180 lower than 2005 count (5-count history) - cause of neg. slope. TDM used.
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,274	1,317						1,359	0.35%	Manual regression significant. TDM value used (was within +/- 10% of manual regression).
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,182	1,245						1,308	0.56%	Manual regression significant. TDM value used (was within +/- 10% of manual regression).
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	187	193						200	0.37%	One count in 20-year history. TDM used.
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	Two counts in 20-year history. TDM used.
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	805	860						914	0.72%	Manual regression not significant. Only 4 counts in 20-year history. TDM used.
591408	CTH A SOUTH OF STH 23	688	761	841						922	1.17%	Two counts in 20-year history. TDM used.
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,922	2,019						2,116	0.53%	Manual regression significant. TDM value used (was within +/- 10% of manual regression).

Attachment B
Manual Regression Worksheet - Site 201185

Year	Count	Residual	Forecast	
2008	12,500	89	12,411	#N/A
2011	12,520	105	12,415	12,500
2012	12,350	-67	12,417	12514
2014	12,030	-390	12,420	12399.2
2017	12,660	235	12,425	12140.76



Project ID	
Location	
Site	201185
AAF	0.845

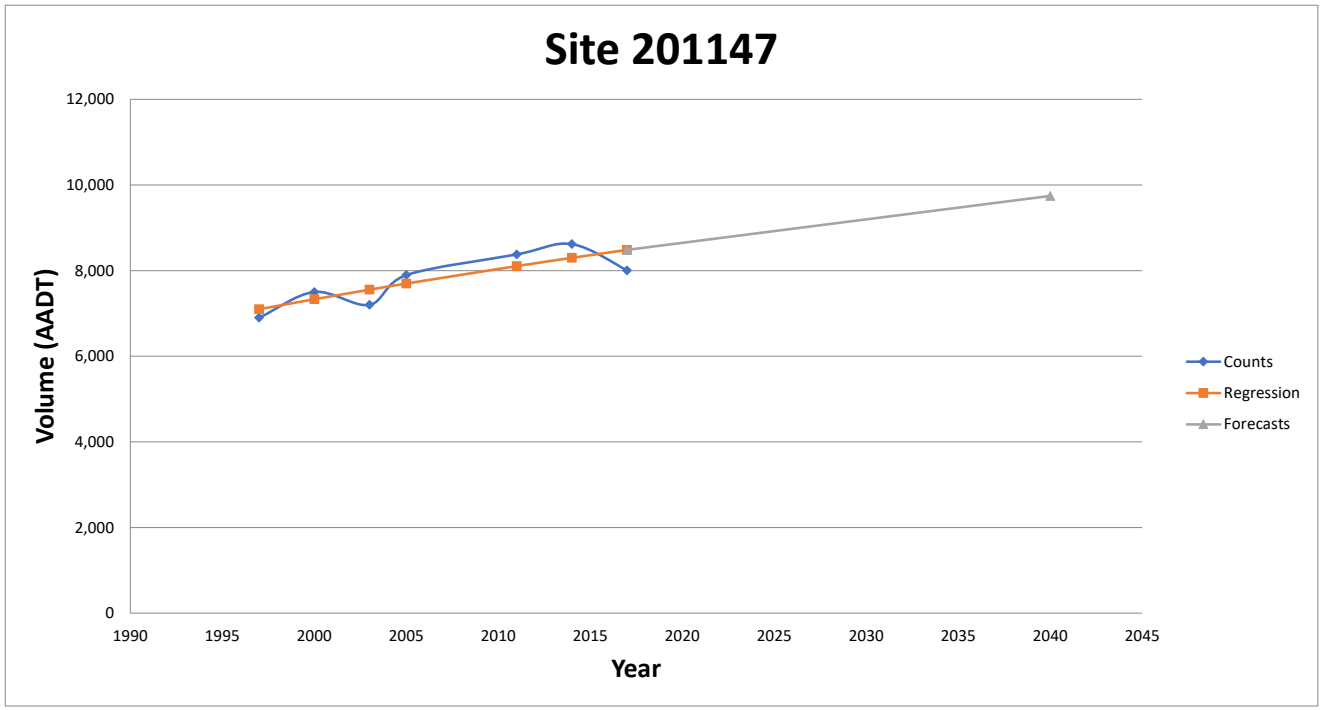
lambda	4
R2	0.001
R_adj	0.666
P-Value	0.9711
Significant?	No

Year	**Forecast**
2017	12425
2040	12461

	Time Span	**Growth Rate**
COUNT	2008 to 2017	0.14%
REGRESSION	2008 to 2017	0.01%
FORECAST	2017 to 2040	0.01%
R + F	2008 to 2040	0.01%
R + F	2017 to 2040	0.01%

Attachment B
Manual Regression Worksheet - Site 201147

Year	Count	Residual	Forecast	
1997	6,900	-197	7,097	#N/A
2000	7,500	169	7,331	6,900
2003	7,200	-354	7,554	7320
2005	7,895	198	7,697	7236
2011	8,378	273	8,105	7697.3
2014	8,619	321	8,297	8173.44
2017	8,004	-479	8,484	8485.157



Project ID	
Location	
Site	201147
AAF	0.898

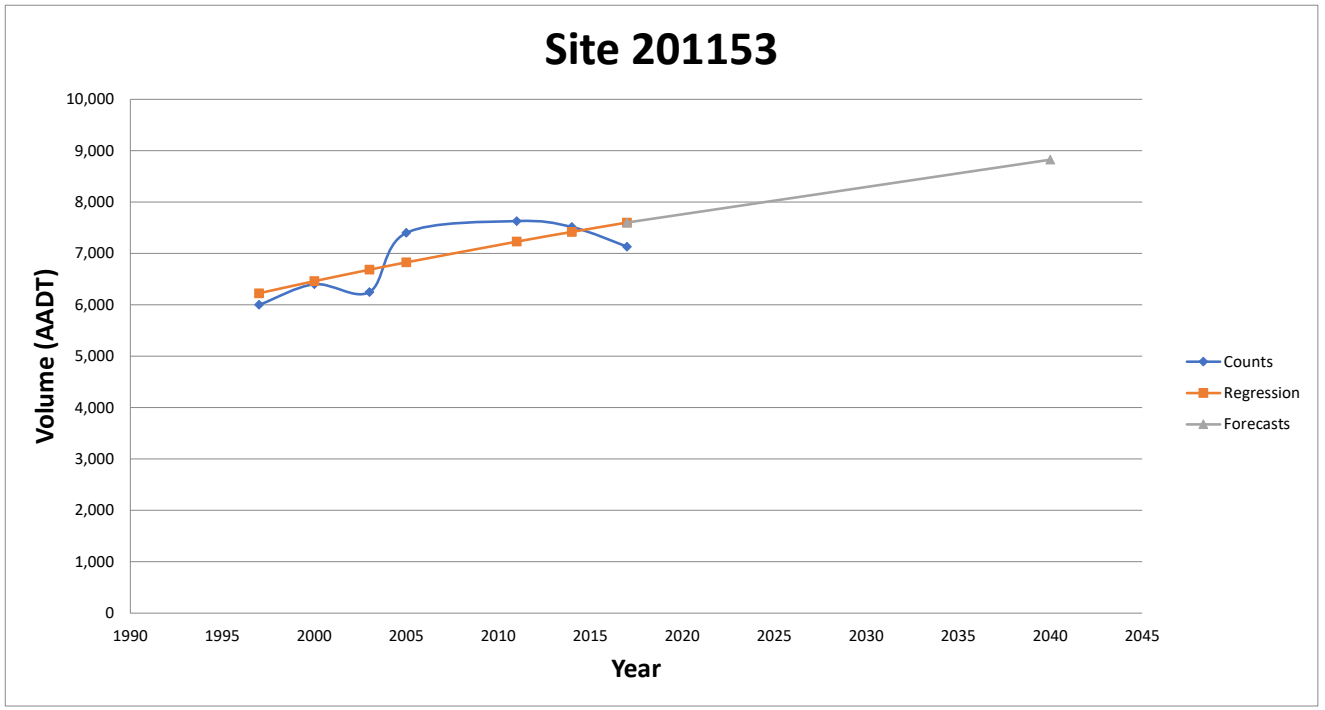
lambda	2.5
R2	0.699
R_adj	0.579
P-Value	0.0191
Significant?	Yes

Year	**Forecast**
2017	8484
2040	9744

	Time Span	**Growth Rate**
COUNT	1997 to 2017	0.80%
REGRESSION	1997 to 2017	0.98%
FORECAST	2017 to 2040	0.65%
R + F	1997 to 2040	0.87%
R + F	2017 to 2040	0.65%

Attachment B
Manual Regression Worksheet - Site 201153

Year	Count	Residual	Forecast	
1997	6,000	-226	6,226	#N/A
2000	6,400	-61	6,461	6,000
2003	6,250	-434	6,684	6280
2005	7,400	573	6,827	6259
2011	7,630	400	7,230	7057.7
2014	7,515	96	7,419	7458.31
2017	7,133	-470	7,602	7497.993



Project ID	
Location	
Site	201153
AAF	0.898

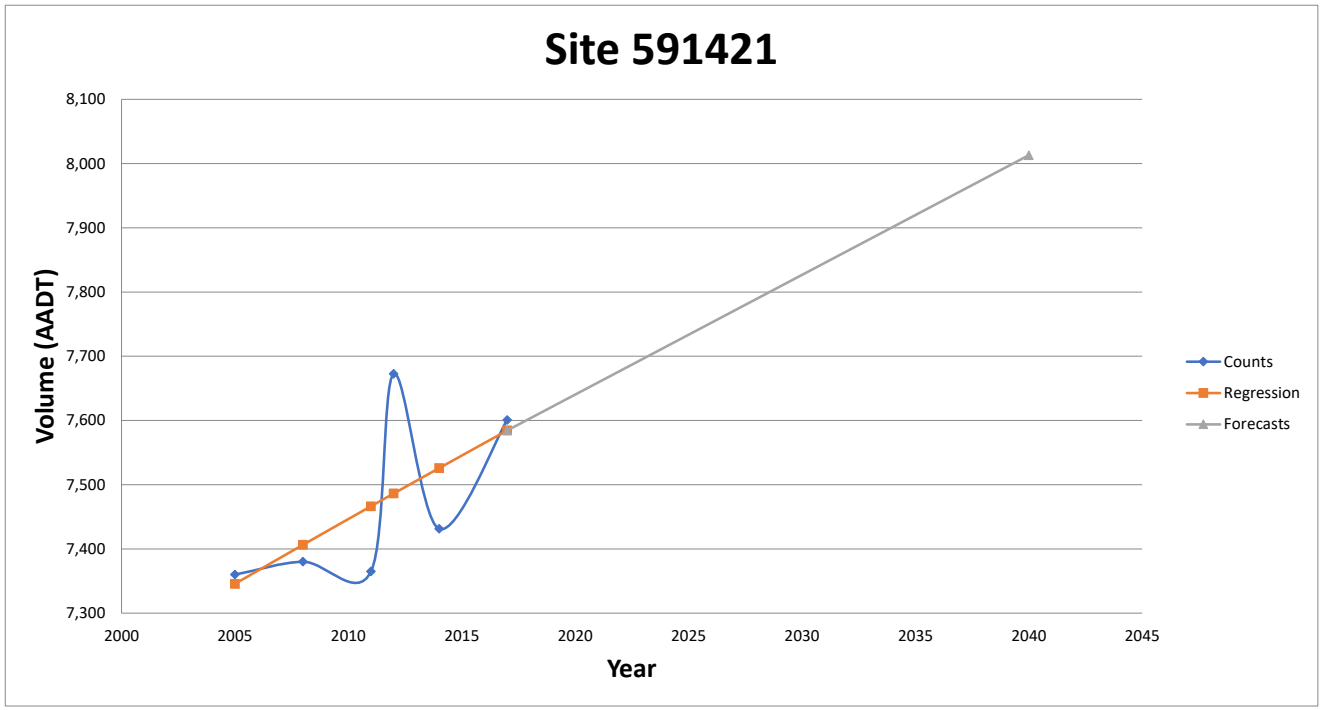
lambda	2.5
R2	0.606
R_adj	0.449
P-Value	0.0391
Significant?	Yes

Year	**Forecast**
2017	7602
2040	8825

	Time Span	**Growth Rate**
COUNT	1997 to 2017	0.94%
REGRESSION	1997 to 2017	1.11%
FORECAST	2017 to 2040	0.70%
R + F	1997 to 2040	0.97%
R + F	2017 to 2040	0.70%

Attachment B
Manual Regression Worksheet - Site 591421

Year	Count	Residual	Forecast	
2005	7,360	14	7,346	#N/A
2008	7,380	-26	7,406	7,360
2011	7,365	-101	7,466	7374
2012	7,673	186	7,486	7367.7
2014	7,431	-95	7,526	7581.06
2017	7,601	16	7,584	7476.193



Project ID	
Location	
Site	591421
AAF	0.898

lambda	2.5
R2	0.389
R_adj	0.083
P-Value	0.1859
Significant?	No

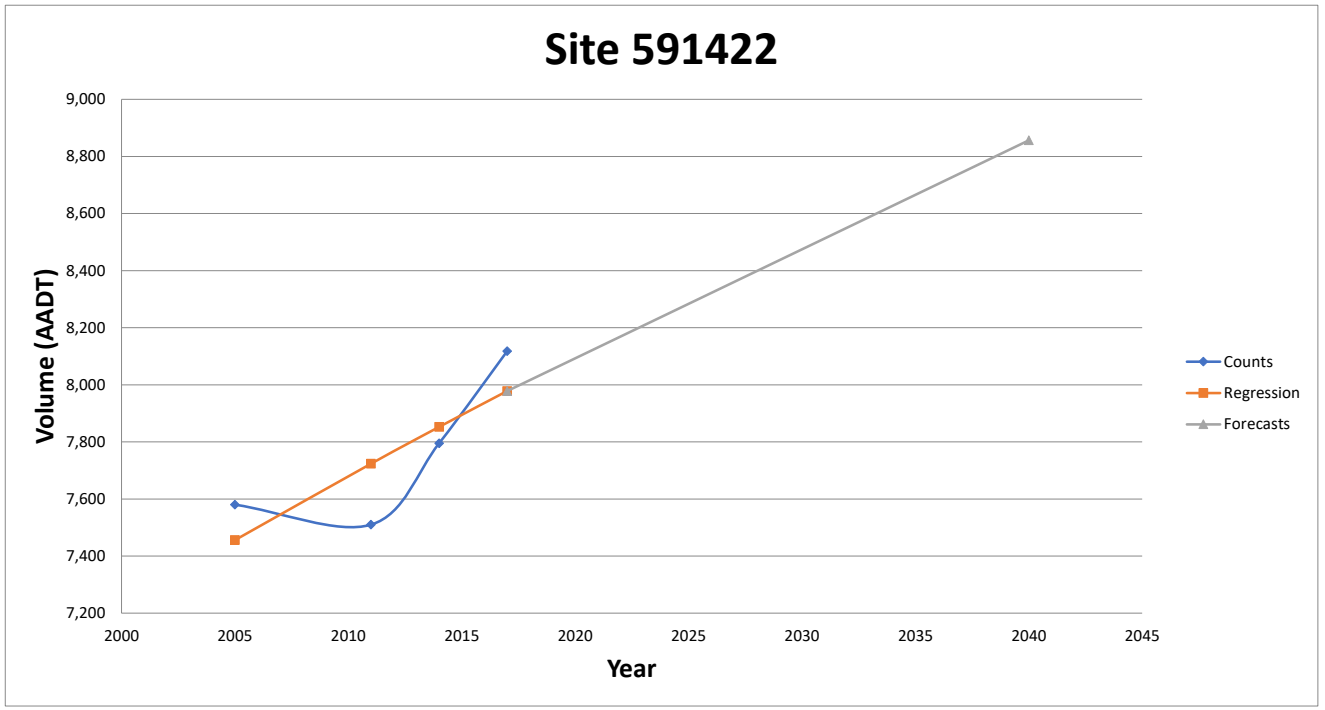
Year	**Forecast**
2017	7584
2040	8013

Smoothed Counts Used in Manual Entry

	Time Span	**Growth Rate**
COUNT	2005 to 2017	0.27%
REGRESSION	2005 to 2017	0.27%
FORECAST	2017 to 2040	0.25%
R + F	2005 to 2040	0.26%
R + F	2017 to 2040	0.25%

Attachment B
Manual Regression Worksheet - Site 591422

Year	Count	Residual	Forecast	
2005	7,580	124	7,456	#N/A
2011	7,510	-214	7,724	7,580
2014	7,795	-57	7,852	7531
2017	8,118	140	7,978	7715.8



Project ID	
Location	
Site	591422
AAF	0.898

lambda	2.5
R2	0.641
R_adj	0.282
P-Value	0.1995
Significant?	No

Year	**Forecast**
2017	7978
2040	8856

	Time Span	**Growth Rate**
COUNT	2005 to 2017	0.59%
REGRESSION	2005 to 2017	0.58%
FORECAST	2017 to 2040	0.48%
R + F	2005 to 2040	0.54%
R + F	2017 to 2040	0.48%

Attachment B
Manual Regression Worksheet - Site 590195

Year	Count	Residual	Forecast	
1999	7,386	-337	7,723	#N/A
2002	8,125	174	7,951	7,386
2005	8,353	191	8,161	7903.3
2007	8,451	159	8,293	8217.74
2008	8,416	60	8,356	8381.197
2011	8,268	-271	8,538	8405.2966
2014	8,544	-166	8,710	8309.0577
2017	8,992	120	8,871	8473.4517

Project ID	
Location	
Site	590195
AAF	0.898

lambda	4
R2	0.781
R_adj	0.708
P-Value	0.0036
Significant?	Yes

Year	**Forecast**
2017	8871
2040	9889

	Time Span	**Growth Rate**
COUNT	1999 to 2017	1.21%
REGRESSION	1999 to 2017	0.83%
FORECAST	2017 to 2040	0.50%
R + F	1999 to 2040	0.68%
R + F	2017 to 2040	0.50%

Attachment B
Manual Regression Worksheet - Site 201022

Year	Count	Residual	Forecast	
1997	980	-82	1,062	#N/A
2000	1,040	10	1,030	980
2003	1,120	123	997	1022
2011	825	-74	899	1090.6
				904.68
				271.404
				81.4212
				24.42636

Project ID	
Location	
Site	201022
AAF	

lambda	2.5
R2	0.325
R_adj	0.349
P-Value	0.4297
Significant?	No

Year	**Forecast**
2011	899
2040	

	Time Span	**Growth Rate**
COUNT	1997 to 2011	-1.13%
REGRESSION	1997 to 2011	-1.09%
FORECAST	2011 to 2040	
R + F	1997 to 2040	
R + F	2011 to 2040	

Attachment B
Manual Regression Worksheet - Site 201021

Year	Count	Residual	Forecast	
1997	860	-55	915	#N/A
2000	905	-6	911	860
2003	1,003	95	907	891.5
2011	851	-45	896	969.2

Project ID	
Location	
Site	201021
AAF	

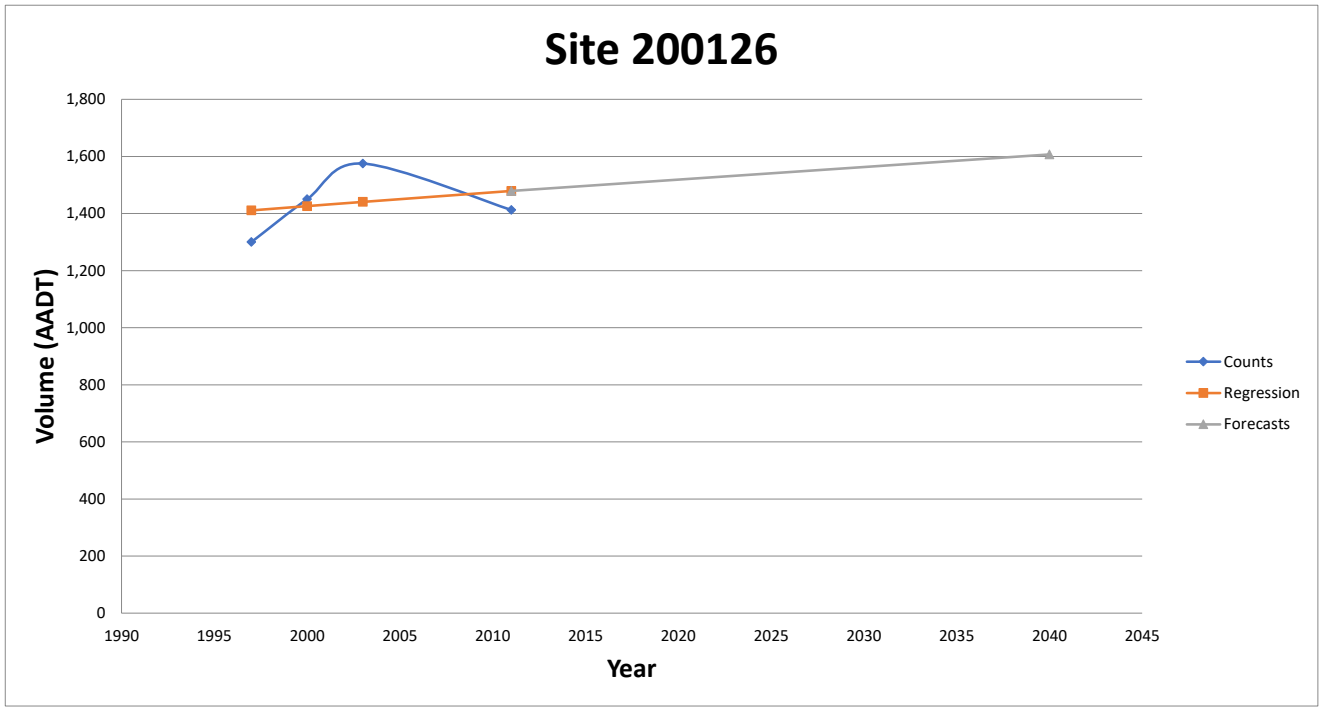
lambda	2.5
R2	0.013
R_adj	0.974
P-Value	0.8862
Significant?	No

Year	**Forecast**
2011	896
2040	855

	Time Span	**Growth Rate**
COUNT	1997 to 2011	-0.07%
REGRESSION	1997 to 2011	-0.15%
FORECAST	2011 to 2040	-0.16%
R + F	1997 to 2040	-0.15%
R + F	2011 to 2040	-0.16%

Attachment B
Manual Regression Worksheet - Site 200126

Year	Count	Residual	Forecast	
1997	1,300	-111	1,411	#N/A
2000	1,450	24	1,426	1,300
2003	1,575	134	1,441	1405
2011	1,413	-66	1,479	1524



Project ID	
Location	
Site	200126
AAF	

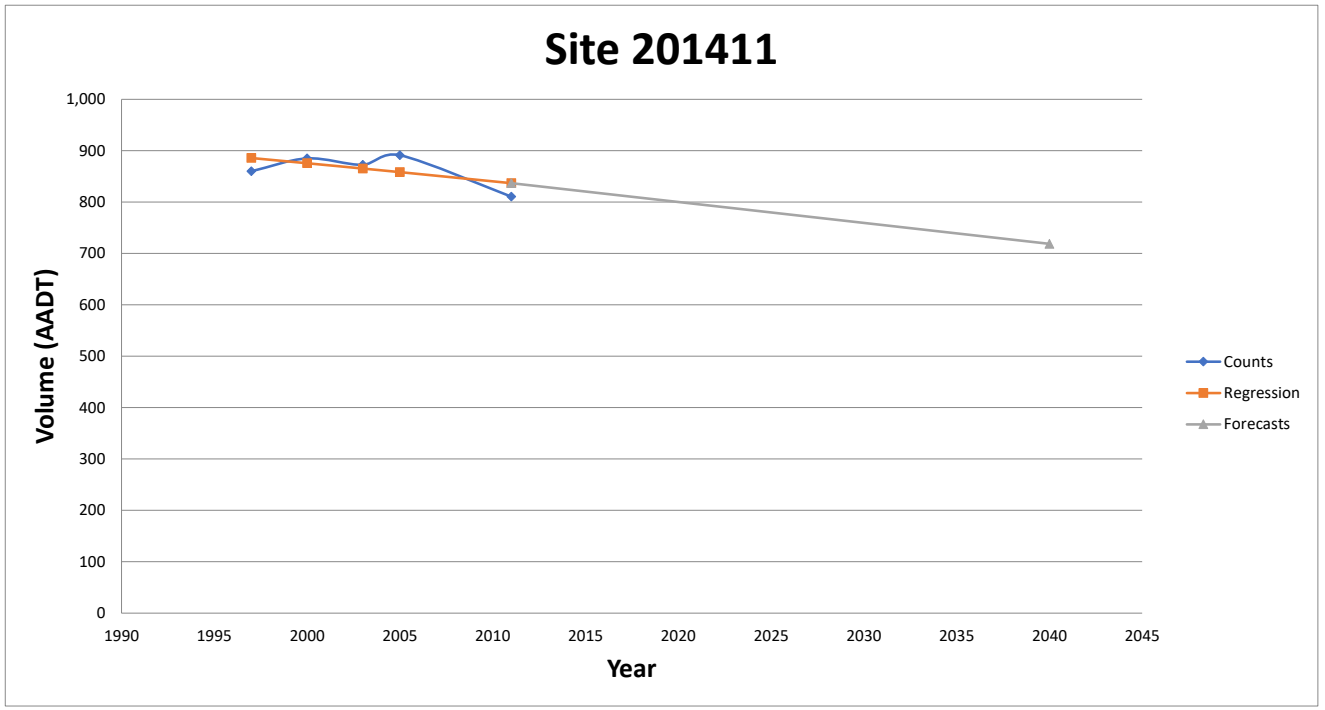
lambda	2.5
R2	0.067
R_adj	0.865
P-Value	0.7404
Significant?	No

Year	**Forecast**
2011	1479
2040	1607

	Time Span	**Growth Rate**
COUNT	1997 to 2011	0.62%
REGRESSION	1997 to 2011	0.35%
FORECAST	2011 to 2040	0.30%
R + F	1997 to 2040	0.32%
R + F	2011 to 2040	0.30%

Attachment B
Manual Regression Worksheet - Site 201411

Year	Count	Residual	Forecast	
1997	860	-26	886	#N/A
2000	885	9	876	860
2003	873	7	865	877.5
2005	891	33	858	874
2011	811	-26	837	886.075



Project ID	
Location	
Site	201411
AAF	

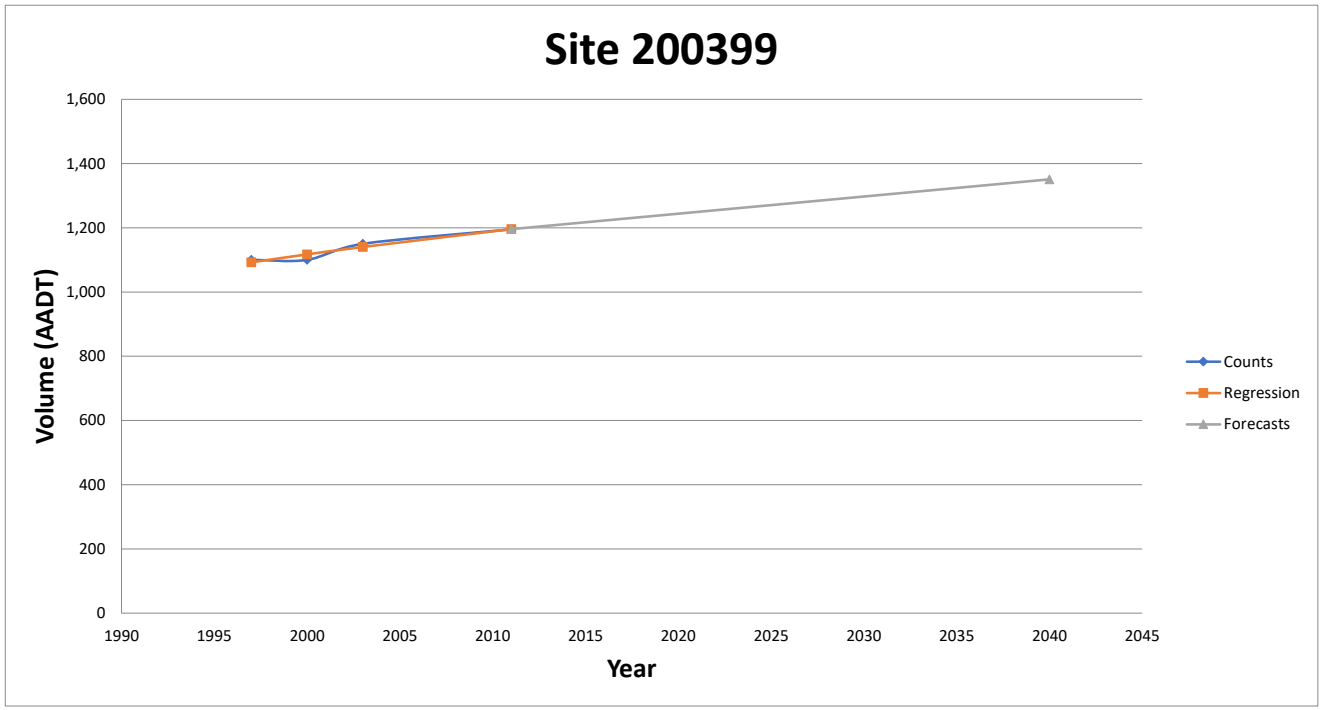
lambda	2.5
R2	0.349
R_adj	0.086
P-Value	0.2946
Significant?	No

Year	**Forecast**
2011	837
2040	719

	Time Span	**Growth Rate**
COUNT	1997 to 2011	-0.41%
REGRESSION	1997 to 2011	-0.39%
FORECAST	2011 to 2040	-0.49%
R + F	1997 to 2040	-0.44%
R + F	2011 to 2040	-0.49%

Attachment B
Manual Regression Worksheet - Site 200399

Year	Count	Residual	Forecast	
1997	1,100	8	1,092	#N/A
2000	1,100	-17	1,117	1,100
2003	1,150	10	1,140	1100
2011	1,195	-1	1,196	1135



Project ID	
Location	
Site	200399
AAF	

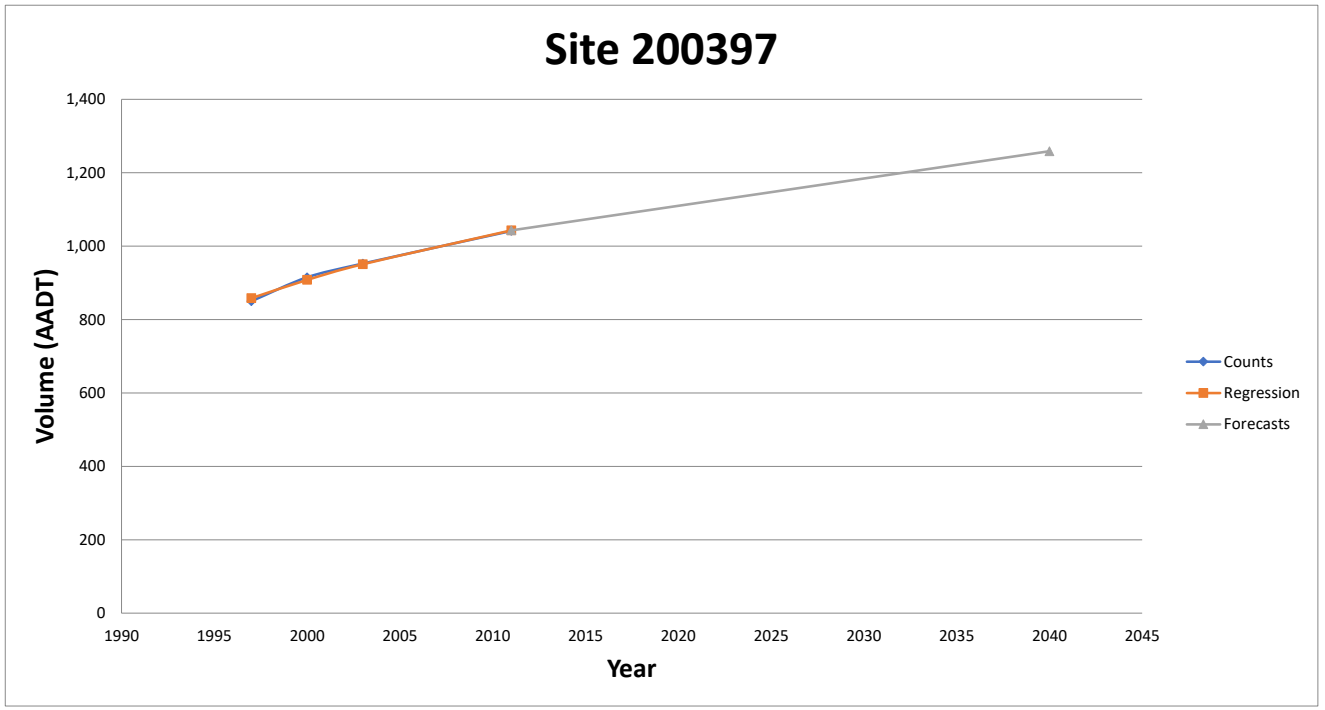
lambda	4
R2	0.939
R_adj	0.879
P-Value	0.0308
Significant?	Yes

Year	**Forecast**
2011	1196
2040	1351

	Time Span	**Growth Rate**
COUNT	1997 to 2011	0.62%
REGRESSION	1997 to 2011	0.68%
FORECAST	2011 to 2040	0.45%
R + F	1997 to 2040	0.55%
R + F	2011 to 2040	0.45%

Attachment B
Manual Regression Worksheet - Site 200397

Year	Count	Residual	Forecast	
1997	850	-8	858	#N/A
2000	915	7	908	850
2003	953	2	951	895.5
2011	1,041	-2	1,043	935.4
				1009.495



Project ID	
Location	
Site	200397
AAF	

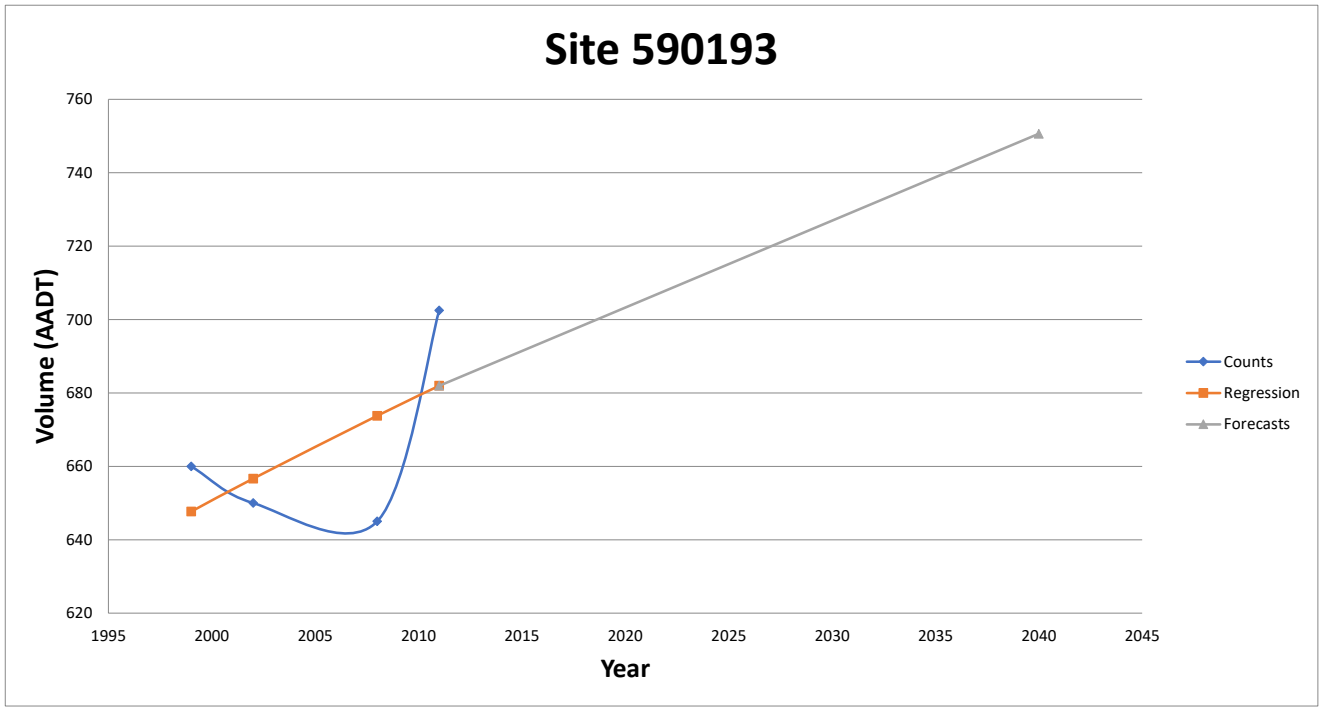
lambda	4
R2	0.996
R_adj	0.992
P-Value	0.0021
Significant?	Yes

Year	**Forecast**
2011	1043
2040	1259

	Time Span	**Growth Rate**
COUNT	1997 to 2011	1.61%
REGRESSION	1997 to 2011	1.54%
FORECAST	2011 to 2040	0.71%
R + F	1997 to 2040	1.09%
R + F	2011 to 2040	0.71%

Attachment B
Manual Regression Worksheet - Site 590193

Year	Count	Residual	Forecast	
1999	660	12	648	#N/A
2002	650	-7	657	660
2008	645	-29	674	653
2011	703	21	682	647.4
				685.97



Project ID	
Location	
Site	590193
AAF	

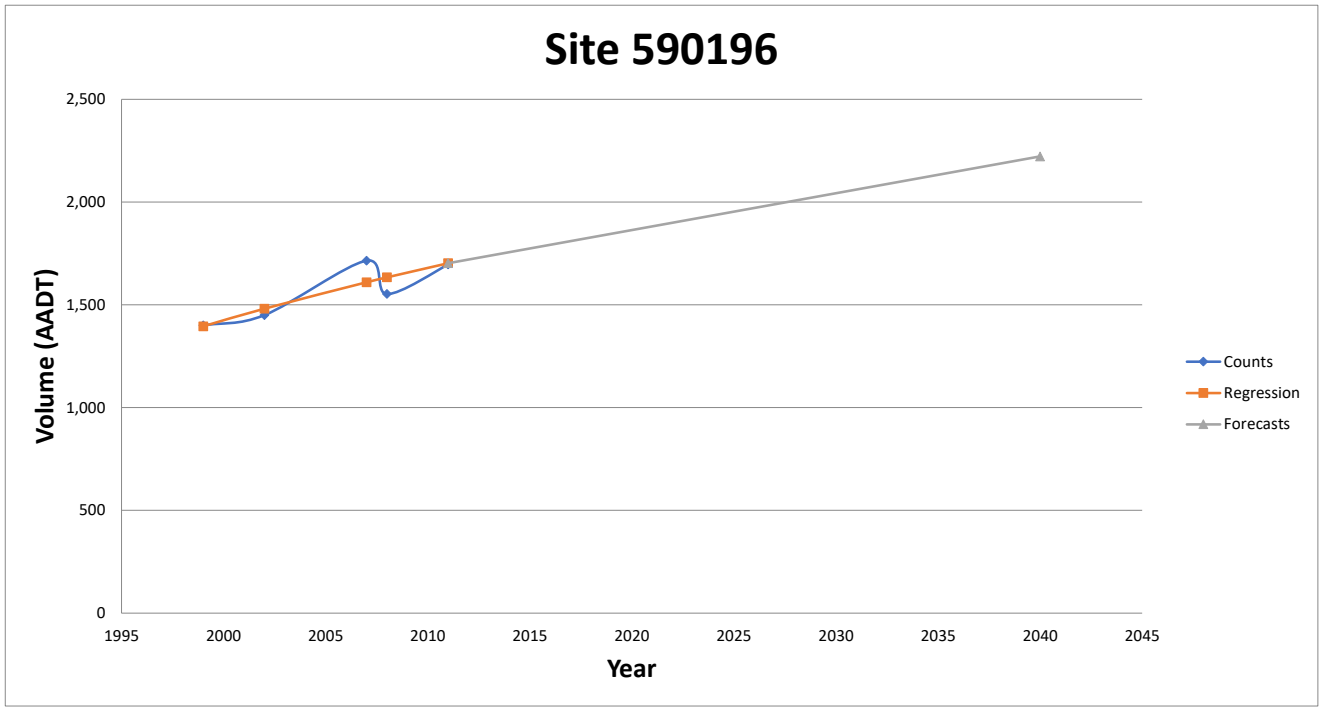
lambda	3.5
R2	0.330
R_adj	0.340
P-Value	0.4257
Significant?	No

Year	**Forecast**
2011	682
2040	751

	Time Span	**Growth Rate**
COUNT	1999 to 2011	0.54%
REGRESSION	1999 to 2011	0.44%
FORECAST	2011 to 2040	0.35%
R + F	1999 to 2040	0.39%
R + F	2011 to 2040	0.35%

Attachment B
Manual Regression Worksheet - Site 590196

Year	Count	Residual	Forecast	
1999	1,400	4	1,396	#N/A
2002	1,450	-31	1,481	1,400
2007	1,715	105	1,610	1435
2008	1,553	-81	1,634	1631
2011	1,696	-6	1,703	1576.05



Project ID	
Location	
Site	590196
AAF	

lambda	2.5
R2	0.738
R_adj	0.563
P-Value	0.0623
Significant?	Yes

Year	**Forecast**
2011	1703
2040	2222

	Time Span	**Growth Rate**
COUNT	1999 to 2011	1.76%
REGRESSION	1999 to 2011	1.83%
FORECAST	2011 to 2040	1.05%
R + F	1999 to 2040	1.45%
R + F	2011 to 2040	1.05%

WisDOT TRAFFIC FORECAST REPORT

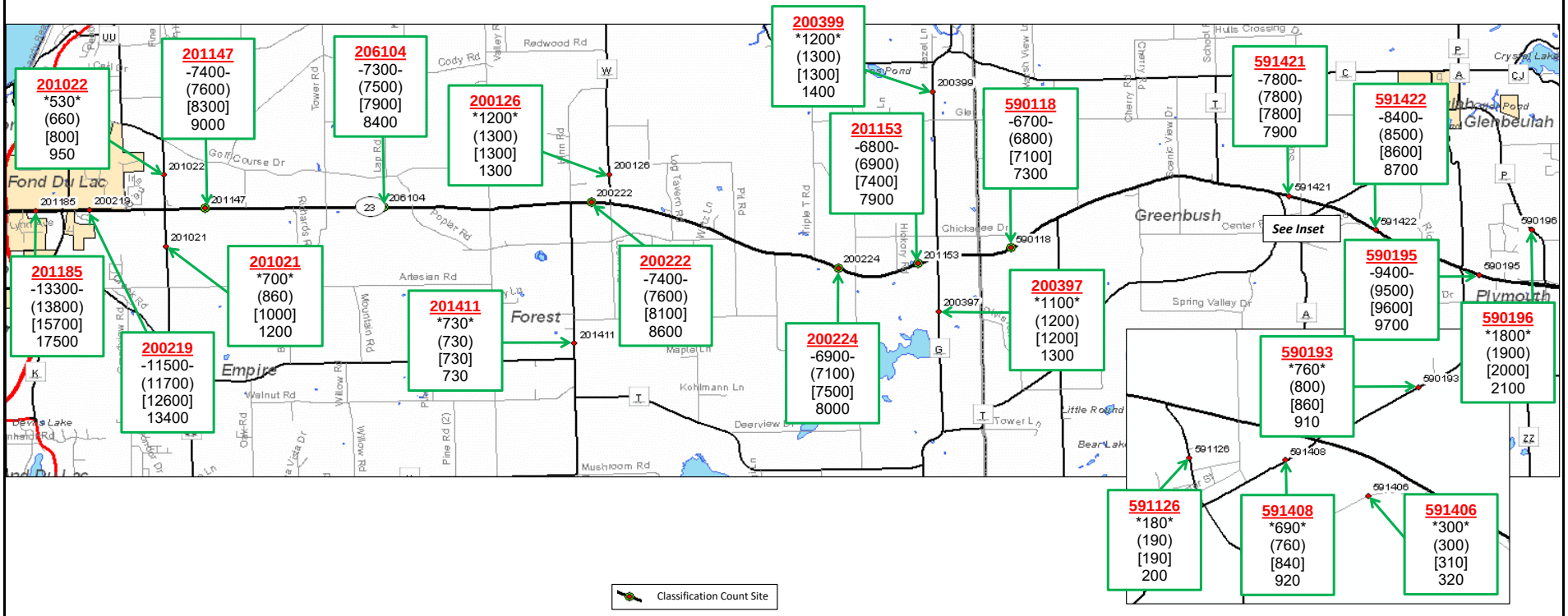
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (No-Build Alternative - TAFIS Incorporated)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Design Values (%)											Truck Classification						
Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	9020	0.96%	9.3	10.0	10.6	12.3	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		8370	0.62%	9.3	10.0	10.7	12.4	60/40	21.6	11.6	1880	12.1	3.3	2.1	8.0	0.2	25.7%
200222		8610	0.70%	9.3	10.0	10.6	12.4	60/40	19.6	10.5	1730	9.8	2.7	2.2	8.4	0.2	23.3%



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Full Vehicle Classification																
Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
+000+	2005 Count	000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH UU, STH 23 is functionally classified as an Urban Principal Arterial (14) for count purposes. From CTH UU to CTH P, STH 23 is functionally classified as a Rural Principal Arterial (2) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast. Traffic Analysis Forecasting Information System output was used as a comparison tool to check against the model output. Adjustments were made as needed.
6. With the exception of the STH 23 Majors project (Four-Lane Build Alternative), roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model were assumed to be in place for the purposes of developing this forecast.

PASSING LANES
TAFIS Incorporated

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	13671	-564	16,980	0.960	16,849	16,914
200219	13,446	10678	9840	-838	12,608	0.921	12,391	12,499
201147	9,022	9961	10200	239	9,261	1.024	9,239	9,250
206104	8,367	9146	9392	245	8,612	1.027	8,591	8,602
200222	8,609	9176	9377	201	8,810	1.022	8,798	8,804
200224	7,985	7881	8097	215	8,200	1.027	8,203	8,202
201153	7,871	7881	8097	215	8,086	1.027	8,086	8,086
590118	7,333	8420	8686	267	7,600	1.032	7,566	7,583
591421	7,861	8122	8357	236	8,097	1.029	8,090	8,093
591422	8,661	8458	8643	184	8,845	1.022	8,849	8,847
590195	9,659	8556	8736	180	9,839	1.021	9,862	9,851
201022	946	868	785	-83	863	0.904	855	859
201021	1,197	912	737	-175	1,022	0.808	967	994
200126	1,344	1069	1073	3	1,348	1.003	1,349	1,348
201411	727	513	512	-1	726	0.998	726	726
200399	1,359	1460	1514	54	1,413	1.037	1,410	1,412
200397	1,308	984	1019	34	1,342	1.035	1,353	1,348
591126	200	392	421	29	229	1.074	215	222
591406	316	7	7	0	316	1.000	316	316
590193	914	1795	1828	33	947	1.018	931	939
591408	922	1691	1673	-18	904	0.989	912	908
590196	2,116	2588	2553	-35	2,081	0.986	2,087	2,084

PASSING LANES
TAFIS Incorporated

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	13,760	15,337						16,914	1.19%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	11,609	12,054						12,499	0.39%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,633	8,441						9,250	1.09%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,487	8,044						8,602	0.76%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,592	8,198						8,804	0.82%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,101	7,651						8,202	0.79%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	6,928	7,507						8,086	0.86%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,805	7,194						7,583	0.58%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,816	7,955						8,093	0.18%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,496	8,672						8,847	0.21%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,490	9,670						9,851	0.19%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	634	746						859	2.11%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	794	894						994	1.43%	
200126	CTH W NORTH OF STH 23	1,247	1,279	1,313						1,348	0.28%	
201411	CTH W SOUTH OF STH 23	726	726	726						726	0.00%	
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,290	1,351						1,412	0.49%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,194	1,271						1,348	0.68%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	193	208						222	0.79%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	812	876						939	0.84%	
591408	CTH A SOUTH OF STH 23	688	756	832						908	1.10%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,912	1,998						2,084	0.47%	

WisDOT TRAFFIC FORECAST REPORT

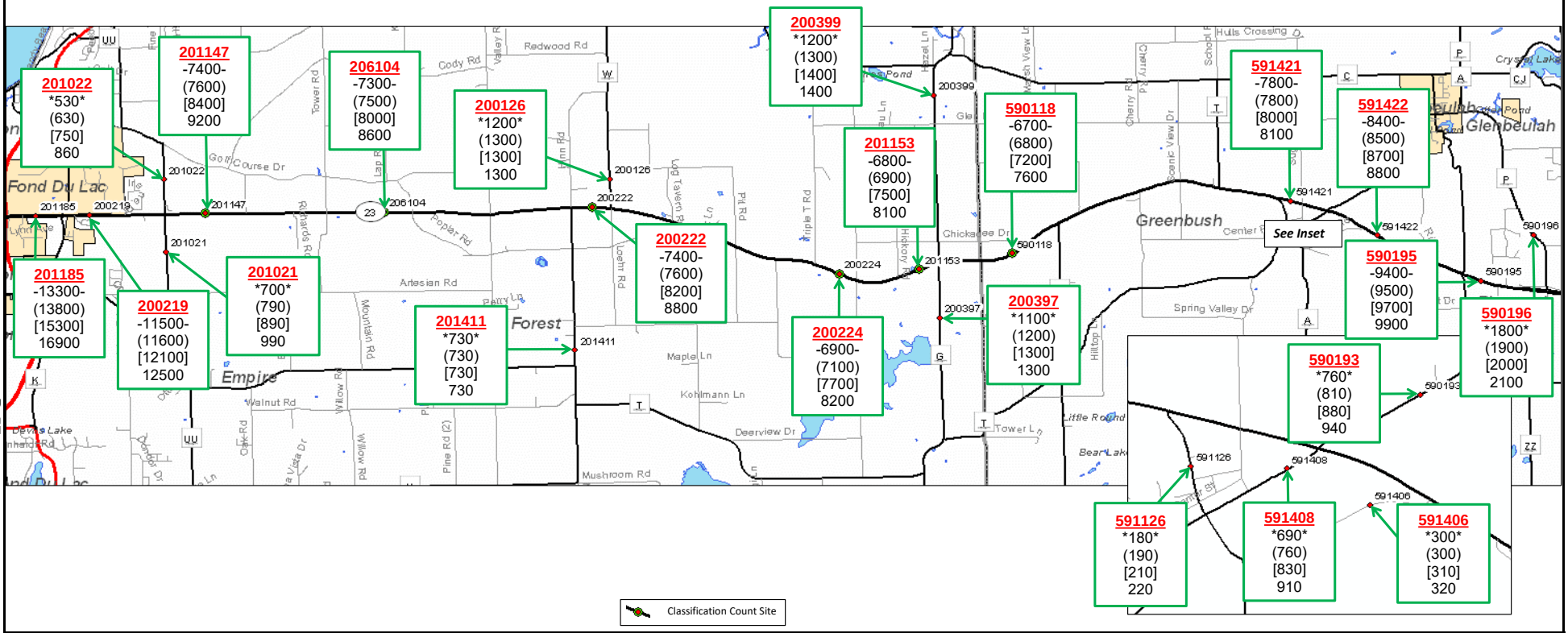
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Passing Lanes Alternative - TAFIS Incorporated)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Design Values (%)											Truck Classification						
Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	9250	1.09%	9.3	9.9	10.6	12.3	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		8600	0.76%	9.3	10.0	10.6	12.4	60/40	20.6	11.0	1790	10.1	2.8	2.3	9.0	0.2	24.5%
200222		8800	0.82%	9.3	10.0	10.6	12.3	60/40	18.7	10.0	1650	7.5	2.1	2.6	9.9	0.2	22.3%



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Full Vehicle Classification

Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
		000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH UU, STH 23 is functionally classified as an Urban Principal Arterial ([14] - in the STH 23 Majors - Passing Lanes Alternative) for count purposes. From CTH UU to CTH P, STH 23 is functionally classified as a Rural Principal Arterial ([2] in the STH 23 Majors - Passing Lanes Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (in addition to the STH 23 Majors Project - Passing Lanes Alternative) were assumed to be in place for the purposes of developing this forecast.

HYBRID
TAFIS Incorporated

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	16543	2,308	19,852	1.162	20,389	20,121
200219	13,446	10678	12592	1,914	15,360	1.179	15,856	15,608
201147	9,022	9961	12942	2,981	12,003	1.299	11,722	11,863
206104	8,367	9146	12271	3,124	11,491	1.342	11,225	11,358
200222	8,609	9176	11855	2,679	11,288	1.292	11,123	11,206
200224	7,985	7881	9892	2,011	9,996	1.255	10,022	10,009
201153	7,871	7881	9892	2,011	9,882	1.255	9,879	9,881
590118	7,333	8420	9652	1,233	8,566	1.146	8,407	8,486
591421	7,861	8122	9254	1,132	8,994	1.139	8,957	8,976
591422	8,661	8458	9427	969	9,629	1.115	9,652	9,641
590195	9,659	8556	9470	914	10,573	1.107	10,691	10,632
201022	946	868	843	-25	921	0.971	919	920
201021	1,197	912	880	-32	1,165	0.965	1,155	1,160
200126	1,344	1069	1779	710	2,054	1.664	2,236	2,145
201411	727	513	479	-34	693	0.933	678	686
200399	1,359	1460	1690	230	1,589	1.157	1,573	1,581
200397	1,308	984	1265	281	1,589	1.286	1,681	1,635
591126	200	392	470	78	278	1.199	240	259
591406	316	7	7	0	316	1.000	316	316
590193	914	1795	1946	151	1,065	1.084	991	1,028
591408	922	1691	1690	-1	921	0.999	922	922
590196	2,116	2588	2570	-19	2,097	0.993	2,100	2,099

HYBRID
TAFIS Incorporated

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	14,179	17,150						20,121	2.24%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	12,014	13,811						15,608	1.57%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	7,974	9,918						11,863	2.63%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,846	9,602						11,358	2.40%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	7,905	9,556						11,206	2.23%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,337	8,673						10,009	1.93%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	7,162	8,521						9,881	2.01%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	6,923	7,705						8,486	1.17%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	7,931	8,453						8,976	0.67%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,600	9,120						9,641	0.62%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,592	10,112						10,632	0.55%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	653	786						920	2.51%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	845	1,003						1,160	2.24%	
200126	CTH W NORTH OF STH 23	1,247	1,526	1,836						2,145	2.48%	
201411	CTH W SOUTH OF STH 23	726	713	700						686	-0.19%	Negative GR (-0.19% for 686; on report, 2020 forecast value set at 624 & grown at 0.5%; 2030=655, 2040=686)
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,343	1,462						1,581	0.96%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,283	1,459						1,635	1.56%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	205	232						259	1.49%	
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	302	309						316	0.24%	
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	840	934						1,028	1.24%	
591408	CTH A SOUTH OF STH 23	688	761	841						922	1.17%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,917	2,008						2,099	0.49%	

WisDOT TRAFFIC FORECAST REPORT

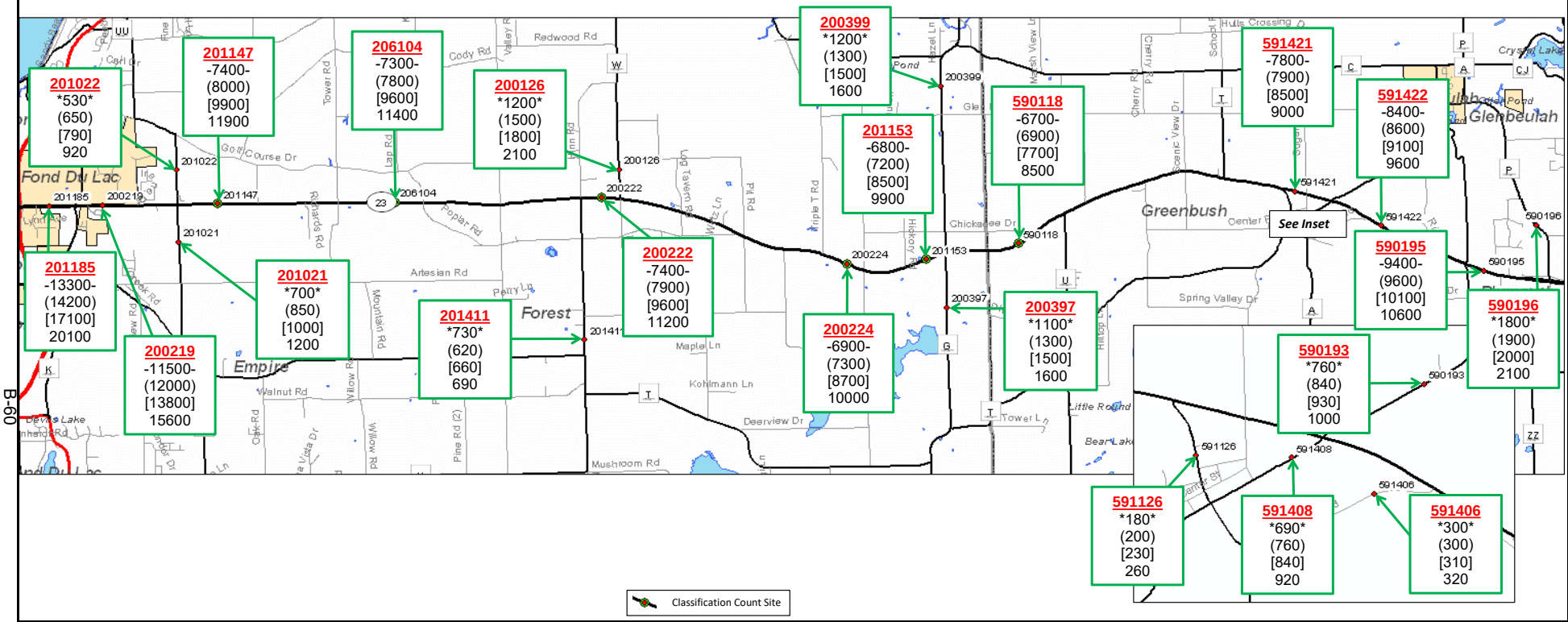
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Hybrid Alternative - TAFIS Incorporated)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
		Design Values (%)									Truck Classification						
201147	STH 23	11860	2.63%	9.9	11.1	12.1	14.8	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		11360	2.40%	9.9	11.1	12.1	14.8	60/40	20.6	11.0	1790	10.1	2.8	2.3	9.0	0.2	24.5%
200222		11210	2.23%	10.0	11.2	12.2	14.8	60/40	18.7	10.0	1650	7.5	2.1	2.6	9.9	0.2	22.3%



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Full Vehicle Classification

Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
		000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH G, STH 23 is functionally classified as an expressway ([4] in the STH 23 Majors - Hybrid Alternative) for count purposes. From CTH G to CTH P, STH 23 is functionally classified as a Rural Principal Arterial ([2] in the STH 23 Majors - Hybrid Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (in addition to the STH 23 Majors Project - Hybrid Alternative) were assumed to be in place for the purposes of developing this forecast.

FOUR-LANE BUILD
TAFIS Incorporated

TRADAS ID	Final No-Build Forecast Volume	Forecast Year Unadjusted TDM No Build Assignment	Forecast Year Unadjusted TDM Build Assignment	Absolute Difference	Absolute Difference Forecast	Percent Difference	Percent Difference Forecast	Average Forecast
201185	17,544	14235	17442	3,207	20,751	1.225	21,497	21,124
200219	13,446	10678	13535	2,857	16,303	1.268	17,044	16,673
201147	9,022	9961	13930	3,969	12,991	1.398	12,616	12,803
206104	8,367	9146	13265	4,119	12,486	1.450	12,135	12,310
200222	8,609	9176	12872	3,696	12,305	1.403	12,077	12,191
200224	7,985	7881	11043	3,161	11,146	1.401	11,188	11,167
201153	7,871	7881	11043	3,161	11,032	1.401	11,028	11,030
590118	7,333	8420	11388	2,968	10,302	1.353	9,919	10,110
591421	7,861	8122	11160	3,039	10,900	1.374	10,803	10,851
591422	8,661	8458	11013	2,554	11,215	1.302	11,276	11,245
590195	9,659	8556	11076	2,519	12,178	1.294	12,503	12,341
201022	946	868	878	10	956	1.012	957	957
201021	1,197	912	884	-28	1,168	0.969	1,159	1,164
200126	1,344	1069	1796	727	2,071	1.680	2,258	2,164
201411	727	513	484	-29	698	0.943	686	692
200399	1,359	1460	1890	430	1,790	1.295	1,760	1,775
200397	1,308	984	1361	376	1,684	1.382	1,807	1,746
591126	200	392	313	-79	121	0.799	160	140
591406	316	7	3	-4	312	0.375	118	215
590193	914	1795	2044	249	1,164	1.139	1,041	1,102
591408	922	1691	1917	225	1,148	1.133	1,045	1,096
590196	2,116	2588	2371	-218	1,898	0.916	1,938	1,918

FOUR-LANE BUILD
TAFIS Incorporated

Site ID	Road Name	COUNT	2020	2030	0	0	0	0	0	2040	Growth Rate	Notes
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	13,287	14,310	17,717						21,124	2.56%	
200219	STH 23 EAST OF CTH K FOND DU LAC	11,475	12,153	14,413						16,673	1.97%	
201147	STH 23 BTWN CTH UU & TAFT RD EMPIRE TNSHP - HPMS	7,391	8,097	10,450						12,803	3.18%	
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	7,319	7,970	10,140						12,310	2.96%	
200222	STH 23 WEST OF CTH W TO THE NORTH	7,410	8,034	10,112						12,191	2.80%	
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	6,936	7,488	9,327						11,167	2.65%	
201153	STH 23 WEST OF CTH G FOREST TNSHP - HPMS	6,754	7,312	9,171						11,030	2.75%	
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	6,688	7,135	8,622						10,110	2.22%	
591421	STH 23 BTWN CTH T SOUTH & SUGAR BUSH RD	7,774	8,175	9,513						10,851	1.72%	
591422	STH 23 BTWN CTH A & PLANK RD GREENBUSH	8,444	8,809	10,027						11,245	1.44%	
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,436	9,815	11,078						12,341	1.34%	
201022	CTH UU NORTH OF STH 23 EMPIRE TNSHP	532	664	810						957	2.75%	
201021	CTH UU SOUTH OF STH 23 EMPIRE TNSHP	704	846	1,005						1,164	2.26%	
200126	CTH W NORTH OF STH 23	1,247	1,532	1,848						2,164	2.54%	
201411	CTH W SOUTH OF STH 23	726	715	704						692	-0.16%	Negative GR (-0.16% for 692; on report, 2020 forecast value set at 629 & grown at 0.5%; 2030=660, 2040=692; 0% assumed for TM forecast)
200399	CTH G SOUTH OF CTH CCC FOREST TNSHP	1,236	1,403	1,589						1,775	1.50%	
200397	CTH G SOUTH OF STH 23 FOREST TNSHP	1,125	1,318	1,532						1,746	1.90%	
591126	CTH T BTWN STH 23 & CEDAR LN GREENBUSH	181	168	154						140	-0.77%	Negative GR (-0.77% for 140; on report, 2020 forecast value set at 127 & grown at 0.5%; 2030=133, 2040=140)
591406	PLANK RD BTWN STH 23 & CEMETERY LN GREENBUSH	295	270	243						215	-0.94%	Negative GR (-0.94% for 215; on report, 2020 forecast value set at 195 & grown at 0.5%; 2030=205, 2040=214)
590193	CTH A NORTHEAST OF STH 23 GREENBUSH TNSHP	756	863	983						1,102	1.58%	
591408	CTH A SOUTH OF STH 23	688	815	956						1,096	2.05%	
590196	CTH P BTWN RED FOX RUN & NRAMCJ RD PLYMOUTH TNSHP	1,835	1,861	1,889						1,918	0.16%	

WisDOT TRAFFIC FORECAST REPORT

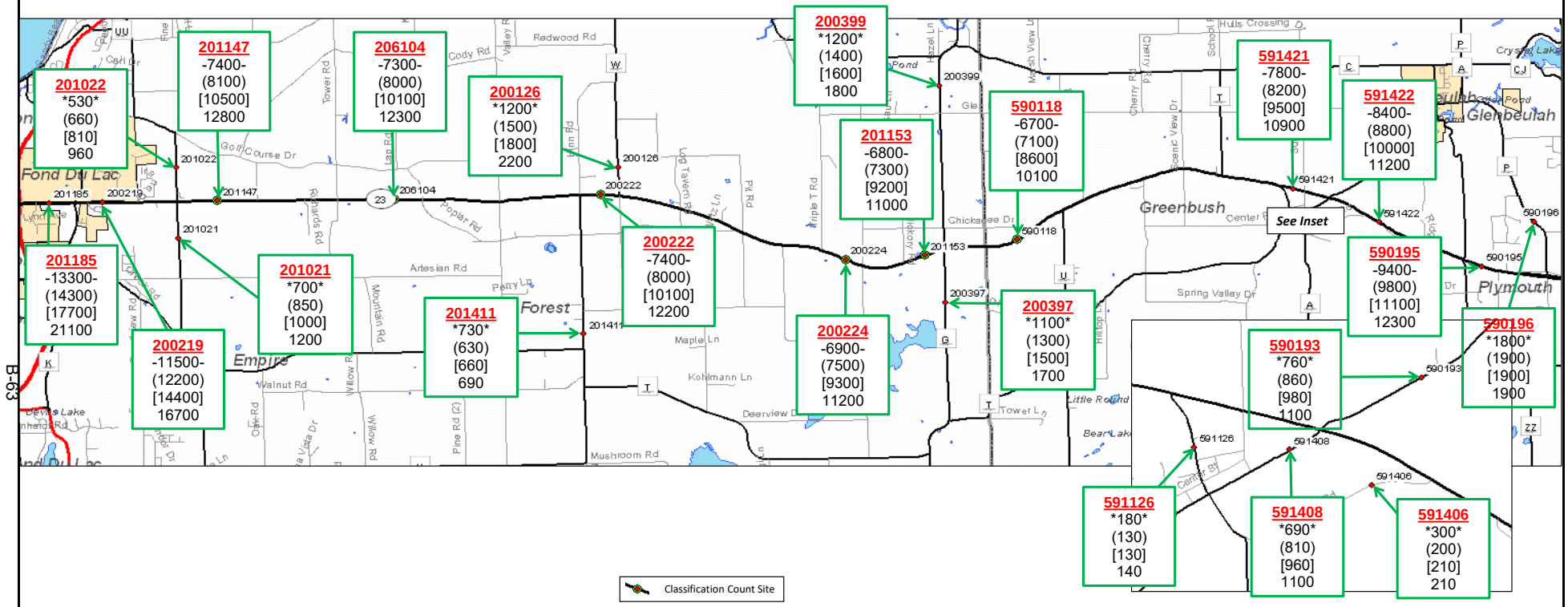
PROJECT ID(S): 1440-13-00 & 1440-15-00
ROUTE(S): STH 23 (Four-Lane Build Alternative - TAFIS Incorporated)

Region/COUNTY(IES): NE / Fond du Lac & Sheboygan
LOCATION: USH 151 - CTH P
COMPLETED: April 6, 2018

Developed by: Chris Chritton
Phone: (608) 266-0194
FAX: (608) 267-0294
E-Mail: chris.chritton@dot.wi.gov

Traffic Forecasting Section; Bureau of Planning and Economic Development; Division of Transportation Investment Management

Design Values (%)											Truck Classification						
Site(s)	Route(s)	Volume(s)	Site Growth %	K250	K100	K30	P	D(Dsgn. Hr.)	T(DHV)	T(PHV)	AADTT	2D	3AX	2S1+2S2	3-S2	DBL-BTM	Total %
201147	STH 23	12800	3.18%	9.9	11.1	12.0	14.7	60/40	19.1	10.2	1680	9.6	2.6	2.1	8.1	0.2	22.7%
206104		12310	2.96%	9.9	11.1	12.1	14.7	60/40	21.6	11.6	1880	12.1	3.3	2.1	8.0	0.2	25.7%
200222		12190	2.80%	9.9	11.1	12.1	14.7	60/40	19.6	10.5	1730	9.8	2.7	2.2	8.4	0.2	23.3%



Full Vehicle Classification																
Site(s)	Route(s)	MC	CARS	SU2-4	BUSES	SU2-6	SU3	SU4+	ST4-	ST5	ST6+	MU5-	MU6	MU7+	TRUCKS	TOTAL
201147	STH 23	0.5	58.6	18.2	2.1	7.6	1.8	0.8	2.1	7.6	0.5	0.1	0.0	0.0	22.7	100.0
206104		0.5	56.4	17.5	2.6	9.5	2.3	1.0	2.1	7.5	0.5	0.1	0.0	0.0	25.7	100.0
200222		0.5	58.2	18.1	2.1	7.7	1.9	0.8	2.2	7.9	0.5	0.1	0.0	0.0	23.3	100.0
200224		0.5	56.7	17.6	2.8	10.3	2.5	1.1	1.7	6.2	0.4	0.1	0.0	0.0	25.2	100.0
201153		0.5	57.3	17.8	2.2	8.0	1.9	0.8	2.3	8.5	0.5	0.1	0.1	0.0	24.5	100.0
590118		0.5	58.9	18.3	1.6	5.9	1.4	0.6	2.6	9.4	0.6	0.1	0.1	0.0	22.3	100.0

N

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2017 Count	(000)	2020 AADT
000	2011 Count	[000]	2030 AADT
+000+	2005 Count	000	2040 AADT

NOTES ON THE FORECAST:

1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.
2. Design values provided on forecast report are statewide average values. Design values employed in operational analysis are specific to the STH 23 corridor.
3. Single-unit and combination-unit truck percentages were taken from observed 2017 Wisconsin vehicle classification data. Statewide average data (RoadRunner 2016 AC14 report) were used to assign percentages to individual vehicle classifications.
4. From USH 151 to CTH UU, STH 23 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From CTH UU to CTH P, STH 23 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). From USH 151 to CTH P, STH 23 is functionally classified as an expressway (in the STH 23 Majors - Four-Lane Build Alternative) for count purposes.
5. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast.
6. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model (including the STH 23 Majors Project - Four-Lane Build Alternative) were assumed to be in place for the purposes of developing this forecast.

ALTERNATIVES SUMMARY
TAFIS Incorporated

TRADAS ID	LOCATION	No-Build 2040 Forecast	Passing Lane 2040 Forecast	Hybrid 2040 Forecast	4-Lane Build 2040 Forecast
201185	STH 23 BTWN WISCONSIN AMERICAN DR & CTH K FOND DU LAC	17,500	16,900	20,100	21,100
200219	STH 23 EAST OF CTH K FOND DU LAC	13,400	12,500	15,600	16,700
206104	STH 23 WEST OF CTH W SOUTH FOREST- HPMS	8,400	8,600	11,400	12,300
200222	STH 23 WEST OF CTH W TO THE NORTH	8,600	8,800	11,200	12,200
200224	STH 23 BTWN TRIPLE T & HILLVIEW RDS FOREST TNSHP - HPMS	8,000	8,200	10,000	11,200
590118	STH 23 BTWN DIVISION RD & CHICKADEE DR GREENBUSH TNSHP - HPMS	7,300	7,600	8,500	10,100
590195	STH 23 WEST OF CTH P PLYMOUTH TNSHP	9,700	9,900	10,600	12,300

Attachment C

Technical Documentation – NERTDM Version 8 and 8a

Changes to NERTDM version 8 inputs, including socioeconomic inputs, were made for the NEPA analysis presented in this Appendix. NERTDM version 8a incorporates these changes. The changes, and the resulting differences in key measures of error between NERTDM versions 8 and 8a are presented in this Attachment.

Adjustments to NERTDM Version 8 Socioeconomic Data

The BLRPC last updated its long-range transportation plan in 2015. As part of the LRTP update, and the development of NERTDM version 8, Sheboygan County socioeconomic data was edited to reflect the preferred land use scenario specified through the LRTP update process.

For the WIS 23 forecast effort, WisDOT conferred with BLRPC to identify any adjustments to the socioeconomic data that may have become necessary since completion of the plan update. Several adjustments to Sheboygan County employment data resulted, and are documented here.

Similar coordination with the ECWRPC (for the Fond du Lac County portion of the WIS 23 corridor) found no changes to the socioeconomic data were necessary.

Changes to NERTDM version 8 Sheboygan County socioeconomic data described below were made in consultation with Jeff Agee-Aguayo (of the BLRPC) in telephone and email communications during August - November, 2017[1].

2010 Socioeconomic Data Edits – Sheboygan County

+ Zone 1762: 40 employees increased to 41.
+ Zone 1898: 85 employees reduced to 83.
+ Zone 1899: 97 employees reduced to 91.

2045 Socioeconomic Data Edits – Sheboygan County

+ Zone 1749: 4 employees increased to 5
+ Zone 1761: 30 employees increased to 37.
+ Zone 1762: 54 employees increased to 66.
+ Zone 1763: 3 employees increased to 4.
+ Zone 1764: 10 employees increased to 12.
+ Zone 1765: 8 employees increased to 9
+ Zone 1898: 106 employees increased to 129
+ Zone 1899: 124 employees increased to 151
+ Zone 1902: 490 employees increased to 599

Other than those described above, no adjustments were made to the base- or future-year socioeconomic data employed in this forecast effort. Going forward, the NERTDM version 8a socioeconomic data sets incorporate the changes described above.

[1] Email correspondence related to NERTDM socioeconomic data edits made for the WIS 23 forecast effort have been placed in the project file.

The resulting socioeconomic characteristics of the STH 23 corridor TAZs assumed for this forecast effort are summarized in **Table 1** following this page. **Figures 1 – 8** graphically depict the socioeconomic characteristics shown in **Table 1**, and those of the surrounding area.

Table 1: Socioeconomic Characteristics of the STH 23 Corridor TAZs

TAZ	2010 Households	2045 Households	Change in Households, 2010 - 2045	% Change in Households, 2010 - 2045	2010 Jobs	2045 Jobs	Change in Employment, 2010 - 2045	% Change in Employment, 2010 - 2045
1226	75	76	1	1	11	21	10	91
1227	14	14	0	0	216	459	243	113
1228	83	106	23	28	165	318	153	93
1229	125	139	14	11	14	181	167	1193
1354	8	32	24	300	5	5	0	0
1359	105	147	42	40	10	10	0	0
1360	49	163	114	233	36	224	188	522
1363	1	28	27	2700	0	0	0	0
1365	120	140	20	17	148	1028	880	595
1366	46	418	372	809	27	27	0	0
1368	276	276	0	0	83	83	0	0
1369	49	118	69	141	4	4	0	0
1370	105	127	22	21	34	35	1	3
1371	40	91	51	128	8	17	9	113
1372	23	71	48	209	7	58	51	729
1373	16	16	0	0	2	12	10	500
1374	19	19	0	0	3	3	0	0
1375	11	11	0	0	2	2	0	0
1444	273	287	14	5	24	24	0	0
1445	268	318	50	19	284	359	75	26
1446	136	160	24	18	39	73	34	87
1448	52	55	3	6	10	43	33	330
1449	75	86	11	15	154	198	44	29
1456	104	113	9	9	30	98	68	227
1748	56	120	64	114	5	6	1	20
1749	42	42	0	0	3	5	2	67
1760	84	135	51	61	66	84	16	24
1761	149	171	22	15	24	37	13	54
1762	45	52	7	16	41	66	25	61
1763	37	37	0	0	2	4	2	100
1764	20	20	0	0	8	12	4	50
1765	220	256	36	16	6	9	3	50
1898	300	365	65	22	83	129	46	55
1899	204	234	30	15	91	151	60	66
1902	174	225	51	29	400	599	199	50

Figure 1- State Highway 23 Corridor: 2010 Employment by Traffic Analysis Zone (TAZ)

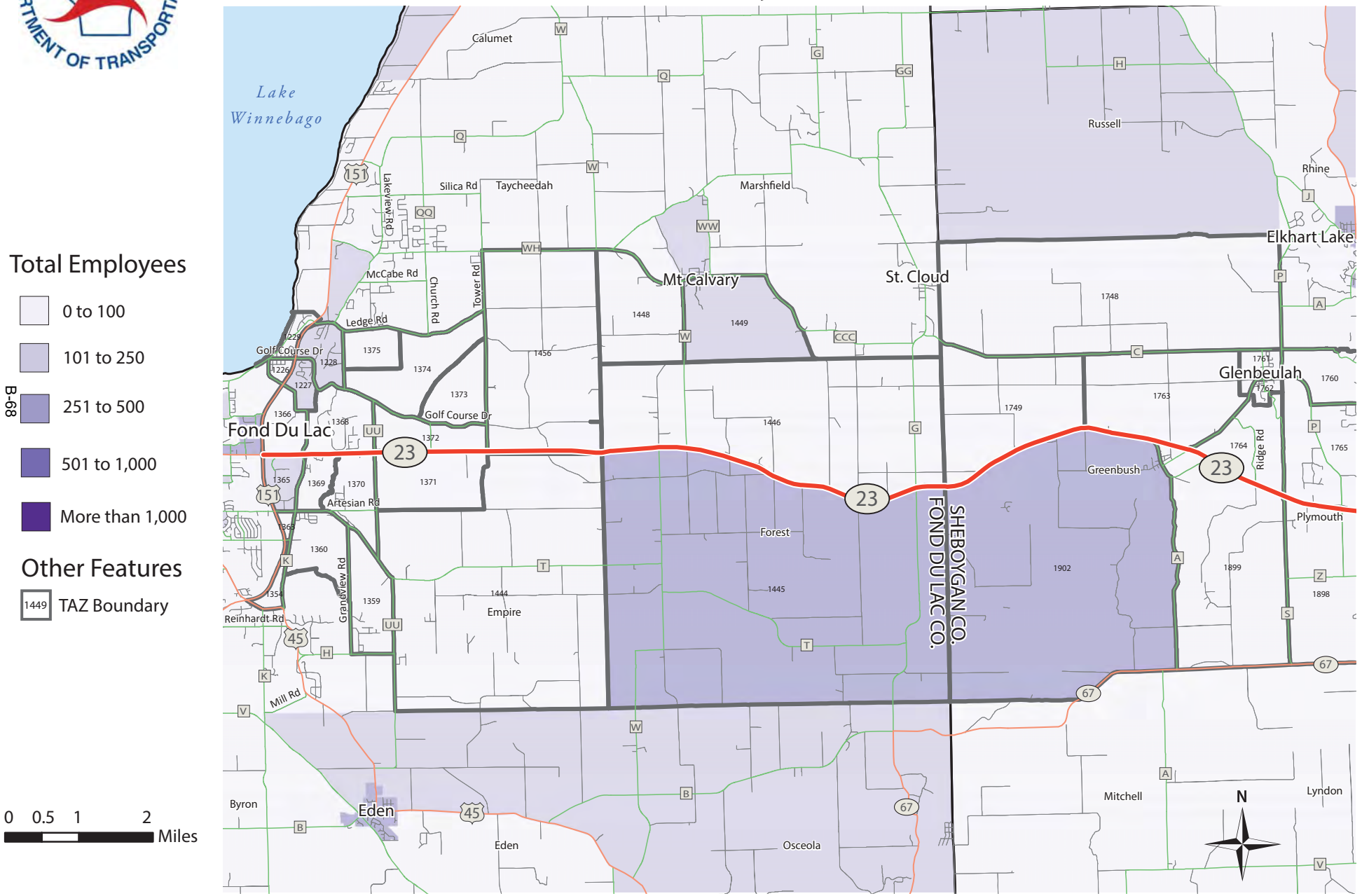


Figure 2- State Highway 23 Corridor: 2045 Employment by Traffic Analysis Zone (TAZ)

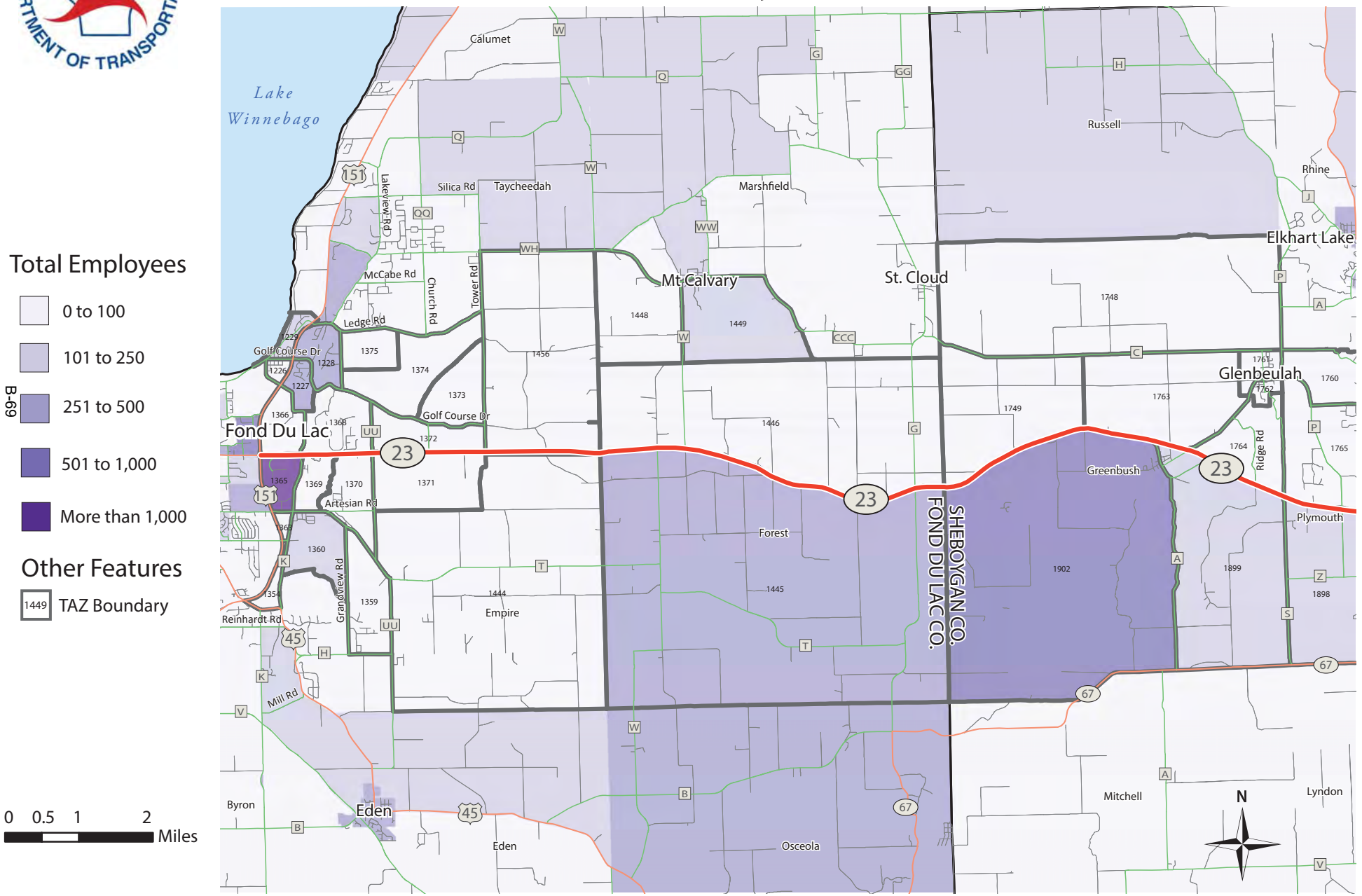


Figure 3- State Highway 23 Corridor: 2010 Households by Traffic Analysis Zone (TAZ)

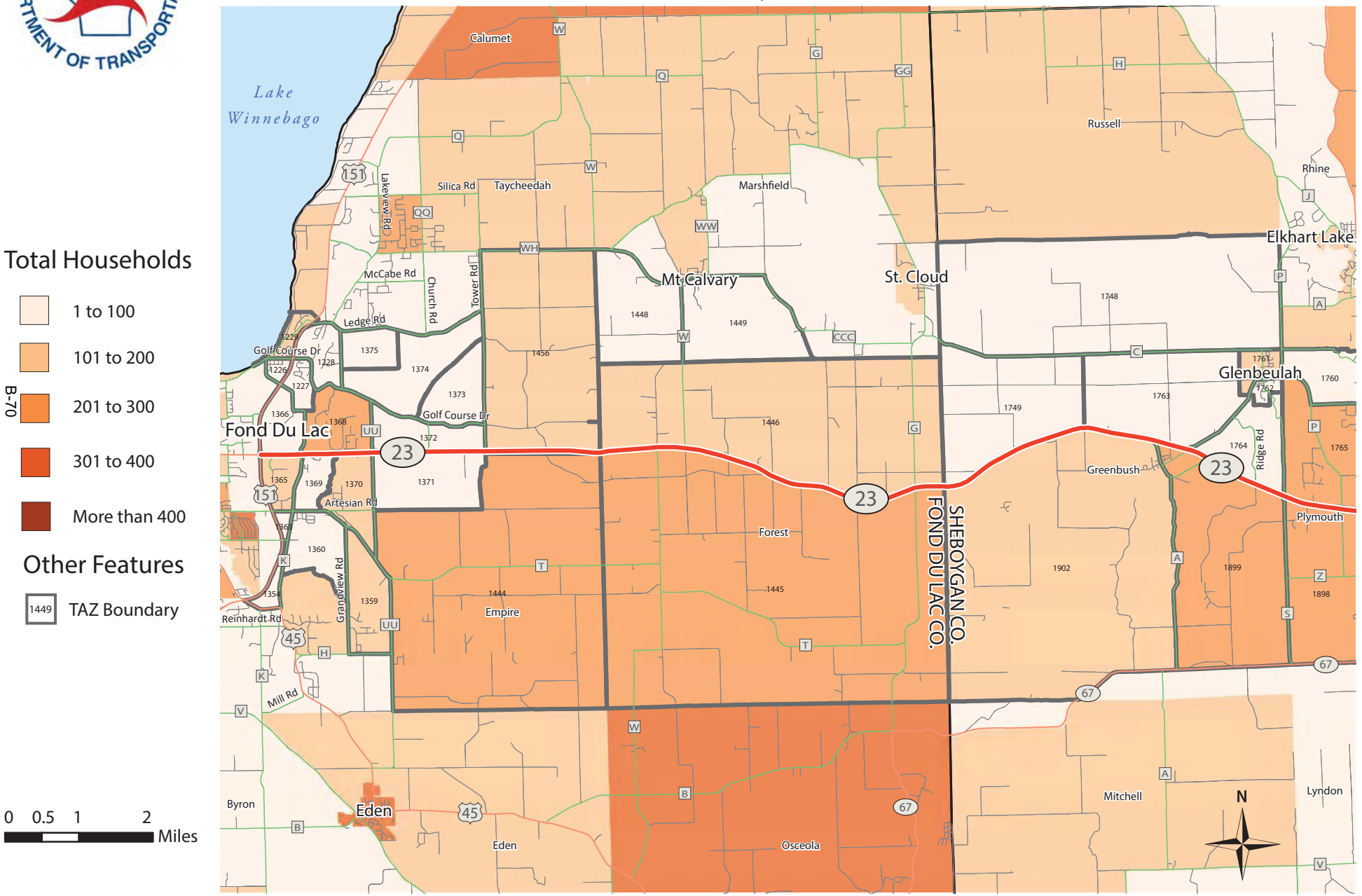


Figure 4- State Highway 23 Corridor: 2045 Households by Traffic Analysis Zone (TAZ)

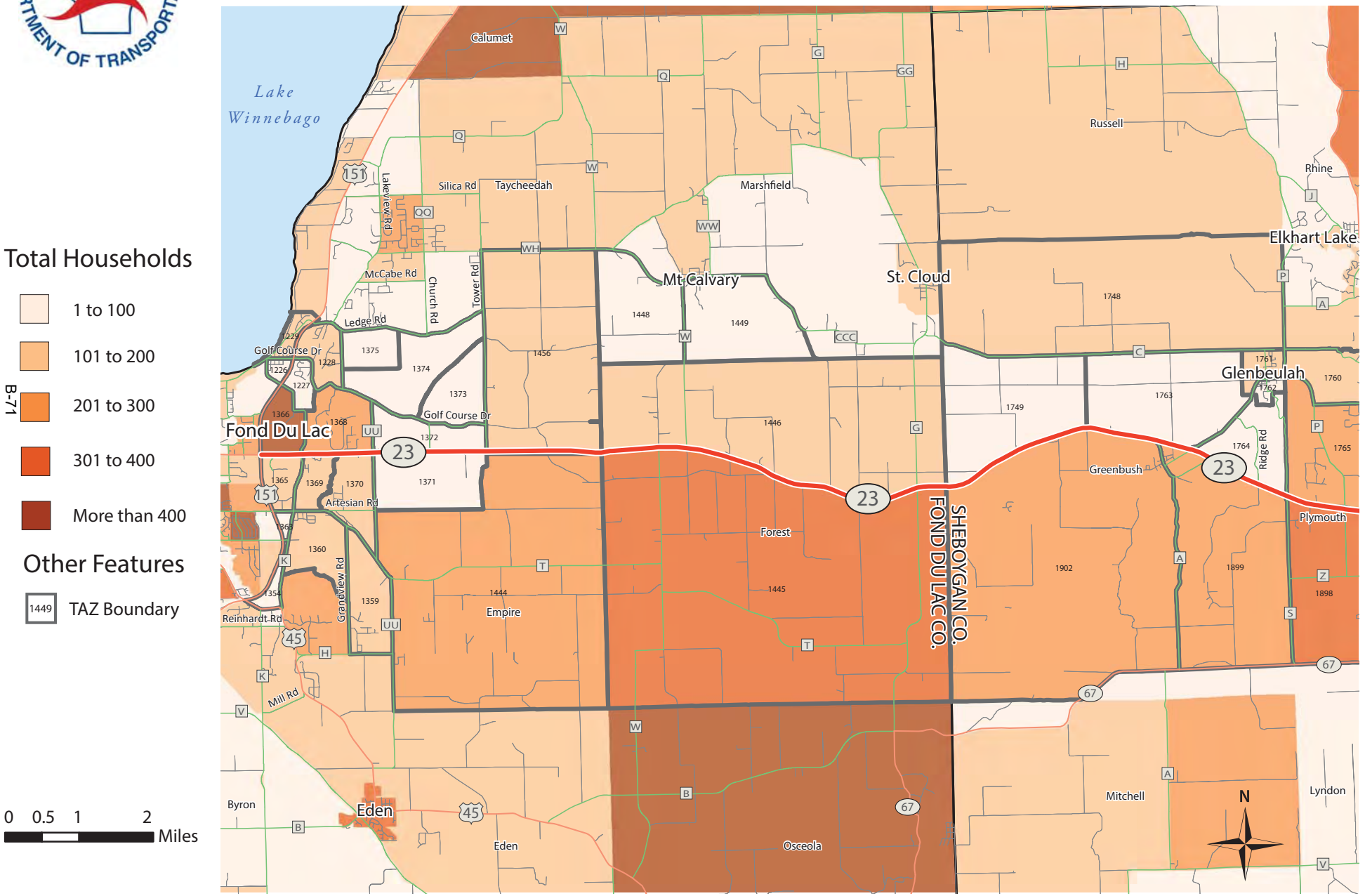


Figure 5- State Highway 23 Corridor: 2010 to 2045 Change in Total Employees by Traffic Analysis Zone (TAZ)

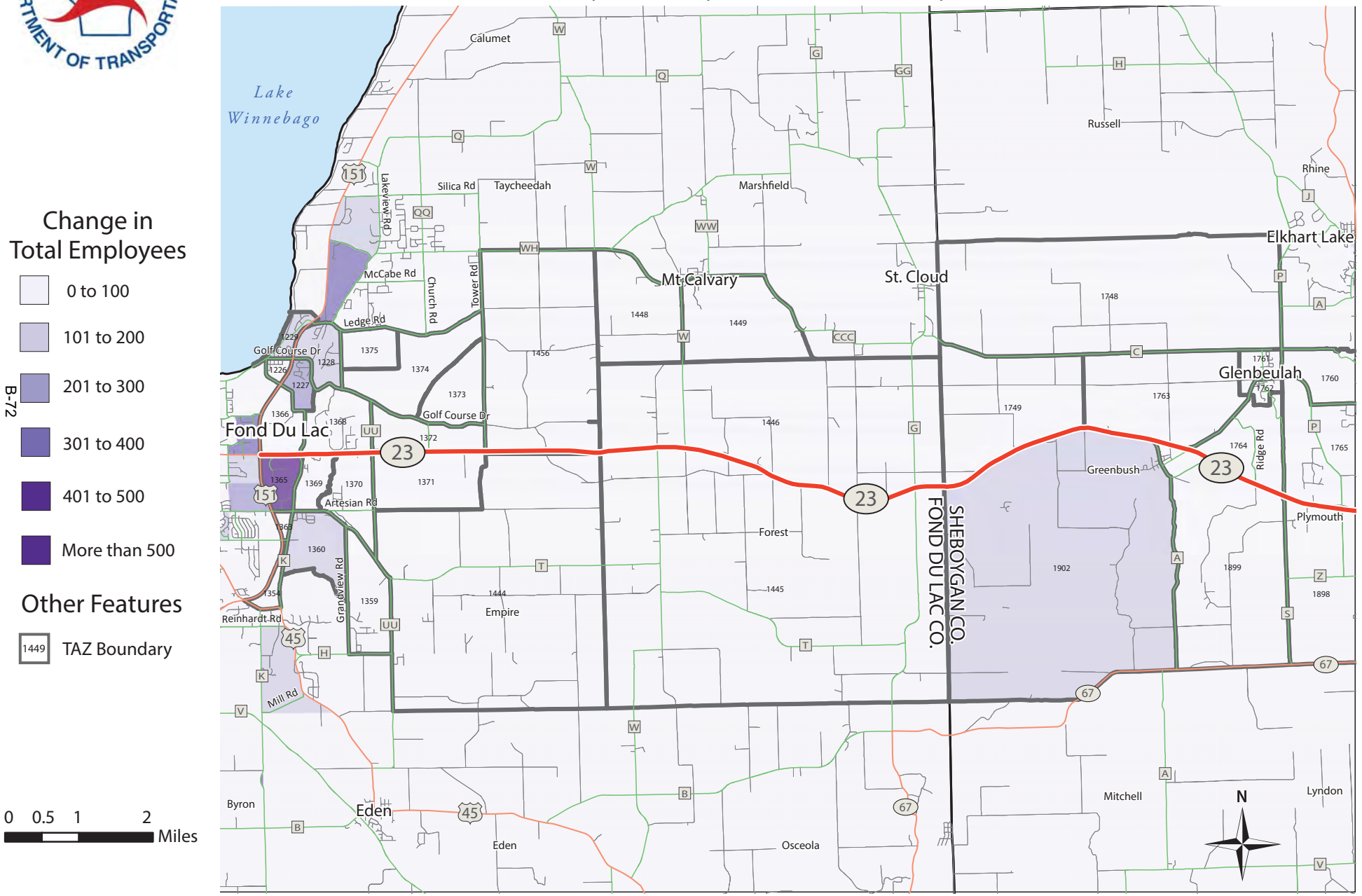
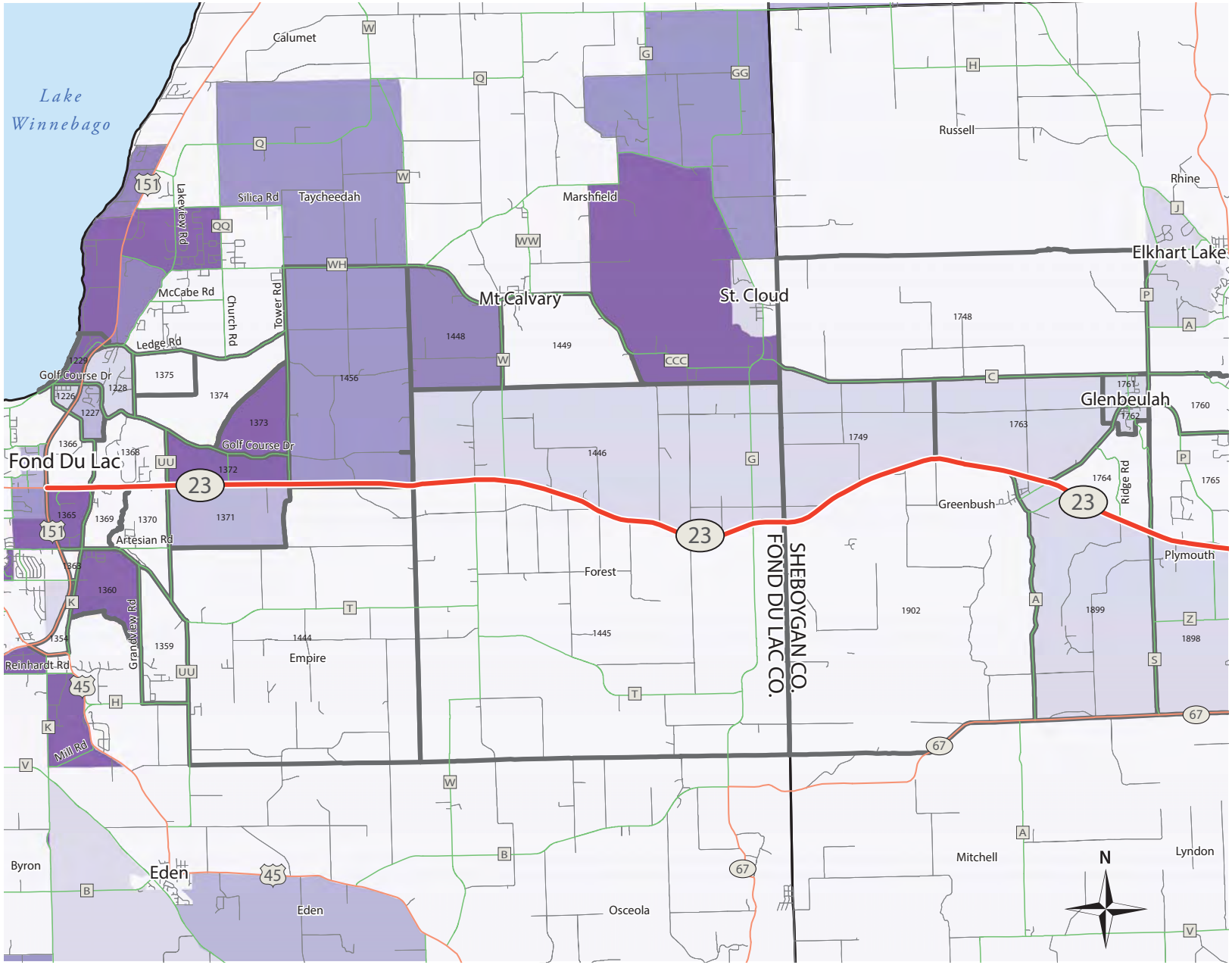


Figure 6- State Highway 23 Corridor: 2010 to 2045 Pct Change in Total Employees by Traffic Analysis Zone (TAZ)



Percent Employee Change

- 0% to 50%
- 51% to 100%
- 101% to 200%
- 201% to 300%
- 301% to 400%
- More than 400%

Other Features

- 1449 TAZ Boundary

0 0.5 1 2 Miles

B-73

Figure 7- State Highway 23 Corridor: 2010 to 2045 Change in Total Households by Traffic Analysis Zone (TAZ)

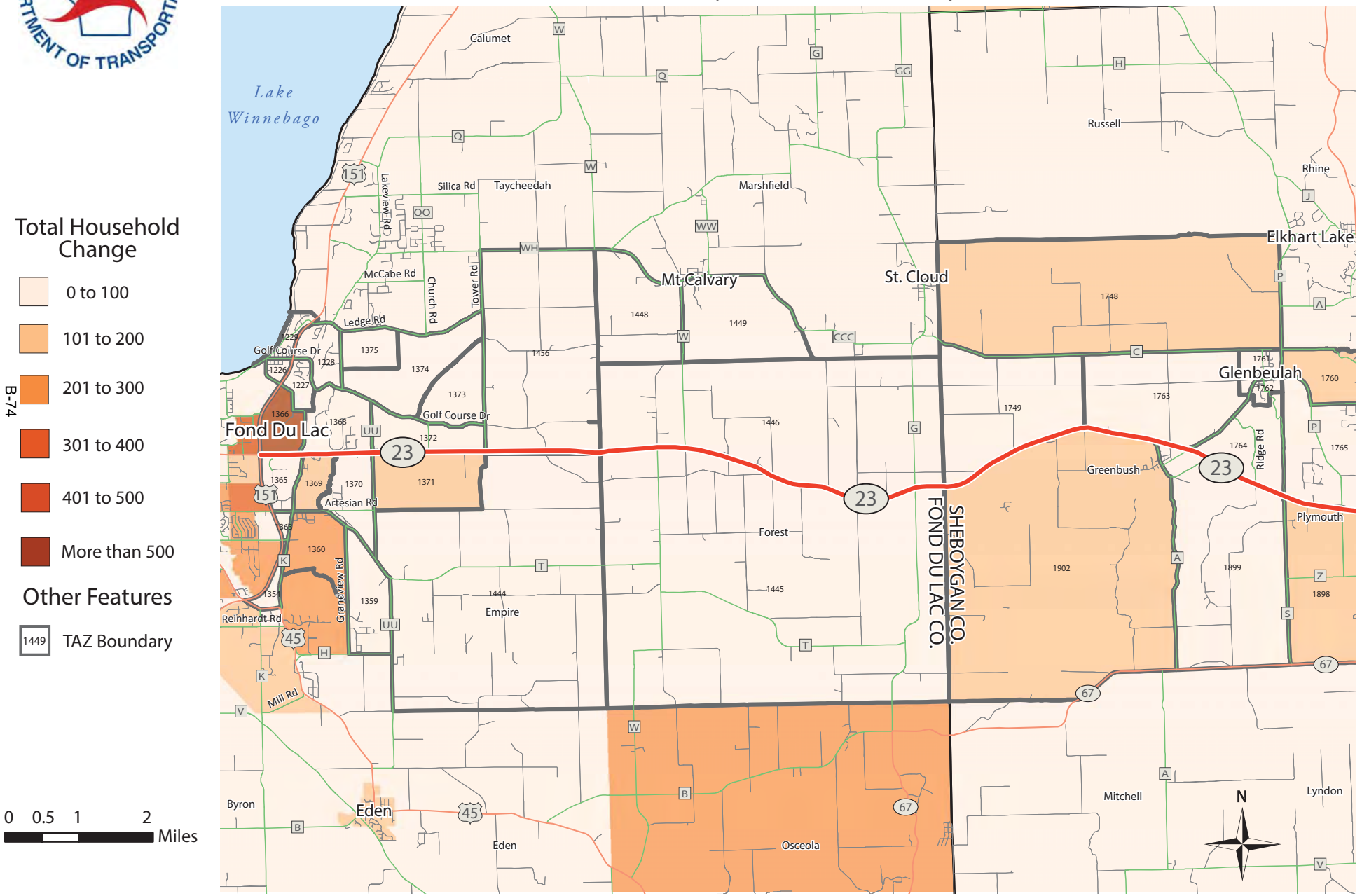
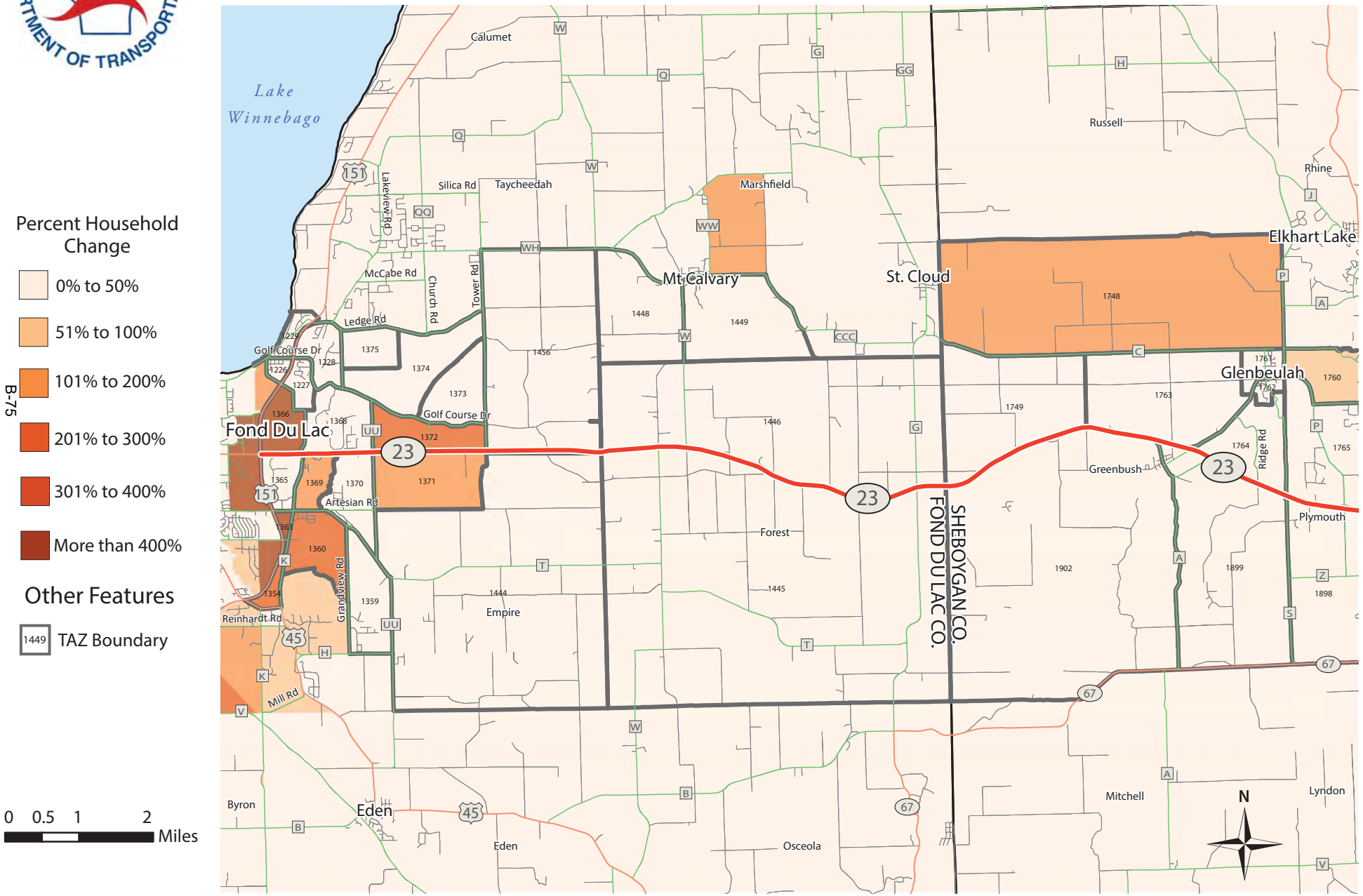


Figure 8- State Highway 23 Corridor: 2010 to 2045 Pct Change in Total Households by Traffic Analysis Zone (TAZ)



Trip Distribution for Southeastern External Traffic Analysis Zones (TAZs)

The NERTDM 2010 base year Version 8 (catalog date December 8, 2016 – run from September 2017 through March 2018 for the WIS 23 LS-SDEIS forecasting effort) model assignments were consistently higher across screenline 8 (**see Exhibit 1**). The total traffic counts for the 2010 condition equal 14,562, while the traffic assignments for the 2010 model equal 27,032, an over-assignment of nearly 86 percent.

Upon further examination of the NERTDM, the external zones were not controlled within the distribution model in terms of their interaction with other zones throughout the model area. As shown in **Exhibit 2**, the Milwaukee metropolitan area is connected to the communities within the NERTDM by two interstates and two arterials.

Drivers crossing into the NERTDM area selected their entry point based on their origin-destination pattern, meaning a bias in trip patterns should be expected at each of the external zones. The modeling team utilized the statewide travel demand model to estimate travel patterns for the external stations.

Select link assignments were conducted from both the NERTDM and the statewide model for the four largest volume externals from the southeast corner, specifically Interstate 41, US 45, STH 57 and Interstate 43. The results of the select link assessment are shown in **Table 1**, and illustrate the difference between the two models in how external trips interact with zones inside the NERTDM boundary.

The statewide model results in **Table 1** indicate very minimal crossing of screenline 8, indicating drivers entering the model area are destined for points north and not likely to travel in an east-west direction. The NERTDM however shows a large number of trips that enter into the model area, then travel east-west across screenline 8 to complete a trip. An example would be a trip entering the NERTDM area on Interstate 43 in the far southeast corner of the model area, then traveling west to Fond du Lac.

The statewide model indicates trips from points south of the NERTDM model area destined for Fond du Lac typically enter the model area from Interstate 41 or US 45 rather than from Interstate 43 and traveling west to Fond du Lac.

The NERTDM was altered to incorporate K factors for the external stations. K factors are used within the trip distribution process to alter the likelihood of trips being made between two specific Transportation Analysis Zones (TAZ), and represent an effect that the demand model does not explicitly include.

In the case of the NERTDM, this effect is the pre-determined routing decisions of trips entering the model area from the southern limits, as illustrated by the statewide model having very few trips that enter the NERTDM model area via the externals and then traveling east-west. Without K factors, the NERTDM had no mechanism to restrict the trips from the southern externals to traveling east-west.

The K factors for I-41, US 45, STH 57 and I-43 were estimated to reduce the attractiveness between each external and those internal zones that would require immediate east-west travel (Sheboygan area for I-41 and US 45, Fond du Lac and Oshkosh for STH 57 and I-43).

Exhibit 1 – Screenline 8 locations

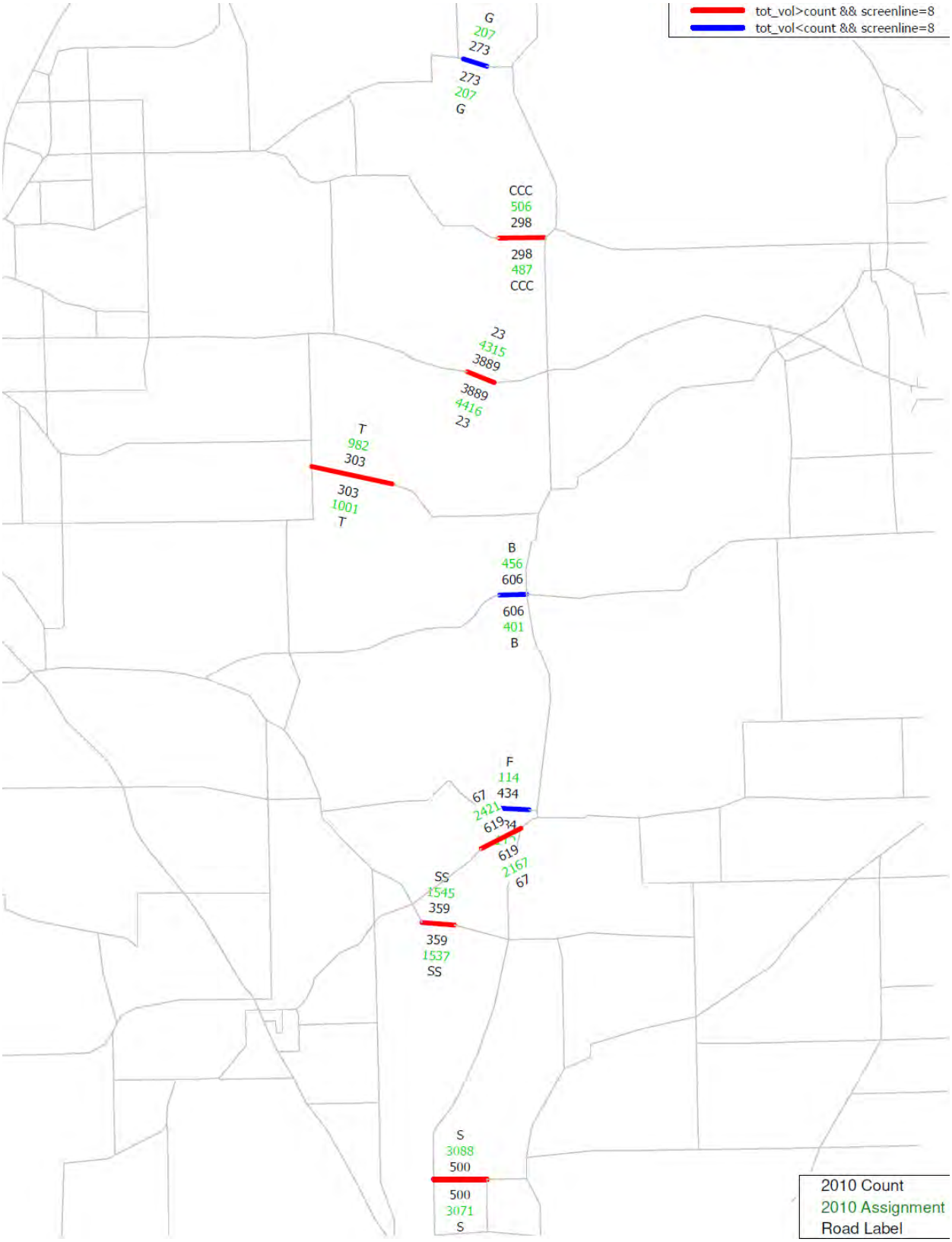
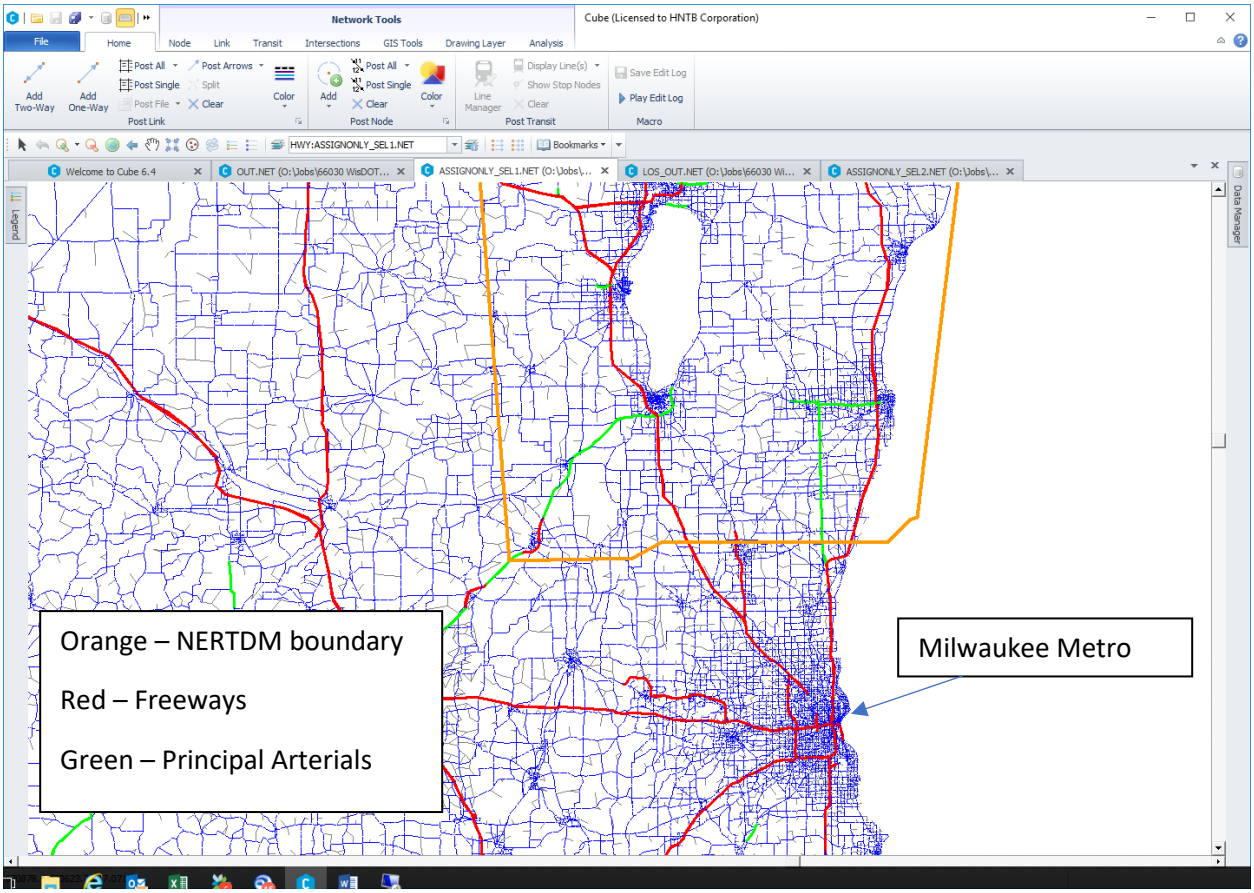


Exhibit 2 – Routes connecting NERTDM with Milwaukee Metro



An exact equation to calculate a K factor value does not exist, but rather the model is tested with reasonable K factors and the factors further modified to generate results comparable to the statewide TDM. Comparing two K factor values is not linear; an input that is 70% lower will not directly impact results by 70%.

The K factor values between the four target external zones and their unlikely metropolitan pairs were set at 15 to 30, where 100 is the baseline value. External to external trip pairs were given a K factor of one to avoid unintended external to external trips.

As shown in **Table 1**, the addition of K factors between the four target external zones and their unlikely metropolitan pairs resulted in substantially reducing external trips traveling east-west across screenline 8, much more consistent with the general level of east-west travel reported by the statewide model.

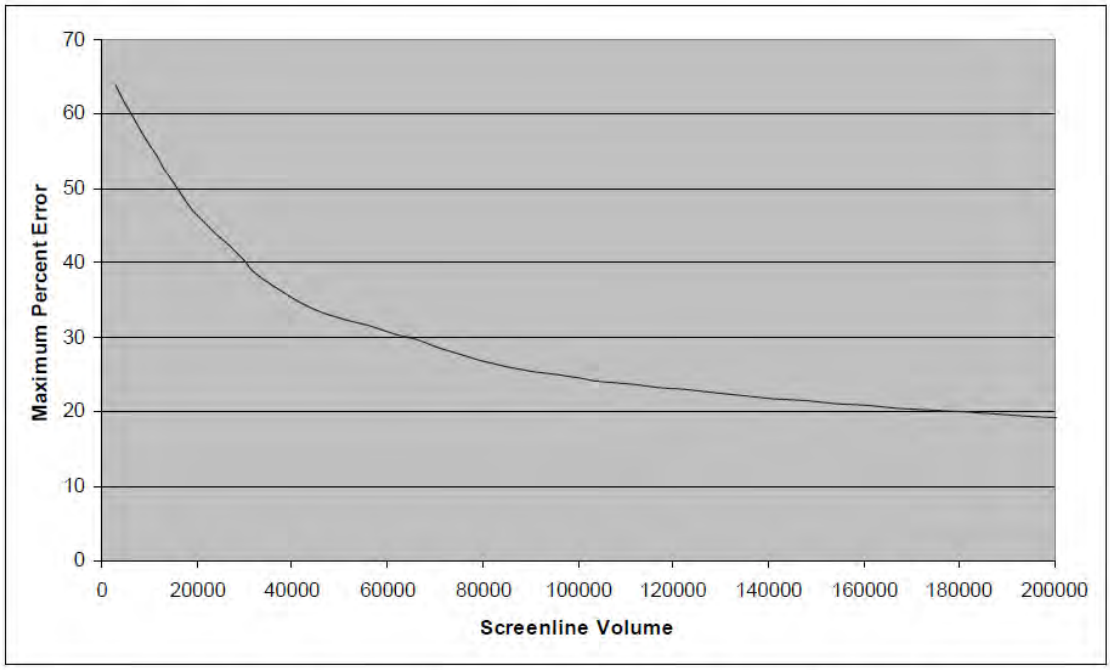
Table 1 - Daily 2010 Model Assignments from Externals Across Screenline 8

External Station	NERTDM v.8	Statewide TDM	NERTDM v. 8a
I-41	2,380	24	308
US 45	4,207	399	450
STH 57	2,480	121	263
I-43	1,698	0	170
TOTAL	10,765	544	1,191

The revised K factors positively impacted the NERTDM's performance along screenline 8. The revised traffic assignment is 17,859 compared to the traffic count of 14,562, or an over-assignment of only 23 percent compared to the original over-assignment of nearly 86 percent.

The Travel Model Validation and Reasonableness Checking Manual (see following figure) indicates an acceptable error of around 50 percent for a total traffic count of approximately 15,000, which the revised NERTDM's screenline 8 error value of 23 percent is well within.

Example Maximum Desirable Deviation in Total Screenline Volumes Guidelines



Source: Calibration and Adjustment of System Planning Models, FHWA, December 1990.

The K factors resulting from the adjustment process described above have been incorporated into NERTDM version 8a.

NERTDM Version 8 and Version 8a Screenlines

The following figure shows the 11 screenlines contained within the NERTDM.

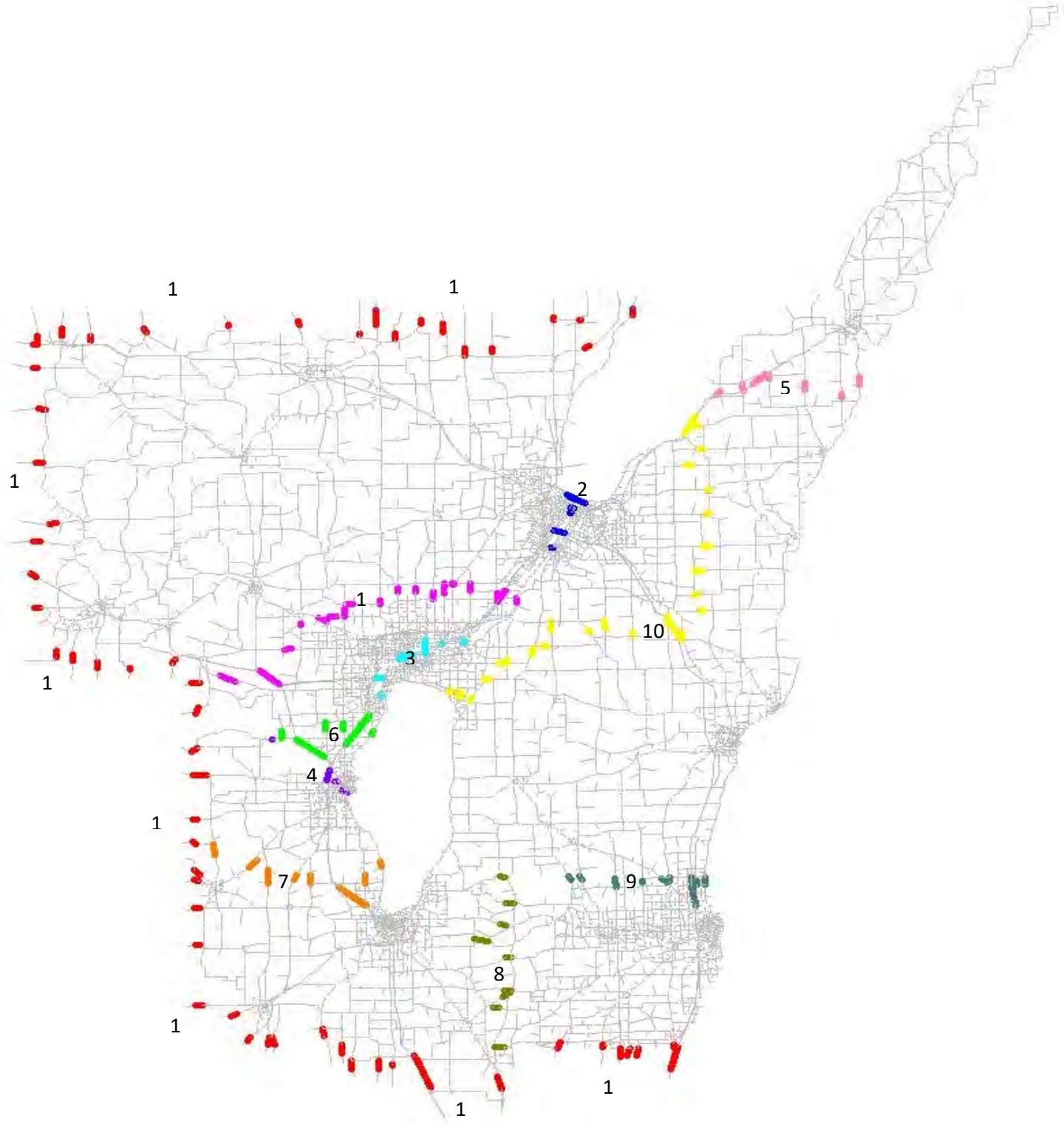


Table 2 shows the percentage difference (or error) between the count and NERTDM assignment for each screenline, both before and after K-factor adjustments were made to the NERTDM.

Table 2 – Percentage Difference Between Count and NERTDM Assignment, pre- and post- K-Factor Adjustment

Screenline	Before K-Factor Adjustment (NERTDM v.8)			After K-Factor Adjustment (NERTDM v. 8a)		
	Count	NERTDM Assignment	% Difference	Count	NERTDM Assignment	% Difference
1	240,442	242,505	0.86	240,442	239,624	-0.34
2	223,146	232,153	4.04	223,146	231,835	3.89
3	221,076	244,148	10.44	221,076	243,430	10.11
4	133,134	144,162	8.28	133,134	142,958	7.38
5	15,872	11,534	-27.33	15,872	11,535	-27.33
6	86,310	94,920	9.98	86,310	94,464	9.45
7	62,854	69,678	10.86	62,854	65,473	4.17
8	14,562	27,001	85.42	14,562	17,859	22.64
9	43,018	42,960	-0.14	43,018	36,969	-14.06
10	83,592	86,054	2.94	83,592	85,412	2.18
11	120,212	136,447	13.51	120,212	136,334	13.41

As is shown, only screenline 9 has less desirable performance after K factor adjustments were made. Overall, the absolute value of screenline error went from approximately 119 before K factor adjustments were made, to approximately 32 after they were made.

Overall Validation Statistics - NERTDM Version 8 and Version 8a

After adjusting the K-Factors to ensure that the modeled traffic in the study area is correctly distributed, as well as incorporating the socioeconomic data adjustments documented earlier in this appendix, the overall statistical performance of NERTDM v.8a was reevaluated using the same validation criteria as the original NERTDM v.8. Those results are presented in **Tables 3** and **4**. The overall model performs at acceptable levels. The K-Factor adjustments improve the sensitivity to changes in the corridor by better associating the model's traffic estimates to conditions within the corridor and overall model area.

Table 3 – Overall NERTDM v.8 Validation Statistics (Before K Factor and Socioeconomic Data Adjustments)

	Link Volumes						
	R-Squared	Acceptable					
	0.84	>0.88					
	GEH Ranges	Values	Acceptable				
10	GEH > 10	22%	40%				
20	GEH > 20	2%	30%				
30	GEH > 30	0%	15%				
40	GEH > 40	0%	5%				
	VOLUME	Count	Model Volume	Observed Volume	Percentage Difference	FHWA Target	PRMSE
Code	Region	8197	27,542,299	27,997,712	-1.6%	-	47.7%
1000	0 - 1000	2281	1,727,053	1,248,911	38.3%	60%	132.8%
2500	1000 - 2500	2272	4,005,883	3,856,722	3.9%	47%	66.3%
5000	2500 - 5000	1869	6,400,210	6,697,056	-4.4%	36%	44.4%
10000	5000 - 10000	1341	8,760,846	9,317,405	-6.0%	29%	34.7%
20000	10000 - 20000	340	4,166,345	4,258,518	-2.2%	25%	26.0%
30000	20000 - 30000	62	1,466,892	1,508,046	-2.7%	22%	14.6%
200000	30000 - 200000	32	1,015,070	1,111,054	-8.6%	-	14.2%
40	Dense Urban	942	3,045,013	3,295,510	-7.6%	-	53.3%
30	Urban	3234	13,856,230	14,209,357	-2.5%	-	43.8%
20	Suburban	1183	4,650,578	5,068,442	-8.2%	-	41.8%
10	Rural	2838	5,990,479	5,424,403	10.4%	-	51.4%
1	Interstate	48	630,954	650,855	-3.1%	7%	26.6%
2	freeway	174	3,401,449	3,339,343	1.9%	7%	17.3%
3	ramp	517	1,808,168	1,898,122	-4.7%	-	48.4%
4	expressway	243	1,753,203	1,718,850	2.0%	10%	30.3%
11	urban principle arterial	1212	7,461,885	8,011,827	-6.9%	10%	35.7%
12	urban minor arterial	1861	6,621,791	6,617,312	0.1%	15%	49.2%
13	urban major collector	1555	2,099,952	2,244,804	-6.5%	25%	79.2%
15	urban minor collector	0	-	-		25%	0.0%
14	urban local	65	39,194	60,517	-35.2%	-	84.9%
21	rural principle arterial	380	1,321,436	1,280,138	3.2%	7%	39.4%
22	rural minor arterial	547	1,116,337	1,054,763	5.8%	10%	59.6%
23	rural major collector	953	978,717	865,141	13.1%	15%	72.2%
24	rural minor collector	614	301,219	242,470	24.2%	25%	124.3%
25	rural local	24	7,692	13,250	-41.9%	25%	132.5%
17	rural others	0	-	-		-	0.0%

Table 4 – Overall NERTDM v.8a Validation Statistics (After K Factor Adjustments)

	Link Volumes						
	R-Squared	Acceptable					
	0.84	>0.88					
	GEH Ranges	Values	Acceptable				
10	GEH > 10	21%	40%				
20	GEH > 20	2%	30%				
30	GEH > 30	0%	15%				
40	GEH > 40	0%	5%				
	VOLUME	Count	Model Volume	Observed Volume	Percentage Difference	FHWA Target	PRMSE
Code	Region	8197	27,207,142	27,997,712	-2.8%	-	47.5%
1000	0 - 1000	2281	1,701,900	1,248,911	36.3%	60%	126.3%
2500	1000 - 2500	2272	3,946,882	3,856,722	2.3%	47%	64.7%
5000	2500 - 5000	1869	6,341,300	6,697,056	-5.3%	36%	44.1%
10000	5000 - 10000	1341	8,693,782	9,317,405	-6.7%	29%	34.6%
20000	10000 - 20000	340	4,069,343	4,258,518	-4.4%	25%	25.8%
30000	20000 - 30000	62	1,442,430	1,508,046	-4.4%	22%	16.3%
200000	30000 - 200000	32	1,011,505	1,111,054	-9.0%	-	14.5%
40	Dense Urban	942	3,040,257	3,295,510	-7.7%	-	53.1%
30	Urban	3234	13,809,526	14,209,357	-2.8%	-	43.6%
20	Suburban	1130	4,235,270	4,691,456	-9.7%	-	42.9%
10	Rural	2891	6,122,089	5,801,389	5.5%	-	49.9%
1	Interstate	48	583,191	650,855	-10.4%	7%	25.9%
2	freeway	174	3,325,310	3,339,343	-0.4%	7%	18.2%
3	ramp	517	1,794,521	1,898,122	-5.5%	-	47.9%
4	expressway	243	1,708,582	1,718,850	-0.6%	10%	30.4%
11	urban principle arterial	1212	7,430,789	8,011,827	-7.3%	10%	35.6%
12	urban minor arterial	1861	6,604,551	6,617,312	-0.2%	15%	49.0%
13	urban major collector	1555	2,098,784	2,244,804	-6.5%	25%	79.0%
15	urban minor collector	0	-	-		25%	0.0%
14	urban local	65	39,190	60,517	-35.2%	-	84.7%
21	rural principle arterial	380	1,292,538	1,280,138	1.0%	7%	38.8%
22	rural minor arterial	547	1,054,566	1,054,763	0.0%	10%	51.5%
23	rural major collector	953	971,096	865,141	12.2%	15%	70.5%
24	rural minor collector	614	296,004	242,470	22.1%	25%	118.6%
25	rural local	24	7,715	13,250	-41.8%	25%	132.5%
17	rural others	0	-	-		-	0.0%

It can be seen in **Tables 3** and **4** that the calculated R-Squared of 0.84 falls beneath the "acceptable" threshold of 0.88. However, while R-Squared has traditionally been computed, it is not currently considered a helpful indicator of model performance[1].

[1] From *TMIP Validation & Reasonableness Manual, 2d Edition,* pp. 9-10: "As such R^2 probably tells more about the coding of facility type and number of lanes than about how the model and assignment is performing. Thus, achieving a regional R^2 of 0.88, as has been suggested as a "standard" for determining a model's validity, has little if any meaning."

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