Chapter 8
UNIVERSITY REGION SUMMARY
PROLOGUE

Since 2014, the Michigan Department of Transportation (MDOT) has used probe vehicle data to create an annual Freeway Congestion and Reliability Report. The probe vehicle data is collected anonymously from GPS enabled devices and in-vehicle telematics to provide real time speeds on roadways nationwide. Probe vehicles provide an enormous amount of data which can be difficult to manage, maintain, and analyze. The University of Maryland Center for Advanced Transportation Technology (CATT) Lab developed a visual analytics platform called the Regional Integrated Transportation Information System, or RITIS. This tool allows MDOT to monitor speeds, incidents, weather, special events, and many other data sources. Using the RITIS platform, the data was processed and compiled into a report summarizing all freeway routes in Michigan.

This report is composed of eight chapters. The first chapter summarizes the performance measures and statewide metrics. The remaining seven chapters use those performance metrics to characterize congestion in each of MDOT's seven regions. This document is for internal use to help MDOT regions, Transportation Service Centers (TSC), and planners understand how Michigan freeways are operating over time, as well as where potential improvement projects may be necessary. This report is typically used as a starting point for more detailed analysis incorporating additional probe data, as well as other MDOT resources. If your area has plans to share this information externally, please contact the Congestion and Mobility Unit to ensure the correct measures are being used.

The report was prepared by the Wayne State University Transportation Research Group under the guidance of the Congestion and Mobility Unit at MDOT. Please contact the Congestion and Mobility Unit if you have any questions/comments or would like to have the actual data for further analysis.

ACKNOWLEDGEMENTS

MDOT
Jason Firman – Congestion and Mobility Manager
John Engle – Operations Engineer
Tyler Hunt – Operations Engineer
Kayla Smith – Student Assistant
Peggy Johnson – Departmental Analyst
MDOT Photography Unit – Cover Photograph of US-23

WAYNE STATE UNIVERSITY
Steve Remias – Assistant Professor
Jenna Kirsch – Student Research Assistant
Shellie Zamponi – Student Research Assistant
Ilyas Ustun – Data Scientist
Matthew Desantis – Student Research Assistant
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</tbody>
</table>
INTRODUCTION

The purpose of this document is to provide an overview of performance on Michigan freeways. Using probe vehicle data and systematic performance measures, a series of visualizations were created for each region in the state. Chapter 8 of this report provides an overview of the University Region. University Region is made up of 9 counties and contains the cities of Lansing, Jackson, and Ann Arbor. Nine freeways are analyzed in the section below.
PERFORMANCE MEASURES DEFINITIONS

The probe data alone provides representative speeds on predefined segments of roadway every minute. Although this data is rich, it provides limited use to engineers and practitioners without well-defined aggregation techniques. Performance measures are growing in the transportation arena to better monitor traffic conditions, improve traveler information, and identify congested areas with the aim of improving operations on roadways. A summary of the performance measures used in this report can be seen in Table 1.

The goal of these performance measures are to quantify both the delay and reliability of the freeway network in Michigan. In this report, delay is quantified when the speed drops below 60 MPH, which is at least 10 MPH lower than the posted speed limit for the freeways (Figure 4). On segments with a speed limit of 55 MPH, delay is calculated when speed falls below that threshold. The lower the value is, the better the freeway segment is operating. The other element of interest is reliability. Reliability is a measure of the consistency of a travel time on a roadway. A roadway that has the same travel time every day is said to be reliable, while a roadways where the travel time varies greatly is said to be unreliable. MDOT’s goal is to provide reliable travel times with minimal delay. This is done through roadway improvement projects including additional lanes, pavement improvements, and adding intelligent transportation systems. These projects can reduce the travel time and also improve the travel time reliability. An example of this is shown in Figure 5.

![FIGURE 1. Delay Calculation](image-url)
Delay can also be represented by converting the user delay into a cost. The delay is multiplied by the number of vehicles that experience that delay. The hourly volumes are derived from Average Daily Traffic (ADT) and Commercial Average Daily Traffic (CADT). Hourly user costs are based on Federal Highway Administration (FHWA) publication number FHWA-SA-98-079, “Life-Cycle Cost Analysis in Pavement Design.” The values used in this report are shown in Table 2.
TABLE 1. Performance Measures of Interest

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL DELAY</td>
<td>Total delay is calculated by taking the difference between actual speeds when they fall below 60 MPH and the posted speed limit for freeways posted at 70 MPH. This is to take out the delay caused by the lower average speeds from commercial vehicles.</td>
</tr>
<tr>
<td>TOTAL DELAY PER MILE</td>
<td>Total delay per mile is calculated by taking the total delay and dividing it by the length of the freeway. This was performed for each route in each county.</td>
</tr>
<tr>
<td>USER DELAY COST</td>
<td>User Delay Costs (UDC) is calculated by multiplying delay x hourly volume per hourly user cost. Delay is calculated by taking the difference between actual speeds when they fall below 60 MPH and the posted speed limit.</td>
</tr>
<tr>
<td>AVERAGE SPEED</td>
<td>Average speed is determined by calculating the space mean speed of the worst ranked hour in the weekday AM peak (6:00 AM - 9:00 AM) and weekday PM peak (3:00 PM - 7:00 PM) periods for each segment of roadway. This is compared to the space mean speed of the previous five year period for the same hour.</td>
</tr>
<tr>
<td>CONGESTION SEVERITY</td>
<td>Congestion severity is calculated based on the worst hourly average speed experienced during the AM or PM peak period per traffic message channel (TMC) segment. A TMC segment is a standard for delivering real-time traffic information. They vary from tenths of a mile long to several miles long.</td>
</tr>
<tr>
<td>TRAVEL TIME RELIABILITY</td>
<td>Travel time reliability is a measure of travel time consistency over a period of time. When travel times are unreliable, customers are more likely to experience unexpected delays. Travel times are shown to be reliable when the 95th percentile travel time remains close to the average travel time.</td>
</tr>
<tr>
<td>AVERAGE TRAVEL TIME</td>
<td>The amount of time a customer should budget to be on-time on average.</td>
</tr>
<tr>
<td>95TH PERCENTILE TRAVEL TIME</td>
<td>The amount of time a customer should budget to be on-time 19 out of 20 days (95% of the time). The 95th percentile travel time is also known as the planning time.</td>
</tr>
</tbody>
</table>

Note: May 1st through September 30th were used for the summer reliability calculations.

TABLE 2. Historical Hourly User Costs

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger</td>
<td>$17.09</td>
<td>$17.44</td>
<td>$17.70</td>
<td>$17.98</td>
<td>$18.00</td>
<td>$18.23</td>
</tr>
<tr>
<td>Commercial</td>
<td>$30.14</td>
<td>$30.77</td>
<td>$31.22</td>
<td>$31.73</td>
<td>$31.76</td>
<td>$32.26</td>
</tr>
</tbody>
</table>
PERFORMANCE MEASURES VISUALIZATIONS

Performance measure visualizations provide an easy to use graphic representation of the performance measures listed above. In this report four main visualizations are used, which are explained in detail below.

USER DELAY COST

Figure 3 is an example of the user delay cost graph. This figure represents I-94 through Washtenaw County in the University Region. The user delay cost visualization displays which months are incurring the most UDC, while comparing how UDC patterns change from a 5-year historical average to the current year. Figure 3 shows the following:

- a) 5-year historical average user delay cost (2012-2016).
- b) Current year user delay cost (2017).
- c) Total user delay cost in dollars.
- d) Month of year.
- e) Poor weather conditions in winter months severely impact the user delay cost.
- f) Example of the current year outperforming the 5-year historical average in UDC.
- g) Example of summer months where construction may impact the delay of a corridor.
- h) Example of the current year underperforming the 5-year historical average in UDC.

![User Delay Cost Graph](image)

**FIGURE 3. Example User Delay Cost Graph**
**AVERAGE SPEED**

Figure 4 is an example of the average speed graph. This figure represents westbound I-94 through the University Region. This performance metric visualizes the speeds on a given corridor during the AM and PM peak periods, along with a 5-year historical average of those speeds. Average speed graphs can display how morning and evening peak speeds can vary by time and magnitude. The following criteria was used in the making of these graphs:

a) Only weekdays (Monday – Friday) are included in the calculations.
b) The AM peak hour is the worst ranked hour between 6:00 AM – 9:00 AM.
c) The PM peak hour is the worst ranked hour between 3:00 PM – 7:00 PM.
d) The worst ranked hour is based on the lowest average speed and minimum speed experienced during the peak hours.

Figure 4 shows the following:

a) Legend.
b) Location of interchanges by exit/mile marker number.
c) Specific significant interchanges.
d) Direction of travel.
e) Average speed in MPH.
f) Example of low speed area during the AM peak while approaching US-12 interchange.
g) Example of location where PM peak speeds are lower than AM peak speeds.
h) Example of limited change in speed from year to year and time period to time period.
i) 2017 PM peak average speed is approximately 55 MPH at Exit 139.
j) Example of improvement in the current year as compared to the 5-year historical average.
FIGURE 4. Example Average Speed Graph
TRAVEL TIME RELIABILITY

Figure 5 is an example of the travel time reliability graph. This figure represents a portion of eastbound I-94 through the University Region. This performance metric displays the reliability of a given corridor over time. A segment is deemed “reliable” when the average and 95th percentile travel times are constant. A segment is deemed “unreliable” when the average and 95th percentile travel times differ by a large amount of time. Figure 5 shows the following:

- a) The 95th percentile travel time reliability and the average (50th percentile) travel time reliability.
- b) Amount of time it will take a vehicle to drive the entire corridor in minutes.
- c) Time of day.
- d) Small difference between average and 95th percentile travel times (reliable).
- e) Large difference between average and 95th percentile travel times (unreliable).

FIGURE 5. Example Travel Time Reliability Graph
CONGESTION SEVERITY

Figure 6 shows an example of the congestion severity figure. This figure represents the University Region during the AM peak hour. This performance metric displays the amount of congestion on corridors during AM and PM peak periods by representing speeds in a color gradient. The color gradient consists of three different categories to distinguish severity levels:

a) Low (≥55 MPH).
   b) Moderate (≥35 MPH & <55 MPH).
   c) Severe (<35 MPH).

Figure 6 shows the following:

a) Location of no congestion in either direction during the AM peak hour.
   b) Congestion exists only in the westbound direction of travel on M-14 from people commuting to work from home during morning hours.

![FIGURE 6. Example Congestion Severity Figure](image)
UNIVERSITY REGION: OVERVIEW

UNIVERSITY REGION: CONGESTION SEVERITY

2017 Congestion Severity
- Low: (≥55 MPH)
- Moderate: (35 MPH & <55 MPH)
- Severe: (<35 MPH)

FIGURE 7. 2017 University Region AM Peak Congestion Severity
UNIVERSITY REGION: CONGESTION SEVERITY

FIGURE 8. 2017 University Region PM Peak Congestion Severity
### UNIVERSITY REGION: CONGESTION SEVERITY

#### TABLE 3. 2017 Congestion Miles by Severity - AM Peak

<table>
<thead>
<tr>
<th>Region</th>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>788.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>667.6</td>
<td>31.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Metro</td>
<td>391.6</td>
<td>189.4</td>
<td>39.0</td>
</tr>
<tr>
<td>Southwest</td>
<td>484.0</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>University</td>
<td>721.1</td>
<td>35.4</td>
<td>11.4</td>
</tr>
<tr>
<td>North</td>
<td>392.6</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Superior</td>
<td>99.1</td>
<td>2.4</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3544.1</td>
<td>264.6</td>
<td>51.7</td>
</tr>
</tbody>
</table>

#### TABLE 4. 2017 Congestion Miles by Severity - PM Peak

<table>
<thead>
<tr>
<th>Region</th>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>788.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>659.3</td>
<td>27.9</td>
<td>11.7</td>
</tr>
<tr>
<td>Metro</td>
<td>364.0</td>
<td>167.5</td>
<td>88.4</td>
</tr>
<tr>
<td>Southwest</td>
<td>482.9</td>
<td>6.2</td>
<td>0.0</td>
</tr>
<tr>
<td>University</td>
<td>704.5</td>
<td>53.9</td>
<td>9.5</td>
</tr>
<tr>
<td>North</td>
<td>392.6</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Superior</td>
<td>97.8</td>
<td>3.7</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3489.2</td>
<td>260.3</td>
<td>110.9</td>
</tr>
</tbody>
</table>
UNIVERSITY REGION: USER DELAY COST

FIGURE 9. University Region User Delay Cost Trend
### TABLE 5. 2017 University Region User Delay Cost Data

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location (Route, County)</th>
<th>2017 Total UDC ($)</th>
<th>2012-2016 Average Total UDC ($)</th>
<th>Change in Total UDC ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>US-23 Washtenaw Co.</td>
<td>$30,309,000</td>
<td>$14,535,000</td>
<td>$15,774,000</td>
</tr>
<tr>
<td>2</td>
<td>I-94 Washtenaw Co.</td>
<td>$13,650,000</td>
<td>$13,766,000</td>
<td>-$116,000</td>
</tr>
<tr>
<td>3</td>
<td>US-23 Livingston Co.</td>
<td>$8,152,000</td>
<td>$6,707,000</td>
<td>$1,445,000</td>
</tr>
<tr>
<td>4</td>
<td>M-14 Washtenaw Co.</td>
<td>$5,894,000</td>
<td>$4,249,000</td>
<td>$1,645,000</td>
</tr>
<tr>
<td>5</td>
<td>I-96 Livingston Co.</td>
<td>$4,192,000</td>
<td>$4,974,000</td>
<td>-$782,000</td>
</tr>
<tr>
<td>6</td>
<td>I-75 Monroe Co.</td>
<td>$4,156,000</td>
<td>$6,895,000</td>
<td>-$2,739,000</td>
</tr>
<tr>
<td>7</td>
<td>I-94 Jackson Co.</td>
<td>$3,483,000</td>
<td>$4,667,000</td>
<td>-$1,184,000</td>
</tr>
<tr>
<td>8</td>
<td>US-23 Monroe Co.</td>
<td>$2,939,000</td>
<td>$2,655,000</td>
<td>$284,000</td>
</tr>
<tr>
<td>9</td>
<td>US-127 Ingham Co.</td>
<td>$2,143,000</td>
<td>$3,029,000</td>
<td>-$886,000</td>
</tr>
<tr>
<td>10</td>
<td>I-96 Ingham Co.</td>
<td>$1,791,000</td>
<td>$2,717,000</td>
<td>-$926,000</td>
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<tr>
<td>11</td>
<td>I-496 Eaton/Ingham Co.</td>
<td>$1,699,000</td>
<td>$2,605,000</td>
<td>-$906,000</td>
</tr>
<tr>
<td>12</td>
<td>I-96 Clinton/Eaton Co.</td>
<td>$977,000</td>
<td>$1,549,000</td>
<td>-$572,000</td>
</tr>
<tr>
<td>13</td>
<td>I-69 Clinton Co.</td>
<td>$853,000</td>
<td>$832,000</td>
<td>$21,000</td>
</tr>
<tr>
<td>14</td>
<td>I-69 Eaton Co.</td>
<td>$783,000</td>
<td>$1,244,000</td>
<td>-$461,000</td>
</tr>
<tr>
<td>15</td>
<td>US-127 Jackson Co. (70 MPH Section)</td>
<td>$738,000</td>
<td>$1,731,000</td>
<td>-$993,000</td>
</tr>
<tr>
<td>16</td>
<td>US-127 Clinton Co. (70 MPH Section)</td>
<td>$356,000</td>
<td>$522,000</td>
<td>-$166,000</td>
</tr>
<tr>
<td>17</td>
<td>I-275 Monroe Co.</td>
<td>$252,000</td>
<td>$644,000</td>
<td>-$392,000</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>$82,367,000</strong></td>
<td><strong>$73,321,000</strong></td>
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</table>

*Note: Minor differences may occur due to rounding.*
<table>
<thead>
<tr>
<th>Rank</th>
<th>Location (Route, County)</th>
<th>2017 UDC Per Mile ($)</th>
<th>2012-2016 Average UDC Per Mile ($)</th>
<th>Change in UDC Per Mile ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>US-23 Washtenaw Co.</td>
<td>$551,000</td>
<td>$264,000</td>
<td>$287,000</td>
</tr>
<tr>
<td>2</td>
<td>M-14 Washtenaw Co.</td>
<td>$210,000</td>
<td>$152,000</td>
<td>$58,000</td>
</tr>
<tr>
<td>3</td>
<td>I-94 Washtenaw Co.</td>
<td>$204,000</td>
<td>$205,000</td>
<td>-$1,000</td>
</tr>
<tr>
<td>4</td>
<td>US-23 Livingston Co.</td>
<td>$163,000</td>
<td>$134,000</td>
<td>$29,000</td>
</tr>
<tr>
<td>5</td>
<td>I-496 Eaton/Ingham Co.</td>
<td>$106,000</td>
<td>$163,000</td>
<td>-$57,000</td>
</tr>
<tr>
<td>6</td>
<td>I-75 Monroe Co.</td>
<td>$77,000</td>
<td>$128,000</td>
<td>-$51,000</td>
</tr>
<tr>
<td>7</td>
<td>I-96 Livingston Co.</td>
<td>$75,000</td>
<td>$89,000</td>
<td>-$14,000</td>
</tr>
<tr>
<td>8</td>
<td>US-23 Monroe Co.</td>
<td>$57,000</td>
<td>$51,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>9</td>
<td>I-94 Jackson Co.</td>
<td>$54,000</td>
<td>$72,000</td>
<td>-$18,000</td>
</tr>
<tr>
<td>10</td>
<td>US-127 Ingham Co.</td>
<td>$39,000</td>
<td>$55,000</td>
<td>-$16,000</td>
</tr>
<tr>
<td>11</td>
<td>I-96 Ingham Co.</td>
<td>$34,000</td>
<td>$51,000</td>
<td>-$17,000</td>
</tr>
<tr>
<td>12</td>
<td>I-96 Clinton/Eaton Co.</td>
<td>$25,000</td>
<td>$39,000</td>
<td>-$14,000</td>
</tr>
<tr>
<td>13</td>
<td>I-69 Clinton Co.</td>
<td>$23,000</td>
<td>$22,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>14</td>
<td>US-127 Jackson Co. (70 MPH Section)</td>
<td>$22,000</td>
<td>$52,000</td>
<td>-$30,000</td>
</tr>
<tr>
<td>15</td>
<td>I-69 Eaton Co.</td>
<td>$16,000</td>
<td>$25,000</td>
<td>-$9,000</td>
</tr>
<tr>
<td>16</td>
<td>I-275 Monroe Co.</td>
<td>$14,000</td>
<td>$36,000</td>
<td>-$22,000</td>
</tr>
<tr>
<td>17</td>
<td>US-127 Clinton Co. (70 MPH Section)</td>
<td>$8,000</td>
<td>$12,000</td>
<td>-$4,000</td>
</tr>
</tbody>
</table>

Note: Minor differences may occur due to rounding.
<table>
<thead>
<tr>
<th>Highway</th>
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<tr>
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<td>Pg. 67</td>
<td></td>
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</table>
INTERSTATE 69: EATON AND CLINTON

a) Segment Map

2012-2016 Average User Delay Cost - $1,244,000
2017 User Delay Cost - $783,000

b) UDC Graph

FIGURE 10. Eaton County I-69 Corridor Total User Delay Cost
INTERSTATE 69: EATON AND CLINTON

![Segment Map]

**a) Segment Map**

**b) UDC Graph**

**FIGURE 11.** Clinton County I-69 Corridor Total User Delay Cost
FIGURE 12. University Region I-69 Eastbound
FIGURE 13. University Region I-69 Westbound
INTERSTATE 75: MONROE

**a) Segment Map**

**b) UDC Graph**

**FIGURE 14. Monroe County I-75 Corridor Total User Delay Cost**
FIGURE 15. University Region I-75 Northbound
FIGURE 16. University Region I-75 Southbound
INTERSTATE 94: JACKSON AND WASHTENAW

a) Segment Map

b) UDC Graph

FIGURE 17. Jackson County I-94 Corridor Total User Delay Cost
INTERSTATE 94: JACKSON AND WASHTENAW

a) Segment Map

b) UDC Graph

FIGURE 18. Washtenaw County I-94 Corridor Total User Delay Cost
FIGURE 19. University Region I-94 Eastbound
FIGURE 20. University Region I-94 Westbound

FREEWAY CONGESTION & RELIABILITY REPORT
University Region
Corridors

Average Speed (MPH)

2012-2016 AM Peak Average Speed
2012-2016 PM Peak Average Speed
2017 AM Peak Speed
2017 PM Peak Speed

80 70 60 50 40 30 20 10 0

RAWSONVILLE RD/EXIT 187
WIARD RD/MCCARTNEY AVE/EXIT 186
US-12/EXIT 185
US-12-BR/HURON ST/EXIT 183
US-12/MICHIGAN AVE/EXIT 181
I-94-BR/US-23/EXIT 180
STATE ST/EXIT 177
ANN ARBOR SALINE RD/EXIT 175
JACKSON AVE/EXIT 172
I-94-BL/EXIT 172
M-14/EXIT 171
ZEEB RD/EXIT 169
BAKER RD/EXIT 167
JACKSON RD/EXIT 162
M-52/EXIT 159
OLD US-12/EXIT 157
KALMBACH RD/EXIT 156
WASHTENAW/JACKSON COUNTY LINE
CLEAR LAKE RD/EXIT 153
MT HOPE RD/EXIT 150
RACE RD/EXIT 147
SARGENT RD/145
MILE MARKER 144
US-127/EXIT 142
ELM RD/EXIT 141
M-106/COOPER ST/EXIT 139
US-127/M-50/EXIT 138
AIRPORT RD/EXIT 137
M-60/EXIT 136
DEARING RD/EXIT 133
PARMA RD/EXIT 130
MICHIGAN AVE/EXIT 128
CONCORD RD/EXIT 127
I-94-BR/M-99/EXIT 124
I-94-BR/EXIT 121
INTERSTATE 94: TRAVEL TIME RELIABILITY

a) University Region and Wayne County

b) Jackson, Michigan and Ann Arbor, Michigan

FIGURE 21. Travel Time Reliability: I-94
INTERSTATE 94: TRAVEL TIME RELIABILITY

FIGURE 22. Segment 1 - I-94 between M-60/Exit 136 and Sargent Rd/Exit 145
INTERSTATE 94: TRAVEL TIME RELIABILITY

INTERSTATE 96: CLINTON, EATON, INGHAM, AND LIVINGSTON

a) Segment Map

b) UDC Graph

FIGURE 25. Clinton and Eaton Counties I-96 Corridor Total User Delay Cost
INTERSTATE 96: CLINTON, EATON, INGHAM, AND LIVINGSTON

FIGURE 26. Ingham County I-96 Corridor Total User Delay Cost
INTERSTATE 96: CLINTON, EATON, INGHAM, AND LIVINGSTON

![Segment Map](image)

**a) Segment Map**

**b) UDC Graph**

**FIGURE 27.** Livingston County I-96 Corridor Total User Delay Cost
FIGURE 28. University Region I-96 Eastbound
FIGURE 29. University Region I-96 Westbound
INTERSTATE 96: TRAVEL TIME RELIABILITY

FIGURE 30. Travel Time Reliability: I-96
INTERSTATE 96: TRAVEL TIME RELIABILITY

FIGURE 32. Segment 2 - I-96 between I-496/US-127/Exit 106 and Williamston Rd/Exit 117
INTERSTATE 275: MONROE

a) Segment Map

b) UDC Graph

FIGURE 33. Monroe County I-275 Corridor Total User Delay Cost
FIGURE 34. University Region I-275 Northbound
FIGURE 35. University Region I-275 Southbound
INTERSTATE 496: EATON AND INGHAM

a) Segment Map

b) UDC Graph

FIGURE 36. Eaton and Ingham Counties I-496 Corridor Total User Delay Cost
FIGURE 37. University Region I-496 Eastbound
FIGURE 38. University Region I-496 Westbound
FIGURE 39. Travel Time Reliability: I-496
INTERSTATE 496: TRAVEL TIME RELIABILITY

FIGURE 40. Segment 1 - I-496 between US-127/Exit 8 and I-69/I-96
FIGURE 41. Washtenaw County M-14 Corridor Total User Delay Cost
FIGURE 42. University Region M-14 Eastbound
FIGURE 43. University Region M-14 Westbound
MICHIGAN 14: TRAVEL TIME RELIABILITY

a) University Region and Wayne County

b) Ann Arbor, Michigan

FIGURE 44. Travel Time Reliability: M-14
MICHIGAN 14: TRAVEL TIME RELIABILITY

**FIGURE 45. Segment 1 - M-14 between I-94 and US-23/Main St/Exit 3**
FIGURE 46. Segment 2 - M-14 between US-23 and I-275
US-23: MONROE, WASHTENAW, AND LIVINGSTON

a) Segment Map

b) UDC Graph

FIGURE 47. Monroe County US-23 Corridor Total User Delay Cost
US-23: MONROE, WASHTENAW, AND LIVINGSTON

a) Segment Map

b) UDC Graph

FIGURE 48. Washtenaw County US-23 Corridor Total User Delay Cost
US-23: MONROE, WASHTENAW, AND LIVINGSTON

a) Segment Map

b) UDC Graph

FIGURE 49. Livingston County US-23 Corridor Total User Delay Cost
FIGURE 50. University Region US-23 Northbound
FIGURE 51. University Region US-23 Southbound
US-23: TRAVEL TIME RELIABILITY

FIGURE 52. Travel Time Reliability: US-23
US-23: TRAVEL TIME RELIABILITY

FIGURE 53. Segment 1 - US-23 between Willis Rd/Exit 31 and I-94/Exit 35
US-23: TRAVEL TIME RELIABILITY

FIGURE 54. Segment 2 - US-23 between I-94/Exit 35 and M-14/Exit 42
US-23: TRAVEL TIME RELIABILITY

FIGURE 55. Segment 3 - US-23 between M-14/Exit 42 and M-14/Exit 45
US-23: TRAVEL TIME RELIABILITY

FIGURE 56. Segment 4 - US-23 between M-14/Exit 45 and I-96/Exit 60
US-127: JACKSON (70 MPH SECTION), INGHAM, AND CLINTON (70 MPH SECTION)

a) Segment Map

b) UDC Graph

FIGURE 57. Jackson County US-127 Corridor Total User Delay Cost
US-127: JACKSON (70 MPH SECTION), INGHAM, AND CLINTON (70 MPH SECTION)

a) Segment Map

2012-2016 Average User Delay Cost - $3,029,000  2017 User Delay Cost - $2,143,000

b) UDC Graph

FIGURE 58. Ingham County US-127 Corridor Total User Delay Cost
US-127: JACKSON (70 MPH SECTION), INGHAM, AND CLINTON (70 MPH SECTION)

a) Segment Map

b) UDC Graph

FIGURE 59. Clinton County US-127 Corridor Total User Delay Cost
FIGURE 60. University Region US-127 Northbound
Figure 61. University Region US-127 Southbound
US-127: TRAVEL TIME RELIABILITY

FIGURE 62. Travel Time Reliability: US-127
US-127: TRAVEL TIME RELIABILITY

FIGURE 63. Segment 1 - US-127 between I-96 and I-496/Trowbridge Rd
US-127: TRAVEL TIME RELIABILITY

![Graphs showing travel time reliability for US-127](image)

**FIGURE 64.** Segment 2 - US-127 between I-496/Trowbridge Rd and I-69/Exit 82
CONCLUSION

This chapter summarizes the performance of the University Region. It is the Congestion and Mobility Unit's goal that these performance measures are not just numbers and figures, but information to help MDOT personnel understand how traffic is operating on its freeways and make actionable decisions on improving traffic. They could be used to help prioritize projects, determine where and when problems are occurring, and how significant they are. We intend to provide these performance measures on an annual basis to help identify trends on the system and to keep MDOT up to date on freeway operations. Various performance measures may change due to changing federal requirements or MDOT needs. As probe data improves, this may expand to non-freeway routes as well. The Congestion and Mobility Unit welcomes any feedback on this report to help us improve it in the future and maximize its usefulness.

CONTACT INFORMATION

Please contact the Congestion and Mobility unit if you have any questions/comments or would like to have the actual data for further analysis.

Jason Firman, Congestion and Mobility Manager

517-636-4547 | firmanj@michigan.gov