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Mobility Measures: I-94 Corridor ....................... 16
Mobility Measures: I-196 Corridor ..................... 26
Mobility Measures: US-31 Corridor .................... 32
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Performance Measures Definitions

**Total delay**  >  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.

**Total delay per mile**  >  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.

**User Delay Cost**  >  User Delay Costs (UDC) is calculated by multiplying delay \( \times \) 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. 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.”

**Congestion Severity**  >  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.

- Three different categories are used to distinguish severity levels: low \((\geq 55 \text{ mph})\), moderate \((\geq 35 \text{ mph} & < 55 \text{ mph})\), and severe \((< 35 \text{ mph})\).

* On segments with a speed limit of 55 mph, delay is calculated when speeds fall below 55 mph.
Performance Measures Definitions

**Travel Time Reliability** > 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.

**75th Percentile Travel Time** > The amount of time a customer should budget to be on-time three out of four days (75% of the time).

**95th Percentile Travel Time** > The amount of time a customer should budget to be on-time nineteen out of twenty days (95% of the time). The 95th percentile travel time is also known as the planning time.
Figure 1. 2016 Southwest Region AM peak congestion severity northbound/eastbound
Figure 2. 2016 Southwest Region PM peak congestion severity northbound/eastbound

2016 Southwest Region
PM Peak Congestion Severity
Northbound/Eastbound

2016 Congestion Severity
- Red: Severe
- Blue: Moderate
- Green: Low
Figure 3. 2016 Southwest Region AM peak congestion severity southbound/westbound

2016 Southwest Region AM Peak Congestion Severity Southbound/Westbound

2016 Congestion Hours
- Red: Severe
- Blue: Moderate
- Green: Low
Figure 4. 2016 Southwest Region PM peak congestion severity southbound/westbound

2016 Southwest Region
PM Peak Congestion Severity
Southbound/Westbound

2016 Congestion Hours
- Severe
- Moderate
- Low

W E
N S
### Table 1. 2016 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>795.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>668.5</td>
<td>27.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Metro</td>
<td>445.6</td>
<td>144.2</td>
<td>35.0</td>
</tr>
<tr>
<td>Southwest</td>
<td>498.6</td>
<td>1.7</td>
<td>0.0</td>
</tr>
<tr>
<td>University</td>
<td>733.6</td>
<td>40.5</td>
<td>8.0</td>
</tr>
<tr>
<td>North</td>
<td>399.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Superior</td>
<td>100.0</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3641.2</strong></td>
<td><strong>215.9</strong></td>
<td><strong>45.3</strong></td>
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</table>

### Table 2. 2016 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>795.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>656.0</td>
<td>34.8</td>
<td>7.1</td>
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<td>Metro</td>
<td>356.8</td>
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<td>55.6</td>
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<td>Southwest</td>
<td>498.6</td>
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<td>University</td>
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<td>North</td>
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<tr>
<td>Superior</td>
<td>100.0</td>
<td>2.4</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3510.7</strong></td>
<td><strong>314.4</strong></td>
<td><strong>77.3</strong></td>
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</table>
Table 3. 2016 Southwest Region UDC Data

<table>
<thead>
<tr>
<th>Rank</th>
<th>UDC Per Mile</th>
<th>Location (Route, County)</th>
<th>2012-2015 Average</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$109,000</td>
<td>I-94 Kalamazoo Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$99,000</td>
<td>I-94 Berrien Co.</td>
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<tr>
<td>3</td>
<td>$99,000</td>
<td>US-131 Kalamazoo Co. (70 mph Section)</td>
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<td>4</td>
<td>$76,000</td>
<td>I-94 Van Buren Co.</td>
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<td>5</td>
<td>$75,000</td>
<td>I-94 Calhoun Co.</td>
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<tr>
<td>6</td>
<td>$32,000</td>
<td>I-196 Berrien Co.</td>
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<tr>
<td>7</td>
<td>$29,000</td>
<td>I-196 Van Buren Co.</td>
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<tr>
<td>8</td>
<td>$20,000</td>
<td>I-69 Calhoun Co.</td>
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<tr>
<td>9</td>
<td>$18,000</td>
<td>I-69 Branch Co.</td>
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<tr>
<td>10</td>
<td>$18,000</td>
<td>US-31 Berrien Co. (70 mph section)</td>
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</table>

Note: Minor differences may occur due to rounding.
Chapter 6
FREEWAY CONGESTION & RELIABILITY REPORT
Freeway Performance Measures

Corridor

Interstate 69: Branch and Calhoun
Interstate 94: Berrien, Van Buren, Kalamazoo, and Calhoun
Interstate 196: Berrien and Van Buren
US-31: Berrien
US-131: Kalamazoo
Figure 5. Branch County I-69 Corridor total user delay cost
Figure 6. Calhoun County I-69 Corridor total user delay cost
Figure 7. Southwest Region I-69 northbound

Average Speed (mph)

- CALHOUN/EATON COUNTY LINE
- N DR/EXIT 42
- I-94/EXIT 38
- I-94-BR/MICHIGAN AVE/EXIT 36
- F DR/EXIT 32
- M-60/EXIT 25
- MARSHALL RD/EXIT 23
- JONESVILLE RD/EXIT 16
- I-69-BL/US-12/EXIT 13
- I-69-BL/EXIT 10
- COPELAND RD/EXIT 3
- MICHIGAN/INDIANA STATE LINE

Legend:
- 4 Yr Avg AM Peak
- 4 Yr Avg PM Peak
- 2016 AM Peak
- 2016 PM Peak
Figure 8. Southwest Region I-69 southbound

Average Speed (mph)

I-94 Interchange
I-94/EXIT 38
I-94/EXIT 36
MARSHALL RD/EXIT 23
JONESVILLE RD/EXIT 16
I-69-BL/US-12/EXIT 13
I-69-BL/EXIT 10
COPELAND RD/EXIT 3
M-60/EXIT 25
MARSHALL RD/EXIT 23
I-94-BR/MICHIGAN AVE/EXIT 36
N DR/EXIT 42
CALHOUN/EATON COUNTY LINE
US-12 Interchange
70 68 66 64 62 60 58 56
4 Yr Avg AM Peak
4 Yr Avg PM Peak
2016 AM Peak
2016 PM Peak
Chapter 6: Corridor

- Interstate 69: Branch and Calhoun
- Interstate 94: Berrien, Van Buren, Kalamazoo, and Calhoun
- Interstate 196: Berrien and Van Buren
- US-31: Berrien
- US-131: Kalamazoo
Figure 9. Berrien County I-94 Corridor total user delay cost

Berrien County I-94 Corridor
Total User Delay Cost

- 2012-2015 Average User Delay Cost
- 2016 User Delay Cost

User Delay Cost
- Avg. $9,042,000
- 2016 $5,658,000

Berrien County I-94 Corridor 2012-2015 Average User Delay Cost

- Jan $2,500,000
- Feb $2,000,000
- Mar $1,500,000
- Apr $1,000,000
- May $500,000
- Jun $500,000
- Jul $500,000
- Aug $500,000
- Sep $500,000
- Oct $500,000
- Nov $500,000
- Dec $500,000

Costs are displayed for each month from January to December.
Figure 10. Van Buren County I-94 Corridor total user delay cost
Figure 11. Kalamazoo County I-94 Corridor total user delay cost

Kalamazoo County I-94 Corridor Total User Delay Cost

- 2012-2015 Average User Delay Cost
- 2016 User Delay Cost

User Delay Cost

- Avg. $5,645,000
- 2016 $5,402,000
Figure 12. Calhoun County I-94 Corridor total user delay cost

Calhoun County I-94 Corridor Total User Delay Cost

- **User Delay Cost**
  - Avg. $5,026,000
  - 2016 $3,394,000

The chart shows the total user delay cost for the Calhoun County I-94 Corridor from 2012-2015 and the user delay cost in 2016, with a focus on the average and 2016 costs.

The data indicates a decrease in the user delay cost from 2012-2015 to 2016, with a notable reduction in 2016 compared to the average of the earlier years.
Figure 13. Southwest Region I-94 eastbound
Figure 14. Southwest Region I-94 westbound

I-94-BR/EXIT 121
26 MILE RD/EXIT 119
22 1/2 MILE RD/EXIT 115
I-94-BR/PARTELLO RD/EXIT 112
OLD US-27/EXIT 110
I-69/US-27/EXIT 108
11 MILE RD/EXIT 104
I-94-BR/EXIT 103
BEADLE LAKE RD/EXIT 100
I-194/M-66/EXIT 98
CAPITAL AVE/EXIT 97
HELMER RD/EXIT 95
I-94-BR/EXIT 92
40TH ST/EXIT 88
35TH ST/EXIT 85
I-94-BR/EXIT 81
SPRINKLE RD/EXIT 80
KILGORE RD/EXIT 78
PORTAGE ST/EXIT 78
WESTNEDGE AVE/EXIT 76
OAKLAND DR/EXIT 75
I-94-BR/US-131/EXIT 74
9TH ST/EXIT 72
CR-652/EXIT 66
M-40/EXIT 60
M-51/EXIT 56
S2ND ST/EXIT 52
64TH ST/EXIT 46
M-140/EXIT 41
FRIDAY RD/EXIT 39
I-196/US-31/EXIT 34
I-94-BR/EXIT 33
NAPIER AVE/EXIT 30
PIPESTONE RD/EXIT 29
US-31/M-139/EXIT 28
M-63/NILES AVE/EXIT 27
I-94-BR/EXIT 23
GRAND MERE RD/EXIT 22
RED ARROW HWY/EXIT 16
SAWYER RD/EXIT 12
UNION PIER RD/EXIT 6
US-12/EXIT 4
M-239/LA PORTE RD/EXIT 1
MICHIGAN/INDIANA STATE LINE

Average Speed (mph)

4 Yr Avg AM Peak | 4 Yr Avg PM Peak | 2016 AM Peak | 2016 PM Peak
Travel Time Reliability

Figure 15. Travel time reliability 1-94
### Figure 16. Segment 1- I-94 between I-94-BR/US-131/Exit 74 and I-94-BR/Exit 81

#### Eastbound Travel Times

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<thead>
<tr>
<th>Time of Day</th>
<th>Avg</th>
<th>75th %</th>
<th>95th %</th>
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<tr>
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</tbody>
</table>

#### Westbound Travel Times

<table>
<thead>
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<th>Time of Day</th>
<th>Avg</th>
<th>75th %</th>
<th>95th %</th>
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</table>
Corridor

- Interstate 69: Branch and Calhoun
- Interstate 94: Berrien, Van Buren, Kalamazoo, and Calhoun
- Interstate 196: Berrien and Van Buren
- US-31: Berrien
- US-131: Kalamazoo
Figure 17. Berrien County I-196 Corridor total user delay cost

Berrien County I-196 Corridor
Total User Delay Cost

2012-2015 Average User Delay Cost
2016 User Delay Cost

User Delay Cost

Avg. $857,000
2016 $338,000

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
**Figure 18. Van Buren County I-196 Corridor total user delay cost**

VanBuren County I-196 Corridor Total User Delay Cost

- **2012-2015 Average User Delay Cost**
- **2016 User Delay Cost**

- **User Delay Cost**
  - Avg. $879,000
  - 2016 $369,000

<table>
<thead>
<tr>
<th>Month</th>
<th>2012-2015 Avg.</th>
<th>2016</th>
<th>Total</th>
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<tr>
<td>Jan</td>
<td>$130,000</td>
<td>$50,000</td>
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<td>Dec</td>
<td>$210,000</td>
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Figure 19. Southwest Region I-196 northbound
Figure 20. Southwest Region I-196 southbound

![Graph of average speed (mph) for various exits on I-196 in the Southwest Region, showing 4 Year Average AM Peak, 4 Year Average PM Peak, 2016 AM Peak, and 2016 PM Peak.]
Corridor

- Interstate 69: Branch and Calhoun
- Interstate 94: Berrien, Van Buren, Kalamazoo, and Calhoun
- Interstate 196: Berrien and Van Buren
- US-31: Berrien
- US-131: Kalamazoo
Figure 21. Berrien County US-31 Corridor total user delay cost

Berrien County US-31 Corridor (70 mph section)
Total User Delay Cost

<table>
<thead>
<tr>
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<th>User Delay Cost</th>
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<tr>
<td>Avg.</td>
<td>$881,000</td>
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<td>2016</td>
<td>$525,000</td>
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</table>

2012-2015 Average User Delay Cost

2016 User Delay Cost

- January: $100,000
- February: $125,000
- March: $75,000
- April: $50,000
- May: $75,000
- June: $100,000
- July: $50,000
- August: $150,000
- September: $100,000
- October: $75,000
- November: $50,000
- December: $125,000
Figure 22. Southwest Region US-31 northbound
Figure 23. Southwest Region US-31 southbound

Average Speed (mph)

Sodus Pky Interchange

SODUS PKY/EXIT 22

TABOR RD/EXIT 18

M-139/OLD US-31

SNOW RD

WALTON RD

NILES-BUCHANAN RD/EXIT 5

US-12 Interchange

US-12/EXIT 3

MICHIGAN/INDIANA STATE LINE

4 Yr Avg AM Peak  4 Yr Avg PM Peak  2016 AM Peak  2016 PM Peak
Corridor

- Interstate 69: Branch and Calhoun
- Interstate 94: Berrien, Van Buren, Kalamazoo, and Calhoun
- Interstate 196: Berrien and Van Buren
- US-31: Berrien
- US-131: Kalamazoo
Figure 24. Kalamazoo County US-131 Corridor total user delay cost

Kalamazoo County US-131 Corridor Total User Delay Cost

- 2012-2015 Average User Delay Cost
- 2016 User Delay Cost

User Delay Cost
- Avg. $2,764,000
- 2016 $2,621,000
Figure 25. Southwest Region US-131 northbound

Average Speed (mph)

- 4 Yr Avg AM Peak
- 4 Yr Avg PM Peak
- 2016 AM Peak
- 2016 PM Peak
Figure 26. Southwest Region US-131 southbound