APPENDIX D: TRAVEL DEMAND FORECASTING MODEL TECH MEMORANDUM

PARSONS BRINCKERHOFF

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:

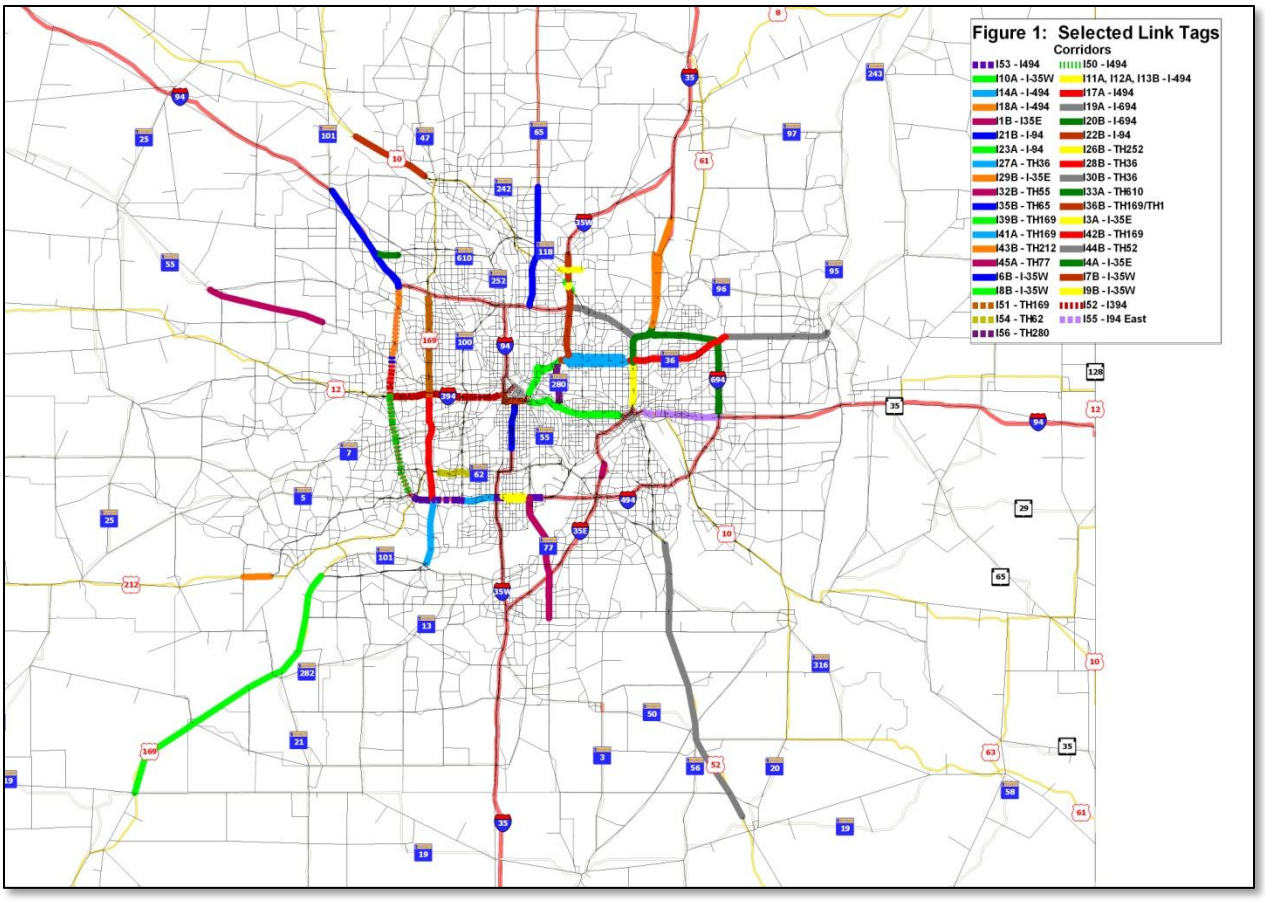
The previous section describes the general methodology used to estimate the performance indicators for individual corridor projects. This section describes the particular modeling steps, and detailed procedures used to execute this methodology.

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

Scenario 1:	I30B, I35B, I36B, I39B, I44B	Scenario 13:	I8B, I9B, I11A, I12A, I13B
Scenario 2:	I32B, I43B	Scenario 14:	I27A
Scenario 3:	I14B, I33A	Scenario 15:	I28B
Scenario 4:	I1B, I6B, I26B	Scenario 16:	I22B
Scenario 5:	I17A, I19A	Scenario 50:	I50
Scenario 6:	I18A, I20B	Scenario 51:	I51
Scenario 7:	I21B, I23A	Scenario 52:	I52
Scenario 8:	I3A, I42B	Scenario 53:	I53
Scenario 9:	I4A, I45A	Scenario 54:	I54
Scenario 10:	I29B, I41A	Scenario 55:	I55
Scenario 11:	I10A	Scenario 56:	I56
Scenario 12:	I7B		

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.

PB PARSONS BRINCKERHOFF 100 YEARS

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.

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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

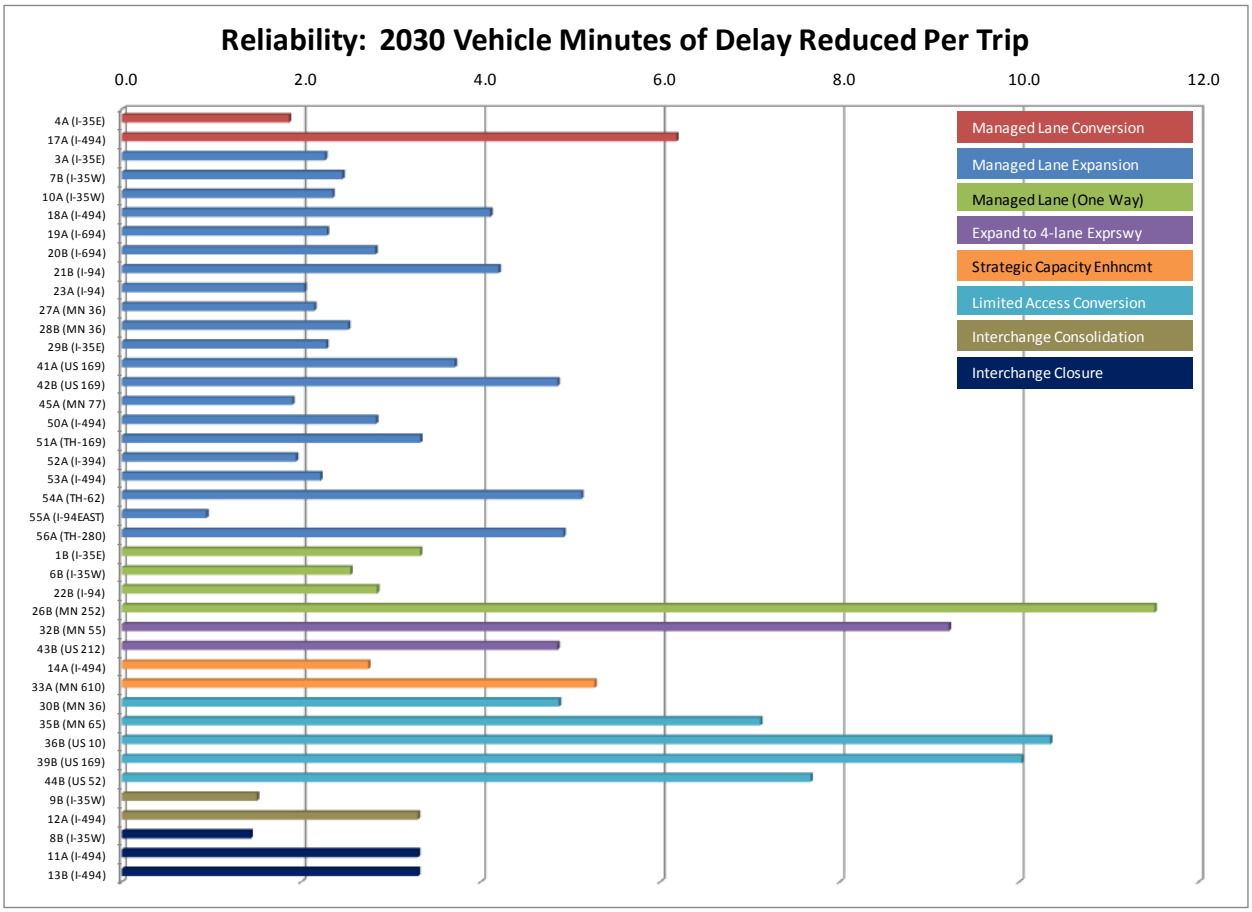


Figure 2: 2060 Vehicle Minutes of Delay Reduced per Trip

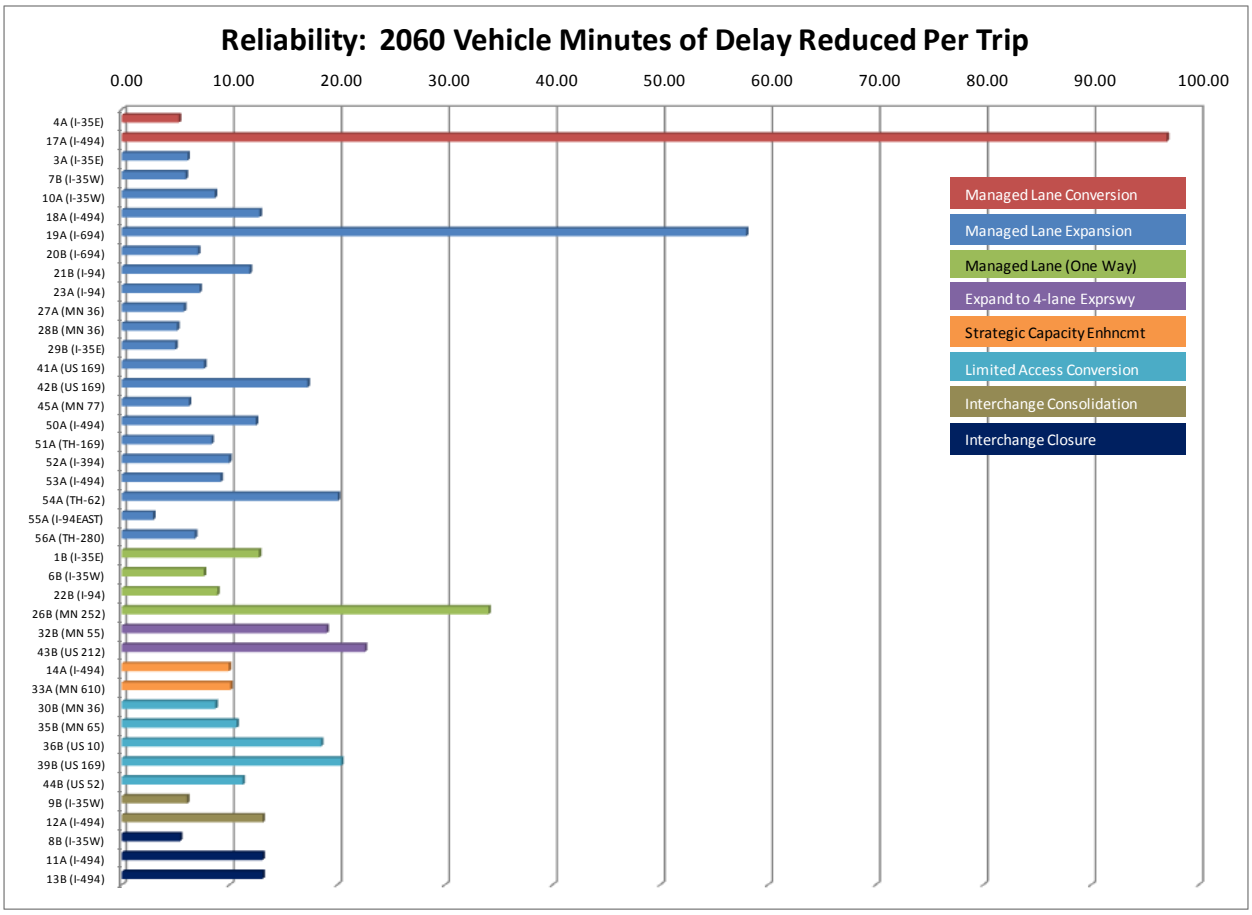


Figure 3: Reliability: 2030 Delay Reduction as a Percent of Total VHD

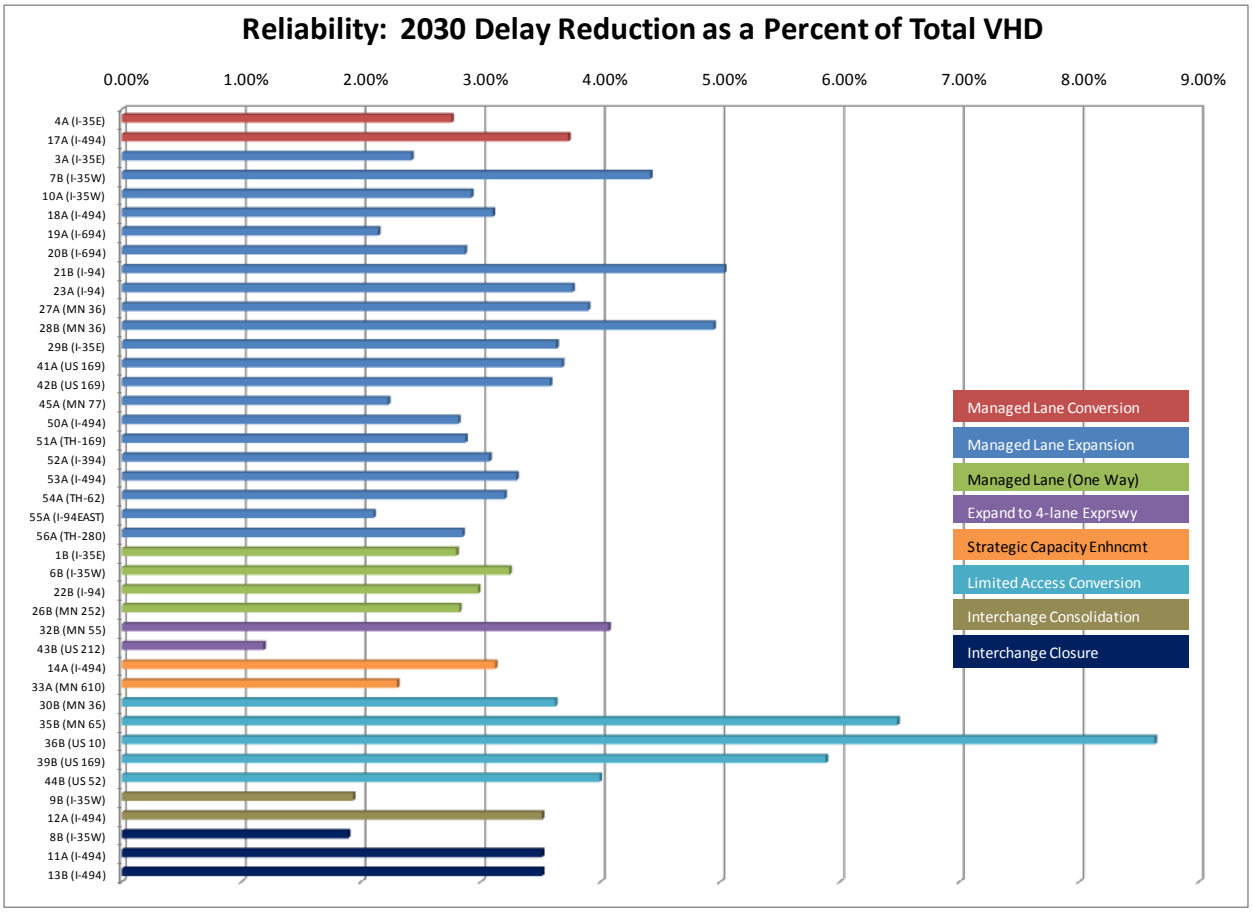


Figure 4: Reliability: 2060 Delay Reduction as a Percent of Total VHD (No-Build)

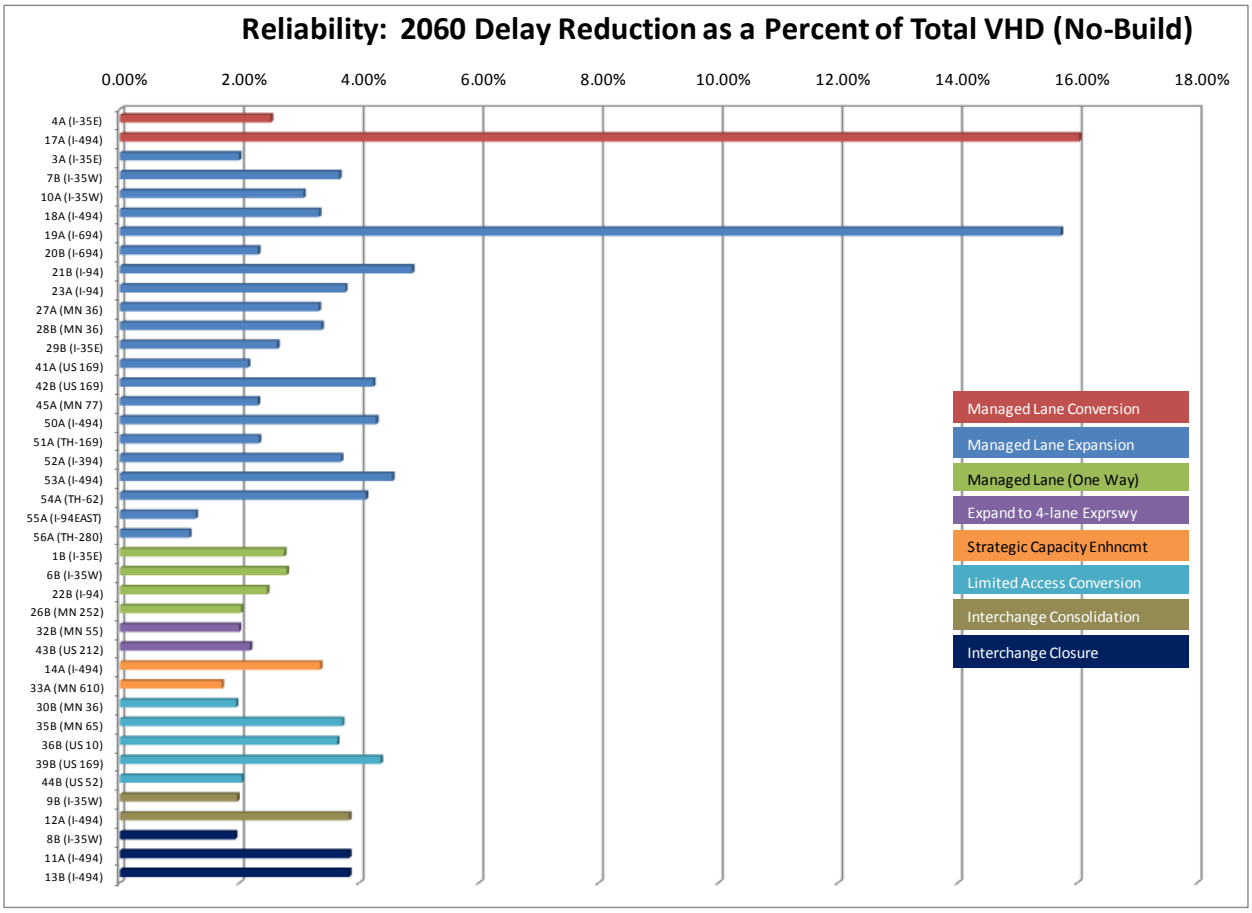


Figure 5: Reliability: Year 2030 Peak Delay Saved Per Trip (min/Trip)

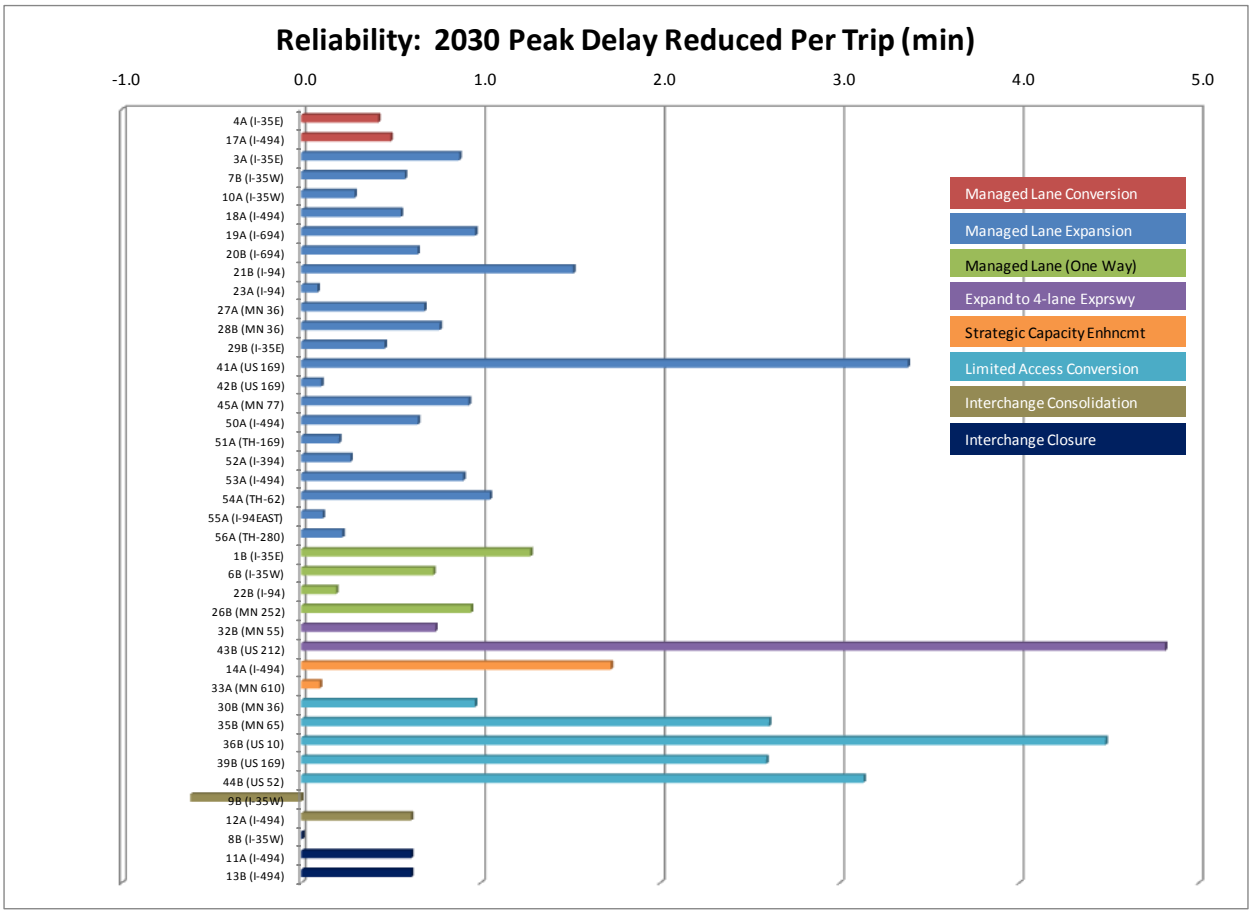
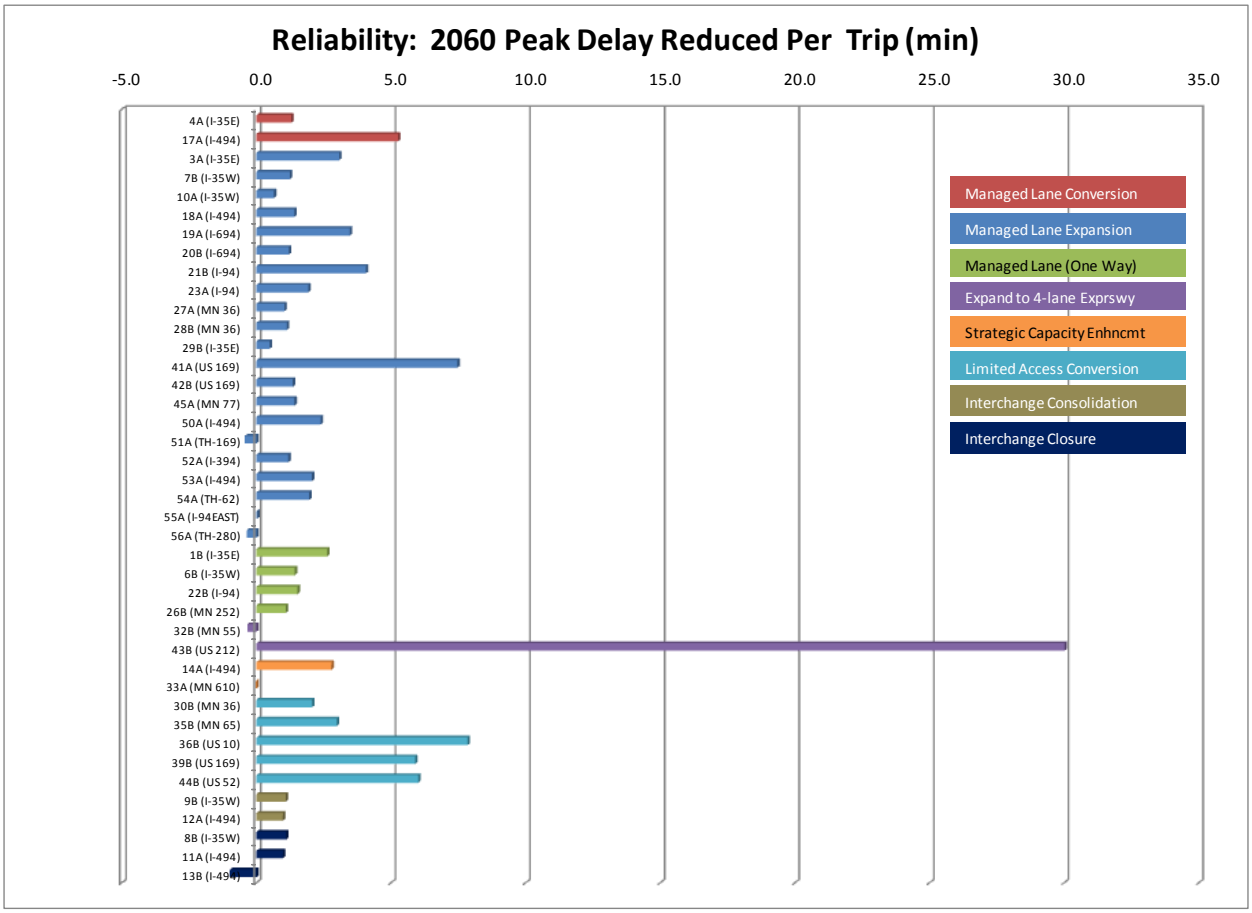


Figure 6: Reliability: Year 2060 Peak Delay Saved Per Trip (min/trip)



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

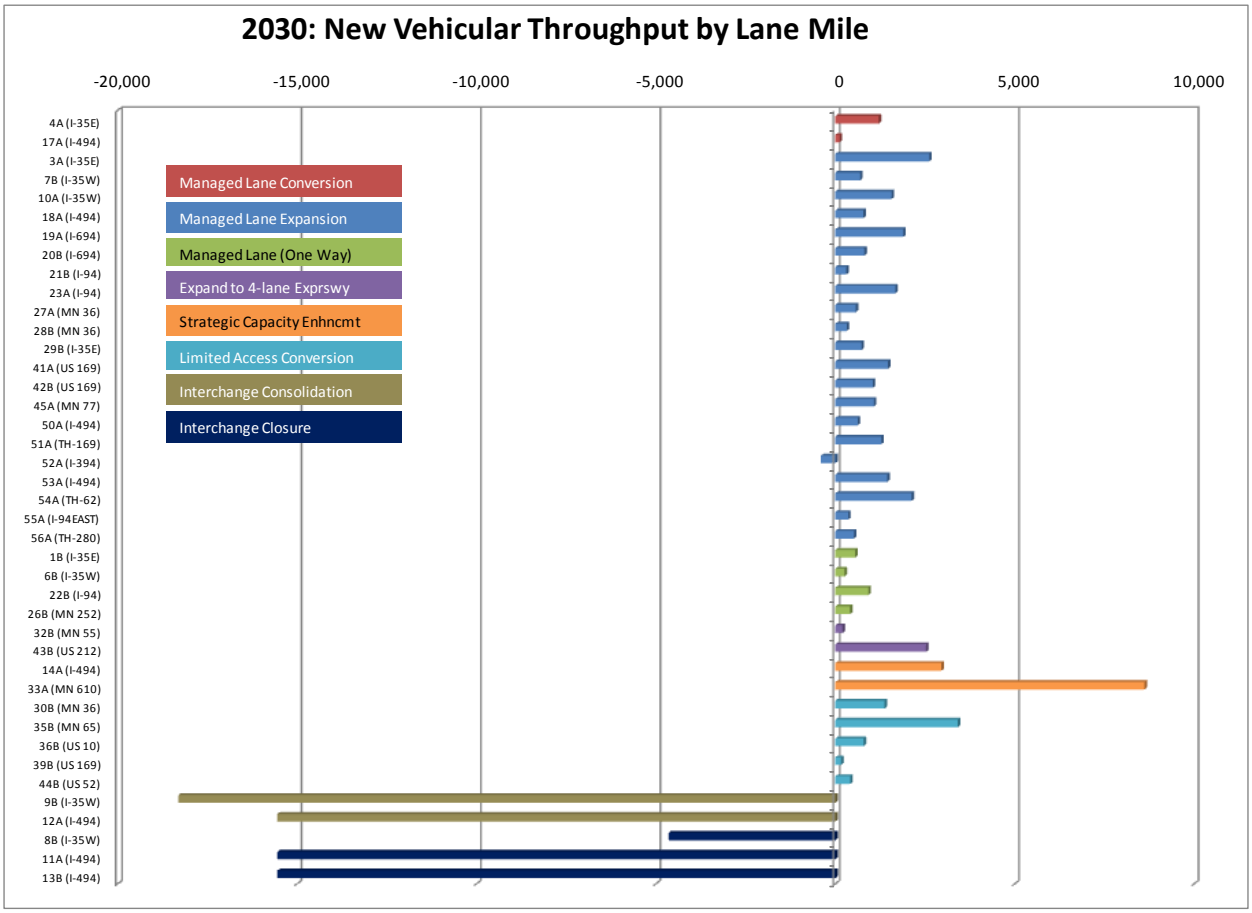


Figure 8: 2060: New Vehicular Throughput by Lane Mile

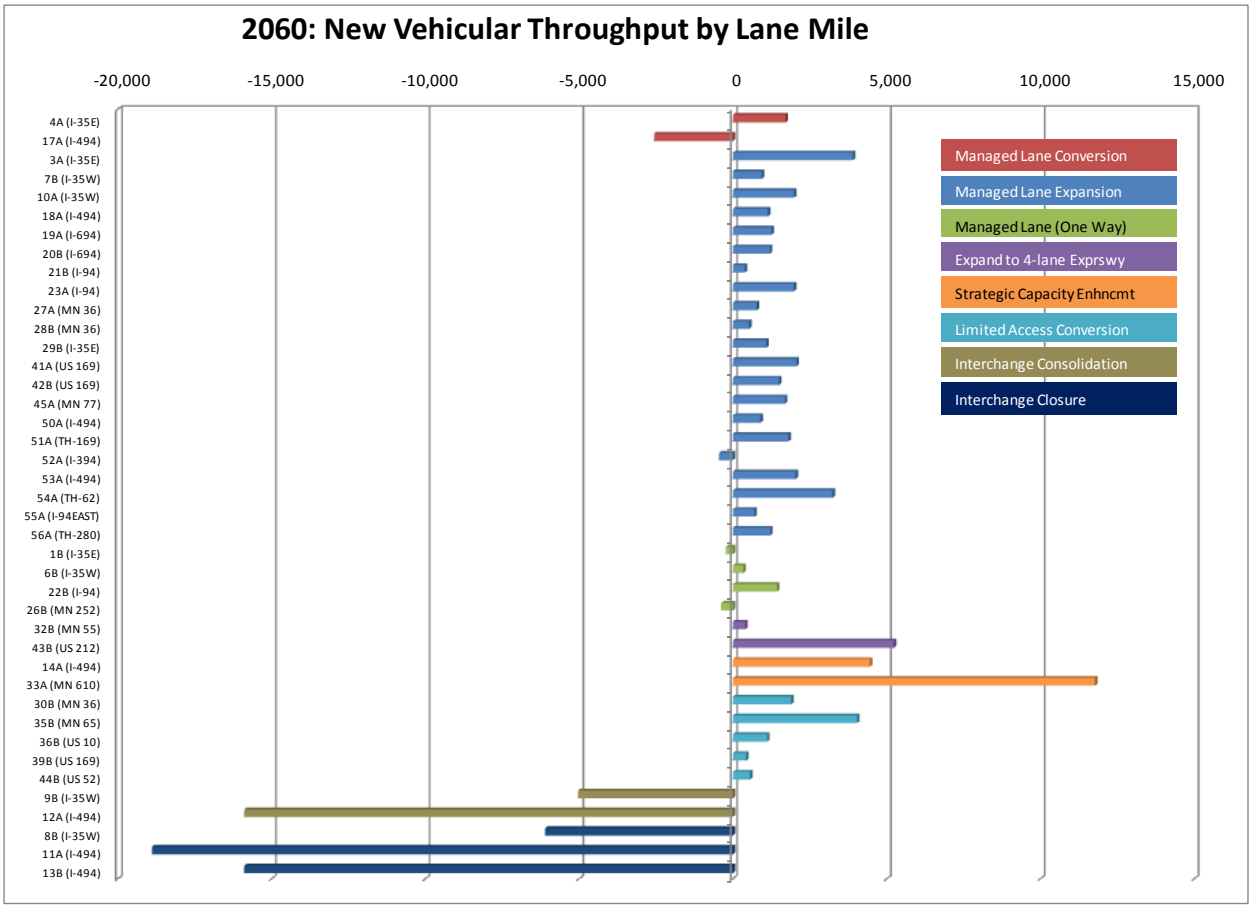


Figure 9: 2030: New Person Throughput by Lane Mile

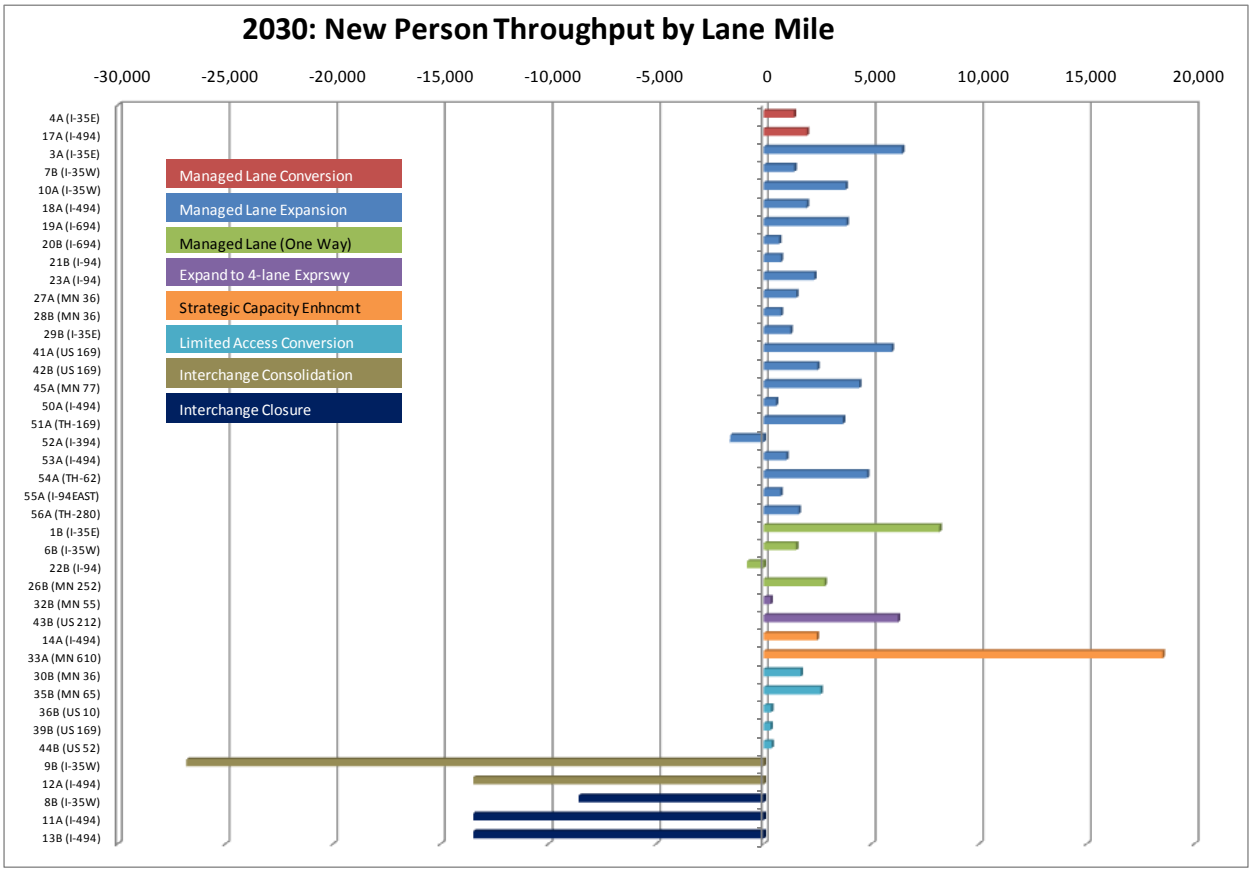
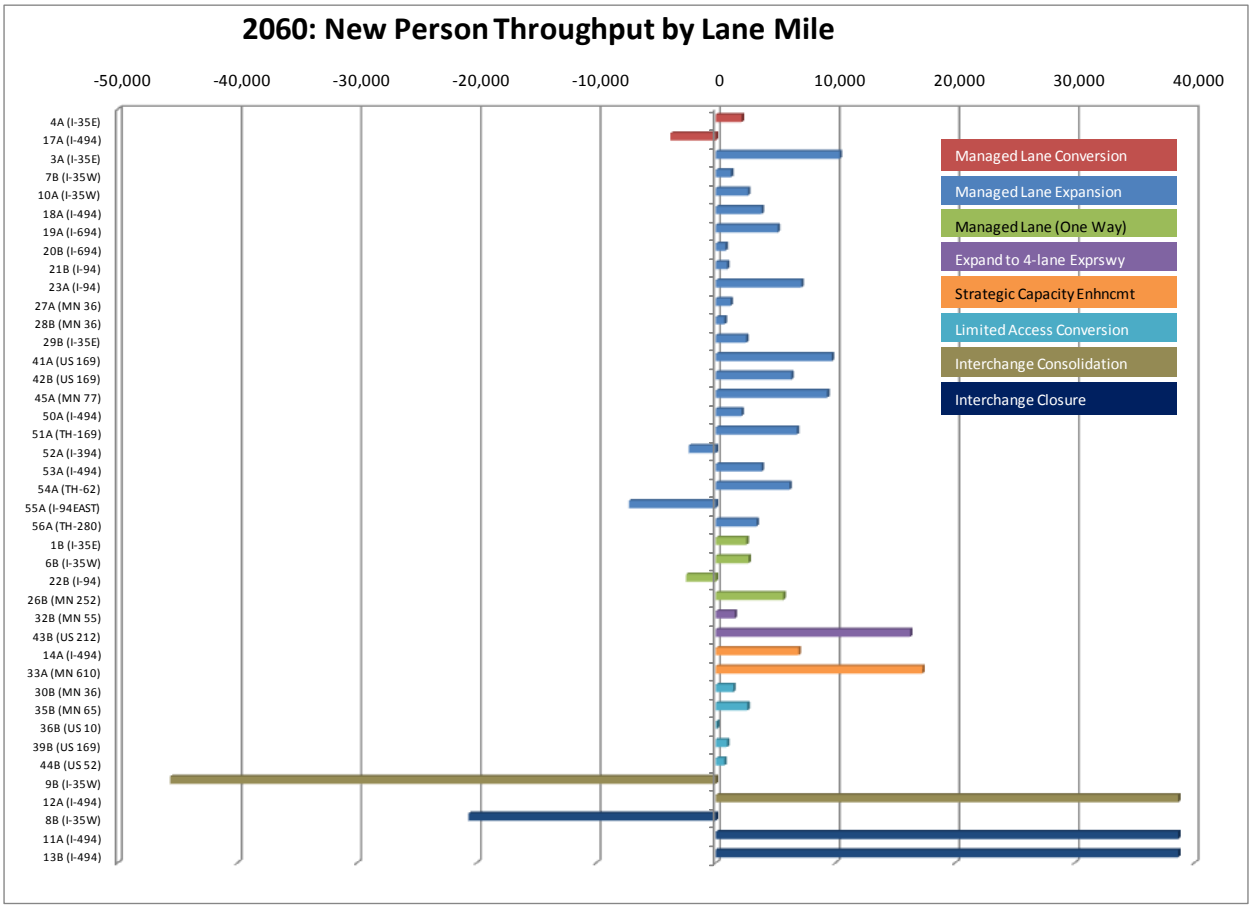


Figure 10: 2060: New Person Throughput by Lane Mile



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

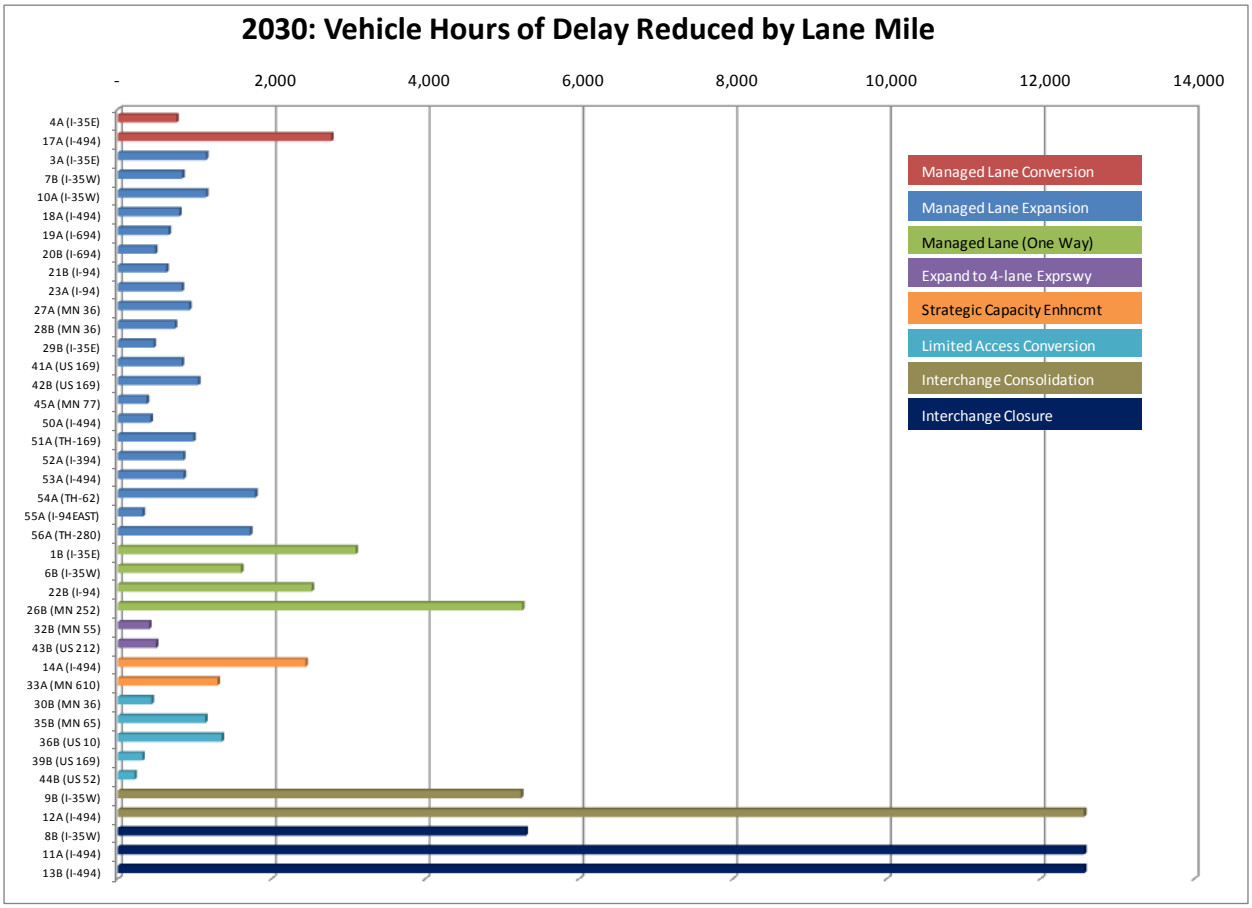


Figure 12: 2060: Vehicle Hours of Delay Reduced by Lane Mile

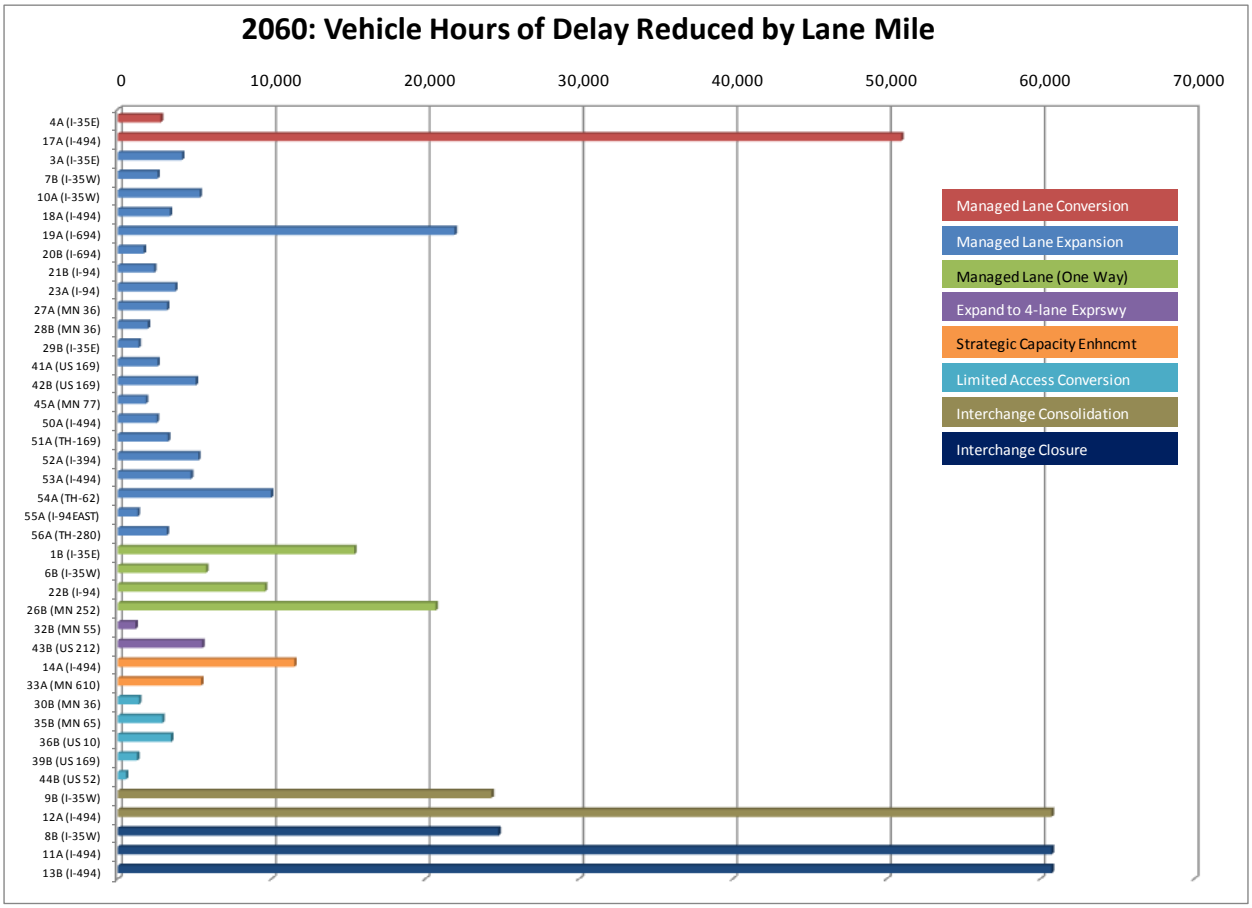


Figure 13: 2030: Change in Average Trip Time (Minutes Reduced)

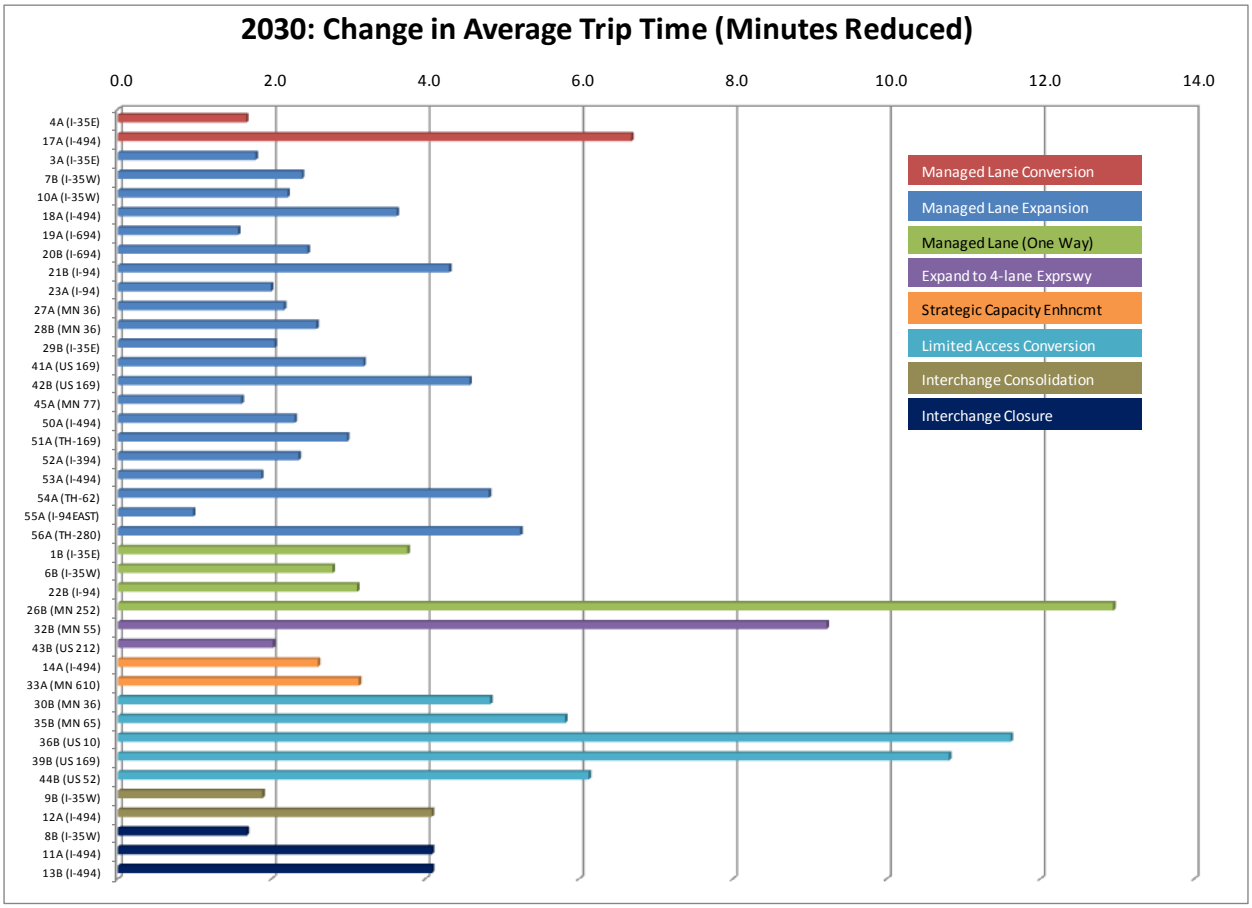
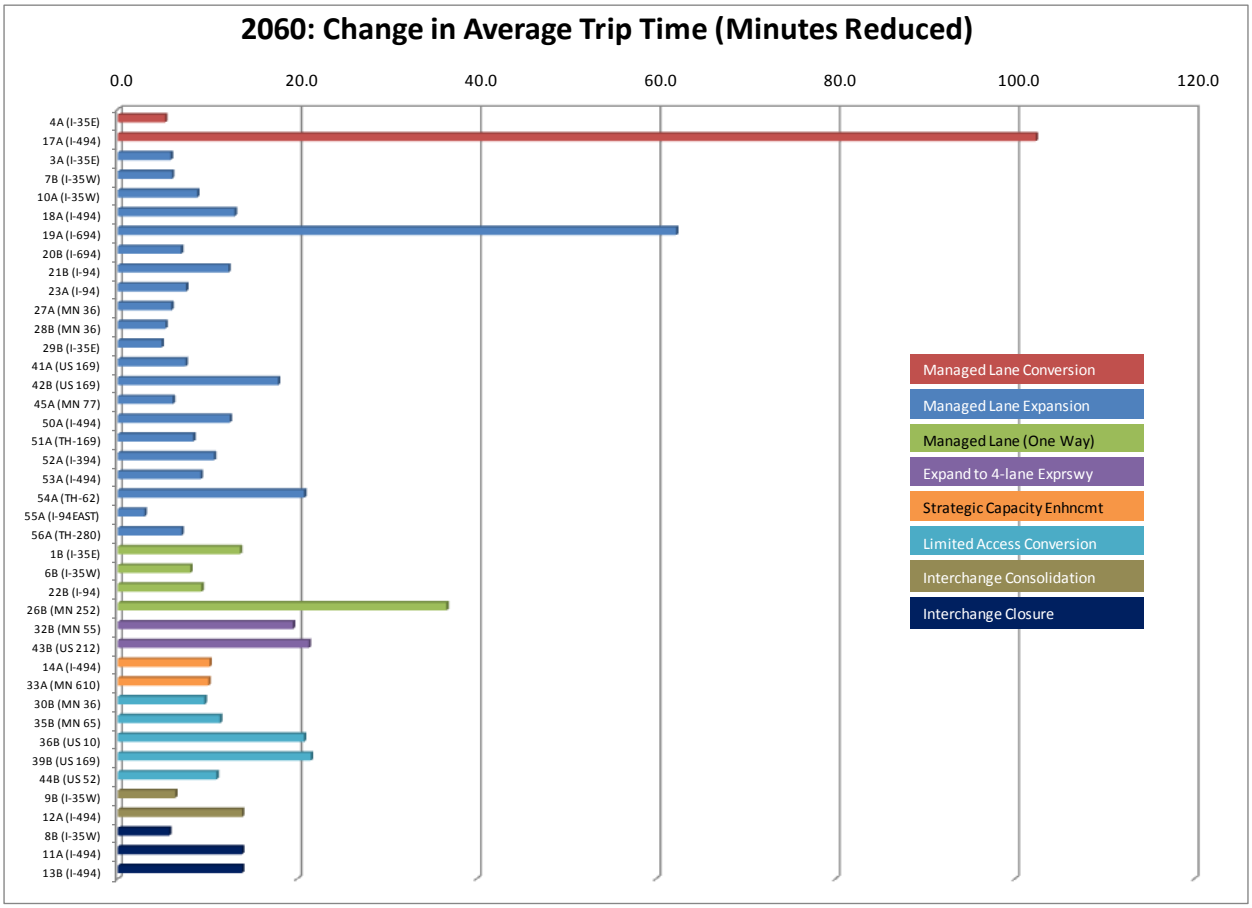


Figure 14: 2060: Change in Average Trip Time (Minutes Reduced)



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

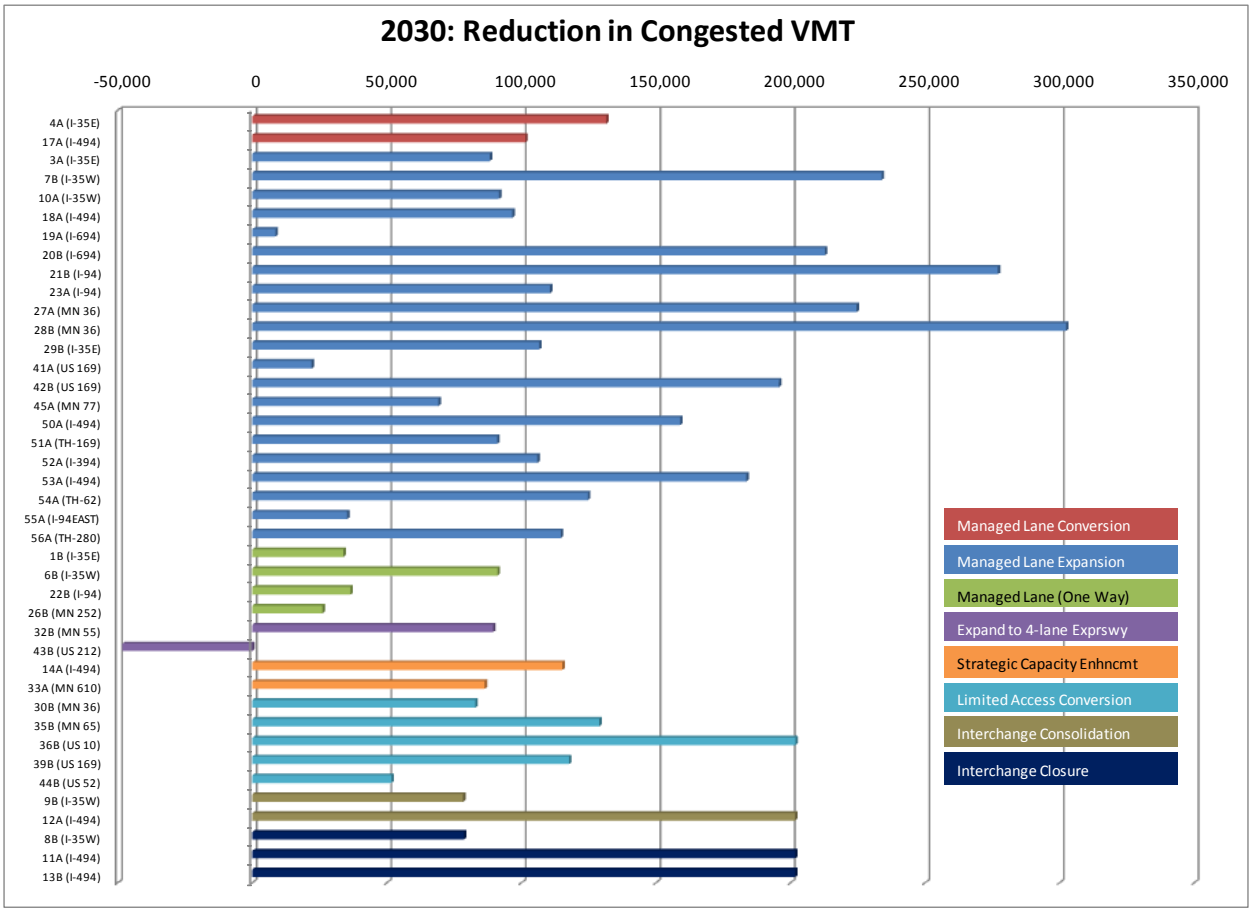
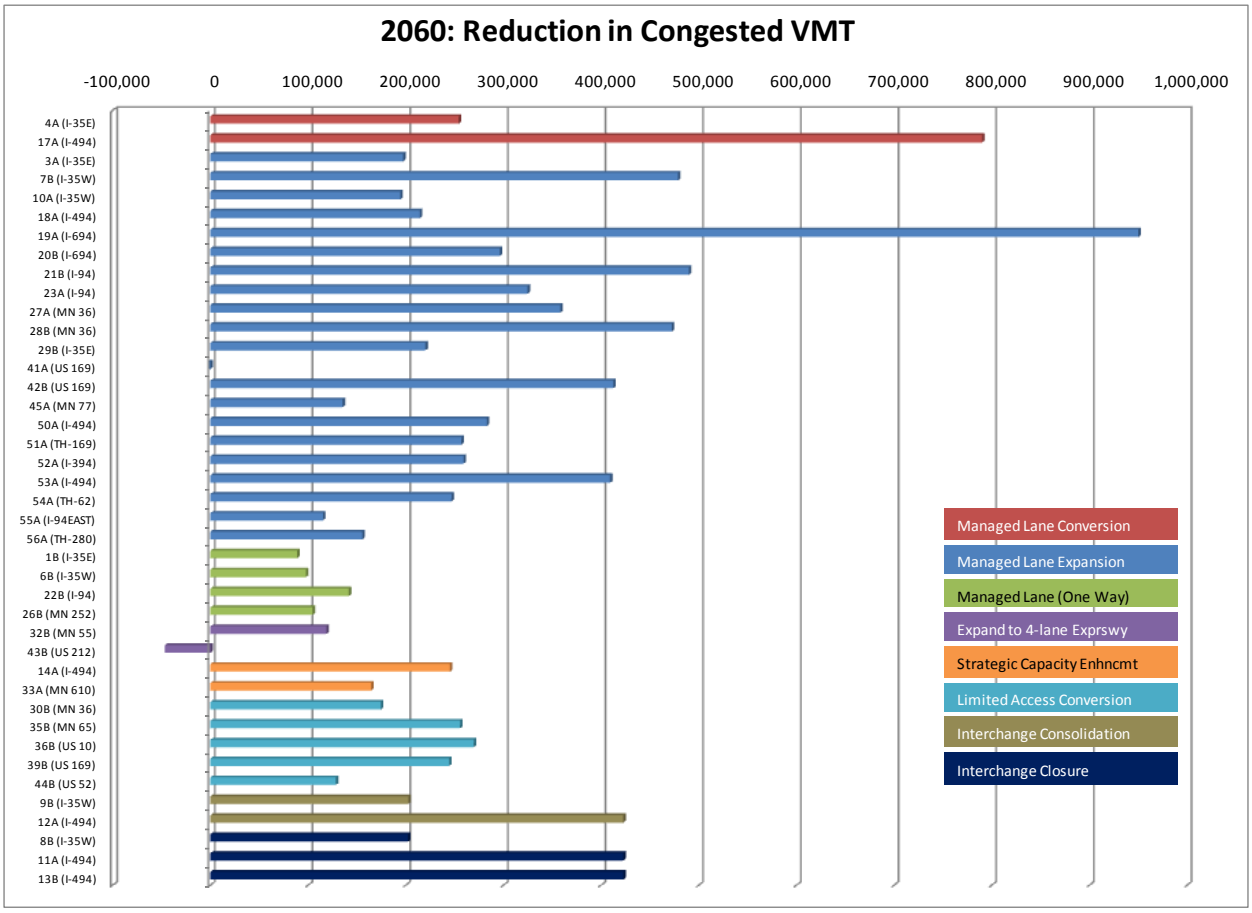


Figure 16: 2060: Reduction in Congested VMT

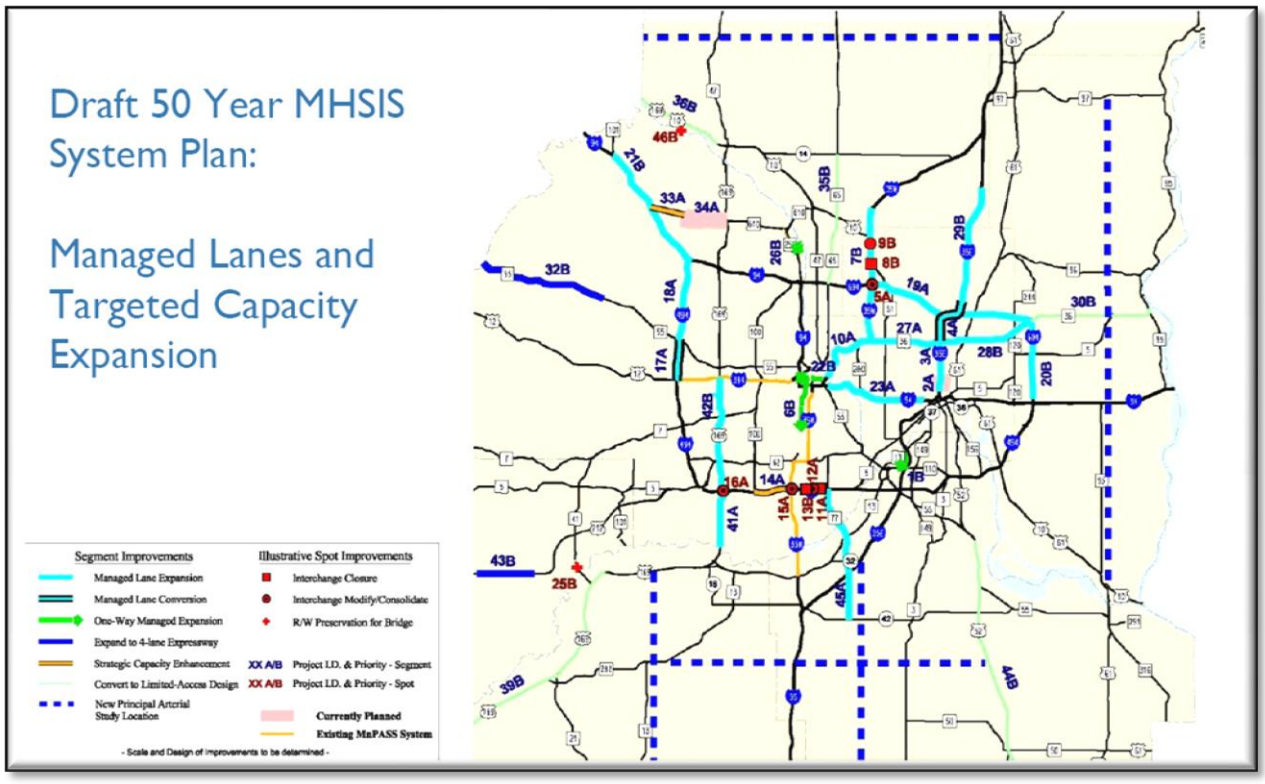


Appendix A:
Build Scenario/Corridor Project Correspondence and Travel Sheds

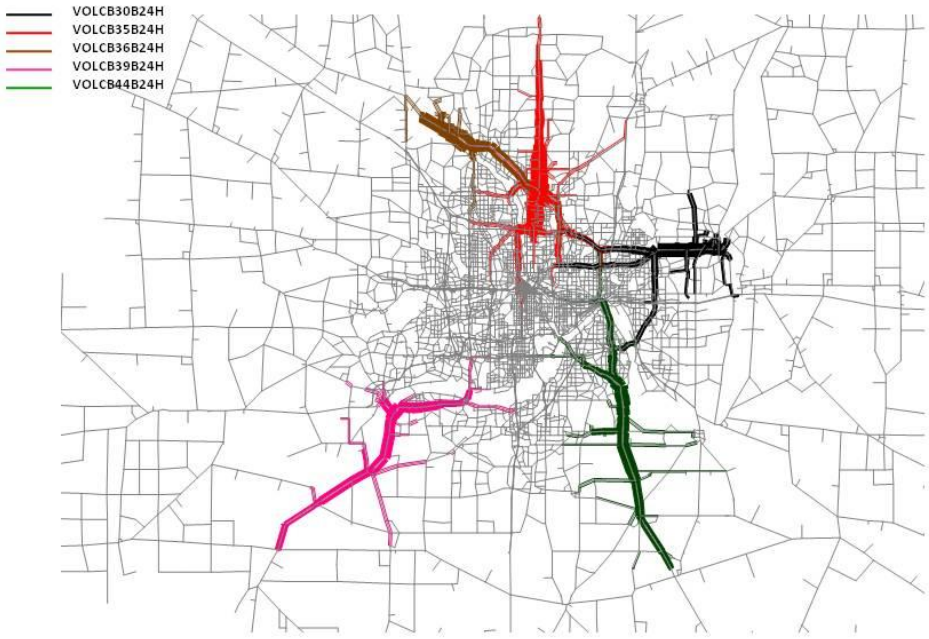
Table A-1: MHSIS Scenario/Project Correspondence

Scenario	Highways in Scenario	Project IDs
1	TH 36, TH 65, TH 169/TH10, TH 169, TH 52	30B, 35B, 36B, 39B, 44B
2	TH 55, TH 212	32B, 43B
3	I-494, TH 610	14A, 33A
4	I-35E, I-35W, TH 252	1B, 6B, 26B
5	I-494, I-694	17A, 19A
6	I-494, I-694	18A, 20B, (includes project 17A)
7	I-94	21B, 23A (includes projects 17A and 18A)
8	I-35E, TH 169	3A, 42B (includes project 2A)
9	I-35E, TH 77	4A, 45A (includes projects 2A and 3A)
10	I-35E, TH 169	29B, 41A (includes projects 2A , 3A, and 4A)
11	I-35W	10A
12	I-35W	7B (includes project 10A)
13	I-35W, I-494	8B, 9B, 11A, 12A, 13B
14	TH 36	27A (includes project 10A)
15	TH 36	28B (includes project 10A and 27A)
16	I-94	22B
50	I-494	50A (includes 17A and 19A)
51	TH 169	51A
52	I-394	52A
53	I-494	53A (includes 14A and 16A)
54	TH 62	54A
55	I-94 East	55A
56	TH 280	56A

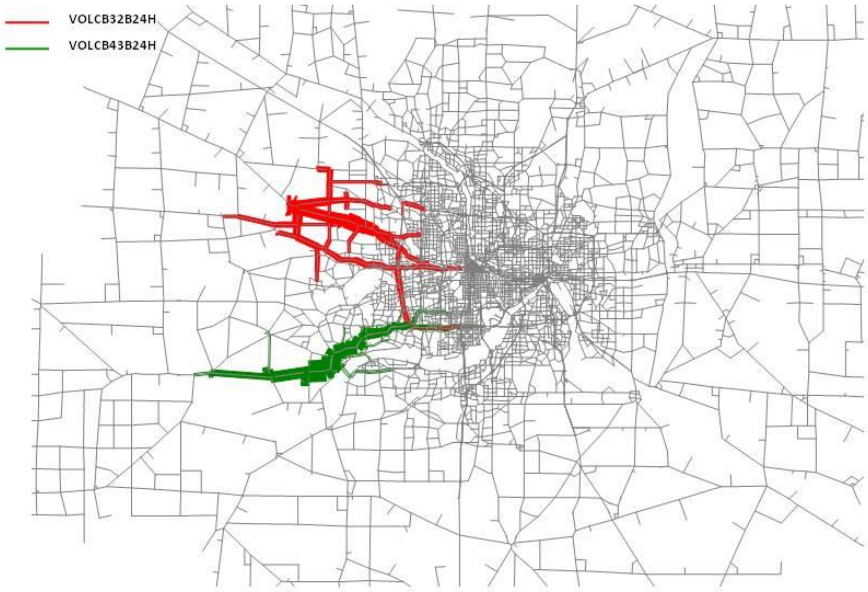
Figure A-1: Corridor Projects for Study



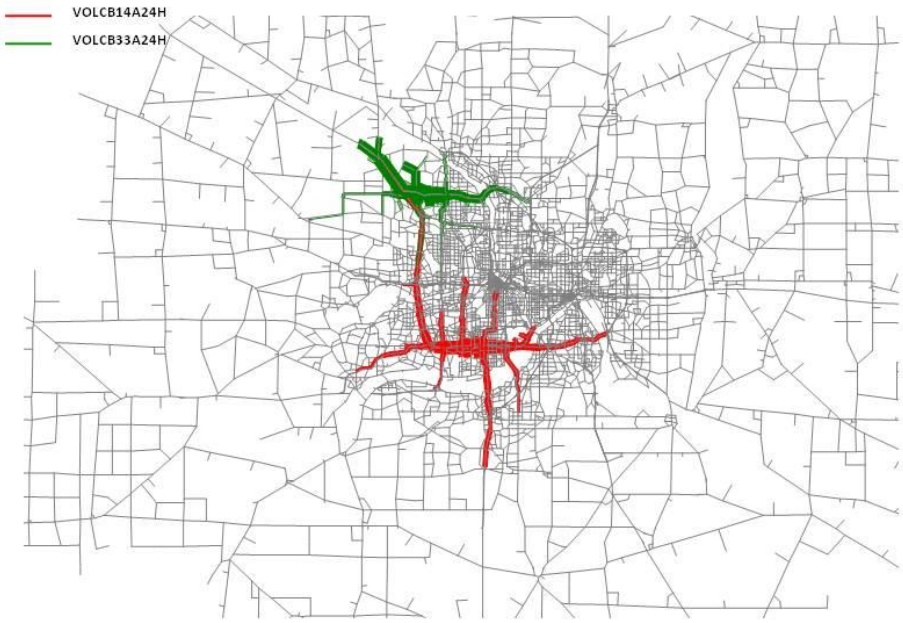
Year 2030 Travel Sheds for Projects Scenario 1: Alt 30B, 35B, 36B,39B and 44B



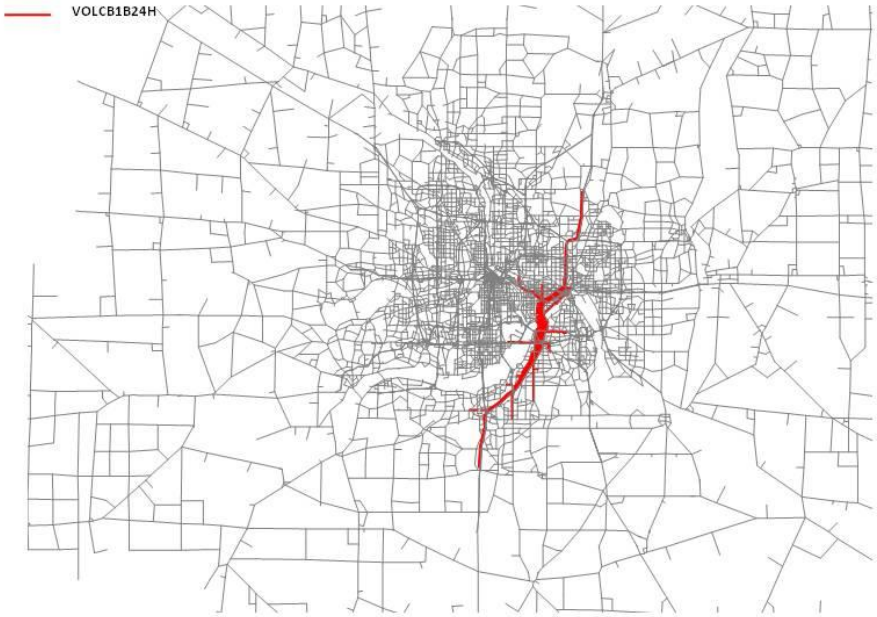
Year 2030 Travel Sheds for Projects Scenario 2: Alt 32B and 43B



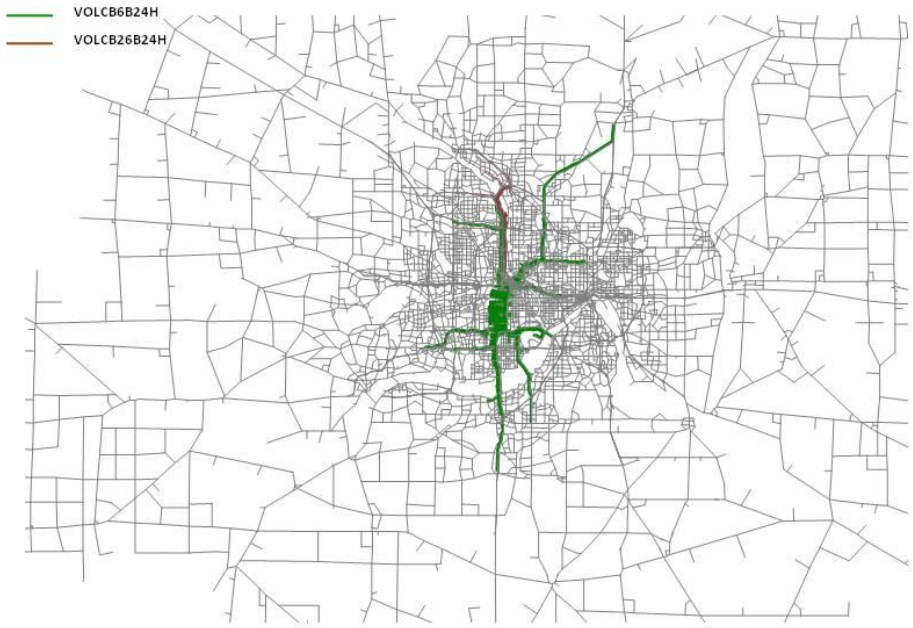
Year 2030 Travel Sheds for Projects Scenario 3: Alt 14A and 33A



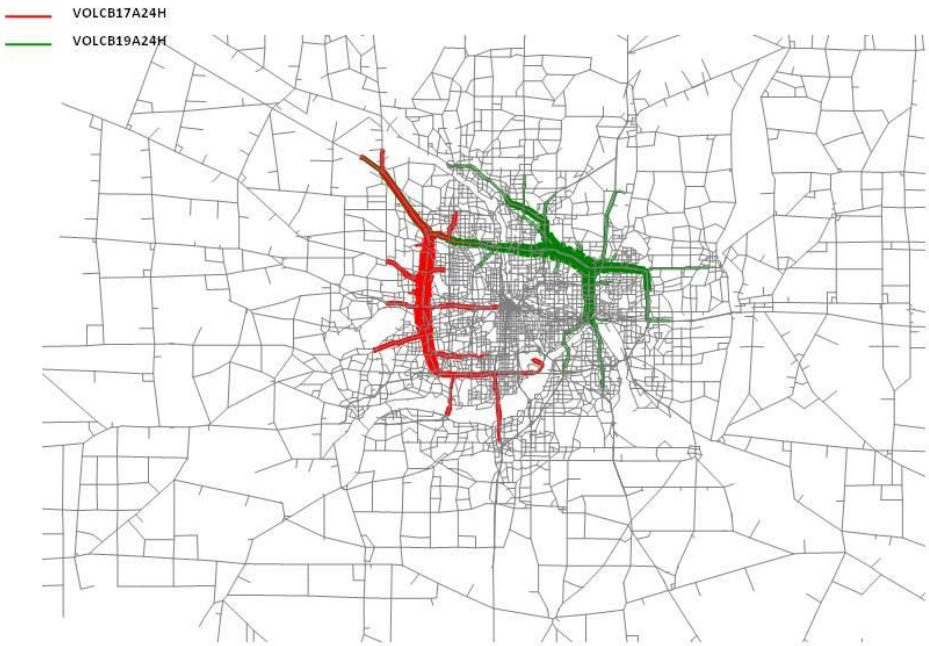
Year 2030 Travel Sheds for Projects Scenario 4: Alt 1B



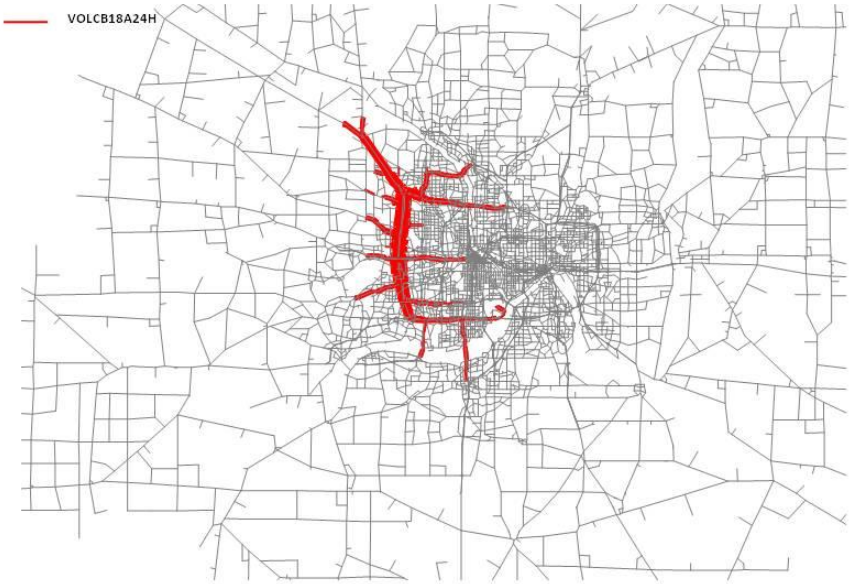
Year 2030 Travel Sheds for Projects Scenario 4B: Alt 6B and 26B



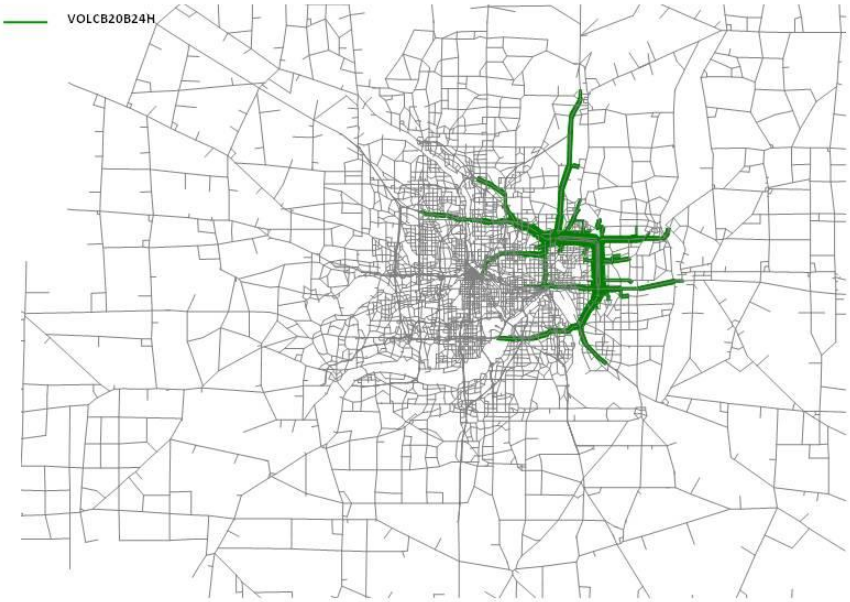
Year 2030 Travel Sheds for Projects Scenario 5: Alt 17A and 19A



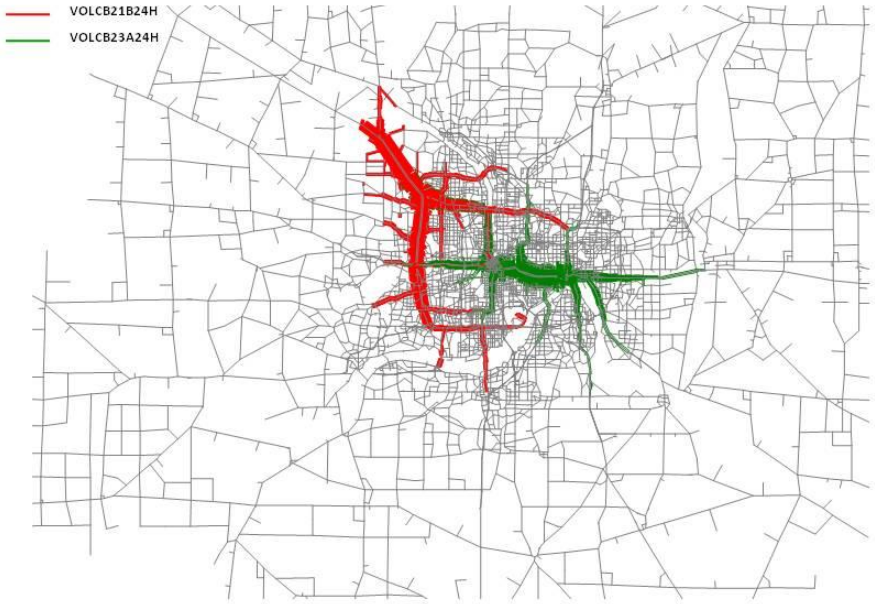
Year 2030 Travel Sheds for Projects Scenario 6A: Alt 18A



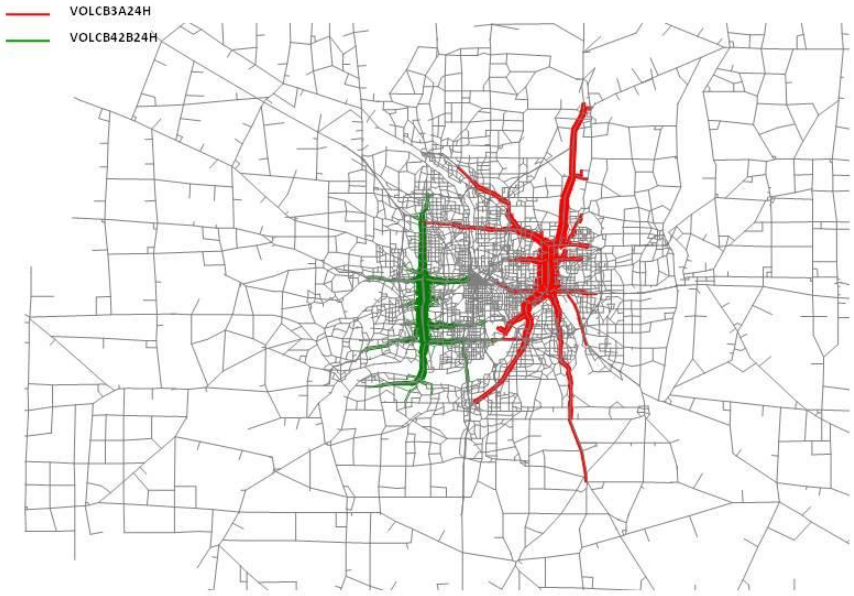
Year 2030 Travel Sheds for Projects Scenario 6B: Alt 20B



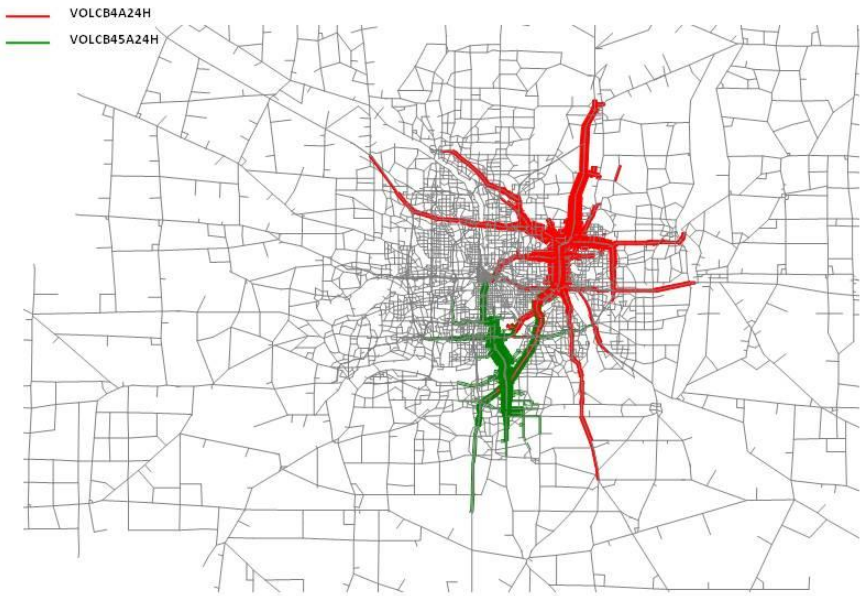
Year 2030 Travel Sheds for Projects Scenario 7: Alt 21B and 23A



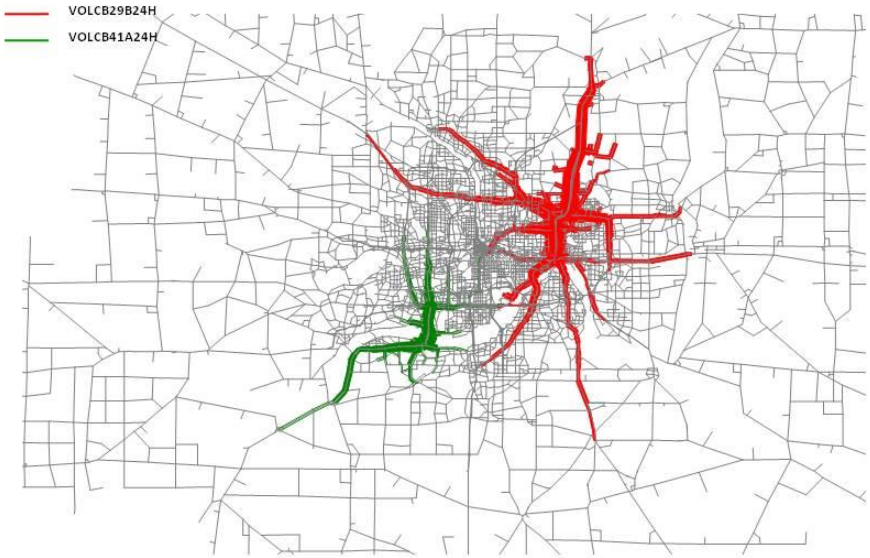
Year 2030 Travel Sheds for Projects Scenario 8: Alt 3A and 42B



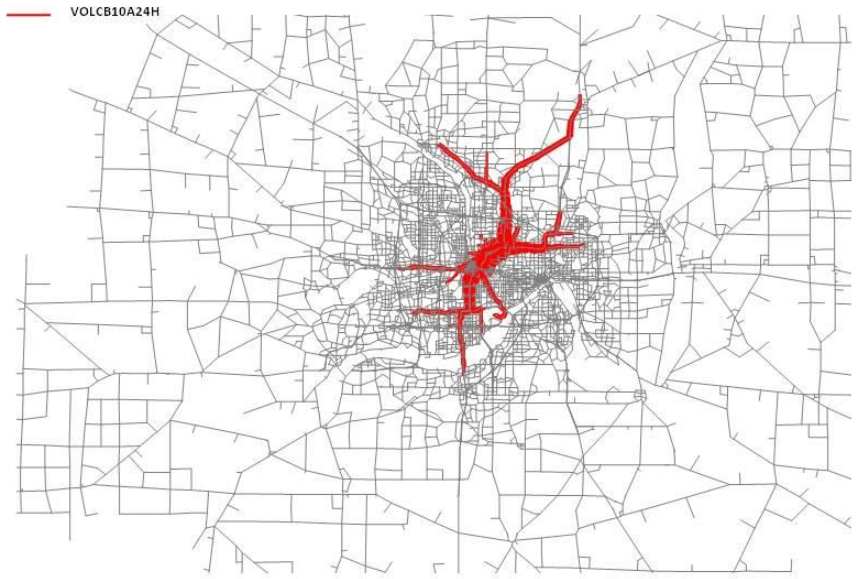
Year 2030 Travel Sheds for Projects Scenario 9: Alt 4A and 45A



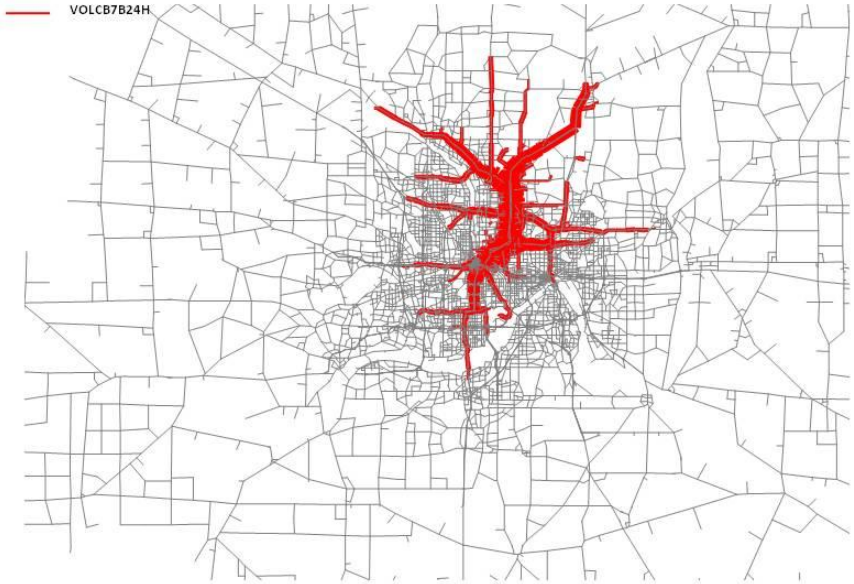
Year 2030 Travel Sheds for Projects Scenario 10: Alt 29B and 41A



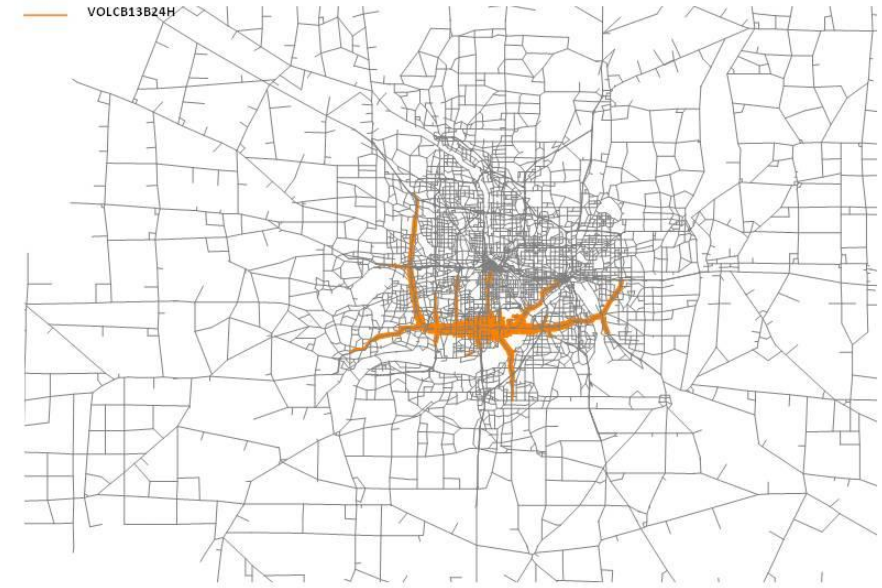
Year 2030 Travel Sheds for Projects Scenario 11: Alt 10A



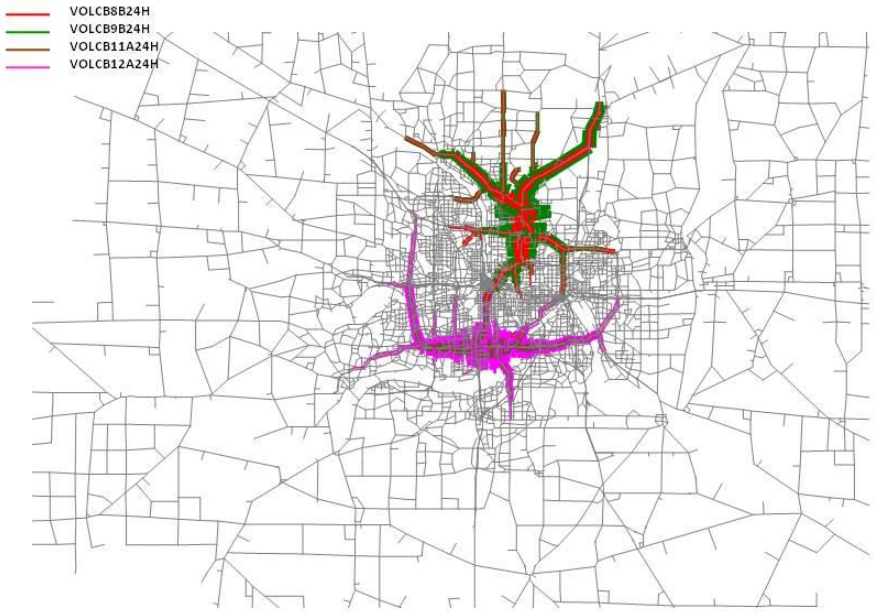
Year 2030 Travel Sheds for Projects Scenario 12: Alt 7B



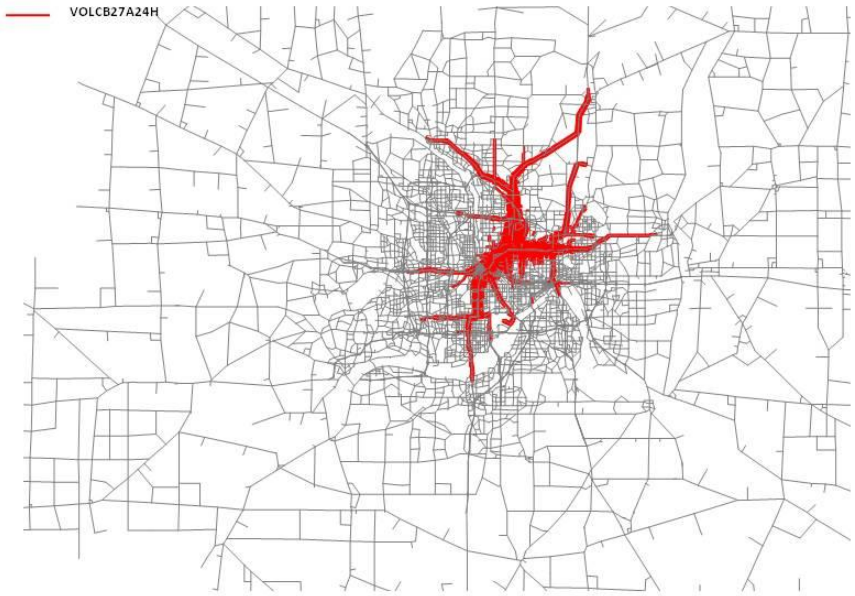
Year 2030 Travel Sheds for Projects Scenario 13B: Alt 13B



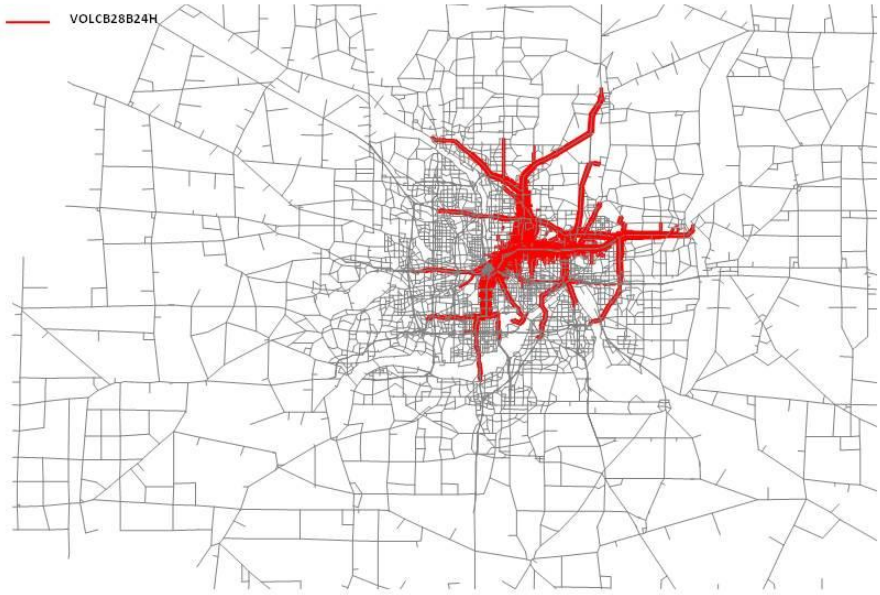
Year 2030 Travel Sheds for Projects Scenario 13: Alt 8B, 9B, 11A and 12A



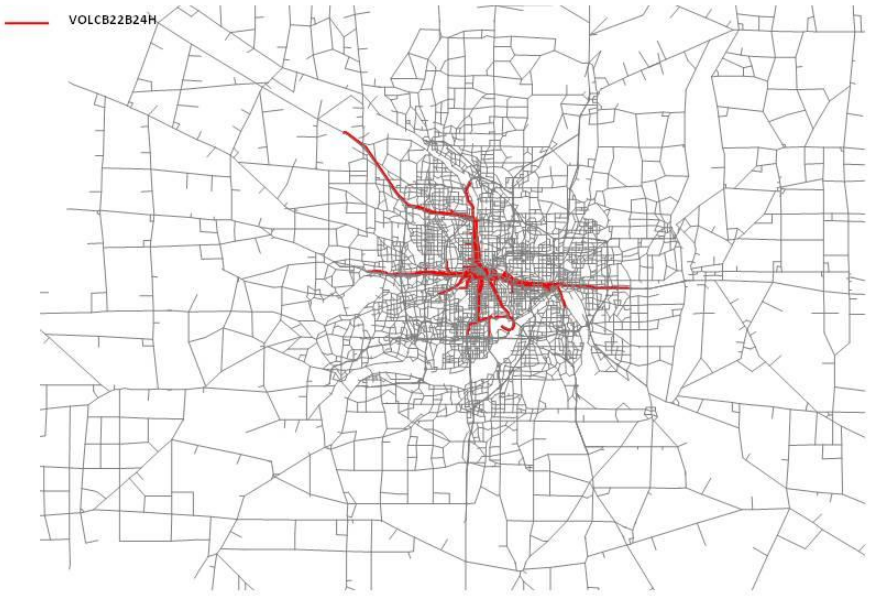
Year 2030 Travel Sheds for Projects Scenario 14: Alt 27A



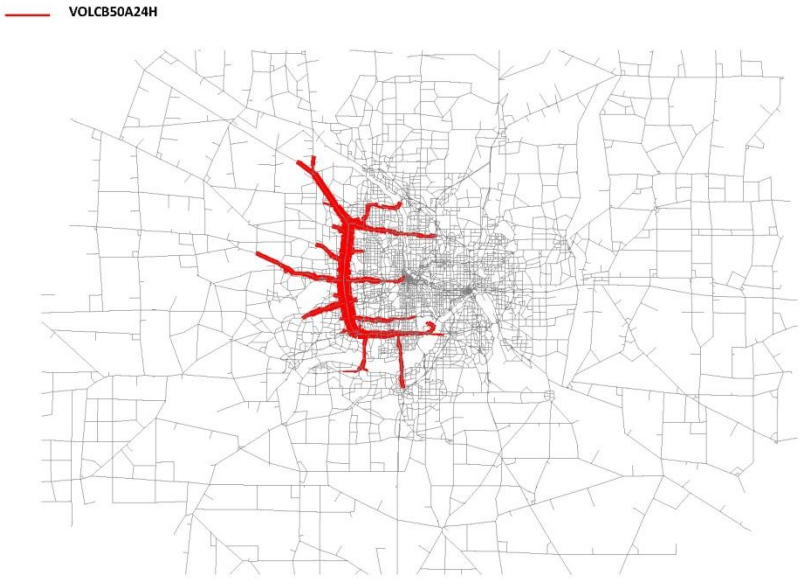
Year 2030 Travel Sheds for Projects Scenario 15: Alt 28B



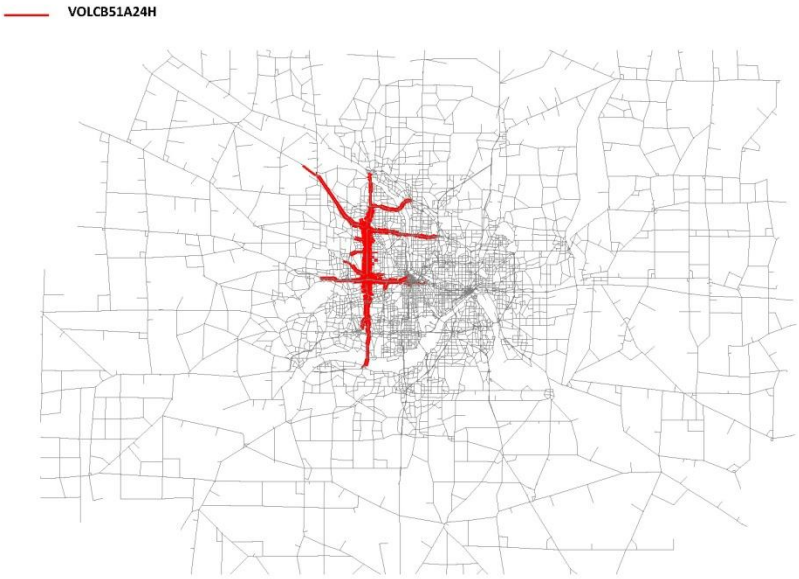
Year 2030 Travel Sheds for Projects Scenario 16: Alt 22B



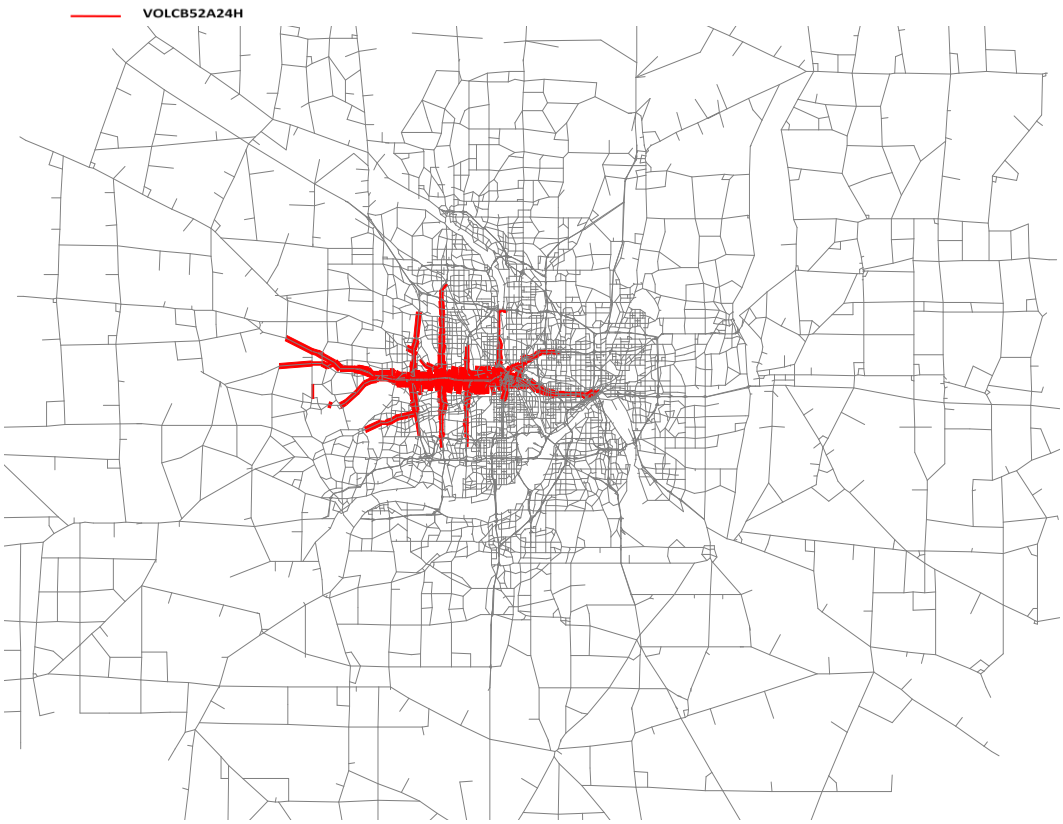
Year 2060 Travel Sheds for Projects Scenario 50: Alt 50A



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

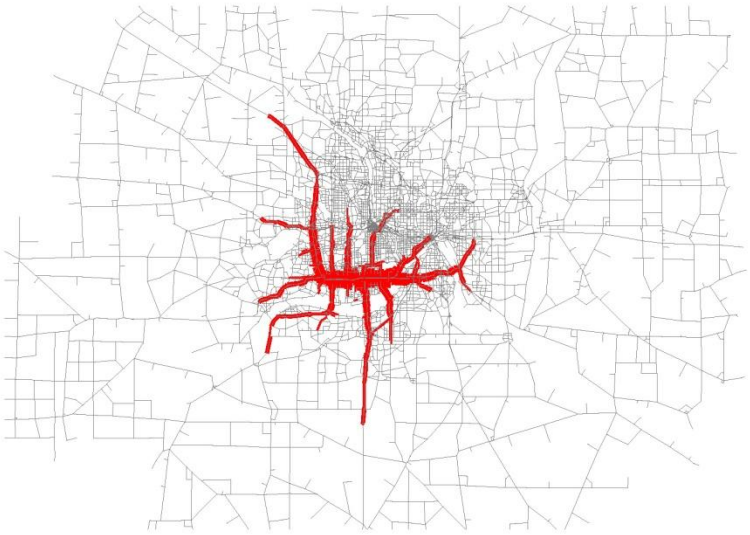


Year 2060 Travel Sheds for Projects Scenario 52: Alt 52A



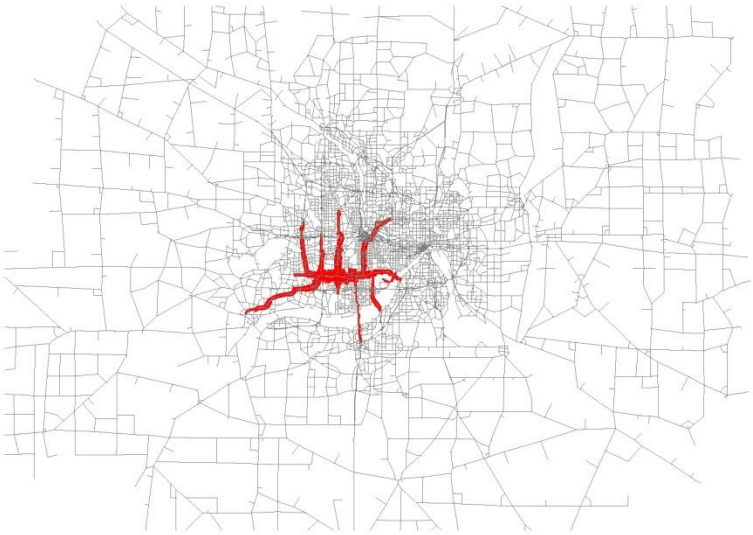
Year 2060 Travel Sheds for Projects Scenario 53: Alt 53A

VOLCB53A24H

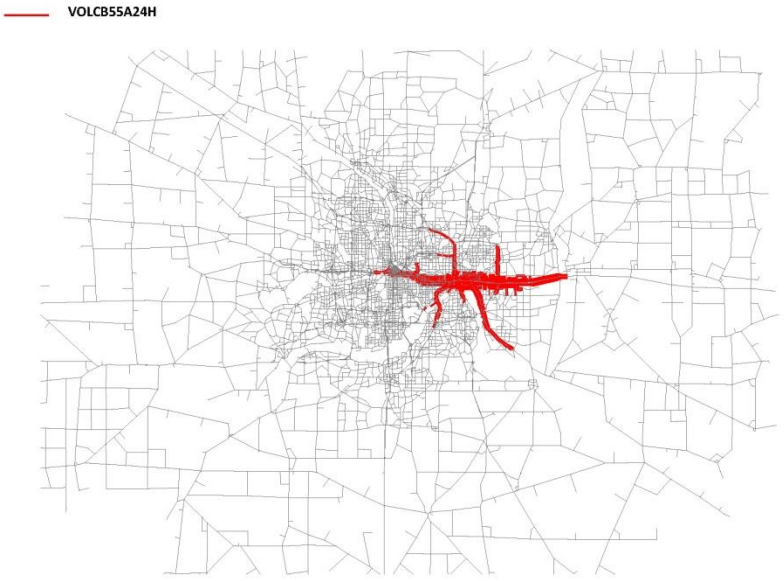


Year 2060 Travel Sheds for Projects Scenario 54: Alt 54A

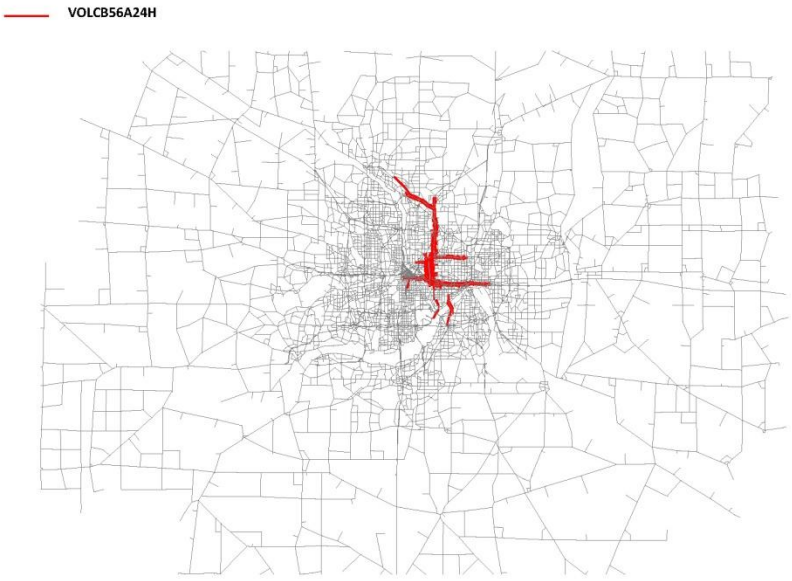
VOLCB54A24H



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)

```
;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='2:00am-3:00am'
if (hourloop=3)  ni='op',  tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='3:00am-4:00am'
if (hourloop=4)  ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='4:00am-5:00am'
if (hourloop=5)  ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='5:00am-6:00am'
if (hourloop=6)  ni='am',  tab=6, capfac=0.75, iters=30, hourlycap='amcap',  label='6:00am-6:45am'
if (hourloop=7)  ni='am',  tab=1, capfac=1.00, iters=30, hourlycap='amcap',  label='6:45am-7:45am'
if (hourloop=8)  ni='am',  tab=2, capfac=1.00, iters=30, hourlycap='amcap',  label='7:45am-8:45am'
if (hourloop=9)  ni='am',  tab=3, capfac=1.00, iters=30, hourlycap='amcap',  label='8:45am-9:45am'
if (hourloop=10) ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:45am-10:45am'
if (hourloop=11) ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:45am-11:45am'
if (hourloop=12) ni='op',  tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:45am-12:45pm'
if (hourloop=13) ni='op',  tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='12:45am-1:45pm'
if (hourloop=14) ni='op',  tab=8, capfac=0.75, iters=30, hourlycap='offcap', label='1:45pm-2:30pm'
if (hourloop=15) ni='pm',  tab=1, capfac=1.00, iters=30, hourlycap='pmcap',  label='2:30pm-3:30pm'
if (hourloop=16) ni='pm',  tab=2, capfac=1.00, iters=30, hourlycap='pmcap',  label='3:30pm-4:30pm'
if (hourloop=17) ni='pm',  tab=3, capfac=1.00, iters=30, hourlycap='pmcap',  label='4:30pm-5:30pm'
if (hourloop=18) ni='pm',  tab=4, capfac=0.50, iters=30, hourlycap='pmcap',  label='5:30pm-6:00pm'
if (hourloop=19) ni='op',  tab=1, capfac=1.00, iters=30, hourlycap='offcap', label='6:00pm-7:00pm'
if (hourloop=20) ni='op',  tab=2, capfac=1.00, iters=30, hourlycap='offcap', label='7:00pm-8:00pm'
if (hourloop=21) ni='op',  tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='8:00pm-9:00pm'
if (hourloop=22) ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:00pm-10:00pm'
if (hourloop=23) ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:00pm-11:00pm'
if (hourloop=24) ni='op',  tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:00pm-12:00am'

if (hourloop=1-6)   m1='veh_nt_nhov_eam',m2='veh_nt_hov_eam', m3='eamtrk'
if (hourloop=7-14)   m1='veh_nt_nhov',    m2='veh_nt_hov', m3='trk'
if (hourloop=15-18) m1='veh_nt_nhov_pm', m2='veh_nt_hov_pm', m3='pmtrk'
if (hourloop=19-24) m1='veh_nt_nhov_eve',m2='veh_nt_hov_eve', m3='evetrk'

;Global Parameters
;if (hourloop=1-24)
; year=2030
; iters=30                                ;Comment out to specify individually
; modelzones=1236                 ;Only Assign Trips in  7-county core
;endif

;distribute intrastep=t

RUN PGM=HWYLOAD
;distributeintrastep processid='nmf', processlist=1-8
    ID TRIP ASSIGNMENT FOR @label@
    FILEI MATI[1] = @m1@.trp        ; Non-HOV trips to be assigned (non-toll)
          MATI[2] = @m2@.trp         ; HOV trips to be assigned (non-toll)
          MATI[3] = @m3@.trp                ; Truck Trips to be assigned (non-toll, non-HOV)
    FILEI NETI= scenario1_attrb.net        ; input network

    FILEO NETO= load2030_scen1_@hourloop@.net       ; output network
          MATO[1]= chktoll_scen1_@hourloop@.mat, MO=1-11, COMBINE=T
          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) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[2] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[3] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[4] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[8] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[10]= T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[9] = T0
    FUNCTION TC[5] = T0 * (2+SQRT(16*(1-(V/C))^2 + 1.361) - 4*(1-(V/C)) - 1.167)
    FUNCTION TC[6] = T0 * (2+SQRT(25*(1-(V/C))^2 + 1.266) - 5*(1-(V/C)) - 1.125)
    FUNCTION TC[7] = T0 * (2+SQRT(36*(1-(V/C))^2 + 1.210) - 6*(1-(V/C)) - 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)

FUNCTION V=VOL[1] + VOL[2] + VOL[3]

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

LOOKUP NAME=DIVERT,
       LOOKUP[1]=1, RESULT=2,
       INTERPOLATE=Y,
       FAIL = 5,100,
       R = ' 0.0  5.0',                ; VOT distribution as reported by NuStats
           ' 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'

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(lw.hovfacility==1,7,9) addtogroup=7
    if(lw.hovfacility==8) addtogroup=8
    if(lw.hovfacility==10) addtogroup=9
    if(lw.hovfacility==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=ILOOP                             ; 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
```

```
            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

   MW[5] =  MW[3]+MW[4]+mw[13]+mw[14]+mw[15]+mw[16]    ; sum of segment tolls
   MW[6] =  MW[1]-MW[2]                  ; non-pay time minus pay time

   JLOOP
    IF (I==J)
     MW[8] = 0
    ELSE
     IF (MW[6]>0)
      MW[7] = MW[5]/MW[6]                ; toll cost per minute saved
      MW[8] = 100 - DIVERT(1,MW[7])      ; percent willing to pay at this level
      MW[9] = MI.1.@tab@ * MW[8] / 100      ; paying non-hov trips
      MW[10] = MI.1.@tab@ - MW[9]           ; non-paying non-hov trips
      MW[11] = MW[9] * MW[5]            ; revenue for average toll calculations
     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] = MI.1.@tab@                   ; 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]+MI.3.@tab@,       ; load non-paying sov and input truck trips
            mw[61]=MW[10]+MI.3.@TAB@, selectgroup=11, vol[4]= mw[61],     ; SOV SL:  TH36        30B
            mw[62]=MW[10]+MI.3.@TAB@, selectgroup=12, vol[7]= mw[62],     ; SOV SL:  TH65        35B
            mw[63]=MW[10]+MI.3.@TAB@, selectgroup=13, vol[10]=mw[63],     ; SOV SL:  TH169/TH10  36B
            mw[64]=MW[10]+MI.3.@TAB@, selectgroup=14, vol[13]=mw[64],     ; SOV SL:  TH169       39B
            mw[65]=MW[10]+MI.3.@TAB@, selectgroup=15, vol[16]=mw[65]      ; SOV SL:  TH52        44B

   PATHLOAD PATH=TIME,                   ; build HOV path based on time, no restrictions
            EXCLUDEGRP=3,
            VOL[2]=MI.2.@tab@,           ; load HOV trips from input matrix
            mw[71]=MI.2.@TAB@, selectgroup=11, vol[5]= mw[71],     ; HOV SL:  TH36        30B
            mw[72]=MI.2.@TAB@, selectgroup=12, vol[8]= mw[72],     ; HOV SL:  TH65        35B
            mw[73]=MI.2.@TAB@, selectgroup=13, vol[11]=mw[73],     ; HOV SL:  TH169/TH10  36B
            mw[74]=MI.2.@TAB@, selectgroup=14, vol[14]=mw[74],     ; HOV SL:  TH169       39B
            mw[75]=MI.2.@TAB@, selectgroup=15, vol[17]=mw[75]      ; HOV SL:  TH52        44B

   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[81]=MW[9], selectgroup=11, vol[6]= mw[81],     ; PAY SL:  TH36        30B
            mw[82]=MW[9], selectgroup=12, vol[9]= mw[82],     ; PAY SL:  TH65        35B
            mw[83]=MW[9], selectgroup=13, vol[12]=mw[83],     ; PAY SL:  TH169/TH10  36B
            mw[84]=MW[9], selectgroup=14, vol[15]=mw[84],     ; PAY SL:  TH169       39B
            mw[85]=MW[9], selectgroup=15, vol[18]=mw[85]      ; PAY SL:  TH52        44B

  mw[91] = mw[61] + mw[71] + mw[81]   ; sum selected link for TH36       30B
  mw[92] = mw[62] + mw[72] + mw[82]   ; sum selected link for TH65       35B
  mw[93] = mw[63] + mw[73] + mw[83]   ; sum selected link for TH169/TH10 36B
  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
```

```
          _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

A1	**30B**	**35B**	**36B**	**39B**	**44B**
Label	TH36	TH65	TH169/TH10	TH169	TH52
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

A2	**32B**	**43B**	**14A**	**33A**	**1B**
Label	TH55	TH212	I494	TH610	I35E
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

A3	**6B**	**26B**	**17A**	**19A**	**18A**
Label	I35W	TH252	I494	I694	I494
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

B1	**20B**	**21B**	**23A**	**3A**	**42B**
Label	I694	I94	I94	I35E	TH169
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

B2	**4A**	**45A**	**29B**	**41A**	**10A**
Label	I35E	TH77	I35E	TH169	I35W
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

C1	**7B**	**8B**	**9B**	**11A**	**12A**
Label	I35W	I35W	I35W	I494	I494
SOV	VOL4	VOL7	VOL10	VOL13	VOL16
HOV	VOL5	VOL8	VOL11	VOL14	VOL17
PAY	VOL6	VOL9	VOL12	VOL15	VOL18

C2	**13B**	**27A**	**28B**	**22B**
Label	I494	TH36	TH36	I94
SOV	VOL4	VOL7	VOL10	VOL13
HOV	VOL5	VOL8	VOL11	VOL14
PAY	VOL6	VOL9	VOL12	VOL15

Table B-1: Assigned No-Build Network SL Volume Attributes

D1	**50A**	**51A**	**53A**
Label	I-494	TH 169	I-494
SOV	VOL4	VOL7	VOL10
HOV	VOL5	VOL8	VOL11
PAY	VOL6	VOL9	VOL12

D2	**54A**	**55A**	**56A**
Label	TH 62	I-94	TH 280
SOV	VOL4	VOL7	VOL10
HOV	VOL5	VOL8	VOL11
PAY	VOL6	VOL9	VOL12

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)

```
;;<<Default Template>><<NETWORK>>;;
;Set up 24 time period loop
YEAR='2030'
SCEN='2'

read file=SNNN_AAA_YYYY_delete.dat, 'SNNN' = '@scen@', 'YYYY' = '@YEAR@', 'AAA' = '32B'
read file=SNNN_AAA_YYYY_delete.dat, 'SNNN' = '@scen@', 'YYYY' = '@YEAR@', 'AAA' = '43B'
; read file=SNNN_AAA_YYYY_delete.dat, 'SNNN' = '@scen@', 'YYYY' = '@YEAR@', 'AAA' = '   '
; read file=SNNN_AAA_YYYY_delete.dat, 'SNNN' = '@scen@', 'YYYY' = '@YEAR@', 'AAA' = '   '
; read file=SNNN_AAA_YYYY_delete.dat, 'SNNN' = '@scen@', 'YYYY' = '@YEAR@', 'AAA' = '   '

alt1='32B'
alt2='43B'
alt3='   '
alt4='   '
alt5='   '

LOOP HOURLOOP=1,24,1
; LOOP HOURLOOP=1,2,1

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='2:00am-3:00am'
if (hourloop=3)  ni='op',  tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='3:00am-4:00am'
if (hourloop=4)  ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='4:00am-5:00am'
if (hourloop=5)  ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='5:00am-6:00am'
if (hourloop=6)  ni='am',  tab=6, capfac=0.75, iters=30, hourlycap='amcap',  label='6:00am-6:45am'
if (hourloop=7)  ni='am',  tab=1, capfac=1.00, iters=30, hourlycap='amcap',  label='6:45am-7:45am'
if (hourloop=8)  ni='am',  tab=2, capfac=1.00, iters=30, hourlycap='amcap',  label='7:45am-8:45am'
if (hourloop=9)  ni='am',  tab=3, capfac=1.00, iters=30, hourlycap='amcap',  label='8:45am-9:45am'
if (hourloop=10) ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:45am-10:45am'
if (hourloop=11) ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:45am-11:45am'
if (hourloop=12) ni='op',  tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:45am-12:45pm'
if (hourloop=13) ni='op',  tab=7, capfac=1.00, iters=30, hourlycap='offcap', label='12:45am-1:45pm'
if (hourloop=14) ni='op',  tab=8, capfac=0.75, iters=30, hourlycap='offcap', label='1:45pm-2:30pm'
if (hourloop=15) ni='pm',  tab=1, capfac=1.00, iters=30, hourlycap='pmcap',  label='2:30pm-3:30pm'
if (hourloop=16) ni='pm',  tab=2, capfac=1.00, iters=30, hourlycap='pmcap',  label='3:30pm-4:30pm'
if (hourloop=17) ni='pm',  tab=3, capfac=1.00, iters=30, hourlycap='pmcap',  label='4:30pm-5:30pm'
if (hourloop=18) ni='pm',  tab=4, capfac=0.50, iters=30, hourlycap='pmcap',  label='5:30pm-6:00pm'
if (hourloop=19) ni='op',  tab=1, capfac=1.00, iters=30, hourlycap='offcap', label='6:00pm-7:00pm'
if (hourloop=20) ni='op',  tab=2, capfac=1.00, iters=30, hourlycap='offcap', label='7:00pm-8:00pm'
if (hourloop=21) ni='op',  tab=3, capfac=1.00, iters=30, hourlycap='offcap', label='8:00pm-9:00pm'
if (hourloop=22) ni='op',  tab=4, capfac=1.00, iters=30, hourlycap='offcap', label='9:00pm-10:00pm'
if (hourloop=23) ni='op',  tab=5, capfac=1.00, iters=30, hourlycap='offcap', label='10:00pm-11:00pm'
if (hourloop=24) ni='op',  tab=6, capfac=1.00, iters=30, hourlycap='offcap', label='11:00pm-12:00am'


RUN PGM=NETWORK
    ID Performance summary for @hourloop@ @ni@ @label@

FILEI  NETI[1]=..\work\load@YEAR@_NoBuild_A2_@hourloop@.net
       neti[2]=..\..\AllDayTolls\scenario_@SCEN@\Scenario@SCEN@_@YEAR@\load@YEAR@_scen@SCEN@_@hourloop@.net

FILEO  NETO=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\load@YEAR@_scen@scen@_pp_@hourloop@.net
fileo printo[1]= ..\..\AllDayTolls\scenario_@scen@\Senario@scen@_@YEAR@\scen@scen@_@alt1@_summaryvht.csv, append=T
fileo printo[2]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen@scen@_@alt1@_summaryvmt.csv, append=T
fileo printo[3]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen@scen@_@alt1@_summaryvcvm.csv, append=T
fileo printo[4]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen@scen@_@alt2@_summaryvht.csv, append=T
fileo printo[5]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen@scen@_@alt2@_summaryvmt.csv, append=T
fileo printo[6]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen@scen@_@alt2@_summaryvcvm.csv, append=T
; fileo printo[7]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt3@_summaryvht.csv, append=T
; fileo printo[8]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt3@_summaryvmt.csv, append=T
; fileo printo[9]= ..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt3@_summaryvcvm.csv, append=T
; fileo printo[10]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt4@_summaryvht.csv, append=T
; fileo printo[11]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt4@_summaryvmt.csv, append=T
; fileo printo[12]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt4@_summaryvcvm.csv, append=T
; fileo printo[13]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt5@_summaryvht.csv, append=T
; fileo printo[14]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt5@_summaryvmt.csv, append=T
; fileo printo[15]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt5@_summaryvcvm.csv, append=T
; fileo printo[16]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt6@_summaryvht.csv, append=T
; fileo printo[17]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt6@_summaryvmt.csv, append=T
; fileo printo[18]=..\..\AllDayTolls\scenario_@scen@\Scenario@scen@_@YEAR@\scen1_@alt6@_summaryvcvm.csv, append=T

merge record=true

read file=Array_AAA.dat, 'AAA' = '32b'
read file=Array_AAA.dat, 'AAA' = '43b'
```

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

PROCESS  PHASE=INPUT FILEI=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 FILEI=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=LINKMERGE
;
ntvol = li.1.v_1
btvol = li.2.v_1
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'
 elseif (_ag = 3-4,13-14)
  gft='      Ramp'
 elseif (_ag = 15)
  gft='expressway'
 elseif (_ag = 5-6,15-16)
  gft='  Arterial'
 elseif (_ag = 7,17)
  gft=' Collector'
 elseif (_ag = 8,10,18,20)
  gft='Mnged Lane'
 elseif (_ag = 9,19)
  gft='     Local'
endif

if(@hourloop@ = 1-5,10-14,19-24)
  per='OFFPK'
 elseif (@hourloop@ = 6-9)
  per=' AMPK'
 elseif (@hourloop@ = 15-18)
  per=' PMPK'
endif

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
```

SNN_AAA_YYY_delete.dat:

```
*del ..\..\AllDayTolls\scenario_SNNN\ScenarioSNNN_YYYY\scenSNNN_AAA_summaryvht.csv
*del ..\..\AllDayTolls\scenario_SNNN\ScenarioSNNN_YYYY\scenSNNN_AAA_summaryvmt.csv
*del ..\..\AllDayTolls\scenario_SNNN\ScenarioSNNN_YYYY\scenSNNN_AAA_summaryvcvm.csv
```

Array_AAA.dat:

```
Array nbAAAvht=20, bdAAAvht=20, nbAAAvmt=20, bdAAAvmt=20, nbAAAffvht=20, bdAAAffvht=20
Array cnbAAAvht=20, cbdAAAvht=20, cnbAAAvmt=20, cbdAAAvmt=20, cnbAAAffvht=20, cbdAAAffvht=20
Array nbAAAvmvc=20, bdAAAvmvc=20, cnbAAAvmvc=20, cbdAAAvmvc=20
Array nbAAAlm=20, bdAAAlm=20, nbAAAcm=20, bdAAAcm=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.vht_1
 bAAA_vht = li.2.vht_1
 nAAA_vhtc = li.1.time_1 * nb_vAAA / 60
 bAAA_vhtc = li.2.time_1 * bd_vAAA / 60
 if(li.1.hovfacility=1-9)
  cnbAAAvht[8] = cnbAAAvht[8] + nAAA_vhtc
  nbAAAvht[8]  = nbAAAvht[8]  + nAAA_vht
 else
  cnbAAAvht[li.1.asgngrp] = cnbAAAvht[li.1.asgngrp] + nAAA_vhtc
  nbAAAvht[li.1.asgngrp]  = nbAAAvht[li.1.asgngrp]  + nAAA_vht
 endif
 if(li.2.hovfacility=1-9)
  bdAAAvht[8]  = bdAAAvht[8]  + bAAA_vht
  cbdAAAvht[8] = cbdAAAvht[8] + bAAA_vhtc
 else
  bdAAAvht[li.2.asgngrp]  = bdAAAvht[li.2.asgngrp]  + bAAA_vht
  cbdAAAvht[li.2.asgngrp] = cbdAAAvht[li.2.asgngrp] + bAAA_vhtc
 endif

; freeflow vht total and for corridor volumes only
 nAAA_ffvht = li.1.time * li.1.v_1 / 60
 bAAA_ffvht = li.2.time * li.2.v_1 / 60
 nAAA_ffvhtc = li.1.time * nb_vAAA / 60
 bAAA_ffvhtc = li.2.time * bd_vAAA / 60

 if(li.1.hovfacility=1-9)
  cnbAAAffvht[8] = cnbAAAffvht[8] + nAAA_ffvhtc
  nbAAAffvht[8]  = nbAAAffvht[8]  + nAAA_ffvht
 else
  cnbAAAffvht[li.1.asgngrp] = cnbAAAffvht[li.1.asgngrp] + nAAA_ffvhtc
  nbAAAffvht[li.1.asgngrp]  = nbAAAffvht[li.1.asgngrp]  + nAAA_ffvht
 endif
 if(li.2.hovfacility=1-9)
  cbdAAAffvht[8] = cbdAAAffvht[8] + bAAA_ffvhtc
  bdAAAffvht[8]  = bdAAAffvht[8]  + bAAA_ffvht
 else
  cbdAAAffvht[li.2.asgngrp] = cbdAAAffvht[li.2.asgngrp] + bAAA_ffvhtc
  bdAAAffvht[li.2.asgngrp]  = bdAAAffvht[li.2.asgngrp]  + bAAA_ffvht
 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[8] + nAAA_vmtc
  nbAAAvmt[8]  = nbAAAvmt[8]  + nAAA_vmt
 else
  cnbAAAvmt[li.1.asgngrp] = cnbAAAvmt[li.1.asgngrp] + nAAA_vmtc
  nbAAAvmt[li.1.asgngrp]  = nbAAAvmt[li.1.asgngrp]  + nAAA_vmt
 endif

 if(li.2.hovfacility=1-9)
  cbdAAAvmt[8] = cbdAAAvmt[8] + bAAA_vmtc
  bdAAAvmt[8]  = bdAAAvmt[8]  + bAAA_vmt
 else
  cbdAAAvmt[li.2.asgngrp] = cbdAAAvmt[li.2.asgngrp] + bAAA_vmtc
  bdAAAvmt[li.2.asgngrp]  = bdAAAvmt[li.2.asgngrp]  + bAAA_vmt
 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))
```

```
 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[nAAA_vci] = bdAAAlm[nAAA_vci] + li.2.numlanes*li.2.distance

nbAAAcm[nAAA_vci] = nbAAAcm[nAAA_vci] + li.1.distance
bdAAAcm[nAAA_vci] = bdAAAcm[nAAA_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
endif
```

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],       cbdAAAvht[_ag], cnbAAAffvht[_ag], cbdAAAffvht[_ag], printo=FILE1

  if(_ag=1 && @hourloop@=1) print csv=T, list=" hour"," length"," period"," ftype","  Genftype",
     "    nbvmt","    bdvmt","   cnbvmt","   cbdvmt", 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),
        nbAAAvmvc[_ag](12.3), bdAAAvmvc[_ag], cnbAAAvmvc[_ag], cbdAAAvmvc[_ag],
        nbAAAlm[_ag], bdAAAlm[_ag], nbAAAcm[_ag], bdAAAcm[_ag], printo=FILE3
```

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

Hour	length	period	ftype	Genftype	nbvmt	bdvmt	cnbvmt	cbdvmt
1	2	OFFPK	1	Freeway	18843.44	18838.03	573.19	570.03
1	2	OFFPK	2	Freeway	3895.753	3901.21	1100.74	1110.17
1	2	OFFPK	3	Ramp	120.344	120.37	5.96	5.95

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
Hour – assignment period
Length – length of assignment period
Period – description of period type
Ftype – facility/lane type
GenFtype – general facility/lane type
All hour/facility types are listed for a given corridor alternative.

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

hour	length	period	ftype	Genftype	nbvht	bdvht	nbffvht	bdffvht	cnbvht	cbdvht	cnbffvht	cbdffvht
1	2	OFFPK	1	Freeway	296.746	296.65	294.85	294.76	8.77	8.71	8.72	8.66
1	2	OFFPK	2	Freeway	55.018	55.09	54.69	54.76	14.99	15.12	14.91	15.04
1	2	OFFPK	3	Ramp	3.155	3.16	3.11	3.11	0.16	0.15	0.15	0.15
1	2	OFFPK	4	Ramp	12.914	12.9	12.81	12.8	2.69	2.69	2.67	2.66

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
Hour – assignment period
Length – length of assignment period
Period – description of period type
Ftype – facility/lane type
GenFtype – general facility/lane type
All hour/facility types are listed for a given corridor alternative.

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

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

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
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'
bdnbd='BD'
scen=4
alt1= '1B'
alt2= '6B'
alt3= '26B'
alt4= '   '
alt5= '   '

cc2=' '
cc3=' '
cc4='; '
cc5='; '

altct=3

LOOP HOURLOOP=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='amcap',  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@_YR@year@_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@_YR@year@_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@_YR@year@_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@_YR@year@_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@
```

```
@cc4@ mw[36]=mi.10.@alt4@
@cc5@ mw[46]=mi.10.@alt5@


jloop

if(mw[6] > 0.0)
; save SOV and HOV times
mw[7]=mi.9.1
mw[8]=mi.9.2
; Non-Motorized, NM, output table 1
 mw[1] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
         mi.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
 mw[2] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
         mi.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
 mw[3] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
         mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
         mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
         mi.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
 mw[4] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
         mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
         mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
         mi.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
 mw[5] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
         mi.1.21 + mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 +
         mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
         mi.2.21 + mi.2.22 + mi.2.23 + mi.2.24 + mi.2.25 + mi.2.26 + mi.2.27 + mi.2.28 +
         mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
         mi.3.21 + mi.3.22 + mi.3.23 + mi.3.24 + mi.3.25 + mi.3.26 + mi.3.27 + mi.3.28 +
         mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
         mi.4.21 + mi.4.22 + mi.4.23 + mi.4.24 + mi.4.25 + mi.4.26 + mi.4.27 + mi.4.28 +
         mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
         mi.5.21 + mi.5.22 + mi.5.23 + mi.5.24 + mi.5.25 + mi.5.26 + mi.5.27 + mi.5.28 +
         mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
         mi.6.21 + mi.6.22 + mi.6.23 + mi.6.24 + mi.6.25 + mi.6.26 + mi.6.27 + mi.6.28 +
         mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
         mi.7.21 + mi.7.22 + mi.7.23 + mi.7.24 + mi.7.25 + mi.7.26 + mi.7.27 + mi.7.28 +
         mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
         mi.8.21 + mi.8.22 + mi.8.23 + mi.8.24 + mi.8.25 + mi.8.26 + mi.8.27 + mi.8.28
endif

@cc2@ if(mw[16] > 0.0)
; save SOV and HOV times
@cc2@ mw[17]=mi.9.1
@cc2@ mw[18]=mi.9.2
; Non-Motorized, NM, output table 1
@cc2@  mw[11] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
@cc2@           mi.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
@cc2@  mw[12] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
@cc2@           mi.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
@cc2@  mw[13] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
@cc2@           mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
@cc2@           mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
@cc2@           mi.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
@cc2@  mw[14] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
@cc2@           mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
@cc2@           mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
@cc2@           mi.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
@cc2@  mw[15] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
@cc2@           mi.1.21 + mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 +
@cc2@           mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
@cc2@           mi.2.21 + mi.2.22 + mi.2.23 + mi.2.24 + mi.2.25 + mi.2.26 + mi.2.27 + mi.2.28 +
@cc2@           mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
@cc2@           mi.3.21 + mi.3.22 + mi.3.23 + mi.3.24 + mi.3.25 + mi.3.26 + mi.3.27 + mi.3.28 +
@cc2@           mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
@cc2@           mi.4.21 + mi.4.22 + mi.4.23 + mi.4.24 + mi.4.25 + mi.4.26 + mi.4.27 + mi.4.28 +
@cc2@           mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
@cc2@           mi.5.21 + mi.5.22 + mi.5.23 + mi.5.24 + mi.5.25 + mi.5.26 + mi.5.27 + mi.5.28 +
@cc2@           mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
@cc2@           mi.6.21 + mi.6.22 + mi.6.23 + mi.6.24 + mi.6.25 + mi.6.26 + mi.6.27 + mi.6.28 +
@cc2@           mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
@cc2@           mi.7.21 + mi.7.22 + mi.7.23 + mi.7.24 + mi.7.25 + mi.7.26 + mi.7.27 + mi.7.28 +
@cc2@           mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
```

```
@cc2@           mi.8.21 + mi.8.22 + mi.8.23 + mi.8.24 + mi.8.25 + mi.8.26 + mi.8.27 + mi.8.28
@cc2@ endif

@cc3@ if(mw[26] > 0.0)
; save SOV and HOV times
@cc3@ mw[27]=mi.9.1
@cc3@ mw[28]=mi.9.2
; Non-Motorized, NM, output table 1
@cc3@  mw[21] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
@cc3@           mi.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
@cc3@  mw[22] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
@cc3@           mi.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
@cc3@  mw[23] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
@cc3@           mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
@cc3@           mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
@cc3@           mi.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
@cc3@  mw[24] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
@cc3@           mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
@cc3@           mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
@cc3@           mi.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
@cc3@  mw[25] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
@cc3@           mi.1.21 + mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 +
@cc3@           mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
@cc3@           mi.2.21 + mi.2.22 + mi.2.23 + mi.2.24 + mi.2.25 + mi.2.26 + mi.2.27 + mi.2.28 +
@cc3@           mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
@cc3@           mi.3.21 + mi.3.22 + mi.3.23 + mi.3.24 + mi.3.25 + mi.3.26 + mi.3.27 + mi.3.28 +
@cc3@           mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
@cc3@           mi.4.21 + mi.4.22 + mi.4.23 + mi.4.24 + mi.4.25 + mi.4.26 + mi.4.27 + mi.4.28 +
@cc3@           mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
@cc3@           mi.5.21 + mi.5.22 + mi.5.23 + mi.5.24 + mi.5.25 + mi.5.26 + mi.5.27 + mi.5.28 +
@cc3@           mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
@cc3@           mi.6.21 + mi.6.22 + mi.6.23 + mi.6.24 + mi.6.25 + mi.6.26 + mi.6.27 + mi.6.28 +
@cc3@           mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
@cc3@           mi.7.21 + mi.7.22 + mi.7.23 + mi.7.24 + mi.7.25 + mi.7.26 + mi.7.27 + mi.7.28 +
@cc3@           mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
@cc3@           mi.8.21 + mi.8.22 + mi.8.23 + mi.8.24 + mi.8.25 + mi.8.26 + mi.8.27 + mi.8.28
@cc3@ endif

@cc4@ if(mw[36] > 0.0)
; save SOV and HOV times
@cc4@ mw[37]=mi.9.1
@cc4@ mw[38]=mi.9.2
; Non-Motorized, NM, output table 1
@cc4@  mw[31] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
@cc4@           mi.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
@cc4@  mw[32] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
@cc4@           mi.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
@cc4@  mw[33] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
@cc4@           mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
@cc4@           mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
@cc4@           mi.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
@cc4@  mw[34] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
@cc4@           mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
@cc4@           mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
@cc4@           mi.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
@cc4@  mw[35] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
@cc4@           mi.1.21 + mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 +
@cc4@           mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
@cc4@           mi.2.21 + mi.2.22 + mi.2.23 + mi.2.24 + mi.2.25 + mi.2.26 + mi.2.27 + mi.2.28 +
@cc4@           mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
@cc4@           mi.3.21 + mi.3.22 + mi.3.23 + mi.3.24 + mi.3.25 + mi.3.26 + mi.3.27 + mi.3.28 +
@cc4@           mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
@cc4@           mi.4.21 + mi.4.22 + mi.4.23 + mi.4.24 + mi.4.25 + mi.4.26 + mi.4.27 + mi.4.28 +
@cc4@           mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
@cc4@           mi.5.21 + mi.5.22 + mi.5.23 + mi.5.24 + mi.5.25 + mi.5.26 + mi.5.27 + mi.5.28 +
@cc4@           mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
@cc4@           mi.6.21 + mi.6.22 + mi.6.23 + mi.6.24 + mi.6.25 + mi.6.26 + mi.6.27 + mi.6.28 +
@cc4@           mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
@cc4@           mi.7.21 + mi.7.22 + mi.7.23 + mi.7.24 + mi.7.25 + mi.7.26 + mi.7.27 + mi.7.28 +
@cc4@           mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
@cc4@           mi.8.21 + mi.8.22 + mi.8.23 + mi.8.24 + mi.8.25 + mi.8.26 + mi.8.27 + mi.8.28
@cc4@ endif
```

```
@cc5@ if(mw[46] > 0.0)
; save SOV and HOV times
@cc5@ mw[47]=mi.9.1
@cc5@ mw[48]=mi.9.2
; Non-Motorized, NM, output table 1
@cc5@  mw[41] = mi.1.1 + mi.1.2 + mi.2.1 + mi.2.2 + mi.3.1 + mi.3.2 + mi.4.1 + mi.4.2 +
@cc5@           mi.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
@cc5@  mw[42] = mi.1.3 + mi.1.4 + mi.2.3 + mi.2.4 + mi.3.3 + mi.3.4 + mi.4.3 + mi.4.4 +
@cc5@           mi.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
@cc5@  mw[43] = mi.1.5 + mi.1.6 + mi.1.9 + mi.1.10 + mi.2.5 + mi.2.6 + mi.2.9 + mi.2.10 +
@cc5@           mi.3.5 + mi.3.6 + mi.3.9 + mi.3.10 + mi.4.5 + mi.4.6 + mi.4.9 + mi.4.10 +
@cc5@           mi.5.5 + mi.5.6 + mi.5.9 + mi.5.10 + mi.6.5 + mi.6.6 + mi.6.9 + mi.6.10 +
@cc5@           mi.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
@cc5@  mw[44] = mi.1.7 + mi.1.8 + mi.1.11 + mi.1.12 + mi.2.7 + mi.2.8 + mi.2.11 + mi.2.12 +
@cc5@           mi.3.7 + mi.3.8 + mi.3.11 + mi.3.12 + mi.4.7 + mi.4.8 + mi.4.11 + mi.4.12 +
@cc5@           mi.5.7 + mi.5.8 + mi.5.11 + mi.5.12 + mi.6.7 + mi.6.8 + mi.6.11 + mi.6.12 +
@cc5@           mi.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
@cc5@  mw[45] = mi.1.13 + mi.1.14 + mi.1.15 + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 +
@cc5@           mi.1.21 + mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 +
@cc5@           mi.2.13 + mi.2.14 + mi.2.15 + mi.2.16 + mi.2.17 + mi.2.18 + mi.2.19 + mi.2.20 +
@cc5@           mi.2.21 + mi.2.22 + mi.2.23 + mi.2.24 + mi.2.25 + mi.2.26 + mi.2.27 + mi.2.28 +
@cc5@           mi.3.13 + mi.3.14 + mi.3.15 + mi.3.16 + mi.3.17 + mi.3.18 + mi.3.19 + mi.3.20 +
@cc5@           mi.3.21 + mi.3.22 + mi.3.23 + mi.3.24 + mi.3.25 + mi.3.26 + mi.3.27 + mi.3.28 +
@cc5@           mi.4.13 + mi.4.14 + mi.4.15 + mi.4.16 + mi.4.17 + mi.4.18 + mi.4.19 + mi.4.20 +
@cc5@           mi.4.21 + mi.4.22 + mi.4.23 + mi.4.24 + mi.4.25 + mi.4.26 + mi.4.27 + mi.4.28 +
@cc5@           mi.5.13 + mi.5.14 + mi.5.15 + mi.5.16 + mi.5.17 + mi.5.18 + mi.5.19 + mi.5.20 +
@cc5@           mi.5.21 + mi.5.22 + mi.5.23 + mi.5.24 + mi.5.25 + mi.5.26 + mi.5.27 + mi.5.28 +
@cc5@           mi.6.13 + mi.6.14 + mi.6.15 + mi.6.16 + mi.6.17 + mi.6.18 + mi.6.19 + mi.6.20 +
@cc5@           mi.6.21 + mi.6.22 + mi.6.23 + mi.6.24 + mi.6.25 + mi.6.26 + mi.6.27 + mi.6.28 +
@cc5@           mi.7.13 + mi.7.14 + mi.7.15 + mi.7.16 + mi.7.17 + mi.7.18 + mi.7.19 + mi.7.20 +
@cc5@           mi.7.21 + mi.7.22 + mi.7.23 + mi.7.24 + mi.7.25 + mi.7.26 + mi.7.27 + mi.7.28 +
@cc5@           mi.8.13 + mi.8.14 + mi.8.15 + mi.8.16 + mi.8.17 + mi.8.18 + mi.8.19 + mi.8.20 +
@cc5@           mi.8.21 + 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

ID Matrix PT Summary by Period, Off-Peak, @bdnbd@, @year@, @alt@

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=8*5
array share=24
```

```
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[1]=mi.1.6/mw[6]
 share[2]=mi.2.6/mw[6]
 share[3]=mi.3.6/mw[6]
 share[4]=mi.4.6/mw[6]
 share[5]=mi.5.6/mw[6]
 share[6]=mi.6.6/mw[6]
 share[10]=mi.7.6/mw[6]
 share[11]=mi.8.6/mw[6]
 share[12]=mi.9.6/mw[6]
 share[13]=mi.10.6/mw[6]
 share[14]=mi.11.6/mw[6]
 share[19]=mi.12.6/mw[6]
 share[20]=mi.13.6/mw[6]
 share[21]=mi.14.6/mw[6]
 share[22]=mi.15.6/mw[6]
 share[23]=mi.16.6/mw[6]
 share[24]=mi.17.6/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

mw[1] = mi.1.1*share[1] + mi.2.1*share[2] + mi.3.1*share[3] + mi.4.1*share[4] + mi.5.1*share[5] +
mi.6.1*share[6] +
        mi.7.1*share[10] + mi.8.1*share[11] + mi.9.1*share[12] + mi.10.1*share[13] + mi.11.1*share[14] +
        mi.12.1*share[19] + mi.13.1*share[20] + mi.14.1*share[21] + mi.15.1*share[22] + mi.16.1*share[23] +
mi.17.1*share[24]

mw[2] = mi.1.2*share[1] + mi.2.2*share[2] + mi.3.2*share[3] + mi.4.2*share[4] + mi.5.2*share[5] +
mi.6.2*share[6] +
        mi.7.2*share[10] + mi.8.2*share[11] + mi.9.2*share[12] + mi.10.2*share[13] + mi.11.2*share[14] +
        mi.12.2*share[19] + mi.13.2*share[20] + mi.14.2*share[21] + mi.15.2*share[22] + mi.16.2*share[23] +
mi.17.2*share[24]

mw[3] = mi.1.3*share[1] + mi.2.3*share[2] + mi.3.3*share[3] + mi.4.3*share[4] + mi.5.3*share[5] +
mi.6.3*share[6] +
        mi.7.3*share[10] + mi.8.3*share[11] + mi.9.3*share[12] + mi.10.3*share[13] + mi.11.3*share[14] +
        mi.12.3*share[19] + mi.13.3*share[20] + mi.14.3*share[21] + mi.15.3*share[22] + mi.16.3*share[23] +
mi.17.3*share[24]

mw[4] = mi.1.4*share[1] + mi.2.4*share[2] + mi.3.4*share[3] + mi.4.4*share[4] + mi.5.4*share[5] +
mi.6.4*share[6] +
        mi.7.4*share[10] + mi.8.4*share[11] + mi.9.4*share[12] + mi.10.4*share[13] + mi.11.4*share[14] +
        mi.12.4*share[19] + mi.13.4*share[20] + mi.14.4*share[21] + mi.15.4*share[22] + mi.16.4*share[23] +
mi.17.4*share[24]

mw[5] = mi.1.5*share[1] + mi.2.5*share[2] + mi.3.5*share[3] + mi.4.5*share[4] + mi.5.5*share[5] +
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]

mw[7] = mi.1.7*share[1] + mi.2.7*share[2] + mi.3.7*share[3] + mi.4.7*share[4] + mi.5.7*share[5] +
mi.6.7*share[6] +
        mi.7.7*share[10] + mi.8.7*share[11] + mi.9.7*share[12] + mi.10.7*share[13] + mi.11.7*share[14] +
        mi.12.7*share[19] + mi.13.7*share[20] + mi.14.7*share[21] + mi.15.7*share[22] + mi.16.7*share[23] +
mi.17.7*share[24]
```

```
mw[8] = mi.1.8*share[1] + mi.2.8*share[2] + mi.3.8*share[3] + mi.4.8*share[4] + mi.5.8*share[5] +
mi.6.8*share[6] +
        mi.7.8*share[10] + mi.8.8*share[11] + mi.9.8*share[12] + mi.10.8*share[13] + mi.11.8*share[14] +
        mi.12.8*share[19] + mi.13.8*share[20] + mi.14.8*share[21] + mi.15.8*share[22] + mi.16.8*share[23] +
mi.17.8*share[24]

endjloop

ENDRUN

RUN PGM=MATRIX

ID Matrix PT Summary by Period, Off-Peak, @bdnbd@, @year@, @alt@

FILEI  MATI[1]=@bdnbd@_YR@year@_PT_OFFPEAK_alt_@alt@.trp
       MATI[2]=@bdnbd@_YR@year@_PT_hour_7_alt_@alt@.trp
       MATI[3]=@bdnbd@_YR@year@_PT_hour_8_alt_@alt@.trp
       MATI[4]=@bdnbd@_YR@year@_PT_hour_9_alt_@alt@.trp
       MATI[5]=@bdnbd@_YR@year@_PT_hour_15_alt_@alt@.trp
       MATI[6]=@bdnbd@_YR@year@_PT_hour_16_alt_@alt@.trp
       MATI[7]=@bdnbd@_YR@year@_PT_hour_17_alt_@alt@.trp
       MATI[8]=@bdnbd@_YR@year@_PT_hour_18_alt_@alt@.trp

FILEO MATO[1]=@bdnbd@_YR@year@_PT_AMPEAK_alt_@alt@.trp, mo=11-18, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME,
dec=8*5
FILEO MATO[2]=@bdnbd@_YR@year@_PT_PMPEAK_alt_@alt@.trp, mo=21-28, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME,
dec=8*5
FILEO MATO[3]=@bdnbd@_YR@year@_PT_DAILY_alt_@alt@.trp,  mo=31-38, name=NM,DA,2P,3P,TRN,SL,SOVTIME,HOVTIME,
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[11] = mi.2.1*sharepk[7] + mi.3.1*sharepk[8] + mi.4.1*sharepk[9]
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
```

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

mw[21] = mi.5.1*sharepk[15] + mi.6.1*sharepk[16] + mi.7.1*sharepk[17] + mi.8.1*sharepk[18]
mw[22] = mi.5.2*sharepk[15] + mi.6.2*sharepk[16] + mi.7.2*sharepk[17] + mi.8.2*sharepk[18]
mw[23] = mi.5.3*sharepk[15] + mi.6.3*sharepk[16] + mi.7.3*sharepk[17] + mi.8.3*sharepk[18]
mw[24] = mi.5.4*sharepk[15] + mi.6.4*sharepk[16] + mi.7.4*sharepk[17] + mi.8.4*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[31] = mi.1.1 + mw[11] + mw[21]
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[35] = mi.1.5 + mw[15] + mw[25]

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
```

Trip Length Frequency Distribution:

```
;;<<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

mw[10] = mw[3] + mw[4]                          ; share-ride
mw[20] = mw[1] + mw[2] + mw[3] + mw[4] + mw[5]   ; total person-trips

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
```