Chapter 3
GRAND 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

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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 3 of this report provides an overview of Grand Region. Grand Region is made up of 13 counties and contains the cities of Grand Rapids and Rockford. Five 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
Delay can also be represented by converting the user delay into a cost. The delay is multiplied by the number of vehicle 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>
<th></th>
<th></th>
<th></th>
<th></th>
<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-196 through Kent County in the Grand 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.

FIGURE 3. Example User Delay Cost Graph
AVERAGE SPEED

Figure 4 is an example of the average speed graph. This figure represents westbound I-96 through the Grand 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 PM peak while approaching M-21 interchange.
g) Example of limited change in speed from year to year and time period to time period.
h) 2017 AM peak average speed is approximately 66 MPH at Exit 16.
i) 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-96 through the Grand 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 Grand Region during the PM 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 PM peak hour.
b) High area of congestion due to people traveling in and out of Grand Rapids during evening hours.
GRAND REGION: OVERVIEW

GRAND REGION: CONGESTION SEVERITY

FIGURE 7. 2017 Grand Region AM Peak Congestion Severity

2017 Congestion Severity

- Low (≥55 MPH)
- Moderate (≥35 MPH & <55 MPH)
- Severe (<35 MPH)
GRAND REGION: CONGESTION SEVERITY

FIGURE 8. 2017 Grand Region PM Peak Congestion Severity
GRAND 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>
GRAND REGION: USER DELAY COST

FIGURE 9. Grand Region User Delay Cost Trend
### GRAND REGION: USER DELAY COST

**TABLE 5. 2017 Grand 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-131 Kent Co.</td>
<td>$15,888,000</td>
<td>$18,831,000</td>
<td>-$2,943,000</td>
</tr>
<tr>
<td>2</td>
<td>I-196 Kent Co.</td>
<td>$9,365,000</td>
<td>$10,360,000</td>
<td>-$995,000</td>
</tr>
<tr>
<td>3</td>
<td>I-96 Kent Co.</td>
<td>$6,380,000</td>
<td>$6,023,000</td>
<td>$357,000</td>
</tr>
<tr>
<td>4</td>
<td>US-31 Muskegon/Ottawa Co. (70 MPH Section)</td>
<td>$2,312,000</td>
<td>$3,885,000</td>
<td>-$1,573,000</td>
</tr>
<tr>
<td>5</td>
<td>I-96 Ionia Co.</td>
<td>$1,742,000</td>
<td>$1,952,000</td>
<td>-$210,000</td>
</tr>
<tr>
<td>6</td>
<td>I-196 Ottawa Co.</td>
<td>$1,652,000</td>
<td>$2,374,000</td>
<td>-$722,000</td>
</tr>
<tr>
<td>7</td>
<td>I-96 Ottawa Co.</td>
<td>$1,576,000</td>
<td>$1,787,000</td>
<td>-$211,000</td>
</tr>
<tr>
<td>8</td>
<td>M-6 Kent/Ottawa Co.</td>
<td>$1,314,000</td>
<td>$1,664,000</td>
<td>-$350,000</td>
</tr>
<tr>
<td>9</td>
<td>US-131 Allegan Co.</td>
<td>$1,189,000</td>
<td>$2,385,000</td>
<td>-$1,196,000</td>
</tr>
<tr>
<td>10</td>
<td>I-196 Allegan Co.</td>
<td>$954,000</td>
<td>$2,489,000</td>
<td>-$1,535,000</td>
</tr>
<tr>
<td>11</td>
<td>US-131 Montcalm Co.</td>
<td>$516,000</td>
<td>$540,000</td>
<td>-$24,000</td>
</tr>
<tr>
<td>12</td>
<td>US-31 Mason Co. (70 MPH Section)</td>
<td>$504,000</td>
<td>$162,000</td>
<td>$342,000</td>
</tr>
<tr>
<td>13</td>
<td>US-131 Meosta Co.</td>
<td>$304,000</td>
<td>$771,000</td>
<td>-$467,000</td>
</tr>
<tr>
<td>14</td>
<td>I-96 Muskegon Co.</td>
<td>$252,000</td>
<td>$511,000</td>
<td>-$259,000</td>
</tr>
<tr>
<td>15</td>
<td>US-131 Osceola Co.</td>
<td>$193,000</td>
<td>$473,000</td>
<td>-$280,000</td>
</tr>
<tr>
<td>16</td>
<td>US-31 Oceana Co.</td>
<td>$190,000</td>
<td>$375,000</td>
<td>-$185,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$44,331,000</strong></td>
<td><strong>$54,582,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Minor differences may occur due to rounding.*
## GRAND REGION: USER DELAY COST

### TABLE 6. 2017 Grand Region User Delay Cost Data per Mile

<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>I-196 Kent Co.</td>
<td>$323,000</td>
<td>$357,000</td>
<td>-$34,000</td>
</tr>
<tr>
<td>2</td>
<td>US-131 Kent Co.</td>
<td>$201,000</td>
<td>$238,000</td>
<td>-$37,000</td>
</tr>
<tr>
<td>3</td>
<td>I-96 Kent Co.</td>
<td>$103,000</td>
<td>$97,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>4</td>
<td>I-196 Ottawa Co.</td>
<td>$55,000</td>
<td>$79,000</td>
<td>-$24,000</td>
</tr>
<tr>
<td>5</td>
<td>US-31 Muskegon/Ottawa Co. (70 MPH Section)</td>
<td>$38,000</td>
<td>$64,000</td>
<td>-$26,000</td>
</tr>
<tr>
<td>6</td>
<td>I-96 Ottawa Co.</td>
<td>$38,000</td>
<td>$44,000</td>
<td>-$6,000</td>
</tr>
<tr>
<td>7</td>
<td>M-6 Kent/Ottawa Co.</td>
<td>$36,000</td>
<td>$45,000</td>
<td>-$9,000</td>
</tr>
<tr>
<td>8</td>
<td>I-96 Ionia Co.</td>
<td>$34,000</td>
<td>$38,000</td>
<td>-$4,000</td>
</tr>
<tr>
<td>9</td>
<td>I-96 Muskegon Co.</td>
<td>$23,000</td>
<td>$46,000</td>
<td>-$23,000</td>
</tr>
<tr>
<td>10</td>
<td>US-131 Allegan Co.</td>
<td>$22,000</td>
<td>$44,000</td>
<td>-$22,000</td>
</tr>
<tr>
<td>11</td>
<td>US-31 Mason Co. (70 MPH Section)</td>
<td>$22,000</td>
<td>$7,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>12</td>
<td>US-131 Montcalm Co.</td>
<td>$19,000</td>
<td>$20,000</td>
<td>-$1,000</td>
</tr>
<tr>
<td>13</td>
<td>I-196 Allegan Co.</td>
<td>$16,000</td>
<td>$42,000</td>
<td>-$26,000</td>
</tr>
<tr>
<td>14</td>
<td>US-131 Mecosta Co.</td>
<td>$5,000</td>
<td>$13,000</td>
<td>-$8,000</td>
</tr>
<tr>
<td>15</td>
<td>US-131 Osceola Co.</td>
<td>$4,000</td>
<td>$9,000</td>
<td>-$5,000</td>
</tr>
<tr>
<td>16</td>
<td>US-31 Oceana Co.</td>
<td>$3,000</td>
<td>$7,000</td>
<td>-$4,000</td>
</tr>
</tbody>
</table>

*Note: Minor differences may occur due to rounding.*
GRAND REGION: CORRIDOR GLOSSARY

Interstate 96: Muskegon, Ottawa, Kent, and Ionia  Pg. 20
Interstate 196: Allegan, Ottawa, and Kent  Pg. 30
Michigan 6: Ottawa and Kent  Pg. 39
US-31: Ottawa (70 MPH Section), Muskegon, Oceana, and Mason (70 MPH Section)  Pg. 42
US-131: Allegan, Kent, Montcalm, Mecosta, and Osceola  Pg. 47
INTERSTATE 96: MUSKEGON, OTTAWA, KENT, AND IONIA

a) Segment Map

b) UDC Graph

FIGURE 10. Muskegon County I-96 Corridor Total User Delay Cost
INTERSTATE 96: MUSKEGON, OTTAWA, KENT, AND IONIA

![Map of Muskegon, Ottawa, Kent, and Ionia counties with segments highlighted.]

**Figure 11.** Ottawa County I-96 Corridor Total User Delay Cost
INTERSTATE 96: MUSKEGON, OTTAWA, KENT, AND IONIA

2012-2016 Average User Delay Cost - $6,023,000
2017 User Delay Cost - $6,380,000

FIGURE 12. Kent County I-96 Corridor Total User Delay Cost
INTERSTATE 96: MUSKEGON, OTTAWA, KENT, AND IONIA

a) Segment Map

b) UDC Graph

FIGURE 13. Ionia County I-96 Corridor Total User Delay Cost
FIGURE 14. Grand Region I-96 Eastbound
FIGURE 15. Grand Region I-96 Westbound
INTERSTATE 96: TRAVEL TIME RELIABILITY

FIGURE 16. Travel Time Reliability: I-96
FIGURE 17. Segment 1 - I-96 between M-11/Exit 24 and US-131/Exit 31
INTERSTATE 96: TRAVEL TIME RELIABILITY

INTERSTATE 96: TRAVEL TIME RELIABILITY

FIGURE 19. Segment 3 - I-96 between I-196/Gerald R Ford Fwy and M-6/Paul B. Henry Fwy
FIGURE 20. Allegan County I-196 Corridor Total User Delay Cost
INTERSTATE 196: ALLEGAN, OTTAWA, AND KENT

a) Segment Map

b) UDC Graph

FIGURE 21. Ottawa County I-196 Corridor Total User Delay Cost
INTERSTATE 196: ALLEGAN, OTTAWA, AND KENT

![Map of Kent County with Interstate 196 highlighted]

**a) Segment Map**

**b) UDC Graph**

**FIGURE 22.** Kent County I-196 Corridor Total User Delay Cost

- 2012-2016 Average User Delay Cost - $10,360,000
- 2017 User Delay Cost - $9,365,000

- [Graph showing annual user delay cost from January to December for each year]
FIGURE 23. Grand Region I-196 Eastbound
**FIGURE 24.** Grand Region I-196 Westbound
INTERSTATE 196: TRAVEL TIME RELIABILITY

a) Grand Region

b) Grand Rapids, Michigan

FIGURE 25. Travel Time Reliability: I-196
INTERSTATE 196: TRAVEL TIME RELIABILITY

FIGURE 26. Segment 1 - I-196 between Ottawa/Allegan County Line and 32nd Ave/Exit 62
INTERSTATE 196: TRAVEL TIME RELIABILITY

**FIGURE 27.** Segment 2 - I-196 between 32nd Ave/Exit 62 and US-131/Exit 77
INTERSTATE 196: TRAVEL TIME RELIABILITY

FIGURE 28. Segment 3 - I-196 between US-131/Exit 77 and I-96/M-37
MICHIGAN 6: OTTAWA AND KENT

FIGURE 29. Ottawa and Kent Counties M-6 Corridor Total User Delay Cost

a) Segment Map

b) UDC Graph

2012-2016 Average User Delay Cost - $1,664,000
2017 User Delay Cost - $1,314,000
FIGURE 30. Grand Region M-6 Eastbound
FIGURE 31. Grand Region M-6 Westbound
US-31: OTTAWA (70 MPH SECTION), MUSKEGON, OCEANA, AND MASON (70 MPH SECTION)

**FIGURE 32.** Ottawa and Muskegon Counties US-31 Corridor Total User Delay Cost
US-31: OTTAWA (70 MPH SECTION), MUSKEGON, OCEANA, AND MASON (70 MPH SECTION)

a) Segment Map

b) UDC Graph

FIGURE 33. Oceana County US-31 Corridor Total User Delay Cost
US-31: OTTAWA (70 MPH SECTION), MUSKEGON, OCEANA, AND MASON (70 MPH SECTION)

**a) Segment Map**

**b) UDC Graph**

**FIGURE 34.** Mason County US-31 Corridor Total User Delay Cost
FIGURE 35. Grand Region US-31 Northbound
FIGURE 36. Grand Region US-31 Southbound
US-131: ALLEGAN, KENT, MONTCALM, MECOSTA, AND OSCEOLA

2012-2016 Average User Delay Cost - $2,385,000
2017 User Delay Cost - $1,189,000

FIGURE 37. Allegan County US-131 Corridor Total User Delay Cost
US-131: ALEGAN, KENT, MONTCALM, MECOSTA, AND OSCEOLA

FIGURE 38. Kent County US-131 Corridor Total User Delay Cost

2012-2016 Average User Delay Cost - $18,831,000

2017 User Delay Cost - $15,888,000
US-131: ALLEGAN, KENT, MONTCALM, MECOSTA, AND OSCEOLA

\[\text{Segment Map}\]

\[\text{UDC Graph}\]

\text{FIGURE 39. Montcalm County US-131 Corridor Total User Delay Cost}\]
FIGURE 40. Mecosta County US-131 Corridor Total User Delay Cost
US-131: ALLEGAN, KENT, MONTCALM, MECOSTA, AND OSCEOLA

**a)** Segment Map

**b)** UDC Graph

**FIGURE 41.** Osceola County US-131 Corridor Total User Delay Cost
FIGURE 42. Grand Region US-131 Northbound
FIGURE 43. Grand Region US-131 Southbound
US-131: TRAVEL TIME RELIABILITY

FIGURE 44. Travel Time Reliability: US-131
US-131: TRAVEL TIME RELIABILITY

![Graph showing travel time reliability for US-131 between 68th St/Exit 77 and I-196/Gerald R Ford Fwy/Exit 86.](image)

**FIGURE 45.** Segment 1 - US-131 between 68th St/Exit 77 and I-196/Gerald R Ford Fwy/Exit 86
US-131: TRAVEL TIME RELIABILITY

![Graph showing travel time reliability for US-131 between I-196/Gerald R Ford Fwy/Exit 86 and I-96/M-37/Exit 89.]

**FIGURE 46.** Segment 2 - US-131 between I-196/Gerald R Ford Fwy/Exit 86 and I-96/M-37/Exit 89
US-131: TRAVEL TIME RELIABILITY

FIGURE 47. Segment 3 - US-131 between I-96/M-37/Exit 89 and M-57/14 Mile Rd/Exit 101
FIGURE 48. Travel Time Reliability: US-131 Seasonal
US-131: TRAVEL TIME RELIABILITY

a) Northbound between May 1st and September 30th (Fridays only)

b) Southbound between May 1st and September 30th (Sundays only)

FIGURE 49. Segment 1 - US-131 between I-96/M-37/Exit 89 and M-115/Exit 176 (Summer)
CONCLUSION

This chapter summarizes the performance of the Grand 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.

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