APPENDIX D: TRAVEL DEMAND FORECASTING MODEL TECH MEMORANDUM
Memorandum To: Project Files
From: Steve Ruegg, PB
Date: March 15, 2010 (DRAFT)
Subject: MHSIS Travel Demand Forecasting Evaluation Methodology

Introduction:
This memorandum describes the methodology used to develop performance measures for transportation system improvements that were identified as a part of the Metropolitan Highway System Investment Study (MHSIS). The MHSIS was a study by the Metropolitan Council (the Council) and the Minnesota Department of Transportation (MnDOT) to develop a new approach to long term transportation investments for the Twin Cities Metropolitan area. This approach explicitly recognized that funding for transportation infrastructure will not be sufficient to eliminate or even reduce current congestion for the overall system for the foreseeable future. Given this, the challenge of the study was to change the way in which we evaluate and prioritize investments with the resources we do have available to maximize cost effectiveness in the broadest terms.

A key part of this study was to systematically evaluate the performance of a set of potential corridor-based improvements which are consistent with providing benefit by targeting specific transportation system deficiencies. These projects included the following strategies:

- Managed Lane Expansions and Conversions
- New Managed lanes
- Strategic capacity enhancement (new facilities)
- Expansion of general purpose capacity
- Conversion and upgrade of facility types
- Interchange modification and/or consolidation

A total of 41 candidate measures were evaluated. While representative of the overall set of new projects being considered, these 34 corridor alternatives should not be considered and exhaustive or exclusive list.

The performance evaluation for these projects was conducted using two approaches. To measure the benefits of capacity enhancement, the regional travel demand forecast model (the regional model) was used. Secondly, to measure the benefits of Active Traffic Management (ATM) strategies the ITS Deployment Analysis System (IDAS). This memo will describe how the regional model was used to evaluate capacity enhancements.
Initial Network Coding and Regional Model Execution:
The Council technical planning support staff coded 23 separate network scenarios for forecast years 2030 and 2060 that contained the 41 selected corridor projects. In addition, model runs were done for 2030 and 2060 for the no-build condition. Each no-build alternative model run was conducted, employing a feedback routine that assured a level of equilibrium between the demand and supply at the distribution and mode choice level. The person trip tables resulting from these model runs (for 2030 and 2060) were used as the basis for the build scenario model runs, which were subject to the mode choice model prior to assignment. Transit service levels (e.g., speeds, fares, headways) were not changed from the no-build for the build scenarios. Therefore, the resulting trip assignments do not reflect changes in transit service levels that may result from the proposed improvements. However, some changes in mode shares may be evident since the auto level of service will often change as a result of the alternatives’ capacity enhancements. Finally, note that the 41 corridor projects were grouped within the 23 build scenario model networks in a way that avoided most of the affected travel flows from each alternative from overlapping. Projects were also grouped, where possible, by similar types of improvement categories (those categories listed above). Appendix A contains a series of selected-link assignments showing the extent of travel sheds and their potential overlap. For a full description of the modeling assumptions and methodology used for these initial model runs, see “MHSIS Modeling Methodology”, a memo from the Council staff. The resulting model runs, and all associated files, were transmitted to the Parsons Brinckerhoff (PB) for performance measure evaluation.

Extraction of Performance Measures:
In order to evaluate the performance of each coded corridor project, it was necessary to isolate the travel shed for that corridor. This was done by tagging the corridor links themselves within the unloaded network, and using these tagged links to run a selected link assignment. New link attributes were added to the network which was specific to the corridor improvement. These were treated as indicator values, which normally defaulted to a value of “0” but took on a value of “1” for corridor links of that particular corridor ID. This was done for both the build and no-build networks for each hour of the day, as the standard assignment model includes them. In some cases, links that were very closely parallel to the subject corridor links, such as coded frontage roads, were also included as selected links for that corridor. The assignment model was re-run for each scenario and year, using the same assignment methodology but adding a selected link procedure for each corridor project within the scenario networks. A selected link option assignment uses the standard regional model assignment algorithm, but adds a feature that essentially tracks any trip that uses any link that is in the specified selected set. The selected link assignment also included a selected trip table as well as link attributes that were specific to the selected corridor links.
Using this approach, which was also applied to the no-build networks, we were able to develop a database of corridor-specific performance measures on a link and origin-destination trip basis. This allowed us to compute a variety of measures including:

- Vehicle-hours and Vehicle Miles of Travel (VHT and VMT)
- Total trips involved in each corridor
- Delay on links, calculated as the difference in congested and uncongested VHT
- Mode share, from the selected OD trip tables

Each of these measures could be summarized by several different categories, including facility/lane type, Volume/Capacity ratio, trip length and/or time of day. Mode share was computed by filtering the regional person-trip tables by the presence of trips in the selected link trip tables, and summarizing the corridor person-trips by mode.

Note that the effectiveness of this methodology to isolate specific project impacts depends upon the degree to which the travel sheds of the projects within each scenario network are in fact separate and distinct. This is largely true of most corridor projects tested, except for two groups of intersection consolidations on I494 and I35E which should be considered as a unit since their travel sheds are identical.
Technical Procedures:
The previous section describes the general methodology used to estimate the performance indicators for individual corridor projects. This section describes the particular modeling steps, and detailed procedures used to execute this methodology.

Transit Network Tagging:
The selected link assignment required that each corridor link in the appropriate scenario networks be tagged, so that these links could be easily identified. The following link ID’s were added:

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
<th>Scenario 11</th>
<th>Scenario 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 13</td>
<td>Scenario 14</td>
<td>Scenario 15</td>
<td>Scenario 16</td>
<td>Scenario 17</td>
<td>Scenario 18</td>
<td>Scenario 19</td>
<td>Scenario 20</td>
<td>Scenario 21</td>
<td>Scenario 22</td>
<td>Scenario 23</td>
<td>Scenario 24</td>
</tr>
</tbody>
</table>

Figure 1 shows the physical location of these tags, which are set to 1 for the links involved with the corridor improvement. This was done for both no-build (all in the same network) and for the build alternatives, as appropriate for the scenario.
**Selected Link Assignments:**

The mode-specific vehicle trip tables, containing SOV, HOV and truck trips, were assigned using the UPA assignment based toll procedure. This was the same script used by the Council staff for the initial assignments, except that the specific period’s capacity was used instead of just the ampeak capacity, and the computation of volume to capacity ratio for each iteration was protected against links with zero capacity. In addition, a selected link designation was added, and both mode-specific selected link volumes and mode-specific selected link volumes were saved. All 24 hours were assigned and both build and no-build, year 2030 and 2060 scenarios were conducted. Appendix B contains an example of the script used for this selected link assignment, and a table and description of which selected link volume attributes are associated with which alternative and mode.
Summary of VMT, VHT and Delay from Networks:

A procedure was next applied to read the build and no-build selected link loaded networks. The result was a comma-separated file that contains a database of VHT, VMT and Delay (in vehicle-hours) by hour, facility/lane type and volume to capacity range. These measures were computed based on the subset of links which contain more than 1 percent of the maximum selected link volume for a particular corridor. This was done to more realistically represent the effective travel shed. Appendix C contains an example script used to generate these databases. The procedure also saved a combined network that contains build and no-build volumes, selected link volumes, vht, vmt and delay measures for the travel sheds of each corridor alternative. The travel shed includes any link with a valid build or no-build selected link volume greater than 1 percent of the maximum selected link volume. The resulting spreadsheet is then summarized to present selected reports showing the change in performance measures for each corridor alternative.

Summary of Corridor Trips and Mode Share from:

The selected link assignments also produced selected link trip tables by hour and vehicle class. These selected link trip tables also included total selected vehicle trips in a separate table and file, and effectively defines the travel shed in a matrix (i.e., O-D) format. A CUBE/Voyager script was written to extract person-trips by mode from the corresponding mode choice output files, along with the loaded SOV and HOV time skims. These matrices, along with the actual selected link vehicle volumes, were consolidated to one file for each year/alternative/build-nobuild project. The tables include:

1 – Non-motorized person-trips
2 – Drive Alone person-trips
3 – 2-person auto person-trips (HOV plus non-hov)
4 – 3+ person Auto person-trips (HOV plus non-hov)
5 -- Transit person-trips
6 – Selected link vehicle trips
7 – SOV congested highway time
8 – HOV congested highway time

The last step in this script consolidated these values to AM Peak (model hour ids 7-9; 6:45am-9:45am) and PM peak (model hour ids 15-18; 2:30pm-6:00pm) and off-peak, which is the remaining hours. Daily totals were also computed. Travel times were computed using a weighted average of component hours based on the selected link vehicle trips, and person trips were allocated to periods also based on the relative hourly proportions from the selected link assignments. Note that the selected link vehicle trips were available by hour, where the person-trips were divided only into peak and off-peak periods.

A second script was developed to generate trip length frequency distributions from the resulting daily trip tables for auto and person-trips, which would be specific to the travel shed. Period-specific trip
length frequency distributions could also be generated. These distributions, along with total trips and mode shares, were summarized in spreadsheets for each alternative, and compared with the corresponding no-build alternative.

Note that the selected link demand matrix did not exclude any non-zero trips interchanges; there was no artificial lower limit, as was used for the link-based analysis. Any absolute or percentage-based cutoff would result in considerable inconsistency between alternatives, since the magnitude of most OD demand is very dispersed. Also note that the usefulness of the mode share information as discussed here was limited since transit times were not adjusted to reflect possible improvements in service levels corresponding to the proposed improvements.

Appendix D contains an example of the matrix aggregation and trip length frequency scripts used in this analysis.
Memorandum To: Project Files  
From: Steve Ruegg, PB  
Date: April 2, 2010 (DRAFT)  
Subject: MHSIS Travel Demand Forecasting Results

Introduction:
This memorandum describes the key results from the travel demand forecasting analysis used to develop performance measures for transportation system improvements that were identified as a part of the Metropolitan Highway System Investment Study (MHSIS). The MHSIS was a study by the Metropolitan Council (the Council) and the Minnesota Department of Transportation (MnDOT) to develop a new approach to long term transportation investments for the Twin Cities Metropolitan area. This approach explicitly recognized that funding for transportation infrastructure will not be sufficient to eliminate or even reduce current congestion for the overall system for the foreseeable future. Given this, the challenge of the study was to change the way in which we evaluate and prioritize investments with the resources we do have available to maximize cost effectiveness in the broadest terms.

A key part of this study was to systematically evaluate the performance of a set of potential corridor-based improvements which are consistent with providing benefit by targeting specific transportation system deficiencies. These projects included the following strategies:

- Managed Lane Expansions and Conversions
- New Managed lanes
- Strategic capacity enhancement (new facilities)
- Expansion of general purpose capacity
- Conversion and upgrade of facility types
- Interchange modification and/or consolidation

A total of 41 candidate corridor alternatives were evaluated. While representative of the overall set of new projects being considered, these 41 corridor alternatives should not be considered and exhaustive or exclusive list.

The performance evaluation for these projects was conducted using two approaches. To measure the benefits of capacity enhancement, the regional travel demand forecast model (the regional model) was used. Secondly, to measure the benefits of Active Traffic Management (ATM) strategies the ITS Deployment Analysis System (IDAS). This memorandum will describe the results of the regional model analysis. A detailed description of the methodology used for this analysis may be found in the March 15, 2010 memorandum entitled “MHSIS Travel Demand Forecasting Evaluation Methodology”.
Travel Time Reliability:
Positive findings for improvements in travel time reliability are largely correlated with congested facilities and peak periods. As such, the reliability measure would best be examined as change in delay hours, separated by lane type (managed lane vs. general purpose lane). As the managed lane conditions will be congestion-free, then the real comparison points will be: 1) between build / no-build conditions in the general purpose lanes, and, 2) vehicular delay differences between managed lane / general purpose lanes. Appropriate measures of effectiveness will be vehicle minutes of delay by trip categorized by facility type. Peak period separation may accentuate the differences.

Figure 1: Reliability: 2030 Vehicle-Minutes of Delay Reduced Per Trip
Figure 2: 2060 Vehicle Minutes of Delay Reduced per Trip

Reliability: 2060 Vehicle Minutes of Delay Reduced Per Trip

- Managed Lane Conversion
- Managed Lane Expansion
- Managed Lane (One Way)
- Expand to 4-lane Expressway
- Strategic Capacity Enhancement
- Limited Access Conversion
- Interchange Consolidation
- Interchange Closure
Figure 3: Reliability: 2030 Delay Reduction as a Percent of Total VHD

Reliability: 2030 Delay Reduction as a Percent of Total VHD

- Managed Lane Conversion
- Managed Lane Expansion
- Managed Lane (One Way)
- Expand to 4-lane Expressway
- Strategic Capacity Enhancement
- Limited Access Conversion
- Interchange Consolidation
- Interchange Closure
Figure 4: Reliability: 2060 Delay Reduction as a Percent of Total VHD (No-Build)
Figure 5: Reliability: Year 2030 Peak Delay Saved Per Trip (min/Trip)
Throughput:
As the travel demand model held regional vehicular tripmaking static, the measures of effectiveness for person throughput in the model results only reflect how much the project expands the spatial market it is serving. An expansion of one market by the project yields a contraction of another market (e.g., I-494 drawing more vehicles from US 169, not necessarily serving more people in aggregate). So, this measure provides a perspective on the size of the market affected by the project. When calculated as person throughput per lane mile (directional centerline), the effect is to evaluate how many travelers are potentially served by the project. The greater the service per mile, the greater the spatial scope of effectiveness.
Figure 7: 2030: New Vehicular Throughput by Lane Mile

- Managed Lane Conversion
- Managed Lane Expansion
- Managed Lane (One Way)
- Expand to 4-lane Expressway
- Strategic Capacity Enhancement
- Limited Access Conversion
- Interchange Consolidation
- Interchange Closure
Figure 8: 2060: New Vehicular Throughput by Lane Mile
Figure 9: 2030: New Person Throughput by Lane Mile

-30,000 -25,000 -20,000 -15,000 -10,000 -5,000 0 5,000 10,000 15,000 20,000

Managed Lane Conversion
Managed Lane Expansion
Managed Lane (One Way)
Expand to 4-lane Expressway
Strategic Capacity Enhancement
Limited Access Conversion
Interchange Consolidation
Interchange Closure
Travel Time Reduction:
Examining the potential benefit/cost (as proxied by mileage normalization) that a project can provide for travel time reduction, vehicle hours of delay reduced per centerline mile will be used. This offers an easy-to-describe means of articulating benefits from the project.
Figure 11: 2030: Vehicle Hours of Delay Reduced by Lane Mile

<table>
<thead>
<tr>
<th>2030: Vehicle Hours of Delay Reduced by Lane Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 2,000 4,000 6,000 8,000 10,000 12,000 14,000</td>
</tr>
<tr>
<td>Managed Lane Conversion</td>
</tr>
<tr>
<td>Managed Lane Expansion</td>
</tr>
<tr>
<td>Managed Lane (One Way)</td>
</tr>
<tr>
<td>Expand to 4-lane Expressway</td>
</tr>
<tr>
<td>Strategic Capacity Enhancement</td>
</tr>
<tr>
<td>Limited Access Conversion</td>
</tr>
<tr>
<td>Interchange Consolidation</td>
</tr>
<tr>
<td>Interchange Closure</td>
</tr>
</tbody>
</table>

Lane Mileage:
Figure 12: 2060: Vehicle Hours of Delay Reduced by Lane Mile
Figure 13: 2030: Change in Average Trip Time (Minutes Reduced)

<table>
<thead>
<tr>
<th>Highway</th>
<th>Change in Average Trip Time (Minutes Reduced)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4A (I-35E)</td>
<td>6.0</td>
</tr>
<tr>
<td>17A (I-494)</td>
<td>4.0</td>
</tr>
<tr>
<td>3A (I-35G)</td>
<td>2.0</td>
</tr>
<tr>
<td>7B (I-35W)</td>
<td>0.0</td>
</tr>
<tr>
<td>10A (I-35W)</td>
<td>2.0</td>
</tr>
<tr>
<td>18A (I-494)</td>
<td>4.0</td>
</tr>
<tr>
<td>19A (I-494)</td>
<td>6.0</td>
</tr>
<tr>
<td>20B (I-694)</td>
<td>8.0</td>
</tr>
<tr>
<td>21A (I-494)</td>
<td>10.0</td>
</tr>
<tr>
<td>23A (I-694)</td>
<td>12.0</td>
</tr>
<tr>
<td>27A (MN 36)</td>
<td>14.0</td>
</tr>
<tr>
<td>28B (MN 36)</td>
<td>16.0</td>
</tr>
<tr>
<td>3A (I-35E)</td>
<td>18.0</td>
</tr>
<tr>
<td>7B (I-35W)</td>
<td>20.0</td>
</tr>
<tr>
<td>10A (I-35W)</td>
<td>22.0</td>
</tr>
<tr>
<td>11A (I-494)</td>
<td>24.0</td>
</tr>
<tr>
<td>13B (I-494)</td>
<td>26.0</td>
</tr>
<tr>
<td>41A (US 169)</td>
<td>28.0</td>
</tr>
<tr>
<td>42A (US 169)</td>
<td>30.0</td>
</tr>
<tr>
<td>45A (MN 77)</td>
<td>32.0</td>
</tr>
<tr>
<td>50A (I-494)</td>
<td>34.0</td>
</tr>
<tr>
<td>51A (TH-169)</td>
<td>36.0</td>
</tr>
<tr>
<td>52A (I-394)</td>
<td>38.0</td>
</tr>
<tr>
<td>53A (I-494)</td>
<td>40.0</td>
</tr>
<tr>
<td>54A (TH-62)</td>
<td>42.0</td>
</tr>
<tr>
<td>55A (I-946060)</td>
<td>44.0</td>
</tr>
<tr>
<td>56A (TH-281)</td>
<td>46.0</td>
</tr>
<tr>
<td>1B (I-35)</td>
<td>48.0</td>
</tr>
<tr>
<td>22A (I-494)</td>
<td>50.0</td>
</tr>
<tr>
<td>26B (MN 352)</td>
<td>52.0</td>
</tr>
<tr>
<td>28B (MN 315)</td>
<td>54.0</td>
</tr>
<tr>
<td>32A (MN 312)</td>
<td>56.0</td>
</tr>
<tr>
<td>16A (I-494)</td>
<td>58.0</td>
</tr>
<tr>
<td>33A (MN 610)</td>
<td>60.0</td>
</tr>
<tr>
<td>30B (MN 36)</td>
<td>62.0</td>
</tr>
<tr>
<td>35A (MN 63)</td>
<td>64.0</td>
</tr>
<tr>
<td>36A (US 15)</td>
<td>66.0</td>
</tr>
<tr>
<td>39A (I-169)</td>
<td>68.0</td>
</tr>
<tr>
<td>42A (US 212)</td>
<td>70.0</td>
</tr>
<tr>
<td>46A (US 52)</td>
<td>72.0</td>
</tr>
<tr>
<td>50A (I-35W)</td>
<td>74.0</td>
</tr>
<tr>
<td>12A (I-494)</td>
<td>76.0</td>
</tr>
<tr>
<td>80B (I-35W)</td>
<td>78.0</td>
</tr>
<tr>
<td>11A (I-494)</td>
<td>80.0</td>
</tr>
<tr>
<td>13B (I-494)</td>
<td>82.0</td>
</tr>
</tbody>
</table>

Legend:
- Managed Lane Conversion
- Managed Lane Expansion
- Managed Lane (One Way)
- Expand to 4-lane Expressway
- Strategic Capacity Enhancement
- Limited Access Conversion
- Interchange Consolidation
- Interchange Closure
Figure 14: 2060: Change in Average Trip Time (Minutes Reduced)

**Change in Congested VMT:**
This performance measure is unscaled, which provides a measure of the total magnitude of the intended improvement and examines (throughout the network) how many sections of roadway are relieved by the project.
Figure 15: 2030: Reduction in Congested VMT
Figure 16: 2060: Reduction in Congested VMT

2060: Reduction in Congested VMT

-100,000 0 100,000 200,000 300,000 400,000 500,000 600,000 700,000 800,000 900,000 1,000,000

4A (I-35E)
17A (I-494)
3A (I-35E)
7A (I-35W)
10A (I-35W)
18A (I-494)
12A (I-494)
20B (I-494)
21B (I-494)
12A (I-494)
27A (MN 36)
28B (MN 36)
29B (I-35W)
41A (US 169)
42B (US 169)
45A (MN 77)
50A (I-494)
51A (I-494)
52A (I-35W)
53A (I-494)
54A (I-62)
55A (I-94W)
56A (I-280)
1B (I-35W)
18B (I-35W)
22B (I-494)
26A (MN 252)
30B (MN 55)
43B (US 212)
14A (I-494)
33A (MN 610)
31B (MN 36)
35B (MN 61)
36B (US 10)
19B (US 169)
48B (US 52)
80B (I-35W)
12A (I-494)
80A (I-35W)
11A (I-494)

- Managed Lane Conversion
- Managed Lane Expansion
- Managed Lane (One Way)
- Expand to 4-lane Expressway
- Strategic Capacity Enhancement
- Limited Access Conversion
- Interchange Consolidation
- Interchange Closure
Appendix A: Build Scenario/Corridor Project Correspondence and Travel Sheds
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Highways in Scenario</th>
<th>Project IDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TH 36, TH 65, TH 169/TH10, TH 169, TH 52</td>
<td>30B, 35B, 36B, 39B, 44B</td>
</tr>
<tr>
<td>2</td>
<td>TH 55, TH 212</td>
<td>32B, 43B</td>
</tr>
<tr>
<td>3</td>
<td>I-494, TH 610</td>
<td>14A, 33A</td>
</tr>
<tr>
<td>4</td>
<td>I-35E, I-35W, TH 252</td>
<td>1B, 6B, 26B</td>
</tr>
<tr>
<td>5</td>
<td>I-494, I-694</td>
<td>17A, 19A</td>
</tr>
<tr>
<td>6</td>
<td>I-494, I-694</td>
<td>18A, 20B, (includes project 17A)</td>
</tr>
<tr>
<td>7</td>
<td>I-94</td>
<td>21B, 23A (includes projects 17A and 18A)</td>
</tr>
<tr>
<td>8</td>
<td>I-35E, TH 169</td>
<td>3A, 42B (includes project 2A)</td>
</tr>
<tr>
<td>9</td>
<td>I-35E, TH 77</td>
<td>4A, 45A (includes projects 2A and 3A)</td>
</tr>
<tr>
<td>10</td>
<td>I-35E, TH 169</td>
<td>29B, 41A (includes projects 2A, 3A, and 4A)</td>
</tr>
<tr>
<td>11</td>
<td>I-35W</td>
<td>10A</td>
</tr>
<tr>
<td>12</td>
<td>I-35W</td>
<td>7B (includes project 10A)</td>
</tr>
<tr>
<td>14</td>
<td>TH 36</td>
<td>27A (includes project 10A)</td>
</tr>
<tr>
<td>15</td>
<td>TH 36</td>
<td>28B (includes project 10A and 27A)</td>
</tr>
<tr>
<td>16</td>
<td>I-94</td>
<td>22B</td>
</tr>
<tr>
<td>50</td>
<td>I-494</td>
<td>50A (includes 17A and 19A)</td>
</tr>
<tr>
<td>51</td>
<td>TH 169</td>
<td>51A</td>
</tr>
<tr>
<td>52</td>
<td>I-394</td>
<td>52A</td>
</tr>
<tr>
<td>53</td>
<td>I-494</td>
<td>53A (includes 14A and 16A)</td>
</tr>
<tr>
<td>54</td>
<td>TH 62</td>
<td>54A</td>
</tr>
<tr>
<td>55</td>
<td>I-94 East</td>
<td>55A</td>
</tr>
<tr>
<td>56</td>
<td>TH 280</td>
<td>56A</td>
</tr>
</tbody>
</table>
Figure A-1: Corridor Projects for Study
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 1: Alt 30B, 35B, 36B, 39B and 44B

Year 2030 Travel Sheds for Projects Scenario 2: Alt 32B and 43B
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 3: Alt 14A and 33A

Year 2030 Travel Sheds for Projects Scenario 4: Alt 1B
Year 2030 Travel Sheds for Projects Scenario 4B: Alt 6B and 26B

Year 2030 Travel Sheds for Projects Scenario 5: Alt 17A and 19A
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 6A: Alt 18A

Year 2030 Travel Sheds for Projects Scenario 6B: Alt 20B
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 7: Alt 21B and 23A

Year 2030 Travel Sheds for Projects Scenario 8: Alt 3A and 42B
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 9: Alt 4A and 45A

Year 2030 Travel Sheds for Projects Scenario 10: Alt 29B and 41A
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 11: Alt 10A

Year 2030 Travel Sheds for Projects Scenario 12: Alt 7B
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 13B: Alt 13B

Year 2030 Travel Sheds for Projects Scenario 13: Alt 8B, 9B, 11A and 12A
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 14: Alt 27A

Year 2030 Travel Sheds for Projects Scenario 15: Alt 28B
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2030 Travel Sheds for Projects Scenario 16: Alt 22B

Year 2060 Travel Sheds for Projects Scenario 50: Alt 50A
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2060 Travel Sheds for Projects Scenario 51: Alt 51A

Year 2060 Travel Sheds for Projects Scenario 52: Alt 52A
Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

Year 2060 Travel Sheds for Projects Scenario 53: Alt 53A

Year 2060 Travel Sheds for Projects Scenario 54: Alt 54A
Year 2060 Travel Sheds for Projects Scenario 55: Alt 55A

Year 2060 Travel Sheds for Projects Scenario 56: Alt 56A
Appendix B: Selected-Link Regional Assignment Script (example)
Appendix B:

Selected-Link Regional Assignment Script (example)

;Set up 24 time period loop
LOOP HOURLOOP=1,24,1
  if (hourloop=1) ni='op', tab=1, capfac=2.00, iters=30, hourlycap='offcap', label='12:00am-2:00am'
  if (hourloop=2) ni='op', tab=2, capfac=1.00, iters=30, hourlycap='offcap', label='3:00am-5:00am'
  if (hourloop=3) ni='op', tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='5:00am-7:00am'
  if (hourloop=4) ni='op', tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='7:00am-9:00am'
  if (hourloop=5) ni='op', tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='9:00am-11:00am'
  if (hourloop=6) ni='op', tab=6, capfac=0.75, iters=30, hourlycap='offcap', label='11:00am-1:00pm'
  if (hourloop=7) ni='op', tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='1:00pm-3:00pm'
  if (hourloop=8) ni='op', tab=8, capfac=1.00, iters=30, hourlycap='offcap', label='3:00pm-5:00pm'
  if (hourloop=9) ni='op', tab=9, capfac=1.00, iters=30, hourlycap='offcap', label='5:00pm-7:00pm'
  if (hourloop=10) ni='op', tab=10, capfac=1.00, iters=30, hourlycap='offcap', label='7:00pm-9:00pm'
  if (hourloop=11) ni='op', tab=11, capfac=1.00, iters=30, hourlycap='offcap', label='9:00pm-11:00pm'
  if (hourloop=12) ni='op', tab=12, capfac=1.00, iters=30, hourlycap='offcap', label='11:00pm-1:00am'

if (hourloop=7-14) ni='op', tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='12:45pm-1:45pm'
if (hourloop=15-18) ni='op', tab=8, capfac=0.75, iters=30, hourlycap='offcap', label='2:00pm-3:00pm'
if (hourloop=19-22) ni='op', tab=9, capfac=1.00, iters=30, hourlycap='offcap', label='3:00pm-4:00pm'
if (hourloop=23) ni='op', tab=10, capfac=1.00, iters=30, hourlycap='offcap', label='4:00pm-5:00pm'

if (hourloop=1-6) ni='op', tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='5:00am-6:00am'
if (hourloop=7-14) ni='op', tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='6:00am-7:00am'
if (hourloop=15-18) ni='op', tab=8, capfac=1.00, iters=30, hourlycap='offcap', label='7:00am-8:00am'
if (hourloop=19-22) ni='op', tab=9, capfac=1.00, iters=30, hourlycap='offcap', label='8:00am-9:00am'
if (hourloop=23) ni='op', tab=10, capfac=1.00, iters=30, hourlycap='offcap', label='9:00am-10:00am'

if (hourloop=1-6) ni='op', tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='10:00am-11:00am'
if (hourloop=7-14) ni='op', tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='11:00am-12:00pm'
if (hourloop=15-18) ni='op', tab=8, capfac=1.00, iters=30, hourlycap='offcap', label='12:00pm-1:00pm'
if (hourloop=19-22) ni='op', tab=9, capfac=1.00, iters=30, hourlycap='offcap', label='1:00pm-2:00pm'
if (hourloop=23) ni='op', tab=10, capfac=1.00, iters=30, hourlycap='offcap', label='2:00pm-3:00pm'

/Global Parameters
/ if (hourloop=1-24)
  year=2030
  iters=30
/ comment out to specify individually
/ modelzones=1236  / only assign trips in 7 county core
/endf

/distribute intrastep=t
RUN PGM=HWYLOAD
; distribute intrastep= processid='nmf', processlist=1-8
ID TRIP ASSIGNMENT FOR @label@
FILEI MATI[1] = @m1@.trp  ; Non-HOV trips to be assigned (non-toll)
FILEI MATI[2] = @m2@.trp  ; HOV trips to be assigned (non-toll)
FILEI MATI[3] = @m3@.trp  ; Truck trips to be assigned (non-toll, non-HOV)
FILEI NETI= scenariol_attrib.net  ; input network
FILEO NETO= load2030_scen1@hourloop@.net  ; output network
MATO[2]= SL_total_scen1@hourloop@.trp, mo=91,95, dec=5*5, name=30B,35B,36B,39B,44B
MATO[3]= SL_bymode_scen1@hourloop@.trp, mo=61,71,81,62,72,82,63,73,83,64,74,84,65,75,85, dec=15*5,
         name=30B_SOV,30B_HOV,30B_PAY, 35B_SOV,35B_HOV,35B_PAY, 36B_SOV,36B_HOV,36B_PAY,
         39B_SOV,39B_HOV,39B_PAY, 44B_SOV,44B_HOV,44B_PAY
PARAMETERS MAXITERS = @iters@ COMBINE=EQUI ; maximum number of iterations
FUNCTION TC[1] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361))
FUNCTION TC[2] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.167))
FUNCTION TC[3] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.167))
FUNCTION TC[4] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.167))
FUNCTION TC[5] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.167))
FUNCTION TC[6] = T0 * (2+SQRT(25*(1-(V/C))^2 + 1.125))
FUNCTION TC[7] = T0 * (2+SQRT(36*(1-(V/C))^2 + 1.100))
FUNCTION TC[8] = T0 * (2+SQRT(49*(1-(V/C))^2 + 1.100))
FUNCTION TC[11] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
FUNCTION TC[13] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
FUNCTION TC[14] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
FUNCTION TC[15] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
FUNCTION TC[18] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)


LOOKUP NAME=TOLL,
LOOKUP[1]=1, RESULT=2,
INTERPOLATE=Y,
FAIL=25,800,
R = '0.00 25',
'0.35 50',
'0.54 150',
'0.77 250',
'0.93 350',
'1.00 600'; LOS-Toll table reported by MnDOT

LOOKUP NAME=DIVERT,
LOOKUP[1]=1, RESULT=2,
INTERPOLATE=Y,
FAIL = 5,100,
R = ' 0.0 5.0',
' 8.0 50.0',
'10.0 60.0',
'16.3 75.0',
'20.0 81.7',
'23.7 85.0',
'31.4 90.5',
'41.7 95.0',
'51.8 96.0',
'58.3 98.0',
'66.7 98.8'; VOT distribution as reported by NuStats

PHASE=LINKREAD
IF(LI.ASGNGRP = 0) LINKCLASS = 10
IF(LI.ASGNGRP > 0) LINKCLASS = LI.ASGNGRP
T0 = LI.TIME
LW.HOVFACILITY = LI.HOVFACILITY
C = LI.@hourlycap@ * @capfac@ ; set capacity equal to a link field ; Note- tolls on in time period 6
if(LI.asgngrp<>9 & LI.@hourlycap@=0) ADDTOGROUP=3
if(LINKCLASS==1,7,9,11,13,14,15) ADDTOGROUP=1
if(LW.HOVFACILITY==99) ADDTOGROUP=2 ; I-35W HOV lanes
if(LW.HOVFACILITY==1,9) ADDTOGROUP=4 ; I-394 HOT lanes
if(LW.HOVFACILITY==5) ADDTOGROUP=5
if(LW.HOVFACILITY==6) ADDTOGROUP=6
if(li.lw.facility==1,7,9) addtogroup=8
if(li.lw.facility==8) addtogroup=9
if(li.lw.facility==10) addtogroup=9
if(li.lw.facility==11) addtogroup=10
if(li.I30B==1) addtogroup=11 ; 30B selected link, TH36
if(li.I35B==1) addtogroup=12 ; 35B selected link, TH65
if(li.I36B==1) addtogroup=13 ; 36B selected link, TH169/TH10
if(li.I39B==1) addtogroup=14 ; 39B selected link, TH169
if(li.I44B==1) addtogroup=15 ; 44B selected link, TH52
_toll1 = 25
_toll2 = 25
_toll3 = 25
_toll4 = 25
_toll5 = 25
_toll6 = 25
ENDPHASE

PHASE=LOOP ; main loop for module
PATHLOAD PATH=TIME, ; build SOV non-pay path based on time
EXCLUDEGRP=2,3,4, ; exclude sovs from hov and toll facilities
MW[1]=PATHCOST

PATHLOAD PATH=TIME, ; build SOV pay path based on time
EXCLUDEGRP=2,3, ; exclude sovs from hov facilities
Appendix B:

Selected-Link Regional Assignment Script (example)

MW[2]=PATHCOST,
MW[3]=toll1, SELECTGROUP=5,
MW[4]=toll2, SELECTGROUP=6,
mw[13]=toll3, selectgroup=7,
mw[14]=toll4, selectgroup=8,
mw[15]=toll5, selectgroup=9,
mw[16]=toll6, selectgroup=10


JLOOP
IF (I==J)
MW[8] = 0
ELSE
IF (MW[6]>0)
MW[8] = 100 - DIVERT(1,MW[7]) ; percent willing to pay at this level
MW[9] = MW[8] / 100 ; paying non-hov trips
ELSE
MW[7] = -1 ; flag for 0 min saved
MW[8] = 0 ; no-one will pay if there is no savings
MW[9] = 0 ; so paying non-hov trips are 0
MW[10] = MW[9] ; all non-hov trips are non-paying
MW[11] = 0
ENDIF
ENDIF
ENDJLOOP

PATHLOAD PATH=TIME, ; build non-paying sov path based on time
EXCLUDEGRP=2,3,4, ; exclude non-paying sovs from hov/hot facilities
VOL[1]=MW[10]+MW[5], ; load non-paying sov and input truck trips

PATHLOAD PATH=TIME, ; build HOV path based on time, no restrictions
EXCLUDEGRP=3, VOLL[2]=MI.2.@TAB@, ; load HOV trips from input matrix

PATHLOAD PATH=TIME, ; build paying sov path based on time
EXCLUDEGRP=2,3, ; exclude paying sovs from hov facilities
VOL[3]=MW[9], ; load paying sov trips

mw[91] = mw[61] + mw[71] + mw[81] ; sum selected link for TH36 30B
mw[94] = mw[64] + mw[74] + mw[84] ; sum selected link for TH169 39B
mw[95] = mw[65] + mw[75] + mw[85] ; sum selected link for TH52 44B

ENDPHASE

PHASE=ADJUST
IF (LINKNO=1)
  _maxVC1 = 0
  _maxVC2 = 0
  _maxVC3 = 0
ENDIF
_maxVC4 = 0
_maxVC5 = 0
_maxVC6 = 0
ENDIF

IF (LW.HOVFACILITY==5 && c>0)
   IF ((V/C) > _maxVC1) _maxVC1 = (V/C)
ELSEIF (LW.HOVFACILITY==6 && c>0)
   IF ((V/C) > _maxVC2) _maxVC2 = (V/C)
ELSEIF (LW.HOVFACILITY==1,7,9 && c>0)
   IF ((V/C) > _maxVC3) _maxVC3 = (V/C)
ELSEIF (LW.HOVFACILITY==8 && c>0)
   IF ((V/C) > _maxVC4) _maxVC4 = (V/C)
ELSEIF (LW.HOVFACILITY==10 && c>0)
   IF ((V/C) > _maxVC5) _maxVC5 = (V/C)
ELSEIF (LW.HOVFACILITY==11 && c>0)
   IF ((V/C) > _maxVC6) _maxVC6 = (V/C)
ENDIF
_toll1 = TOLL(1,_maxVC1)
_toll2 = TOLL(1,_maxVC2)
_toll3 = toll(1,_maxvc3)
_toll4 = toll(1,_maxvc4)
_toll5 = toll(1,_maxvc5)
_toll6 = toll(1,_maxvc6)
ENDPHASE
ENDRUN
Endloop
### Table B-1: Assigned No-Build Network SL Volume Attributes

<table>
<thead>
<tr>
<th>A1</th>
<th>30B</th>
<th>35B</th>
<th>36B</th>
<th>39B</th>
<th>44B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>TH36</td>
<td>TH65</td>
<td>TH169/TH10</td>
<td>TH169</td>
<td>TH52</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A2</th>
<th>32B</th>
<th>43B</th>
<th>14A</th>
<th>33A</th>
<th>1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>TH55</td>
<td>TH212</td>
<td>I494</td>
<td>TH610</td>
<td>I35E</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A3</th>
<th>6B</th>
<th>26B</th>
<th>17A</th>
<th>19A</th>
<th>18A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I35W</td>
<td>TH252</td>
<td>I494</td>
<td>I694</td>
<td>I494</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B1</th>
<th>20B</th>
<th>21B</th>
<th>23A</th>
<th>3A</th>
<th>42B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I694</td>
<td>I94</td>
<td>I94</td>
<td>I35E</td>
<td>TH169</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B2</th>
<th>4A</th>
<th>45A</th>
<th>29B</th>
<th>41A</th>
<th>10A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I35E</td>
<td>TH77</td>
<td>I35E</td>
<td>TH169</td>
<td>I35W</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C1</th>
<th>7B</th>
<th>8B</th>
<th>9B</th>
<th>11A</th>
<th>12A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I35W</td>
<td>I35W</td>
<td>I35W</td>
<td>I494</td>
<td>I494</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
<td>VOL16</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
<td>VOL17</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
<td>VOL18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C2</th>
<th>13B</th>
<th>27A</th>
<th>28B</th>
<th>22B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I494</td>
<td>TH36</td>
<td>TH36</td>
<td>I94</td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td>VOL13</td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td>VOL14</td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td>VOL15</td>
</tr>
</tbody>
</table>
Table B-1: Assigned No-Build Network SL Volume Attributes

<table>
<thead>
<tr>
<th></th>
<th>D1</th>
<th>50A</th>
<th>51A</th>
<th>53A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>I-494</td>
<td>TH 169</td>
<td>I-494</td>
<td></td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td></td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td></td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>D2</th>
<th>54A</th>
<th>55A</th>
<th>56A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>TH 62</td>
<td>I-94</td>
<td>TH 280</td>
<td></td>
</tr>
<tr>
<td>SOV</td>
<td>VOL4</td>
<td>VOL7</td>
<td>VOL10</td>
<td></td>
</tr>
<tr>
<td>HOV</td>
<td>VOL5</td>
<td>VOL8</td>
<td>VOL11</td>
<td></td>
</tr>
<tr>
<td>PAY</td>
<td>VOL6</td>
<td>VOL9</td>
<td>VOL12</td>
<td></td>
</tr>
</tbody>
</table>

Note: for Build scenarios, the SOV, HOV and SOV-PAY selected link volume attributes are assigned to VOL4, VOL5, VOL6 in order for the first project listed in Table A-1, VOL7, VOL8, VOL9 in order for the second project listed in Table A-1, and follows this pattern for all corridor projects within a particular build scenario.
Appendix C: Script to Summarize Build and No-Build Link-Based Performance Statistics, and Output File Contents (example)
Appendix C: Script to Summarize Build and No-Build Link-Based Performance Statistics and Output File Contents

; read file=Array_AAA.dat, 'AAA' = '36b'
; read file=Array_AAA.dat, 'AAA' = '39b'
; read file=Array_AAA.dat, 'AAA' = '44b'

PROCESS PHASE=INPUT FILE=LI.1
read file=max_read_nb.dat, 'AAA' = '33b', 'N1' = '4', 'N2' = '5', 'N3' = '6'
read file=max_read_nb.dat, 'AAA' = '43b', 'N1' = '7', 'N2' = '8', 'N3' = '9'
; read file=max_read_nb.dat, 'AAA' = '36b', 'N1' = '10', 'N2' = '11', 'N3' = '12'
; read file=max_read_nb.dat, 'AAA' = '39b', 'N1' = '13', 'N2' = '14', 'N3' = '15'
; read file=max_read_nb.dat, 'AAA' = '44b', 'N1' = '16', 'N2' = '17', 'N3' = '18'
ENDPROCESS

PHASE=INPUT FILE=LI.2
read file=max_read_bd.dat, 'AAA' = '32b', 'N1' = '4', 'N2' = '5', 'N3' = '6'
read file=max_read_bd.dat, 'AAA' = '43b', 'N1' = '7', 'N2' = '8', 'N3' = '9'
; read file=max_read_bd.dat, 'AAA' = '36b', 'N1' = '10', 'N2' = '11', 'N3' = '12'
; read file=max_read_bd.dat, 'AAA' = '39b', 'N1' = '13', 'N2' = '14', 'N3' = '15'
; read file=max_read_bd.dat, 'AAA' = '44b', 'N1' = '16', 'N2' = '17', 'N3' = '18'
ENDPROCESS

PROCESS PHASE=LINMERGE
; ntvol = li.1.v_1
btvol = li.2.v_2
read file=max_share.dat, 'AAA' = '32b', 'N1' = '4', 'N2' = '5', 'N3' = '6'
read file=max_share.dat, 'AAA' = '43b', 'N1' = '7', 'N2' = '8', 'N3' = '9'
; read file=max_share.dat, 'AAA' = '36b', 'N1' = '10', 'N2' = '11', 'N3' = '12'
; read file=max_share.dat, 'AAA' = '39b', 'N1' = '13', 'N2' = '14', 'N3' = '15'
; read file=max_share.dat, 'AAA' = '44b', 'N1' = '16', 'N2' = '17', 'N3' = '18'
read file=moes.dat, 'AAA' = '32b'
read file=moes.dat, 'AAA' = '43b'
; read file=moes.dat, 'AAA' = '36b'
; read file=moes.dat, 'AAA' = '39b'
; read file=moes.dat, 'AAA' = '44b'
ENDPROCESS

PROCESS PHASE=SUMMARY
loop _ag=1,20,1
if(_ag = 1-2,11-12)
  gft=' Freeway'
else if(_ag = 3-4,13-14)
  gft=' Ramp'
else if(_ag = 15)
  gft='Expressway'
else if(_ag = 5-6,15-16)
  gft='Arterial'
else if(_ag = 7,17)
  gft='Collector'
else if(_ag = 8,10,18,20)
  gft='Mnged Lane'
else if(_ag = 9,19)
  gft='Local'
dendif
if(@hourloop@ = 1-5,10-14,19-24)
  per='OFFPK'
else if(@hourloop@ = 6-9)
  per='AMPK'
else if(@hourloop@ = 15-18)
  per='PMFK'
dendif
read file=report.dat, 'AAA' = '32b', 'FILE1' = '1', 'FILE2' = '2', 'FILE3' = '3'
read file=report.dat, 'AAA' = '43b', 'FILE1' = '4', 'FILE2' = '5', 'FILE3' = '6'
; read file=report.dat, 'AAA' = '36b', 'FILE1' = '7', 'FILE2' = '8', 'FILE3' = '9'
; read file=report.dat, 'AAA' = '39b', 'FILE1' = '10', 'FILE2' = '11', 'FILE3' = '12'
; read file=report.dat, 'AAA' = '44b', 'FILE1' = '13', 'FILE2' = '14', 'FILE3' = '15'
endloop
ENDPROCESS
ENDRUN
Endloop
Appendix C:

Script to Summarize Build and No-Build Link-Based Performance Statistics and Output File Contents

**SNN_AAA_YYY_delete.dat:**

*del ..\AllDayTolls\scenario_SNNN\scenarioSNNN_YYY\scenSNNN_AAA_summaryvht.csv
*del ..\AllDayTolls\scenario_SNNN\scenarioSNNN_YYY\scenSNNN_AAA_summaryvmt.csv
*del ..\AllDayTolls\scenario_SNNN\scenarioSNNN_YYY\scenSNNN_AAA_summaryvcvm.csv

**Array_AAA.dat:**

Array nbAAAvht=20, bdAAAvht=20, nbAAAvmt=20, bdAAAvmt=20, nbAAAaffvht=20, bdAAAaffvht=20
Array cnbAAAvht=20, cbdAAAvht=20, cnbAAAvmt=20, cbdAAAvmt=20, cnbAAAaffvht=20, cbdAAAaffvht=20
Array nbAAAvmvc=20, bdAAAvmvc=20, cnbAAAvmvc=20, cbdAAAvmvc=20, nbAAAlm=20, bdAAAlm=20, nbAAAc=20, bdAAAc=20

**Max_read_nb.dat:**

```
nb_vAAA = VN1_1 + VN2_1 + VN3_1
_maxsl_nb_AAA = max(_maxsl_nb_AAA,nb_vAAA)
```

**Max_read_bd.dat:**

```
nb_vAAA = VN1_1 + VN2_1 + VN3_1
_maxsl_nb_AAA = max(_maxsl_nb_AAA,nb_vAAA)
```

**Max_share.dat:**

```
nb_vAAA = li.1.VNB1_1 + li.1.VNB2_1 + li.1.VNB3_1
bd_vAAA = li.2.VN1_1 + li.2.VN2_1 + li.2.VN3_1
if(_maxsl_nb_AAA > 0.0)
  nbshAAA = nb_vAAA/_maxsl_nb_AAA
else
  nbshAAA = 0.0
endif
if(_maxsl_bd_AAA > 0.0)
  bdshAAA = bd_vAAA/_maxsl_bd_AAA
else
  bdshAAA = 0.0
endif
```
moes.dat:

if(nbshAAA >= 0.01 || bdshAAA >= 0.01)
; congested vht total and for corridor volumes only
nAAA_vht = li.1.time_1 / 60
bAAA_vht = li.2.time_1 / 60
nAAA_vhtc = li.1.time_1 * nb_vAAA / 60
bAAA_vhtc = li.2.time_1 * bd_vAAA / 60
if(li.1.hovfacility=1-9)
    cnbAAA[vht][8] = cnbAAAvht[li.1.asgngrp] + nAAA_vhtc
    nbAAAvht[li.1.asgngrp] = nbAAAvht[li.1.asgngrp] + nAAA_vht
else
    if(li.1.hovfacility=1-9)
        bAAA_vht = bAAA_vht + cnbAAAvht[li.1.asgngrp]
    else
        bAAA_vht = bAAA_vht + cnbAAAvht[li.1.asgngrp]
endif
endif

; freeflow vht total and for corridor volumes only
nAAA_ffvht = li.1.time_1 / 60
bAAA_ffvht = li.2.time_1 / 60
nAAA_ffvhtc = li.1.time_1 * nb_vAAA / 60
bAAA_ffvhtc = li.2.time_1 * bd_vAAA / 60
if(li.1.hovfacility=1-9)
    cnbAAAffvht[8] = cnbAAAffvht[li.1.asgngrp] + nAAA_ffvhtc
    nbAAAffvht[8] = nbAAAffvht[li.1.asgngrp] + nAAA_ffvht
else
    if(li.1.hovfacility=1-9)
        bAAA_ffvht = bAAA_ffvht + cnbAAAffvht[li.1.asgngrp]
    else
        bAAA_ffvht = bAAA_ffvht + cnbAAAffvht[li.1.asgngrp]
endif
endif

; vmt total and for corridor volumes only
nAAA_vmt = li.1.vdt_1
bAAA_vmt = li.2.vdt_1
nAAA_vmtc = li.1.distance * nb_vAAA
bAAA_vmtc = li.2.distance * bd_vAAA
if(li.1.hovfacility=1-9)
    cnbAAAvmt[8] = cnbAAAvmt[li.1.asgngrp] + nAAA_vmtc
else
    if(li.1.hovfacility=1-9)
        bAAA_vmt = bAAA_vmt + cnbAAAvmt[li.1.asgngrp]
    else
        bAAA_vmt = bAAA_vmt + cnbAAAvmt[li.1.asgngrp]
endif
endif

; v/c
nAAA_vc = li.1.vc_1
bAAA_vc = li.2.vc_1
nAAA_vci = min(20, int(10*nAAA_vc))
bAAA_vci = min(20, int(10*bAAA_vc))
Appendix C:

Script to Summarize Build and No-Build Link-Based Performance Statistics and Output File Contents

nbAAAvmvc[nAAA_vci] = nbAAAvmvc[nAAA_vci] + nAAA_vmt
bdAAAvmvc[bAAA_vci] = bdAAAvmvc[bAAA_vci] + bAAA_vmt
cnbAAAvmvc[nAAA_vci] = cnbAAAvmvc[nAAA_vci] + nAAA_vmtc
cbdAAAvmvc[bAAA_vci] = cbdAAAvmvc[bAAA_vci] + bAAA_vmtc

; lane-miles and center-line miles by v/c
nbAAAlm[nAAA_vci] = nbAAAlm[nAAA_vci] + li.1.numlanes*li.1.distance
bdAAAlm[bAAA_vci] = bdAAAlm[bAAA_vci] + li.2.numlanes*li.2.distance

nbAAAcm[nAAA_vci] = nbAAAcm[nAAA_vci] + li.1.distance
bdAAAcm[bAAA_vci] = bdAAAcm[bAAA_vci] + li.2.distance

; volumes, total and for corridor only
nAAA_vol = li.1.v_1
bAAA_vol = li.2.v_1
nAAA_volc = nb_vAAA
bAAA_volc = bd_vAAA

Report.dat:

if(_ag=1 && @hourloop@=1) print csv=T, list=" hour"," length"," period"," ftype"," Genftype"," nbvht"," bdvht"," nbffvht"," bdffvht"," cnbvht"," cbdvht"," cnbffvht"," cbdffvht", printo=FILE1
print csv=T, list = @hourloop@(5), @capfac@(7.2), per(7R), _ag(6), gft(10R), nbAAAvht[_ag](12.3), bdAAAvht[_ag], nbAAAffvht[_ag], bdAAAffvht[_ag], cnbAAAvht[_ag], cbdaAAAvht[_ag], cnbAAAffvht[_ag], cbdaAAAffvht[_ag], printo=FILE1

if(_ag=1 && @hourloop@=1) print csv=T, list=" hour"," length"," period"," ftype"," Genftype",
" nbvmt"," bdvmt"," nbffvmt"," bdffvmt", printo=FILE2
print csv=T, list = @hourloop@(5), @capfac@(7.2), per(7R), _ag(6), gft(10R), nbAAAvmt[_ag](12.3), bdAAAvmt[_ag], cnbAAAvmt[_ag], cbdAAAvmt[_ag], printo=FILE2

if(_ag=1 && @hourloop@=1) print csv=T, list=" hour"," length"," period"," v/c"," nbvmt"," bdvmt",
" cnbvmt"," cbdvmt"," nblnmi"," bdlnmi"," nbclmi"," bdclmi", printo=FILE3
_vc = _ag/10
print csv=T, list = @hourloop@(5), @capfac@(7.2), per(7R), _vc(6.2),
nbAAAvmv[_ag](12.3), bdAAAvmv[_ag], cnbAAAvmv[_ag], cbdaAAAvmv[_ag],
nbAAAlm[_ag], bdAAAlm[_ag], nbAAAcm[_ag], bdAAAcm[_ag], printo=FILE3
### VMT Link Summary Output File (scen<<scenario#>>_<<corridor>>_summaryvmt.csv):

<table>
<thead>
<tr>
<th>Hour</th>
<th>Length</th>
<th>Period</th>
<th>FType</th>
<th>GenFtype</th>
<th>NbVmt</th>
<th>BdVmt</th>
<th>CnBvmt</th>
<th>Cbdvmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>1</td>
<td>Freeway</td>
<td>18843.44</td>
<td>18838.03</td>
<td>573.19</td>
<td>570.03</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>2</td>
<td>Freeway</td>
<td>3895.753</td>
<td>3901.21</td>
<td>1100.74</td>
<td>1110.17</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>3</td>
<td>Ramp</td>
<td>120.344</td>
<td>120.37</td>
<td>5.96</td>
<td>5.95</td>
</tr>
</tbody>
</table>

Where:

All totals are based on links in travel shed (selected volume > 1% of max selected link volume)
- NbVmt – No-Build VMT, based on total volumes
- BdVmt – Build VMT, based on total volumes
- CnBvmt – No-Build VMT, based on corridor selected link volumes
- Cbdvmt – Build VMT, based on corridor selected link volumes

### VHT Link Summary Output File (scen<<scenario#>>_<<corridor>>_summaryvht.csv):

<table>
<thead>
<tr>
<th>Hour</th>
<th>Length</th>
<th>Period</th>
<th>FType</th>
<th>GenFtype</th>
<th>NbVht</th>
<th>BdVht</th>
<th>NbFFVht</th>
<th>BdFFVht</th>
<th>CnBvht</th>
<th>Cbdvht</th>
<th>CnNbFFVht</th>
<th>CbdFFVht</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>1</td>
<td>Freeway</td>
<td>296.746</td>
<td>296.65</td>
<td>294.85</td>
<td>294.76</td>
<td>8.77</td>
<td>8.71</td>
<td>8.72</td>
<td>8.66</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>2</td>
<td>Freeway</td>
<td>55.018</td>
<td>55.09</td>
<td>54.69</td>
<td>54.76</td>
<td>14.99</td>
<td>15.12</td>
<td>14.91</td>
<td>15.04</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>3</td>
<td>Ramp</td>
<td>3.155</td>
<td>3.16</td>
<td>3.11</td>
<td>3.11</td>
<td>0.16</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>4</td>
<td>Ramp</td>
<td>12.914</td>
<td>12.9</td>
<td>12.81</td>
<td>12.8</td>
<td>2.69</td>
<td>2.69</td>
<td>2.67</td>
<td>2.66</td>
</tr>
</tbody>
</table>

Where:

All totals are based on links in travel shed (selected volume > 1% of max selected link volume)
- NbVht – No-Build VHT, based on total volumes and congested time
- BdVht – Build VHT, based on total volumes and congested time
- NbFFVht – No-Build VHT, based on total volumes and free-flow time
- BdFFVht – Build VHT, based on total volumes and free-flow time
- CnBvht – No-Build VHT, based on corridor selected link volumes
- Cbdvht – Build VHT, based on corridor selected link volumes
- CnNbFFVht – No-Build VHT, based on selected link volumes and free-flow time
- CbdFFVht – Build VHT, based on selected link volumes and free-flow time
Appendix C:

Script to Summarize Build and No-Build Link-Based Performance Statistics and Output File Contents

VHT link summary output file (scen<<scenario#>>_<<<corridor>>_summaryvcvm.csv):

<table>
<thead>
<tr>
<th>hour</th>
<th>length</th>
<th>period</th>
<th>v/c</th>
<th>nbvmt</th>
<th>bdvmt</th>
<th>cnbvmt</th>
<th>cbdvmt</th>
<th>nblnmi</th>
<th>bdlnmi</th>
<th>nbclmi</th>
<th>bdclmi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>0.1</td>
<td>1081.847</td>
<td>717.89</td>
<td>430.28</td>
<td>66.62</td>
<td>6.31</td>
<td>8.34</td>
<td>4.47</td>
<td>4.47</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>0.2</td>
<td>150.868</td>
<td>150.85</td>
<td>1.38</td>
<td>1.38</td>
<td>0.78</td>
<td>0.78</td>
<td>0.39</td>
<td>0.39</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OFFPK</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Where:

All totals are based on links in travel shed (selected volume > 1% of max selected link volume)

Nbvt – No-Build VMT, based on total volumes
Bdvmt – Build VMT, based on total volumes
Cnbvmt – No-Build VMT, based on corridor selected link volumes
Cbdvmt – Build VMT, based on corridor selected link volumes
Nblnmi – No-Build lane-miles, based on total volumes
Bdlnmi – Build lane-miles, based on total volumes
NbClnmi – No-Build lane-miles, based on selected link volumes
BdClnmi – Build lane-miles, based on selected link volumes

Hour – assignment period
Length – length of assignment period
Period – description of period type

v/c – volume to capacity (aggregated by tenths, 0 to 2.0 by 0.1)

All hour/volume to capacity ranges are listed for a given corridor alternative.
Appendix D:
Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)
Person-Trip Consolidation:

; Set up 24 time period loop
year='2030'
bdtbo='BD'
sf=4
alt1='1B'
alt2='6B'
alt3='26B'
alt4='   '
alt5='   '
c2=' '
c3=' '
c4=' ' c5=' '
altct=3

LOOP HOUURLOOP=1,24,1
  if (hourloop=1)  ni='op', per='OP', tab=1, capfac=2.00, iters=30, hourlycap='offcap', label='12:00am-2:00am'
  if (hourloop=2)  ni='op', per='OP', tab=2, capfac=1.00, iters=30, hourlycap='offcap', label='2:00am-3:00am'
  if (hourloop=3)  ni='op', per='OP', tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='3:00am-4:00am'
  if (hourloop=4)  ni='op', per='OP', tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='4:00am-5:00am'
  if (hourloop=5)  ni='op', per='OP', tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='5:00am-6:00am'
  if (hourloop=6)  ni='am', per='OP', tab=6, capfac=0.75, iters=30, hourlycap='offcap', label='6:00am-6:45am'
  if (hourloop=7)  ni='am', per='PK', tab=1, capfac=1.00, iters=30, hourlycap='amcap', label='6:45am-7:45am'
  if (hourloop=8)  ni='am', per='PK', tab=2, capfac=1.00, iters=30, hourlycap='amcap', label='7:45am-8:45am'
  if (hourloop=9)  ni='am', per='PK', tab=3, capfac=1.00, iters=30, hourlycap='amcap', label='8:45am-9:45am'
  if (hourloop=10) ni='op', per='OP', tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:45am-10:45am'
  if (hourloop=11) ni='op', per='OP', tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:45am-11:45am'
  if (hourloop=12) ni='op', per='OP', tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:45am-12:45pm'
  if (hourloop=13) ni='op', per='OP', tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='12:45am-1:45pm'
  if (hourloop=14) ni='op', per='OP', tab=8, capfac=0.75, iters=30, hourlycap='offcap', label='1:45pm-2:30pm'
  if (hourloop=15) ni='pm', per='PK', tab=1, capfac=1.00, iters=30, hourlycap='pmcap', label='2:30pm-3:30pm'
  if (hourloop=16) ni='pm', per='PK', tab=2, capfac=1.00, iters=30, hourlycap='pmcap', label='3:30pm-4:30pm'
  if (hourloop=17) ni='pm', per='PK', tab=3, capfac=1.00, iters=30, hourlycap='pmcap', label='4:30pm-5:30pm'
  if (hourloop=18) ni='pm', per='PK', tab=4, capfac=0.50, iters=30, hourlycap='pmcap', label='5:30pm-6:00pm'
  if (hourloop=19) ni='op', per='OP', tab=1, capfac=1.00, iters=30, hourlycap='offcap', label='6:00pm-7:00pm'
  if (hourloop=20) ni='op', per='OP', tab=2, capfac=1.00, iters=30, hourlycap='offcap', label='7:00pm-8:00pm'
  if (hourloop=21) ni='op', per='OP', tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='8:00pm-9:00pm'
  if (hourloop=22) ni='op', per='OP', tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:00pm-10:00pm'
  if (hourloop=23) ni='op', per='OP', tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:00pm-11:00pm'
  if (hourloop=24) ni='op', per='OP', tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:00pm-12:00am'
RUN PGM=MATRIX
ID Matrix PT Summary for @label@

; The MATRIX module does not have any explicit phases. The module does run within an implied ILOOP
; where I is the origin zones. All user statements in the module are processed once for each origin.
; Matrix computation (MW[#]=) are solved for all values of J for each I. Thus for a given origin zone I
; the values for all destination zones J are automatically computed. The user can control the computations
; at each J by using a JLOOP.

FILEI MATI[1]=HBW_@per@_MODE.TRP
MATI[2]=HBWR_@per@_MODE.TRP
MATI[3]=HBO_@per@_MODE.TRP
MATI[4]=HBSCH_@per@_MODE.TRP
MATI[5]=HBU_@per@_MODE.TRP
MATI[6]=HBSH_@per@_MODE.TRP
MATI[7]=NHBW_@per@_MODE.TRP
MATI[8]=NHBO_@per@_MODE.TRP
MATI[9]=chktoll_scen@scen@_@hourloop@.mat
MATI[10]=SL_total_scen@scen@_@hourloop@.trp
FILEO MATO=@bdnbd@_YR@year@_PT_hour_@hourloop@_alt_@alt1@.trp, mo=1-8, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=8*5 @cc2@ MATO[2]=@bdnbd@_YRyear@_PT_hour_@hourloop@_alt_@alt2@.trp, mo=11-18, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=8*5 @cc3@ MATO[3]=@bdnbd@_YRyear@_PT_hour_@hourloop@_alt_@alt3@.trp, mo=21-28, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=8*5 @cc4@ MATO[4]=@bdnbd@_YRyear@_PT_hour_@hourloop@_alt_@alt4@.trp, mo=31-38, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=8*5 @cc5@ MATO[5]=@bdnbd@_YRyear@_PT_hour_@hourloop@_alt_@alt5@.trp, mo=41-48, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=8*5
mw[6]=mi.10.@alt1@
@cc2@ mw[16]=mi.10.@alt2@
@cc3@ mw[26]=mi.10.@alt3@
\begin{verbatim}
\texttt{Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)}
\end{verbatim}
Appendix D:

Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)
Appendix D: Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)

```plaintext
@cc5 if(mw[46] > 0.0)
; save SOV and HOV times
@cc5mw[47]=mi.9.1
@cc5mw[48]=mi.9.2
; Non-Motorized, NM, output table 1
@cc5mw[49] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
@cc5mi.5.1 + mi.5.2 + mi.6.1 + mi.6.2 + mi.7.1 + mi.7.2 + mi.8.1 + mi.8.2
; Drive-Alone, DA, output table 2
@cc5mw[50] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
@cc5mi.5.3 + mi.5.4 + mi.6.3 + mi.6.4 + mi.7.3 + mi.7.4 + mi.8.3 + mi.8.4
; 2-Person Auto, 2P, output table 3
@cc5mw[51] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
@cc5mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
@cc5mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
@cc5mi.7.5 + mi.7.6 + mi.7.9 + mi.7.10 + mi.8.5 + mi.8.6 + mi.8.9 + mi.8.10
; 3+ Person Auto, 3P, output table 4
@cc5mw[52] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
@cc5mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
@cc5mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
@cc5mi.7.7 + mi.7.8 + mi.7.11 + mi.7.12 + mi.8.7 + mi.8.8 + mi.8.11 + mi.8.12
; Transit, TRN, output table 5
@cc5mw[53] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
@cc5mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
@cc5mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
@cc5mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
@cc5mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
@cc5mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
@cc5mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
@cc5mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
@cc5mi.9.21 + mi.8.22 + mi.8.23 + mi.8.24 + mi.8.25 + mi.8.26 + mi.8.27 + mi.8.28
@cc5 endif
endjloop
ENDRUN
endloop
loop ac=1,3,1
if(ac=1) alt='1B'
if(ac=2) alt='6B'
if(ac=3) alt='26B'
if(ac=4) alt='   '
if(ac=5) alt='   '
RUN PGM=MATRIX
FILEI MATI[1]=@bdnbd@_YR@year@_PT_hour_1_alt_@alt@.trp
MATI[2]=@bdnbd@_YR@year@_PT_hour_2_alt_@alt@.trp
MATI[3]=@bdnbd@_YR@year@_PT_hour_3_alt_@alt@.trp
MATI[4]=@bdnbd@_YR@year@_PT_hour_4_alt_@alt@.trp
MATI[5]=@bdnbd@_YR@year@_PT_hour_5_alt_@alt@.trp
MATI[6]=@bdnbd@_YR@year@_PT_hour_6_alt_@alt@.trp
MATI[7]=@bdnbd@_YR@year@_PT_hour_10_alt_@alt@.trp
MATI[8]=@bdnbd@_YR@year@_PT_hour_11_alt_@alt@.trp
MATI[9]=@bdnbd@_YR@year@_PT_hour_12_alt_@alt@.trp
MATI[10]=@bdnbd@_YR@year@_PT_hour_13_alt_@alt@.trp
MATI[11]=@bdnbd@_YR@year@_PT_hour_14_alt_@alt@.trp
MATI[12]=@bdnbd@_YR@year@_PT_hour_19_alt_@alt@.trp
MATI[13]=@bdnbd@_YR@year@_PT_hour_20_alt_@alt@.trp
MATI[14]=@bdnbd@_YR@year@_PT_hour_21_alt_@alt@.trp
MATI[15]=@bdnbd@_YR@year@_PT_hour_22_alt_@alt@.trp
MATI[16]=@bdnbd@_YR@year@_PT_hour_23_alt_@alt@.trp
MATI[17]=@bdnbd@_YR@year@_PT_hour_24_alt_@alt@.trp
FILEO MATO=@bdnbd@_YR@year@_PT_OFFPEAK_alt_@alt@.trp, mo=1-8, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME, dec=5
array share=24
```

Appendix D: Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)
Appendix D:
Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)

```plaintext
jloop
    ; off-peak shares
    mw[6] = mi.1.6 + mi.2.6 + mi.3.6 + mi.4.6 + mi.5.6 + mi.6.6 +
            mi.7.6 + mi.8.6 + mi.9.6 + mi.10.6 + mi.11.6 +
            mi.12.6 + mi.13.6 + mi.14.6 + mi.15.6 + mi.16.6 + mi.17.6

if (mw[6] > 0)
    share[12] = mi.9.6 / mw[6]
    share[22] = mi.15.6 / mw[6]
    share[23] = mi.16.6 / mw[6]
else
    share[1] = 0.0
    share[2] = 0.0
    share[3] = 0.0
    share[4] = 0.0
    share[5] = 0.0
    share[6] = 0.0
    share[10] = 0.0
    share[11] = 0.0
    share[12] = 0.0
    share[13] = 0.0
    share[14] = 0.0
    share[19] = 0.0
    share[20] = 0.0
    share[21] = 0.0
    share[22] = 0.0
    share[23] = 0.0
    share[24] = 0.0
endif

        mi.6.1 * share[6] +
        mi.17.1 * share[24]

        mi.6.2 * share[6] +
        mi.17.2 * share[24]

        mi.6.3 * share[6] +
        mi.17.3 * share[24]

        mi.6.4 * share[6] +
        mi.17.4 * share[24]

        mi.6.5 * share[6] +
        mi.7.5 * share[10] + mi.8.5 * share[11] + mi.9.5 * share[12] + mi.10.5 * share[13] + mi.11.5 * share[14] +
        mi.12.5 * share[19] + mi.13.5 * share[20] + mi.14.5 * share[21] + mi.15.5 * share[22] + mi.16.5 * share[23] +
        mi.17.5 * share[24]

        mi.6.7 * share[6] +
        mi.17.7 * share[24]
```

Appendix D:  
Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)

```plaintext
        mi.6.8*share[6] +
        mi.17.8*share[24]
endjloop
ENDRUN

RUN PGM=MATRIX
ID Matrix PT Summary by Period, Off-Peak, @bdnbd@, @ymyr@, @alt@
FILEI MATI[1]=@bdnbd@_YR@ymyr@_PT_OFFPEAK_alt_@alt@.trp
  MATI[2]=@bdnbd@_YR@ymyr@_PT_hour_7_alt_@alt@.trp
  MATI[3]=@bdnbd@_YR@ymyr@_PT_hour_8_alt_@alt@.trp
  MATI[4]=@bdnbd@_YR@ymyr@_PT_hour_9_alt_@alt@.trp
  MATI[5]=@bdnbd@_YR@ymyr@_PT_hour_15_alt_@alt@.trp
  MATI[6]=@bdnbd@_YR@ymyr@_PT_hour_16_alt_@alt@.trp
  MATI[7]=@bdnbd@_YR@ymyr@_PT_hour_17_alt_@alt@.trp
  MATI[8]=@bdnbd@_YR@ymyr@_PT_hour_18_alt_@alt@.trp
FILEO MATO[1]=@bdnbd@_YR@ymyr@_PT_AMPEAK_alt_@alt@.trp, mo=11-18, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOTIME,
  dec=8*5
FILEO MATO[2]=@bdnbd@_YR@ymyr@_PT_PMPEAK_alt_@alt@.trp, mo=21-28, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOTIME,
  dec=8*5
FILEO MATO[3]=@bdnbd@_YR@ymyr@_PT_DAILY_alt_@alt@.trp, mo=31-38, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOTIME,
  dec=8*5
array share=24, sharepk=24
jloop
; am-peak shares
mw[16] = mi.2.6 + mi.3.6 + mi.4.6
if(mw[16]>0)
  share[2]=mi.2.6/mw[16]
  share[3]=mi.3.6/mw[16]
  share[4]=mi.4.6/mw[16]
else
  share[2]=0.0
  share[3]=0.0
  share[4]=0.0
endif
mw[46] = mi.2.6 + mi.3.6 + mi.4.6 + mi.5.6 + mi.6.6 + mi.7.6 + mi.8.6
if(mw[46]>0)
  sharepk[7]=mi.2.6/mw[46]
  sharepk[8]=mi.3.6/mw[46]
  sharepk[9]=mi.4.6/mw[46]
  sharepk[15]=mi.5.6/mw[46]
  sharepk[16]=mi.6.6/mw[46]
  sharepk[17]=mi.7.6/mw[46]
  sharepk[18]=mi.8.6/mw[46]
else
  sharepk[7]=0.0
  sharepk[8]=0.0
  sharepk[9]=0.0
  sharepk[15]=0.0
  sharepk[16]=0.0
  sharepk[17]=0.0
  sharepk[18]=0.0
endif
mw[12] = mi.2.2*sharepk[7] + mi.3.2*sharepk[8] + mi.4.2*sharepk[9]
mw[13] = mi.2.3*sharepk[7] + mi.3.3*sharepk[8] + mi.4.3*sharepk[9]
mw[14] = mi.2.4*sharepk[7] + mi.3.4*sharepk[8] + mi.4.4*sharepk[9]
mw[15] = mi.2.5*sharepk[7] + mi.3.5*sharepk[8] + mi.4.5*sharepk[9]
mw[17] = mi.2.7*share[7] + mi.3.7*share[8] + mi.4.7*share[9]
mw[18] = mi.2.8*share[7] + mi.3.8*share[8] + mi.4.8*share[9]

; pm-peak shares
mw[26] = mi.5.6 + mi.6.6 + mi.7.6 + mi.8.6
if(mw[26]>0)
  share[15]=mi.5.6/mw[26]
  share[16]=mi.6.6/mw[26]
  share[17]=mi.7.6/mw[26]
  share[18]=mi.8.6/mw[26]
else
  share[15]=0.0
```
Appendix D:

Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)

share[16]=0.0
share[17]=0.0
share[18]=0.0
endif

mw[23] = mi.5.3*sharepk[15] + mi.6.3*sharepk[16] + mi.7.3*sharepk[17] + mi.8.3*sharepk[18]
mw[25] = mi.5.5*sharepk[15] + mi.6.5*sharepk[16] + mi.7.5*sharepk[17] + mi.8.5*sharepk[18]
mw[27] = mi.5.7*share[15] + mi.6.7*share[16] + mi.7.7*share[17] + mi.8.7*share[18]
mw[28] = mi.5.8*share[15] + mi.6.8*share[16] + mi.7.8*share[17] + mi.8.8*share[18]

; daily totals
mw[32] = mi.1.2 + mw[12] + mw[22]
mw[33] = mi.1.3 + mw[13] + mw[23]
mw[34] = mi.1.4 + mw[14] + mw[24]
mw[36] = mi.1.6 + mw[16] + mw[26]
if(mw[36]>0)
opksh=mi.1.6/mw[36]
ampksh=mw[16]/mw[36]
pmpksh=mw[26]/mw[36]
else
opksh=0.0
ampksh=0.0
pmpksh=0.0
endif
mw[37] = opksh*mi.1.7 + ampksh*mw[17] + pmpksh*mw[27]
mw[38] = opksh*mi.1.8 + ampksh*mw[18] + pmpksh*mw[28]
endjloop
ENDRUN
endloop
Appendix D:
Script to Consolidate and Summarize Matrix-Based Performance Statistics (example)

Trip Length Frequency Distribution:

```plaintext
;<<Default Template>><<MATRIX>>;
year='2030'
bdnbd='BD'
alt='26B'
scen=4

RUN PGM=MATRIX
ID TLFD, YR@year@, @bdnbd@, alt=@alt@
FILEI MATI[1]=@bdnbd@_YR@year@_PT_DAILY_alt_@alt@.trp
zones=1632
mw[1]=mi.1.1; non-motorized
mw[2]=mi.1.2; drive-alone
mw[3]=mi.1.3; 2-person auto
mw[4]=mi.1.4; 3+ person auto
mw[5]=mi.1.5; transit
mw[6]=mi.1.6; selected link autos
mw[7]=mi.1.7; sov time
mw[8]=mi.1.8; hov time

FREQUENCY BASEMW=8,VALUEMW=6,RANGE=0-220-2.5,TITLE='Selected link TLFD'
FREQUENCY BASEMW=7,VALUEMW=2,RANGE=0-220-2.5,TITLE='DA PT TLFD'
FREQUENCY BASEMW=8,VALUEMW=10,RANGE=0-220-2.5,TITLE='SR PT TLFD'

ENDRUN
```