MEMORANDUM

Jason Carbee, AICP
Bill Troe, AICP
12120 Shamrock Plaza
Suite 300
Omaha, NE 68154
(402) 334-8181
(402) 334-1984 (Fax)

To: **Bill Austin, AICP**

Date: May 4, 2010

Subject: **Performance Review of Morgantown Model Conversion to TransCAD**

The purpose of this memorandum is to provide a summary of our performance review of the recently-converted Morgantown-Monongalia County Travel Model. The model was converted by Caliper Corporation from the QRS II modeling software package to TransCAD for its three main scenarios: 2000 baseline, 2030 existing-plus-committed (E+C) and 2030 recommended networks. The MPO intends to maintain the converted 2030 TransCAD model as an "interim" travel forecasting tool until next year when the model is updated and revalidated as a part of the LRTP update. Thus, the goal of this review was not to validate or calibrate the TransCAD travel model, but rather to review the level at which it is replicating the model performance within the QRS II software (which was validated in 2006).

APPROACH

URS staff reviewed the converted TransCAD model input and output files beginning in February 2010, providing Caliper Corporation with suggested revisions to model parameters and attributes, then testing those changes and evaluating the model output. Over the next several weeks, TransCAD model performance was brought more in-line with the previously-validated QRS II model.

There were four different methods by which the conversion was evaluated. Two of these evaluation methods relied on a GIS database that compared the QRS II daily model traffic assignments and TransCAD daily traffic model assignments on a link-by-link basis for the 2030 Existing-plus-Committed scenario. There was no method to automatically link the QRS II and TransCAD model networks due to how they were created. To provide a comprehensive comparison of the two models, URS staff entered the QRS II daily traffic assignments into the GIS-based TransCAD network database for the 2030 E+C scenario. The performance of the 2030 E+C scenario is the most relevant scenario for this interim TransCAD model, as it is the likely model baseline for any network alternatives scenarios that would need to be run over the next year. The link-by-link comparison database allowed us to complete a goodness of fit comparison between the TransCAD and QRS II networks.

The two other methods for evaluating the conversion performance were to compare trip length distributions (in terms of travel time) by trip purpose, and to compare traffic volume assignments

across seven regional screenlines from across the study area were also established.

RESULTS

The overview of the converted model's performance relies on some basic comparison statistics, and a visual comparison of QRS II and TransCAD volumes. For the visual inspection, we will rely on your feedback on the volume plot file comparisons and shapefiles that we provided you on April 14, 2010. There are no published guidelines / metrics for how well a travel model conversion should perform. Thus, our comparisons relied on typical travel model validation checks and targets, which compare model performance to observed traffic data, as a starting point for statistical fit. The results of these evaluations are provided in the following bullets.

- *Screenline comparison*: Screenlines were established in seven locations across the study area. Table 1 displays the comparison of the TransCAD and QRS II travel model assignments for the screenlines (illustrated in Figure 1). As shown in Table 1, all of the screenlines have less than 10 percent deviation between the TransCAD and QRS II daily traffic model assignments. Typical model validation target (when validating models against observed traffic data) for screenlines is to have a 10 percent or less deviation, which the conversion has achieved.
- *Comparison of Trip Length Distributions*: Figures 2 through 5 show the model output for the QRS II and converted TransCAD models. The figures reflect the frequency of trips by trip (time) length for home-based-work, home-based non-work, home-based university and non-home-based trips. As shown in the Figures, there are some minor differences, but nothing substantial, in the distribution of trip lengths between the two.
- *Goodness of Fit*: the coefficient of determination (r^2), used to compare the goodness of fit between the TransCAD model assigned daily traffic volumes and the QRS II model assigned daily traffic volumes. Typical validation targets (*Model Validation and Reasonableness Checking Manual*, Travel Model Improvement Program, 1997) suggest that the r^2 for all comparison links should be at least 0.88. The r^2 comparison of TransCAD and QRS II model assignments exceeds the guidance at nearly 0.98.
- *Percent Root Mean Square Error*: An additional conversion performance review that we used was a percent root mean square error (%RMSE) evaluation. The %RMSE is a calculation that evaluates the overall level of error between the QRS II and TransCAD model assignments for links that have observed traffic counts. Typical %RMSE targets for regional model validations range between 30 and 40. The calculated %RMSE for the TransCAD converted model assignments compared to the QRS II model assignments was 16.0, well within general deviation limits for model validation.

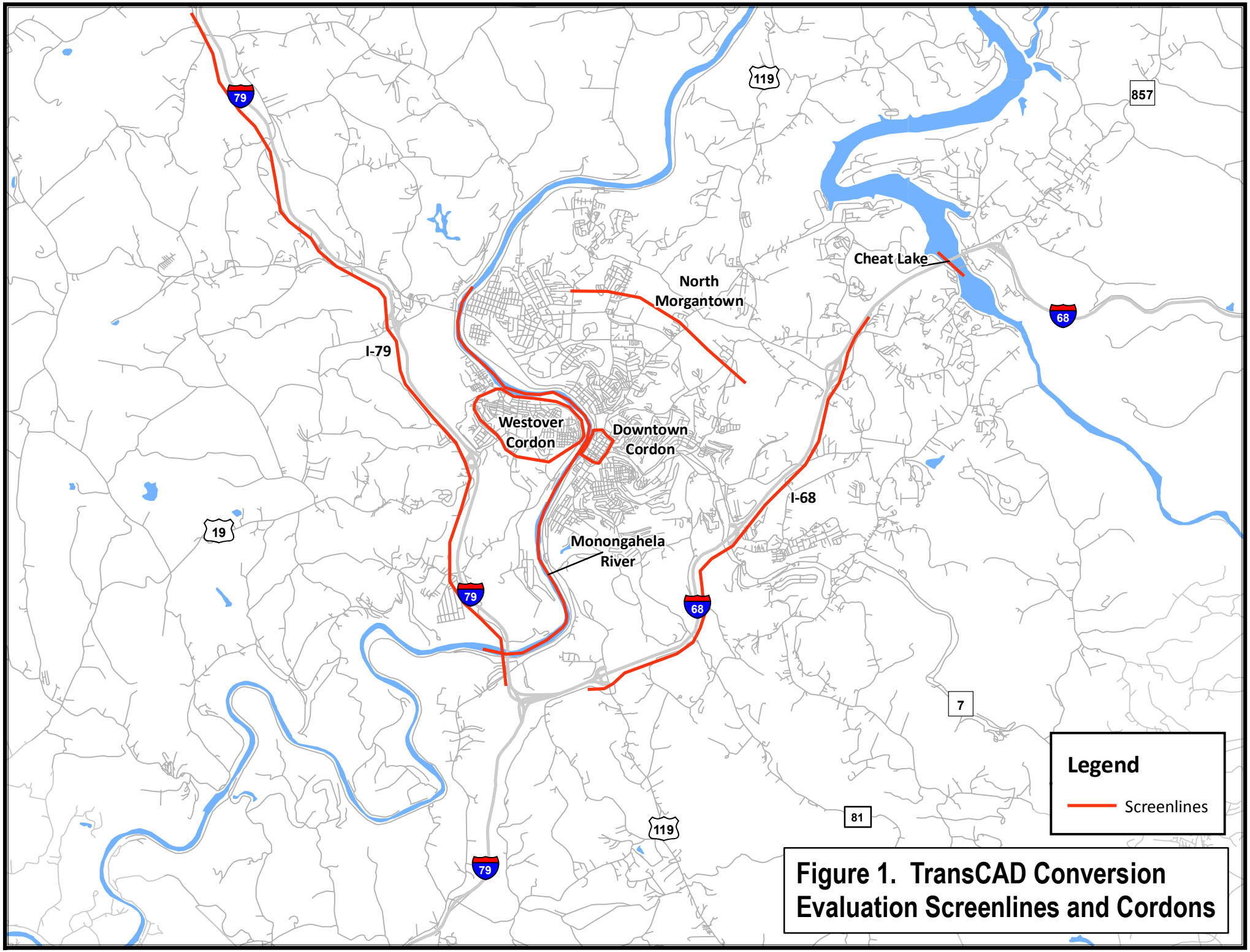


Figure 1. TransCAD Conversion Evaluation Screenlines and Cordons

Table 1. Screenline Comparison of Converted TransCAD Daily Traffic Assignments to QRS II Daily Traffic Assignments by Scenario

	2000 Base Scenario				2030 E+C Scenario				2030 Recommended Scenario			
Screenline	**QRS II Assigned Traffic**	**TransCAD Assigned Traffic**	**Traffic Volume Deviation**	**Percentage Deviation**	**QRS II Assigned Traffic**	**TransCAD Assigned Traffic**	**Traffic Volume Deviation**	**Percentage Deviation**	**QRS II Assigned Traffic**	**TransCAD Assigned Traffic**	**Traffic Volume Deviation**	**Percentage Deviation**
Monongahela River	72,071	71,768	-303	-0.42%	130,799	128,466	-2,333	-1.78%	127,730	126,080	-1,650	-1.29%
Downtown Morgantown Cordon	109,696	113,994	4,298	3.92%	131,553	142,023	10,470	7.96%	133,588	143,603	10,015	7.50%
Westover Cordon	47,704	49,573	1,869	3.92%	63,188	62,026	-1,162	-1.84%	64,418	62,828	-1,590	-2.47%
I-79	34,127	34,321	194	0.57%	50,070	52,217	2,147	4.29%	46,834	50,027	3,193	6.82%
I-68	42,520	41,207	-1,313	-3.09%	65,330	67,215	1,885	2.89%	65,614	67,454	1,840	2.80%
Cheat Lake	26,258	24,406	-1,852	-7.05%	62,862	61,312	-1,550	-2.47%	63,537	61,288	-2,249	-3.54%
North Morgantown	51,900	50,867	-1,033	-1.99%	65,816	66,175	359	0.55%	78,791	71,398	-7,393	-9.38%

Figure 2. HBW Trip Length Distribution Comparison

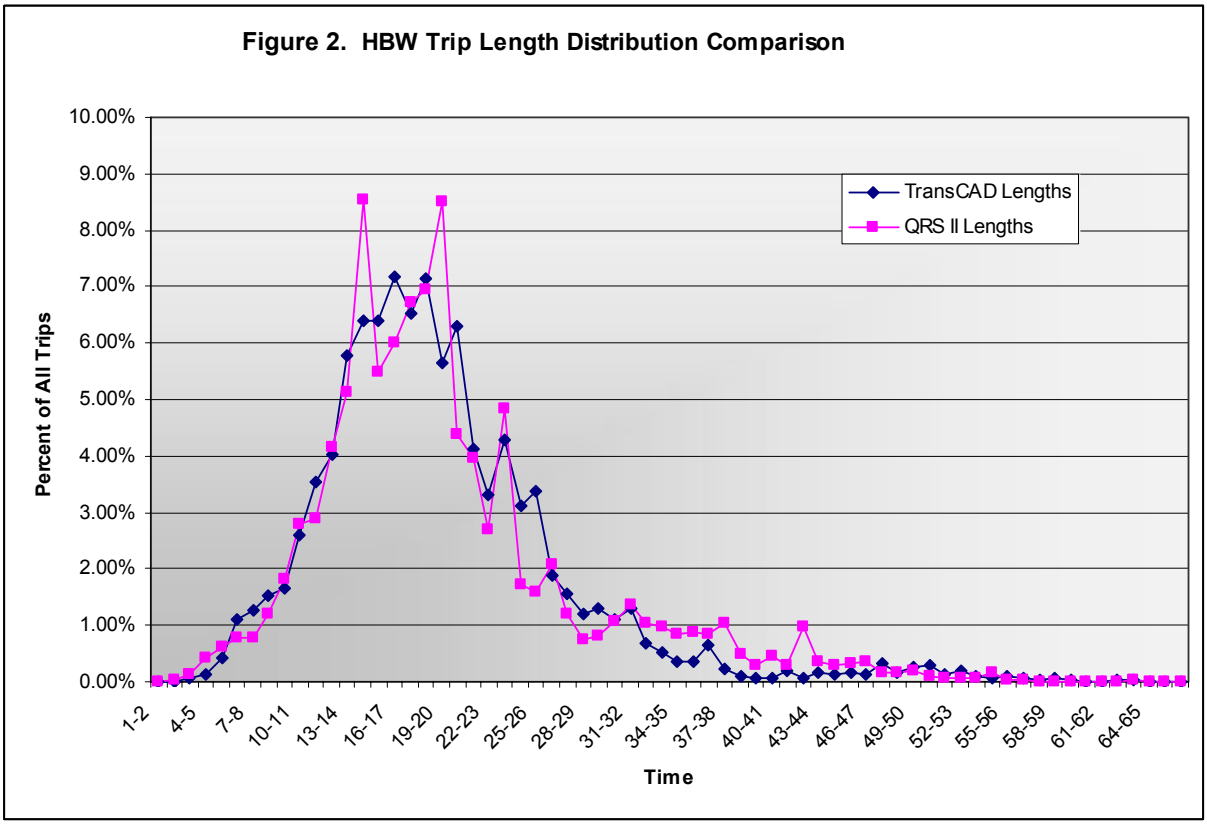


Figure 3. HBNW Trip Length Distribution Comparison

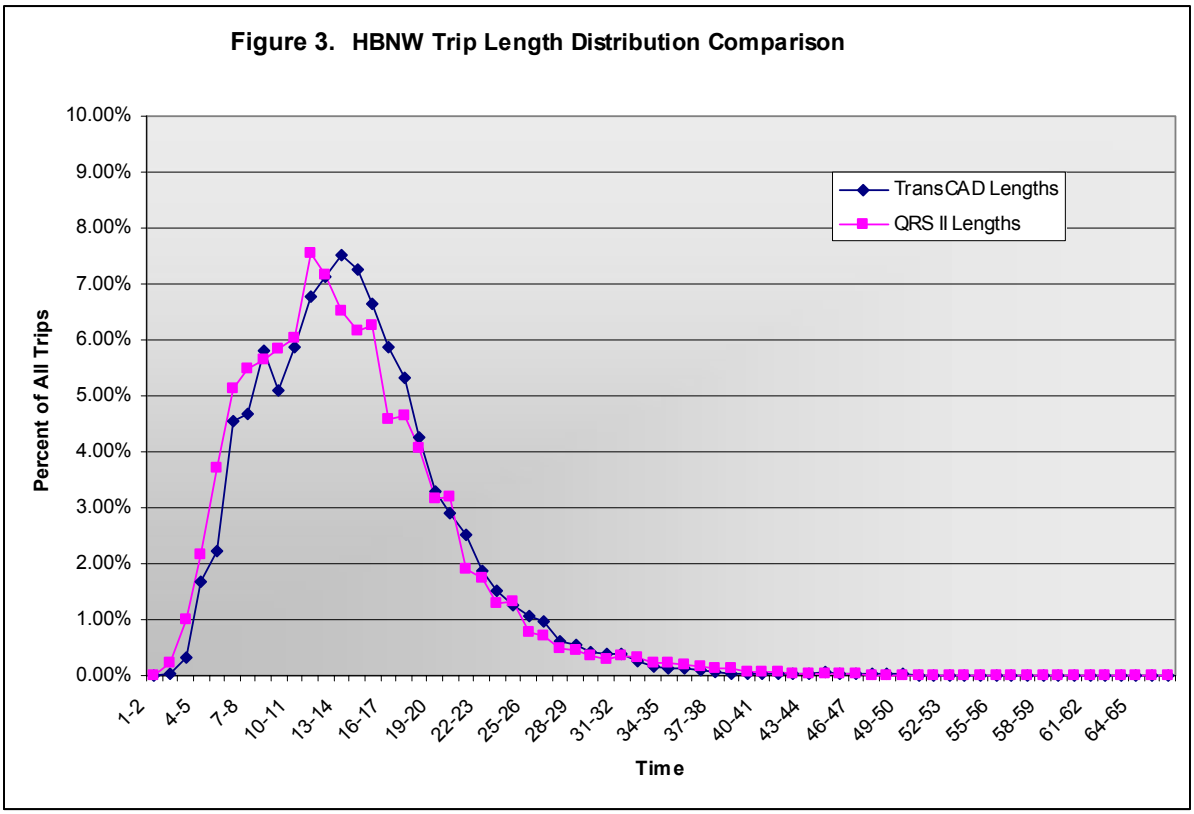


Figure 4. HBU Trip Length Distribution Comparison

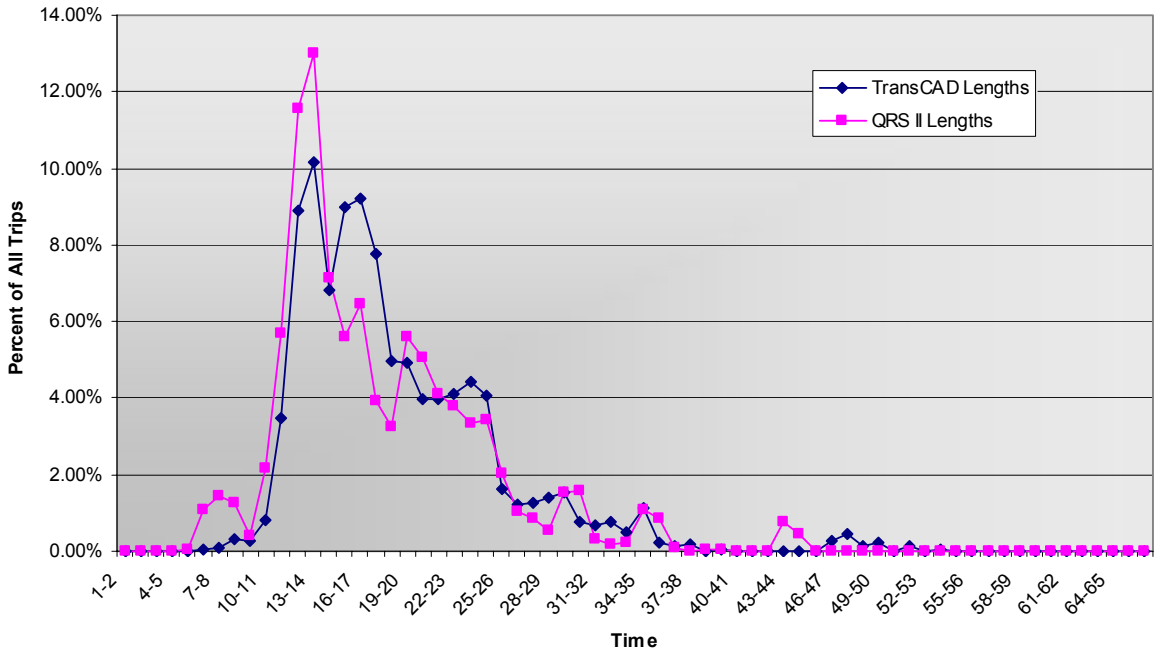
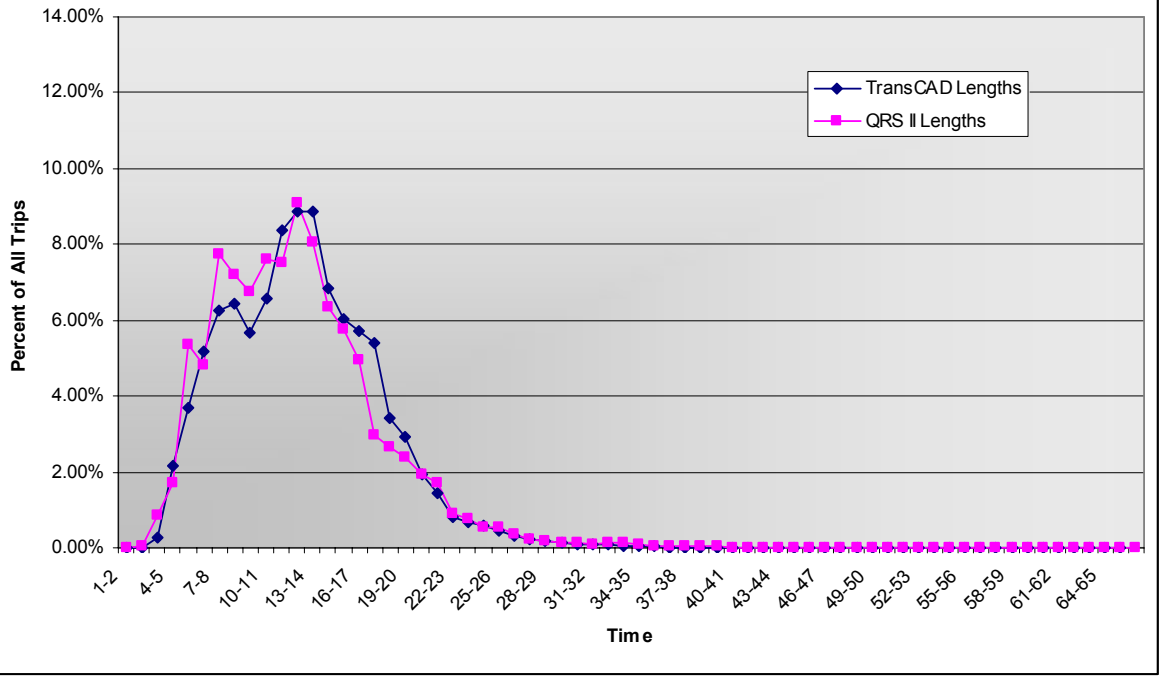


Figure 5. NHB Trip Length Distribution Comparison



VISUAL COMPARISON OF VOLUMES

We reviewed the same plots we sent you on April 14, and looked at the major corridors in the metropolitan area to identify model performance. In this visual review we found three primary corridors where we noted the most significant differences in the TransCAD and QRS II model assignments, where the TransCAD and QRS II volumes deviate by approximately 20 to 25 percent:

- WV 7 northeast of I-79
- US 119 north of I-68
- WV 705 northwest of I-68

An explanation for this difference is that the ramp lengths are modeled for a more simplified, shorter distance in the QRS II model at these interchanges, and ramps in the TransCAD and QRS II models are given lower speeds. Thus, the TransCAD model is providing some additional impedance at these interchanges relative to the QRS II model, and that seems to affect the assignments adjacent to the Interstate in these corridors. It is recommended that we keep these individual corridors in mind as we develop forecasts with this interim model, and focus on the *relative* traffic difference between model scenarios when applying the interim model here.

SUMMARY

Based on our review of the original QRS II model and the converted TransCAD model, it is our opinion that the converted TransCAD model is performing well relative to the validated QRS II model. As noted above, there are still some of locations that do not replicate the QRS II model perfectly, and we believe that when the interim 2030 TransCAD model is used over the next year we need to keep these locations in mind as the model is applied. When the interim model is applied, the analyst should focus on the relative change in model-assigned traffic volumes between scenarios. As Paul Ricotta noted when he provided the converted TransCAD, the TransCAD network was constructed based on available GIS mapping, and the QRS II model was not, so some deviation between the two models is expected.

In addition to the differences in network construction, the software platforms have a few different operational approaches to demand modeling. Thus, we would recommend that the next model update take a fresh look at model parameters when validating the TransCAD model for the first time.

As Jason mentioned in his e-mail last month, let us know what you think about the performance of the TransCAD model. Paul Ricotta can provide you with the latest TransCAD model files when you are ready for them. Through this model conversion review, we feel that we have a good understanding of the converted TransCAD model, and would like to be able to assist you with any forecasting efforts you might have.

If there are any questions about this, please give Jason a call at (402) 952-2506.