

**APPENDIX A**  
**TRAFFIC ANALYSIS**



## TRAFFIC ANALYSIS

This appendix provides a summary of existing traffic and capacity conditions, and a comparative analysis of design-year (2030) traffic operations for the No Build and proposed Build Alternatives. Additional existing and future traffic and capacity analysis for existing and forecasted traffic are included in the *I-196/I-96 and M-37/M-44 EA Traffic Analysis* Technical Report which is available upon request. Listed below is a list of the capacity improvements along the I-196, I-96 and M-37/M-44 (East Beltline) corridors that are included in the Build Alternative.

### **Proposed Capacity Improvements**

#### **I-196**

- Construct a third through lane in each direction between US-131 and I-96.
- Construct auxiliary weave-merge lanes in each direction between Ionia Avenue/Ottawa Avenue and College Avenue interchanges.
- Construct auxiliary weave-merge lanes in each direction between College Avenue and Fuller Avenue interchanges.
- Construct a ramp from westbound I-196 to northbound US-131BR (Division Avenue).
- Convert existing Division Avenue to one-way northbound between I-196 and Mason Street. Convert existing Ionia Avenue to one-way southbound between Mason Street and I-196.
- Eliminate Hastings Street from the existing north ramp terminal intersection of the I-196/College Avenue interchange.
- Construct additional laneage and storage at the College Avenue and Fuller Avenue interchanges.

#### **I-96**

- Construct a third through lane in each direction between M-44 and Cascade Road.
- Construct an eastbound I-196 to westbound I-96 fly-over ramp.
- Construct a eastbound I-96 to westbound I-196 ramp.
- Construct collector-distributor road on eastbound I-96 between I-196 and M-44.
- Construct collector-distributor road on westbound I-96 between M-44 and Leonard Street.
- Reconstruct the eastbound I-96 on-ramp from Leonard Street and construct additional laneage and storage at the I-96/Leonard Street interchange.
- Construct an auxiliary weave-merge lane on eastbound I-96 between M-44 and M-21.
- Widen the existing eastbound I-96 off-ramp to M-21 and provide access to eastbound M-21.
- Construct an eastbound I-96 on-ramp from M-21.
- Construct a westbound I-96 off-ramp to M-21.
- Construct a two-lane on-ramp from Cascade Road to westbound I-96.

**M-37/M-44 (East Beltline)**

- Construct a third through lane in each direction from north of Knapp Street to M-21.
- Increase capacity and storage of the directional median crossovers at Leonard Street and Knapp Street.
- Improve turning lane capacity at various locations along the corridor.

**Traffic Analysis-Base Year (2004) Traffic**

Conventional analysis of basic freeway segments, ramp-freeway ramps, weave sections, signalized intersections and unsignalized intersections involves the determination of a “Level of Service” (LOS). Levels of Service range from “A” to “F”, similar to an alphabetic grading system, with each level describing a different set of operational characteristics. LOS “A” describes operational performance under light traffic volumes and minimal delay. LOS “F” describes a high degree of congestion with extensive delays and queuing. LOS “D” is commonly considered to be acceptable for peak-hour traffic operations in urbanized areas.

*Freeway Segments-Base Year*

The existing (2004) peak-hour Levels of Service for the I-196 and I-96 basic freeway segments are depicted in **Table 1**. Capacity analysis worksheets for all existing (2004) basic freeway segment analyses are available on request.

TABLE 1  
EXISTING (2004) PEAK-HOUR LEVELS OF SERVICE  
BASIC FREEWAY SEGMENTS

| Free-way | Segment           | AM-Peak Hour                   |          |             |          | PM-Peak Hour |          |             |          |
|----------|-------------------|--------------------------------|----------|-------------|----------|--------------|----------|-------------|----------|
|          |                   | Eastbound                      |          | Westbound   |          | Eastbound    |          | Westbound   |          |
|          |                   | Vol ume                        | LOS      | Vol ume     | LOS      | Vol ume      | LOS      | Vol ume     | LOS      |
| I-196    | Ionia to College  | <b>4410</b>                    | <b>F</b> | <b>3610</b> | <b>E</b> | <b>4150</b>  | <b>F</b> | <b>3980</b> | <b>F</b> |
| I-196    | College to Fuller | <b>3860</b>                    | <b>E</b> | <b>3770</b> | <b>E</b> | <b>3880</b>  | <b>F</b> | <b>3760</b> | <b>E</b> |
| I-196    | Fuller to I-96    | 3210                           | D        | 3020        | C        | 3310         | D        | 3340        | D        |
| I-96     | North of Leonard  | 3010                           | C        | 1530        | B        | 1520         | B        | 3140        | D        |
| I-96     | Leonard to I-196  | 2780                           | C        | 1410        | B        | 1550         | B        | 2730        | C        |
| I-96     | I-196 to M-44     | Weave Analysis. See Table 2-4. |          |             |          |              |          |             |          |
| I-96     | M-44 to M-21      | 5110                           | D        | 3730        | C        | 4050         | C        | 5210        | D        |
| I-96     | M-21 to Cascade   | <b>4240</b>                    | <b>F</b> | 2490        | C        | 3100         | D        | <b>4350</b> | <b>F</b> |

Source: URS Corporation, November 2004

As noted above, there are numerous basic freeway segments (shaded areas) which operate at unacceptable Levels of Service. These results reveal the need for additional freeway capacity on I-96 and I-196.

*Ramp-Freeway Junctions-Base Year*

The existing (2004) peak-hour Levels of Service for the I-196 and I-96 ramp-freeway junctions are depicted in **Table 2**. Some ramps cannot be analyzed by the methods of the *2000 Highway Capacity Manual* because some ramps do not create merge or diverge conditions, but rather involve adding or dropping a freeway lane or creating a weave section. Capacity analysis worksheets for all existing (2004) ramp-freeway junction are available on request.

As shown in **Table 2**, there are numerous ramp-freeway junctions (shaded areas) which operate at unacceptable Levels of Service. Some of the ramps have low volumes, but the merge and/or diverge influence areas have dense volumes of traffic due to the high volumes of traffic on the freeway. These results reveal the need for additional freeway capacity on I-96 and I-196.

TABLE 2  
EXISTING (2004) PEAK-HOUR LEVELS OF SERVICE  
RAMP-FREEWAY JUNCTIONS

| Ramp Location                       | AM-Peak Hour |           | PM-Peak Hour |           |
|-------------------------------------|--------------|-----------|--------------|-----------|
|                                     | Ramp Volume  | LOS       | Ramp Volume  | LOS       |
| <b>Eastbound On-Ramps</b>           |              |           |              |           |
| Ionia Avenue On-ramp to EB I-196    | <b>190</b>   | <b>F</b>  | <b>680</b>   | <b>F</b>  |
| College Avenue On-ramp to EB I-196  | <b>290</b>   | <b>E</b>  | <b>460</b>   | <b>E</b>  |
| Fuller Avenue On-ramp to EB I-196   | 250          | D         | 330          | D         |
| Leonard Street On-ramp to EB I-96   | 360          | C         | 280          | B         |
| M-44 On-ramp to EB I-96             | 450          | D         | 400          | C         |
| <b>Westbound On-Ramps</b>           |              |           |              |           |
| Ionia Avenue On-ramp to WB I-196    | 280          | Add-lane  | 920          | Add-lane  |
| College Avenue On-ramp to WB I-196  | 720          | D         | <b>620</b>   | <b>F</b>  |
| Fuller Avenue On-ramp to WB I-196   | <b>1030</b>  | <b>E</b>  | <b>1000</b>  | <b>E</b>  |
| Leonard Street On-ramp to WB I-96   | 240          | B         | 650          | D         |
| SB M-44 On-ramp to WB I-96          | 630          | Weave     | 610          | Weave     |
| NB M-44 On-ramp to WB I-96          | 600          | C         | 920          | D         |
| M-21 On-ramp to WB I-96             | 1240         | Add-lane  | 860          | Add-lane  |
| Cascade Road On-ramp to WB I-96     | 1000         | C         | <b>1630</b>  | <b>F</b>  |
| <b>Eastbound Off-Ramps</b>          |              |           |              |           |
| EB I-196 Off-ramp to Ottawa Avenue  | 420          | Drop-lane | 230          | Drop-lane |
| EB I-196 Off-ramp to College Avenue | <b>840</b>   | <b>F</b>  | <b>730</b>   | <b>F</b>  |
| EB I-196 Off-ramp to Fuller Avenue  | <b>900</b>   | <b>E</b>  | <b>900</b>   | <b>E</b>  |
| EB I-96 Off-ramp to Leonard Street  | 590          | D         | 250          | B         |
| EB I-96 Off-ramp to M-44            | 1330         | Weave     | 1210         | Weave     |
| EB I-96 Off-ramp to M-21            | 870          | Drop-lane | 950          | Drop-lane |
| EB I-96 Off-ramp to WB Cascade Rd   | <b>830</b>   | <b>F</b>  | 420          | D         |
| <b>Westbound Off-Ramps</b>          |              |           |              |           |
| WB I-196 Off-ramp to Ottawa Avenue  | 1050         | D         | <b>270</b>   | <b>F</b>  |
| WB I-196 Off-ramp to College Avenue | <b>880</b>   | <b>E</b>  | <b>400</b>   | <b>E</b>  |
| WB I-196 Off-ramp to Fuller Avenue  | 280          | D         | 580          | D         |
| WB I-96 Off-ramp to Leonard Street  | 120          | B         | 240          | C         |
| WB I-96 Off-ramp to M-44            | 530          | C         | 670          | D         |

Add-Lane: Ramp lane creates an add-on lane and cannot be analyzed by methods of HCM. Drop-Lane: Freeway lane is dropped at off-ramp and cannot be analyzed by methods of HCM. Weave: Ramp is part of a weave segment. See Table 4.

Weave Sections-Base Year

The existing (2004) peak-hour Levels of Service for the two weave sections in the project limits are depicted in **Table 3**. Each weave section operates at Level of Service “E” or “F” in at least one of the peak hours. The weave analyses results are indicative of the bottleneck conditions created by these weave sections during peak hours. Movement-by-movement Levels of Service are shown in the *I-196/I-96 and M-37/M-44 EA Traffic Analysis Technical Report*. Capacity analysis worksheets for all existing (2004) weave section analyses are available on request.

**TABLE 3**  
**EXISTING (2004) PEAK-HOUR LEVELS OF SERVICE**  
**WEAVE SECTIONS**

| Freeway | Section                         | Length<br>h<br>(feet)  | Peak | V a-c       | V a-d       | V b-c       | V b-d      | LOS      |
|---------|---------------------------------|--|------|-------------|-------------|-------------|------------|----------|
| EB I-96 | I-196 to M-44<br>(Type C Weave) | 900  | AM   | <b>2380</b> | <b>400</b>  | <b>2280</b> | <b>930</b> | <b>E</b> |
|         |                                 |  | PM   | 1320        | 230         | 2330        | 980        | D        |
| WB I-96 | M-44 to I-196<br>(Type B Weave) | 1400   | AM   | 2640        | 1160        | 380         | 250        | D        |
|         |                                 |  | PM   | <b>2970</b> | <b>2490</b> | <b>370</b>  | <b>240</b> | <b>F</b> |
| EB I-96 | M-44 to M-21                    | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |      |             |             |             |            |          |
| WB I-96 | M-21 to M-44                    | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |      |             |             |             |            |          |

V a-c = Freeway-to-freeway volume (mainline through); V a-d = Freeway to Ramp

V b-c = Ramp to Freeway; V b-d = Ramp to Ramp

*Signalized Intersections-Base Year*

The existing (2004) peak-hour Levels of Service for the signalized intersections within the project limits are depicted in **Table 4**. Movement-by-movement Levels of Service are shown in the *I-196/I-96/M-44 Technical Report*. Capacity analysis worksheets for all existing (2004) signalized intersection analyses are available on request.

*TABLE 4*  
**EXISTING (2004) PEAK-HOUR LEVELS OF SERVICE  
SIGNALIZED INTERSECTIONS**

| Signalized Intersection         | AM-Peak Hour     |                         | PM-Peak Hour     |                         |
|---------------------------------|------------------|-------------------------|------------------|-------------------------|
|                                 | Level of Service | Average Delay (sec/veh) | Level of Service | Average Delay (sec/veh) |
| Ottawa Avenue / Michigan Street | C                | 23.9                    | C                | 34.1                    |
| Ionia Avenue / Michigan Street  | <b>E</b>         | <b>62.9</b>             | <b>F</b>         | <b>82.2</b>             |
| EB I-196 / College Avenue       | B                | 18.8                    | C                | 30.5                    |
| WB I-196 / College Avenue       | D                | 48.9                    | C                | 30.5                    |
| EB I-196 / Fuller Avenue        | C                | 29.1                    | <b>F</b>         | <b>83.2</b>             |
| WB I-196 / Fuller Avenue        | D                | 51.2                    | D                | 53.4                    |
| EB I-96 / Leonard Street        | B                | 16.9                    | B                | 12.9                    |
| M-44 / M-21                     | <b>E</b>         | <b>61.3</b>             | <b>E</b>         | <b>60.1</b>             |
| M-44 / Michigan Street          | D                | 40.9                    | C                | 26.3                    |
| M-44 / EB I-96                  | C                | 23.7                    | <b>E</b>         | <b>62.5</b>             |
| M-44 / WB I-96                  | B                | 18.1                    | D                | 41.9                    |
| M-44 / Leonard Street           | D                | 40.4                    | <b>E</b>         | <b>71.3</b>             |
| M-44 / Knapp Street             | <b>E</b>         | <b>77.6</b>             | D                | 41.0                    |

Source: URS Corporation, November 2004

As shown in **Table 4** on the previous page, six of the thirteen signalized intersections in the study area operate at an unacceptable Level of Service during at least one of the two existing (2004) peak hours.

It should be noted that the Levels of Service depicted at the College Avenue and Fuller Avenue interchanges are worse than shown in **Table 4**. The *Highway Capacity Software* is limited in its ability to analyze congestion, and *the results do not account for the fact that the left-turn movements entering the freeway at those locations back up into the adjacent intersection.*

Each of the M-44 signals which simultaneously stop northbound and southbound traffic (M-21, EB I-96 off-ramp, Leonard Street, and Knapp Street) operate at Level of Service “E” or “F”, indicating the need for additional capacity along East Beltline Avenue.

## Comparison of Build Alternative and No-Build Alternative

### Basic Freeway Segments

A comparison of the results of the various capacity analyses (basic freeway segments, ramp/junction and signalized intersections) is presented in the following tables for the Build and the No-Build Alternatives. Future traffic volumes were forecasted using the Grand Rapids MPO model sub-set of the MDOT Statewide Model coupled with a review of historical growth in the project area.

Major differences between the alternatives include increased traffic induced by the additional capacity provided in the Build Alternative. In addition, traffic volumes on I-96 west of the I-196 junction are greater under the Build Alternative due to the redistribution of trips and attraction of new trips associated with construction of the proposed new, eastbound I-96 to westbound I-196 and eastbound I-196 to westbound I-96, freeway-to-freeway ramps at the I-96/I-196 interchange. This additional traffic is caused by travel pattern changes for both freeway to freeway and freeway interchange access routes. Freeway trip length, especially for the Plainfield Avenue, Leonard Street, and Fuller Avenue interchanges, will be shortened by using the new freeway to freeway ramps. As a result, some trips currently using US-131 to access I-196 interchanges, are projected to use I-96 to access I-196 via the new ramps when completed. As shown in **Tables 5 and 6**, the Build Alternative operates at an acceptable Level of Service for the freeway segments in the project area.

*TABLE 5  
DESIGN YEAR (2030) MORNING PEAK-HOUR LEVELS OF SERVICE  
BASIC FREEWAY SEGMENTS  
NO-BUILD AND BUILD ALTERNATIVE COMPARISON*

| Free way | Segment           | 2030 No Build |          |             |          | 2030 Build Alternative      |     |           |     |
|----------|-------------------|---------------|----------|-------------|----------|-----------------------------|-----|-----------|-----|
|          |                   | Eastbound     |          | Westbound   |          | Eastbound                   |     | Westbound |     |
|          |                   | Volume        | LOS      | Volume      | LOS      | Volume                      | LOS | Volume    | LOS |
| I-196    | Ionia to College  | <b>5440</b>   | <b>F</b> | <b>4460</b> | <b>F</b> | Weave Analysis. See Table 4 |     |           |     |
| I-196    | College to Fuller | <b>4760</b>   | <b>F</b> | <b>4660</b> | <b>F</b> | 5130                        | D   | 5120      | D   |
| I-196    | Fuller to I-96    | <b>3970</b>   | <b>E</b> | <b>3740</b> | <b>E</b> | 4580                        | C   | 4430      | C   |
| I-96     | M-44 to M-21      | <b>6440</b>   | <b>F</b> | 4710        | D        | 6930                        | C   | 4930      | C   |
| I-96     | M-21 to Cascade   | <b>5340</b>   | <b>F</b> | 3140        | D        | 5990                        | C   | 3590      | B   |

Source: URS Corporation, November 2004

TABLE 6  
DESIGN YEAR (2030) EVENING PEAK-HOUR LEVELS OF SERVICE  
BASIC FREEWAY SEGMENTS  
NO-BUILD AND BUILD ALTERNATIVE COMPARISON

| Free way | Segment           | 2030 No Build |          |             |          | 2030 Build Alternative      |     |           |     |
|----------|-------------------|---------------|----------|-------------|----------|-----------------------------|-----|-----------|-----|
|          |                   | Eastbound     |          | Westbound   |          | Eastbound                   |     | Westbound |     |
|          |                   | Volume        | LOS      | Volume      | LOS      | Volume                      | LOS | Volume    | LOS |
| I-196    | Ionia to College  | <b>5130</b>   | <b>F</b> | <b>4900</b> | <b>F</b> | Weave Analysis. See Table 4 |     |           |     |
| I-196    | College to Fuller | <b>4800</b>   | <b>F</b> | <b>4630</b> | <b>F</b> | 5180                        | D   | 5090      | D   |
| I-196    | Fuller to I-96    | <b>4090</b>   | <b>E</b> | <b>4120</b> | <b>E</b> | 4710                        | D   | 4840      | D   |
| I-96     | M-44 to M-21      | 4960          | D        | <b>6570</b> | <b>F</b> | 5400                        | B   | 6880      | D   |
| I-96     | M-21 to Cascade   | <b>3760</b>   | <b>E</b> | <b>5480</b> | <b>F</b> | 4360                        | B   | 6110      | C   |

Source: URS Corporation, November 2004

## Ramp Freeway Junctions

As shown in **Table 7**, some ramps cannot be analyzed by methods of the *2000 Highway Capacity Manual* because some ramps do not create merge or diverge conditions but involve adding or dropping a freeway lane or creating a weave section. The Build Alternative operates at an acceptable Level of Service during design year (2030) peak hours.

*TABLE 7  
DESIGN YEAR (2030) PEAK-HOUR LEVELS OF SERVICE  
RAMP-FREEWAY JUNCTIONS  
NO-BUILD AND BUILD ALTERNATIVE COMPARISON*

| Ramp Location                       | AM-Peak Hour |           | PM-Peak Hour |           |
|-------------------------------------|--------------|-----------|--------------|-----------|
|                                     | No Build     | Build     | No Build     | Build     |
| <b>Eastbound On-Ramps</b>           |              |           |              |           |
| Ionia Avenue On-ramp to EB I-196    | F            | Weave     | F            | Weave     |
| College Avenue On-ramp to EB I-196  | F            | Add-lane  | F            | Add-lane  |
| Fuller Avenue On-ramp to EB I-196   | E            | D         | F            | D         |
| Leonard Street On-ramp to EB I-96   | D            | Add lane  | B            | Add lane  |
| M-44 On-ramp to EB I-96             | F            | Add lane  | D            | Add lane  |
| M-21 On Ramp to EB I-96             | N/A          | Add lane  | N/A          | Add lane  |
| <b>Westbound On-Ramps</b>           |              |           |              |           |
| Ionia Avenue On-ramp to WB I-196    | Add-lane     | Add lane  | Add-lane     | Add lane  |
| College Avenue On-ramp to WB I-196  | F            | Weave     | F            | Weave     |
| Fuller Avenue On-ramp to WB I-196   | F            | Add lane  | F            | Add lane  |
| SB M-44 On-ramp to WB I-96          | Weave        | Weave     | Weave        | Weave     |
| NB M-44 On-ramp to WB I-96          | D            | Weave     | F            | Weave     |
| M-21 On-ramp to WB I-96             | Add-lane     | Add lane  | Add-lane     | Add lane  |
| Cascade Road On-ramp to WB I-96     | D            | Add lane  | F            | Add lane  |
| <b>Eastbound Off-Ramps</b>          |              |           |              |           |
| EB I-196 Off-ramp to Ottawa Avenue  | Drop-lane    | Drop-lane | Drop-lane    | Drop-lane |
| EB I-196 Off-ramp to College Avenue | F            | Weave     | F            | Weave     |
| EB I-196 Off-ramp to Fuller Avenue  | F            | Drop-lane | F            | Drop-lane |
| EB I-96 Off-ramp to M-44            | N/A          | Drop-lane | N/A          | Drop-lane |
| EB I-96 Off-ramp to M-44            | Weave        | Drop-lane | Weave        | Drop-lane |
| EB I-96 Off-ramp to M-21            | Drop-lane    | Drop-lane | Drop-lane    | Drop-lane |
| EB I-96 Off-ramp to WB Cascade Rd   | F            | Drop-lane | E            | Drop-lane |
| <b>Westbound Off-Ramps</b>          |              |           |              |           |
| WB I-196 Off-ramp to Ottawa Avenue  | F            | Weave     | F            | Weave     |
| WB I-196 Off-ramp to College Avenue | F            | Drop-lane | F            | Drop-lane |
| WB I-196 Off-ramp to Fuller Avenue  | E            | D         | F            | D         |
| WB I-96 Off-ramp to Leonard Street  | B            | Weave     | D            | Weave     |
| WB I-96 Off-ramp to M-44            | D            | C         | F            | D         |
| WB I-96 Off-ramp to M-21            | N/A          | Drop-lane | N/A          | Drop-lane |

Add-Lane: Ramp lane creates an add-on lane and cannot be analyzed by methods of HCM.

Drop-Lane: Freeway lane is dropped at off-ramp and cannot be analyzed by methods of HCM.

Weave: Ramp is part of a weave segment. See Table 4.

Source: URS Corporation, November 2004

*Weaving Sections*

The proposed improvements of the Build Alternative create two new weave sections—along I-196 (in each direction) between the Ottawa Avenue and College Avenue interchanges. The improvements eliminate the existing weave along eastbound I-96 between I-196 and M-44. The existing weave along westbound I-96 between M-44 and I-196 still exists in the Build Alternative, but the volumes within the weave are reduced as I-96 “through” traffic is eliminated from the weave. **Table 8** shows each weave section operates at an acceptable Level of Service under design year (2030) peak hour traffic volumes for the Build Alternative.

*TABLE 8  
DESIGN YEAR (2030) PEAK-HOUR LEVELS OF SERVICE  
RAMP-FREEWAY JUNCTIONS  
NO-BUILD AND BUILD ALTERNATIVE COMPARISON*

| <b>Freeway</b> | <b>Section</b>    |  | <b>No Build</b>      | <b>Build</b> |
|----------------|-------------------|--|----------------------|--------------|
| EB I-196       | Ionia to College  | AM<br>PM   | N/A                  | D<br>D       |
| WB I-196       | College to Ionia  | AM<br>PM   | N/A                  | D<br>D       |
| EB I-196       | College to Fuller | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |
| WB I-196       | Fuller to College | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |
| EB I-196       | I-196 to M-44     | AM<br>PM   | <b>F</b><br><b>F</b> | N/A          |
| WB I-96        | M-44 to I-196     | AM<br>PM   | <b>E</b><br><b>F</b> | C<br>C       |
| EB I-96        | M-44 to M-21      | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |
| WB I-96        | M-21 to M-44      | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |
| EB I-96        | M-21 to Cascade   | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |
| WB I-96        | Cascade to M-21   | Weave length greater than HCM weave boundaries. Analyzed as freeway segment. |                      |              |

### Signalized Intersections

The comparison of signalized intersection capacities and levels of services shown in **Tables 9** and **10** confirm that all signalized intersections in the project area operate at an acceptable LOS under the Build Alternative. More detailed information on turning movements for existing, Build and No Build Alternatives are provided in the **I-196/I-96 and M-37/M-44 EA Traffic Analysis Technical Report**.

**TABLE 9**  
**DESIGN YEAR (2030) MORNING PEAK-HOUR LEVELS OF SERVICE**  
**SIGNALIZED INTERSECTIONS**  
**NO-BUILD AND BUILD ALTERNATIVE COMPARISON**

| Signalized Intersection         | No-Build         |                         | Build Alternative |                         |
|---------------------------------|------------------|-------------------------|-------------------|-------------------------|
|                                 | Level of Service | Average Delay (sec/veh) | Level of Service  | Average Delay (sec/veh) |
| Ottawa Avenue / Michigan Street | C                | 34.0                    | C                 | 30.7                    |
| Ionia Avenue / Michigan Street  | F                | 82.2                    | D                 | 48.0                    |
| EB I-196 / College Avenue       | C                | 22.2                    | D                 | 41.7                    |
| WB I-196 / College Avenue       | F                | 99.6                    | C                 | 20.6                    |
| EB I-196 / Fuller Avenue        | F                | 131.3                   | C                 | 28.1                    |
| WB I-196 / Fuller Avenue        | F                | 105.1                   | C                 | 26.1                    |
| EB I-96 / Leonard Street        | C                | 29.5                    | C                 | 21.3                    |
| WB I-96 / Leonard Street        |                  |                         | D                 | 43.8                    |
| M-44 / M-21                     | F                | 164.6                   | D                 | 52.9                    |
| M-44 / Michigan Street          | F                | 168.2                   | B                 | 16.5                    |
| M-44 / EB I-96                  | F                | 80.9                    | D                 | 47.0                    |
| M-44 / WB I-96                  | D                | 50.3                    | D                 | 53.2                    |
| M-44 / Leonard Street           | F                | 141.6                   | D                 | 48.7                    |
| M-44 / Knapp Street             | F                | 192.5                   | C                 | 27.4                    |

Note: Movement-by-movement LOS values are depicted on Figures 3-1a, 3-1b, 3-2a, 3-2b, 4-16a, 4-16b, 4-16c, 4-17a, 4-17b, and 4-17c.

Source: URS Corporation, November 2004

**TABLE 10**  
**DESIGN YEAR (2030) AFTERNOON PEAK-HOUR LEVELS OF SERVICE**  
**SIGNALIZED INTERSECTIONS**  
**NO-BUILD AND BUILD ALTERNATIVE COMPARISON**

| Signalized Intersection         | No Build         |                         | Build Alternative |                         |
|---------------------------------|------------------|-------------------------|-------------------|-------------------------|
|                                 | Level of Service | Average Delay (sec/veh) | Level of Service  | Average Delay (sec/veh) |
| Ottawa Avenue / Michigan Street | C                | 32.9                    | C                 | 30.7                    |
| Ionia Avenue / Michigan Street  | <b>F</b>         | <b>124.4</b>            | D                 | 48.0                    |
| EB I-196 / College Avenue       | D                | 54.7                    | D                 | 41.7                    |
| WB I-196 / College Avenue       | <b>E</b>         | <b>61.8</b>             | C                 | 20.6                    |
| EB I-196 / Fuller Avenue        | <b>F</b>         | <b>148.0</b>            | C                 | 28.1                    |
| WB I-196 / Fuller Avenue        | <b>F</b>         | <b>117.0</b>            | C                 | 26.1                    |
| EB I-96 / Leonard Street        | B                | 16.4                    | C                 | 21.3                    |
| WB I-96 / Leonard Street        |                  |                         | D                 | 43.8                    |
| M-44 / M-21                     | <b>F</b>         | <b>269.3</b>            | D                 | 52.9                    |
| M-44 / Michigan Street          | <b>F</b>         | <b>172.9</b>            | B                 | 16.5                    |
| M-44 / EB I-96                  | <b>F</b>         | <b>212.0</b>            | D                 | 47.0                    |
| M-44 / WB I-96                  | <b>F</b>         | <b>181.1</b>            | D                 | 53.2                    |
| M-44 / Leonard Street           | <b>F</b>         | <b>257.9</b>            | D                 | 48.7                    |
| M-44 / Knapp Street             | <b>F</b>         | <b>95.5</b>             | C                 | 27.4                    |

Note: Movement-by-movement LOS values are depicted on Figures 3-1a, 3-1b, 3-2a, 3-2b, 4-16a, 4-16b, 4-16c, 4-17a, 4-17b, and 4-17c.

Source: URS Corporation, November 2004

*Signalized Intersections-Base Year*

The existing (2004) peak-hour Levels of Service for the signalized intersections within the project limits are depicted in **Table 4**. Movement-by-movement Levels of Service are shown in the *I-196/I-96/M-44 Technical Report*. Capacity analysis worksheets for all existing (2004) signalized intersection analyses are available on request.

*TABLE 4*  
**EXISTING (2004) PEAK-HOUR LEVELS OF SERVICE  
SIGNALIZED INTERSECTIONS**

| Signalized Intersection         | AM-Peak Hour     |                         | PM-Peak Hour     |                         |
|---------------------------------|------------------|-------------------------|------------------|-------------------------|
|                                 | Level of Service | Average Delay (sec/veh) | Level of Service | Average Delay (sec/veh) |
| Ottawa Avenue / Michigan Street | C                | 23.9                    | C                | 34.1                    |
| Ionia Avenue / Michigan Street  | <b>E</b>         | <b>62.9</b>             | <b>F</b>         | <b>82.2</b>             |
| EB I-196 / College Avenue       | B                | 18.8                    | C                | 30.5                    |
| WB I-196 / College Avenue       | D                | 48.9                    | C                | 30.5                    |
| EB I-196 / Fuller Avenue        | C                | 29.1                    | <b>F</b>         | <b>83.2</b>             |
| WB I-196 / Fuller Avenue        | D                | 51.2                    | D                | 53.4                    |
| EB I-96 / Leonard Street        | B                | 16.9                    | B                | 12.9                    |
| M-44 / M-21                     | <b>E</b>         | <b>61.3</b>             | <b>E</b>         | <b>60.1</b>             |
| M-44 / Michigan Street          | D                | 40.9                    | C                | 26.3                    |
| M-44 / EB I-96                  | C                | 23.7                    | <b>E</b>         | <b>62.5</b>             |
| M-44 / WB I-96                  | B                | 18.1                    | D                | 41.9                    |
| M-44 / Leonard Street           | D                | 40.4                    | <b>E</b>         | <b>71.3</b>             |
| M-44 / Knapp Street             | <b>E</b>         | <b>77.6</b>             | D                | 41.0                    |

Source: URS Corporation, November 2004

As shown in **Table 4** on the previous page, six of the thirteen signalized intersections in the study area operate at an unacceptable Level of Service during at least one of the two existing (2004) peak hours.

It should be noted that the Levels of Service depicted at the College Avenue and Fuller Avenue interchanges are worse than shown in **Table 4**. The *Highway Capacity Software* is limited in its ability to analyze congestion, and *the results do not account for the fact that the left-turn movements entering the freeway at those locations back up into the adjacent intersection*.

Each of the M-44 signals which simultaneously stop northbound and southbound traffic (M-21, EB I-96 off-ramp, Leonard Street, and Knapp Street) operate at Level of Service “E” or “F”, indicating the need for additional capacity along East Beltline Avenue.

**APPENDIX B**  
**TRAFFIC CRASH ANALYSIS**



## TRAFFIC CRASH ANALYSIS

Crash statistics were provided by MDOT for the most recent five-year span (1999-2003). Crash data was provided for freeway segments, ramps, and ramp terminals on I-196 and I-96 and the boulevard segment of M-44/M-37.

### **I-196 and I-96**

#### ***Freeway Segment Crash Analysis***

A crash analysis was completed for each freeway segment along I-196 and I-96 in the study area. The total number of crashes by freeway segment, a breakdown of crashes by type, and an overall crash rate for each freeway segment is depicted in Table B-1.

As shown in Table B-1, 1,525 crashes occurred within the study area freeways from 1999 to 2003. A total of 327 (21%) of these crashes resulted in injuries. There were three reported fatalities during the five-year period. A double fatality occurred on westbound I-196 between Ottawa Avenue and US-131—a rear-end crash which occurred at dusk just east of the I-196 westbound on-ramp from Ionia Avenue. One fatality involved a pedestrian and occurred on eastbound I-196 between US-131 and Ottawa Avenue. The pedestrian fatality occurred at night in the vicinity of the diverge point of the I-196 eastbound off-ramp to Ottawa Avenue.

Freeway segments that experienced higher than average crash rates as compared to statewide averages are shaded in Table B-1. Three segments on I-196 and one segment on I-96 experience higher than average crash rates compared to other similar facilities in the state from 1999-2003. These segments are on I-196 between Ottawa Avenue and College Avenue (both eastbound and westbound segments), westbound I-196 between College Avenue and Fuller Avenue, and eastbound I-96 between Leonard Street and I-196.

The higher-than-average crash rate on I-196 between Ottawa Avenue and College Avenue are partly attributed to the heavy traffic volumes on the segment and peak-hour traffic congestion. Both eastbound and westbound at this segment had a high level of Rear-End crashes – 65% eastbound and 81% westbound. High levels of rear-end crashes are common on congested freeways. Also, the 4% uphill grade on eastbound I-196 on this segment reduces travel speed and capacity, particularly for large trucks, which creates rear-end crashes.

The higher-than-average rate on westbound I-196 between College Avenue and Fuller Avenue are partly attributed to the heavy traffic volumes associated with peak-hour traffic congestion. The segment had a very high level of rear-end crashes (87%). High levels of rear-end crashes are common on congested freeways.

The higher-than-average crash rate on eastbound I-96 between Leonard Street and I-196 can be attributed to the curvature of this segment, the high number of lane changes associated with the subsequent merge with I-196, and the weave movement needed to exit at M-44.

**TABLE B-1  
CRASH ANALYSIS SUMMARY (1999-2003)  
I-196 AND I-96 FREEWAY SEGMENTS**

| Freeway         | Section                         | Type of Crash |           |            |              |       |       |     | Crash Rate* |
|-----------------|---------------------------------|---------------|-----------|------------|--------------|-------|-------|-----|-------------|
|                 |                                 | Total         | Rear--End | Side-Swipe | Fixed Object | Angle | Other |     |             |
| I-196 (1)       | US-131 to Ottawa Avenue         | EB            | 118       | 75         | 19           | 14    | 2     | 8   | 364         |
|                 |                                 | WB            | 70        | 38         | 10           | 10    | 0     | 12  | 181         |
| I-196 2-Lane    | Ottawa Avenue to College Avenue | EB            | 153       | 100        | 22           | 18    | 1     | 12  | <b>262</b>  |
|                 |                                 | WB            | 141       | 114        | 8            | 6     | 0     | 13  | <b>297</b>  |
| I-196 2-Lane    | College Avenue to Fuller Avenue | EB            | 79        | 54         | 9            | 4     | 0     | 12  | 132         |
|                 |                                 | WB            | 212       | 185        | 10           | 3     | 0     | 14  | <b>311</b>  |
| I-196 2-Lane    | Fuller Avenue to I-96           | EB            | 138       | 67         | 23           | 22    | 5     | 21  | 117         |
|                 |                                 | WB            | 133       | 53         | 14           | 36    | 4     | 26  | 113         |
| I-96 2-Lane     | Leonard Street to I-196         | EB            | 45        | 6          | 4            | 13    | 0     | 22  | <b>221</b>  |
|                 |                                 | WB            | 32        | 4          | 6            | 4     | 2     | 16  | 181         |
| I-96 (1)        | I-196 to M-44                   | EB            | 126       | 58         | 22           | 17    | 3     | 26  | 293         |
|                 |                                 | WB            | 106       | 34         | 23           | 15    | 8     | 26  | 218         |
| I-96 3-Lane     | M-44 to M-21                    | EB            | 97        | 29         | 14           | 17    | 6     | 31  | 175         |
|                 |                                 | WB            | 75        | 14         | 22           | 11    | 1     | 27  | 130         |
| <b>TOTALS:</b>  |                                 |               | 1525      | 831        | 206          | 190   | 32    | 266 |             |
| <b>Percent:</b> |                                 |               | 100%      | 55%        | 14%          | 12%   | 2%    | 17% |             |

\* - Per 100 million vehicle miles traveled

Notes: 1. The statewide average crash rate is 206 crashes per 100 million VMT for 4-lane divided, limited-access urban highways.

2. The statewide average crash rate is 438 crashes per 100 million VMT for 6-lane divided, limited-access urban highways.

(1) 4-Lane Eastbound, 3-Lane Westbound

Source: Michigan Department of Transportation, November 2004

### ***Freeway Crash Countermeasures***

Various countermeasures are incorporated into the Build Alternative which will decrease the potential for traffic crashes for the high-crash segments listed in TableB-1 and for the entire study area. These countermeasures include: Construction of additional freeway capacity to minimize congestion and unexpected traffic back-ups; construction of weave-merge lanes between Ottawa Avenue and College Avenue and between College Avenue and Fuller Avenue to increase ramp-freeway merge capacity; and construction of collector-distributor roads on I-96 between I-196 and M-44 to eliminate weave movements.

Additional countermeasures which could be erected prior to full build-out include: Construction of a “choice” lane at the eastbound I-96 exit to M-44, providing the outside through lane the choice of staying on I-96 or exiting at M-44. A choice lane would reduce the number of lane changes required by an eastbound I-96 motorist who desires to exit at M-44. Only one lane change would be required if a “choice” lane were constructed, whereas this maneuver currently requires a two-lane change.

Erection of a permanent variable message sign on westbound I-196 at Plymouth Avenue warning of traffic backups ahead at Fuller Avenue or College Avenue. Static signing on eastbound I-196 warning motorists of SLOW TRUCKS climbing the hill between Ottawa Avenue and College Avenue.

### ***Ramp Crash Analysis***

A crash analysis was completed for each ramp along I-196 and I-96 in the study area. The total number of crashes by ramp and a breakdown of crashes by type are depicted in Table B-2.

As shown in Table B-2, 109 crashes occurred on study area ramps from 1999 to 2003. A total of 28 (26%) of these crashes resulted in injuries. There were two reported fatalities on study area ramps in the five-year period. One fatality involved a one-vehicle rollover crash on the westbound I-96 loop exit ramp to Leonard Street. The other fatality involved a one-vehicle rollover crash on the eastbound I-96 off ramp at the merge point with eastbound M-21.

The majority of ramps (14 of 23 ramps) averaged less than one crash per year. MDOT does not compute crash rates for freeway ramps. Total crashes over the five-year period ranged from zero crashes at three ramps to 12 crashes at both the I-196 westbound Ionia Avenue on-ramp and the I-96 eastbound M-21 off-ramp.

**TABLE B-2  
CRASH ANALYSIS SUMMARY (1999-2003)  
I-196 AND I-96 RAMPS**

| Interchange              | Ramp Type       | Total | Rear-End | Side-swipe | Fixed Object | Angle | Other | Crashes per Year |
|--------------------------|-----------------|-------|----------|------------|--------------|-------|-------|------------------|
| Ottawa Avenue/<br>I-196  | EB Off - Slip   | 2     | 2        | 0          | 0            | 0     | 0     | 0.4              |
|                          | WB Off - Loop   | 10    | 2        | 1          | 2            | 2     | 3     | 2.0              |
| Ionia Avenue/<br>I-196   | EB On - Loop    | 0     | 0        | 0          | 0            | 0     | 0     | 0.0              |
|                          | WB On - Slip    | 12    | 0        | 1          | 6            | 2     | 3     | 2.4              |
| College Avenue/<br>I-196 | EB Off - Slip   | 2     | 1        | 0          | 0            | 0     | 1     | 0.4              |
|                          | EB On - Slip    | 4     | 3        | 0          | 0            | 0     | 1     | 0.8              |
|                          | WB Off - Slip   | 2     | 0        | 0          | 0            | 0     | 2     | 0.4              |
|                          | WB On - Slip    | 0     | 0        | 0          | 0            | 0     | 0     | 0.0              |
| Fuller Avenue/<br>I-196  | EB Off - Slip   | 1     | 1        | 0          | 0            | 0     | 0     | 0.2              |
|                          | EB On - Slip    | 3     | 1        | 0          | 1            | 1     | 0     | 0.6              |
|                          | WB Off - Slip   | 2     | 0        | 0          | 1            | 0     | 1     | 0.4              |
|                          | WB On - Slip    | 0     | 0        | 0          | 0            | 0     | 0     | 0.0              |
| Leonard Street/<br>I-96  | EB Off - Slip   | 2     | 2        | 0          | 0            | 0     | 0     | 0.4              |
|                          | EB On - Slip    | 1     | 0        | 0          | 0            | 1     | 0     | 0.2              |
|                          | WB Off - Loop   | 10    | 0        | 0          | 3            | 0     | 7     | 2.0              |
|                          | WB On - Slip    | 9     | 0        | 2          | 2            | 0     | 5     | 1.8              |
| M-44/I-96                | EB Off - Slip   | 9     | 4        | 0          | 2            | 0     | 3     | 1.8              |
|                          | EB On - Loop    | 3     | 1        | 0          | 0            | 1     | 1     | 0.6              |
|                          | WB Off - Slip   | 4     | 2        | 0          | 1            | 0     | 1     | 0.8              |
|                          | SB>WB On - Slip | 3     | 1        | 0          | 1            | 0     | 1     | 0.6              |
|                          | NB>WB On - Loop | 8     | 3        | 1          | 2            | 0     | 2     | 1.6              |
| M-21/I-96                | EB Off - Slip   | 12    | 1        | 0          | 5            | 0     | 6     | 2.4              |
|                          | WB On - Slip    | 10    | 2        | 0          | 1            | 0     | 7     | 2.0              |
| <b>TOTALS:</b>           |                 | 109   | 26       | 5          | 27           | 7     | 44    |                  |
| <b>Percent:</b>          |                 | 100%  | 24%      | 5%         | 25%          | 6%    | 40%   |                  |

\* - Per 100 million vehicle miles traveled

Source: Michigan Department of Transportation, November 2004

### ***Ramp Crash Countermeasures***

Various countermeasures are incorporated into the Build Alternative which will decrease the potential for traffic crashes on the freeway ramps in the study area. These countermeasures include: Increased storage for off-ramp approaches; Lengthening of acceleration and deceleration lanes where possible; and Improved signage and attenuation for all ramp movements which require a significant decrease in speed in order to navigate the ramp (westbound I-196 at Ottawa Avenue and westbound I-96 at Leonard Street).

### ***Ramp Terminal Crash Analysis***

A crash analysis was completed for each ramp terminal intersection at the I-96 and I-196 interchanges within the study area. The total number of crashes per intersection by year, the average number of crashes per intersection, and the crash rate for each intersection is depicted in Table B-3.

As shown in Table B-3, the Ottawa Avenue/Michigan Street intersection has by far the highest crash rate (4.84 crashes per MEV), more than double the next highest rate. This ramp terminal has an unusual design with two off ramps and one local street merging only 300 feet before the signal with a resultant five-lane southbound approach at the intersection. Turn restrictions are posted for some movements at the intersection: “No Left Turn” for eastbound off-ramp traffic and “No Right Turn” for westbound off-ramp traffic. A total of 150 of the 272 crashes (55%) are on the southbound approach to the intersection. A review of crash types indicates that primarily two types of crashes occur on the southbound leg: angle crashes (41% of total) and side-swipe crashes (39%). These types of crashes are common at intersections like the Ottawa Avenue/Michigan Street intersection, where a high number of merges and lane changes occur.

While no average intersection crash rate statistics are compiled in West Michigan, the intersection crash rates were compared to average rates compiled by the Southeast Michigan Council of Governments (SEMCOG)—the local Metropolitan Planning Organization overseeing transportation decisions in the seven counties comprising the Detroit metropolitan area.

SEMCOG computes an average crash rate of 1.4 crashes per million-entering vehicles (MEV) at urban signalized intersections with an ADT of 20,000 to 30,000 vehicles per day, and an average crash rate of 1.2 crashes per MEV for signalized intersections with an ADT of greater than 30,000 vehicles per day. The average crash rate for unsignalized intersections with an ADT of 20,000 to 30,000 vehicles per day is 0.5 crashes per MEV. Assuming these average crash rates apply to West Michigan, Table B-3 reveals that six of the eight signalized ramp terminal intersections exceed the average rate and each of the unsignalized ramp terminal intersections exceed the average rate.

**TABLE B-3  
CRASH ANALYSIS SUMMARY (1999-2003)  
RAMP TERMINAL INTERSECTIONS**

| Intersection             | Traffic Control | Number of Crashes |      |      |      |      |       | Average (crashes/yr) | Crash Rate (per MEV*) |
|--------------------------|-----------------|-------------------|------|------|------|------|-------|----------------------|-----------------------|
|                          |                 | 1999              | 2000 | 2001 | 2002 | 2003 | Total |                      |                       |
| Ottawa Ave / Michigan St | Signal          | 48                | 66   | 54   | 58   | 46   | 272   | 54.4                 | <b>4.84</b>           |
| Ionia Ave / Michigan St  | Signal          | 37                | 42   | 29   | 25   | 18   | 151   | 24.2                 | <b>2.49</b>           |
| EB I-196 / College Ave   | Signal          | 12                | 7    | 10   | 22   | 3    | 54    | 10.8                 | 1.16                  |
| WB I-196 / College Ave   | Signal          | 12                | 10   | 12   | 15   | 16   | 65    | 13.0                 | <b>1.54</b>           |
| EB I-196 / Fuller Ave    | Signal          | 28                | 21   | 27   | 18   | 9    | 103   | 20.6                 | <b>1.78</b>           |
| WB I-196 / Fuller Ave    | Signal          | 10                | 6    | 9    | 12   | 1    | 38    | 7.6                  | 0.62                  |
| EB I-96 / Leonard St     | Stop Sign (1)   | 6                 | 9    | 3    | 5    | n/a  | 23    | 5.8                  | <b>0.73</b>           |
| WB I-96 / Leonard St     | Stop Sign       | 4                 | 3    | 3    | 7    | 12   | 29    | 5.8                  | <b>0.66</b>           |
| EB I-96 / M-44           | Signal          | 25                | 36   | 20   | 36   | 26   | 143   | 28.6                 | <b>1.51</b>           |
| WB I-96 / M-44           | Signal          | 19                | 13   | 17   | 21   | 19   | 89    | 17.8                 | <b>1.97</b>           |

\* MEV = million entering vehicles Source: Michigan Department of Transportation, November 2004  
(1) Unsignalized intersection from 1999 through 2002. This ramp terminal became signalized in 2003 and experienced 10 crashes that year.

***Ramp Terminal Intersection Countermeasures***

Various countermeasures are incorporated into the Build Alternative which will decrease the potential for traffic crashes at ramp-terminal intersections in the study area. These countermeasures include: Increased storage for off-ramp and surface street turn bays; Optimized traffic signal timing, including incorporation of all-red clearance phases; Turn prohibitions for turn movements with limited sight distance, and Improved lane definition through pavement markings.

## East Beltline

Crash data for the East Beltline was also analyzed from approximately 300 feet south of M-21 to 300 feet north of Knapp Street. During the period from 1999 to 2003 there were 1,119 crashes resulting in 371 injuries and two fatalities (see Table B-4). Both fatalities occurred in 1999 just south of the Knapp Street intersection.

The segment from I-96 south to south of M-21 displayed a much higher crash rate than the statewide average for the same type of roadway, as shaded on Table B-4. This higher-than-average crash rate is also most likely due to heavy traffic volumes on the segment and peak hour congestion. The majority of crashes were rear-end crashes (65%), which is a common indicator of heavy congestion.

**TABLE B-4  
CRASH ANALYSIS SUMMARY (1999-2003)  
M-37 / M-44**

|                    | <b>Total</b> | <b>Rear--<br/>End</b> | <b>Side-<br/>Swipe</b> | <b>Fixed<br/>Object</b> | <b>Angle</b> | <b>Other</b> |            |
|--------------------|--------------|-----------------------|------------------------|-------------------------|--------------|--------------|------------|
| S of M-21 to I-96  | 412          | 286                   | 29                     | 12                      | 35           | 50           | <b>743</b> |
| I-96 to N of Knapp | 707          | 445                   | 56                     | 19                      | 106          | 81           | 428        |
| <b>TOTAL</b>       | 1119         | 731                   | 85                     | 31                      | 141          | 131          |            |
| <b>Percent</b>     | 100%         | 65%                   | 7%                     | 3%                      | 13%          | 12%          |            |

\* - Per 100 million vehicle miles traveled

Notes: 1. The statewide average crash rate is 206 crashes per 100 million VMT for 4-lane divided, limited-access urban highways. 2. The statewide average crash rate is 438 crashes per 100 million VMT for 6-lane divided, limited-access urban highways. 3. The statewide average crash rate is 450 crashes per 100 million VMT for 4-lane divided urban free-access trunkline. (1) 4-Lane Eastbound, 3-Lane Westbound Source: Michigan Department of Transportation, November 2004

### ***M-37/M-44 Crash Countermeasures***

There are several countermeasures incorporated into the Build Alternative which should help to reduce congestion and increase traffic flow on M-37/M-44 (East Beltline). These countermeasures include:

1. Construction of additional (third) through lane to help reduce congestion.
2. Construction of additional left turn lane at select crossover locations.
3. Construction of right turn lanes at select driveway and cross-street locations.

