TransModeler Training
4- Matrix Estimation

presented to

Caltrans, District 1-Eureka

presented by

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Think Forward

July 2018

Preparation

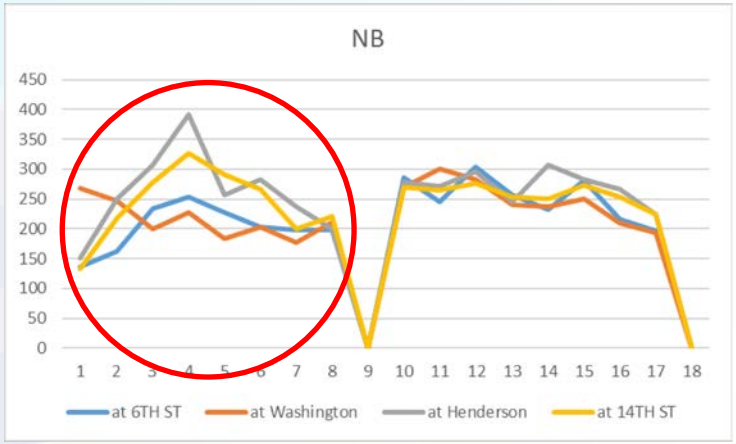
- Edited network, deleted some centroids, modified some centroid connectors, added missing lane connectors, such as left turns.
- Made sure there is a one-to one association between network centroids and matrix rows (with lookup table, found centroids that didnt have corresponding row in the matrix, and found rows in the matrix that didn't have corresponding centroid in the network)
- Edited the turning movement count table, some "ToLink", "From Link" and "Node" had to be modified because the network was modified and link and node numbers were changed.
- During modification of the turning movement table, I noticed some errors in the turning movement data. (refer to notes)

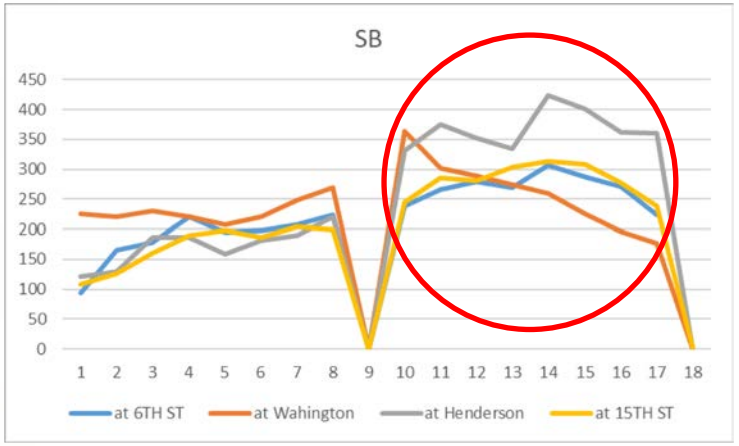
Initial demand profiling

- Initial seed matrix from TransCAD is for 2-hour peak period, and needs to be distributed over 15-minute period.
- The simplest approach is to divide the trips equally into 8 slices. But is better to slice the demand based on data, if available.
- It is hard to judge the directionality on Broadway by time of day. A permanent count station on Broadway south of Harris st showed that in AM, NB has higher traffic and SB has lower traffic. So we decided to slice the AM demand based on counts on NB, and profile the PM demand based on counts on SB.

Matrix and link count profiling

- SB through and NB through movements from intersection counts were used for demand slicing. Three locations were used: Broward intersection with 6th st, 14th st, and Henderson st.





- At 10 locations, hourly hose data was available, which was sliced into 15-minute counts by interpolation.

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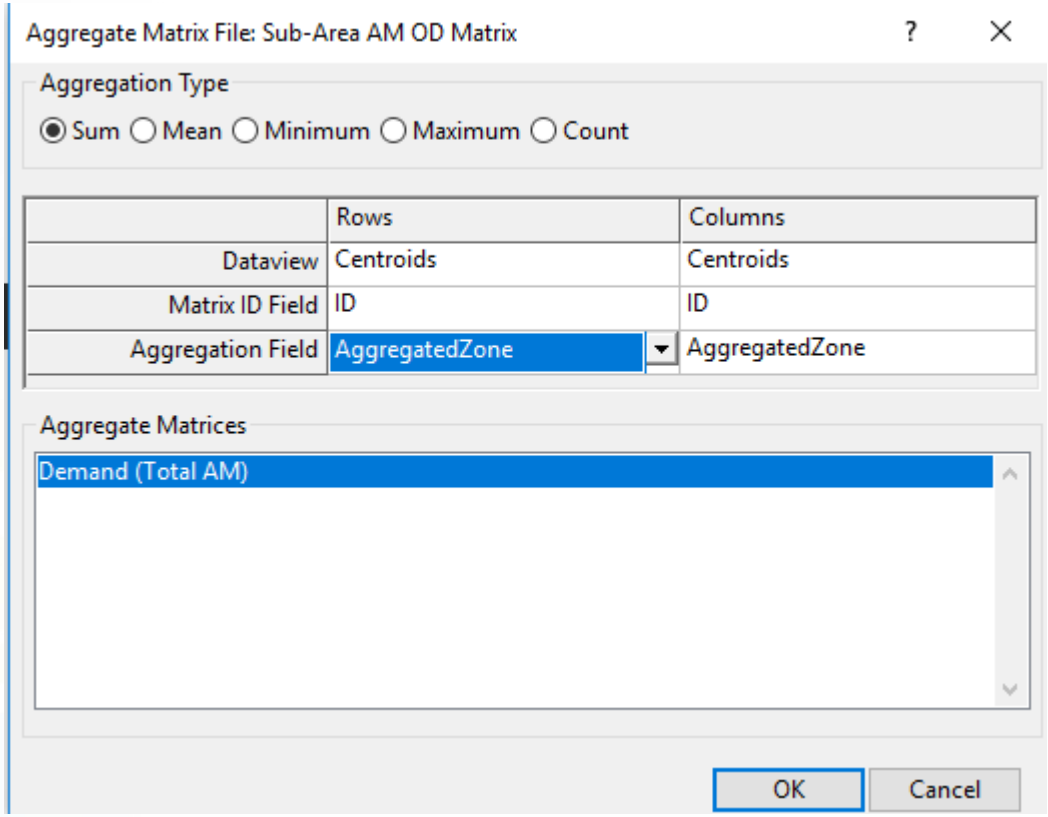
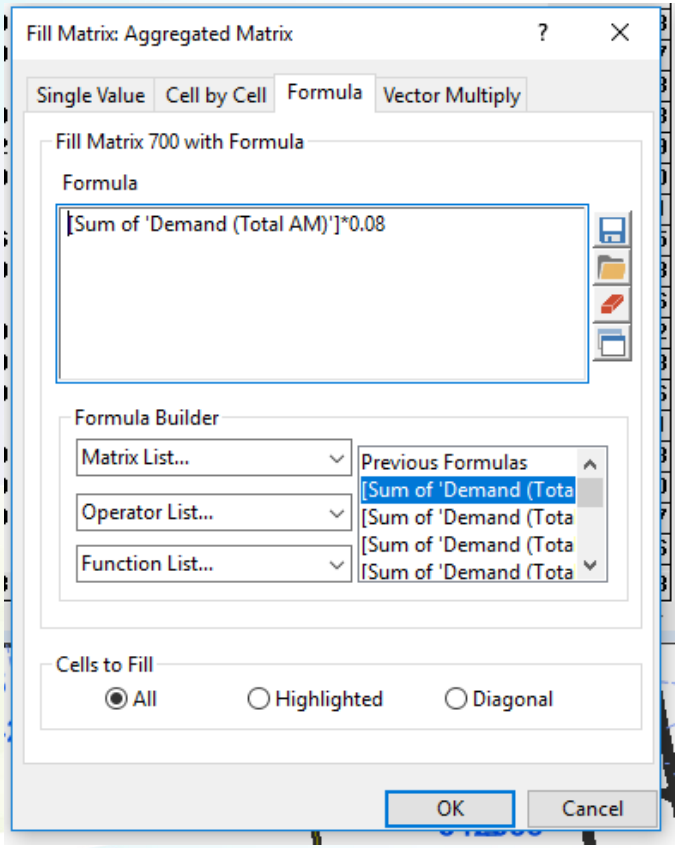
Matrix Aggregation

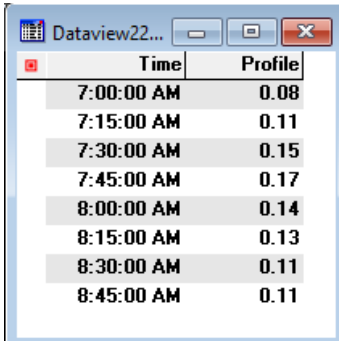
- After Network editing and assuring each row in the matrix is associated with a centroid in the network, 262*262 matrices were produced for AM and PM, were reduced to 250*250 matrices.



Creating 15-minute Trip Tables

- The aggregated matrices for AM and PM were each converted to 8 matrices, containing 15-minute demand.





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Validating Turning Movement and Link Counts

- You can create link volume based on turning movements.
- Demand→ Turning Movement Volumes→ Aggregate Turning Volumes by Link
- AB_Exiting and AB_Entering are expected to be similar. If they are not, upstream and downstream intersection counts should be reviewed. Also, the reason for discrepancy may be a minor road or driveway that has not been modeled, but attracts or generates significant number of trips. Modifying centroid connector can be helpful in this case.

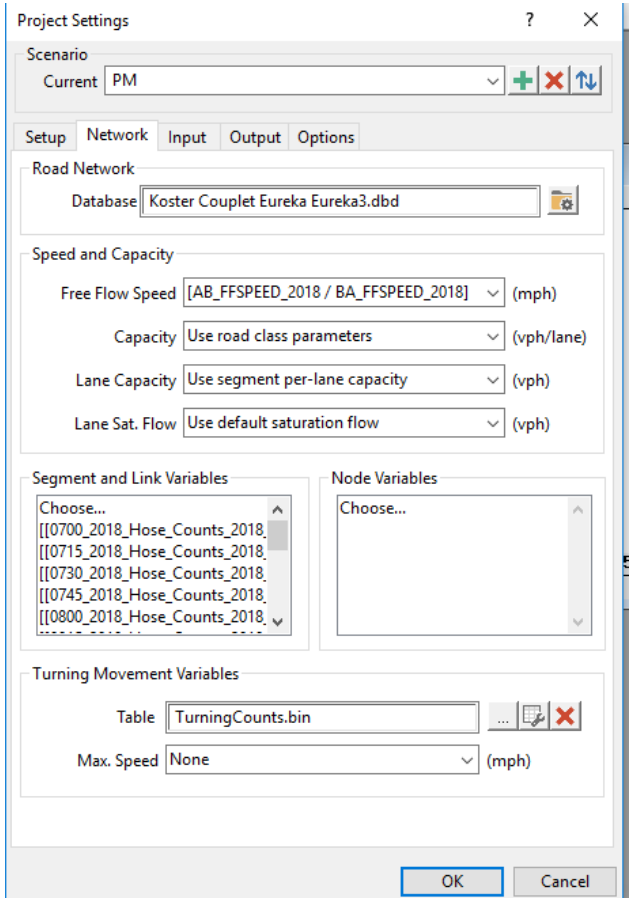
LinkVolFromTMC_700.ID	AB_Exiting	BA_Exiting	AB_Entering	BA_Entering	AB_Average	BA_Average
4951	333	--	283	--	308	--
7616	260	--	--	276	260	276
7977	212	--	--	358	212	358
4627	210	--	--	--	210	--
4516	205	--	235	--	220	--
4904	192	--	28	--	110	--
8023	162	--	--	--	162	--
5084	160	--	454	--	307	--
3788	159	--	--	--	159	--

Validate Turning Movement and Link Counts

- TransModeler doesn't report turning movement after static ODME, it only reports link volume.
- We need to evaluate goodness of fit BEFORE running the simulation.
- We can assume the link volume that we generated from turning movements (previous slide) is link count, and then compare the link volume output from ODME vs this volume.
- I used default capacity (link user class), free flow time (link user class), alpha (0.15) and beta (4)

Demand – Matrix Estimation

- Make sure segment-coded counts and weight (shows count reliability or importance) are defined in Project Settings→ Network→ Segment Variables
- Open the matrix that you want to perform ODME on it
- Demand→ OD Matrices→ OD Matrix Estimation
- You need to separately run ODME for 8 matrices in AM and 8 matrices in PM



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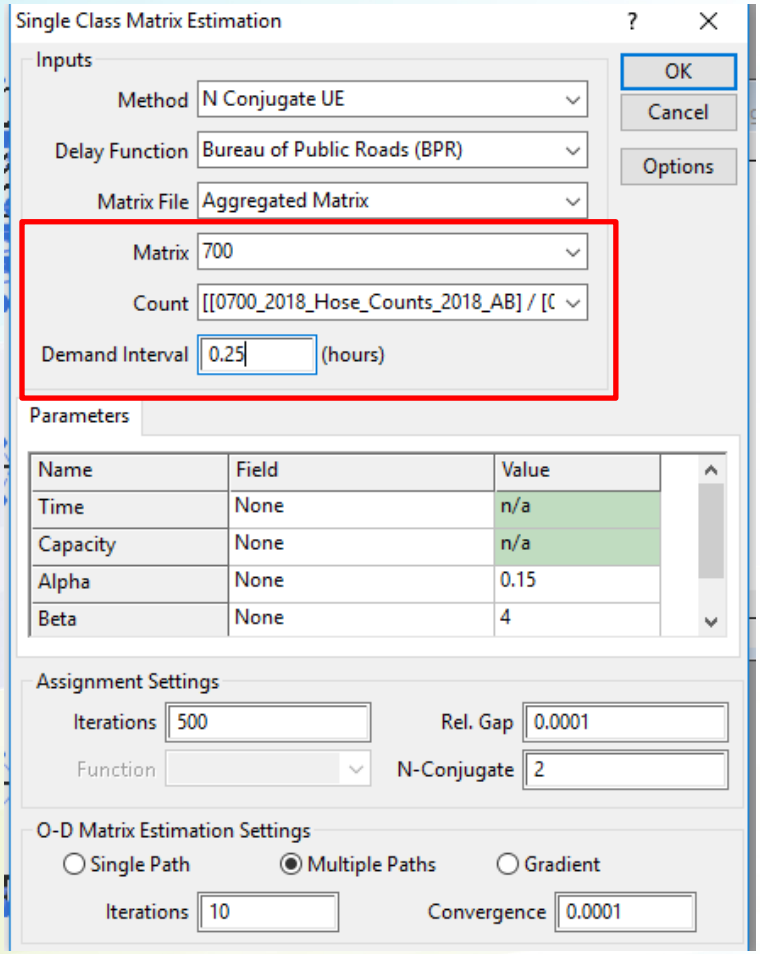
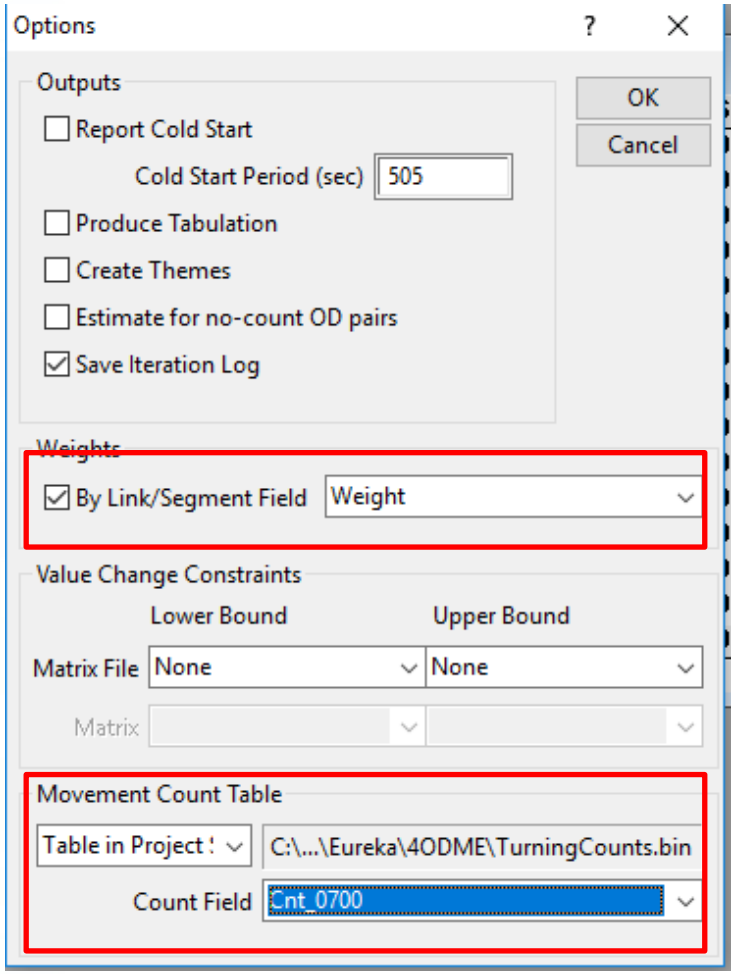
Demand – Matrix Estimation





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Evaluation, Manual Adjustment

- How well our counts are replicated? Start with most important locations or locations with the highest discrepancy
- Are the major routes being used as we expected? If not, check network connectivity, link class, free flow speed. Output tools such as desired lines, trip browser, critical path, etc can be very helpful to identify the problem, however, they are only available after simulation run (not after the ODME)
- Modifying count weight may help to put more emphasis on correctly replicate more important counts.

Evaluation, Manual Adjustment

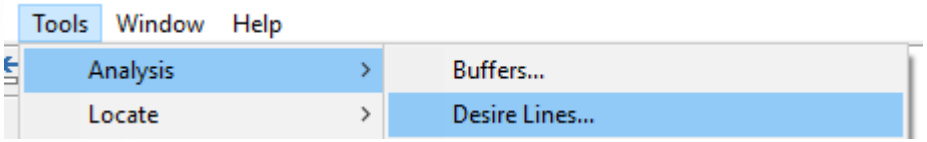
- Check absolute or relative change in each matrix cell before/ after ODME create a matrix of difference between matrices before and after ODME, and observe the highest values in 3d matrix
- No jump between each OD pair value is justifiable between successive 15-minute intervals)
- Use constrain matrices to control deviation from the seed matrix. We may constrain the OD pairs that have low initial values, or we have high confidence about their initial values and we don't want to change it during ODME
- Controlling the total trips. If reliable counts are available on links that are origins or destinations, it means that the trip ends are reliable and shouldn't change during ODME. If they do, we can force the initial values through Fratar)

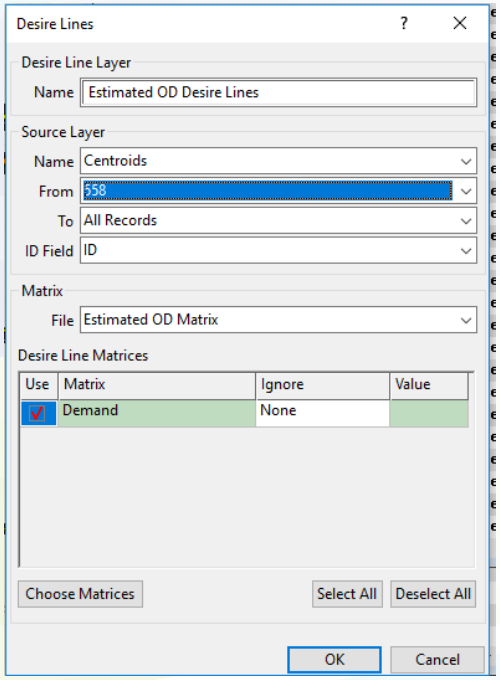
Evaluation, Manual Adjustment

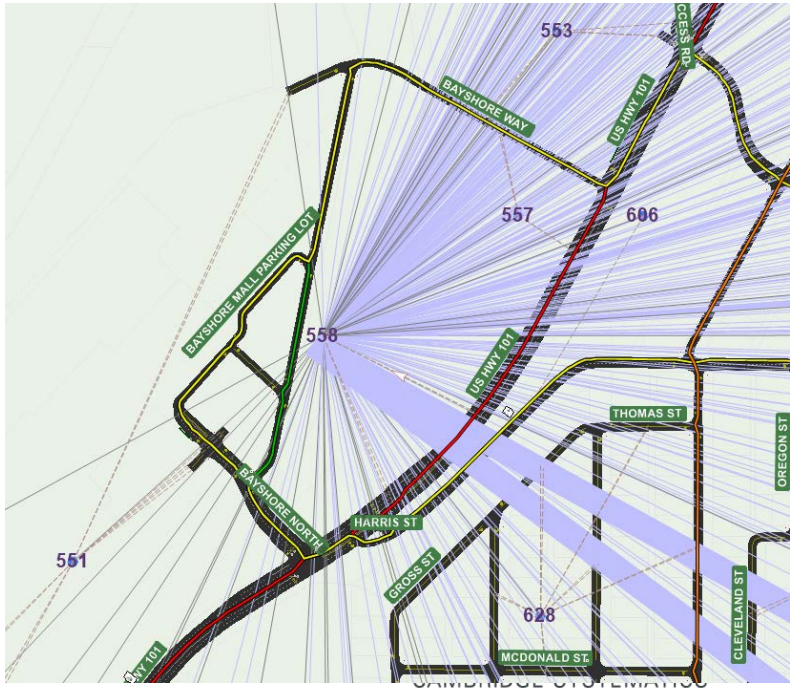
- TransModeler's Desire Line tool may help to visualize how trips are distributed from a zone or to a zone. It may help to see how reasonable the estimated trips are, and to visualize the difference between before/after ODME
- Critical Tool is a great way to evaluate and manually adjust the trip tables.

Desire Line

- Set the layer to node or centroid
- Open the trip table
- Tools→ Analysis→ Desire Lines

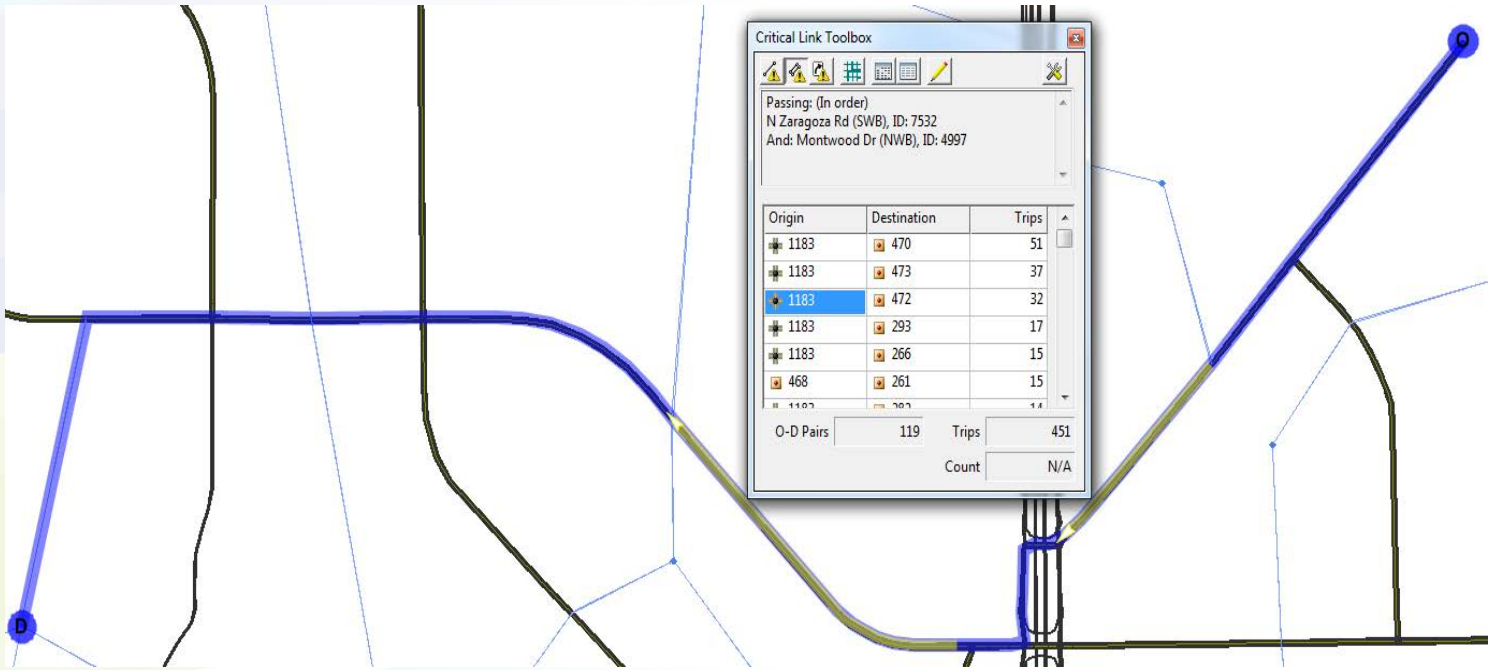






Critical Link Toolbox

- Demand→ Critical Link Tools
  This is a very powerful feature, acts similar to Select Link Analysis (SLA) in TransCAD. It gives the list of trips that passed through one link, 2 links, or made a turn. If the associated trip table is open, you can click on any OD, and edit the associated cell in the trip table.



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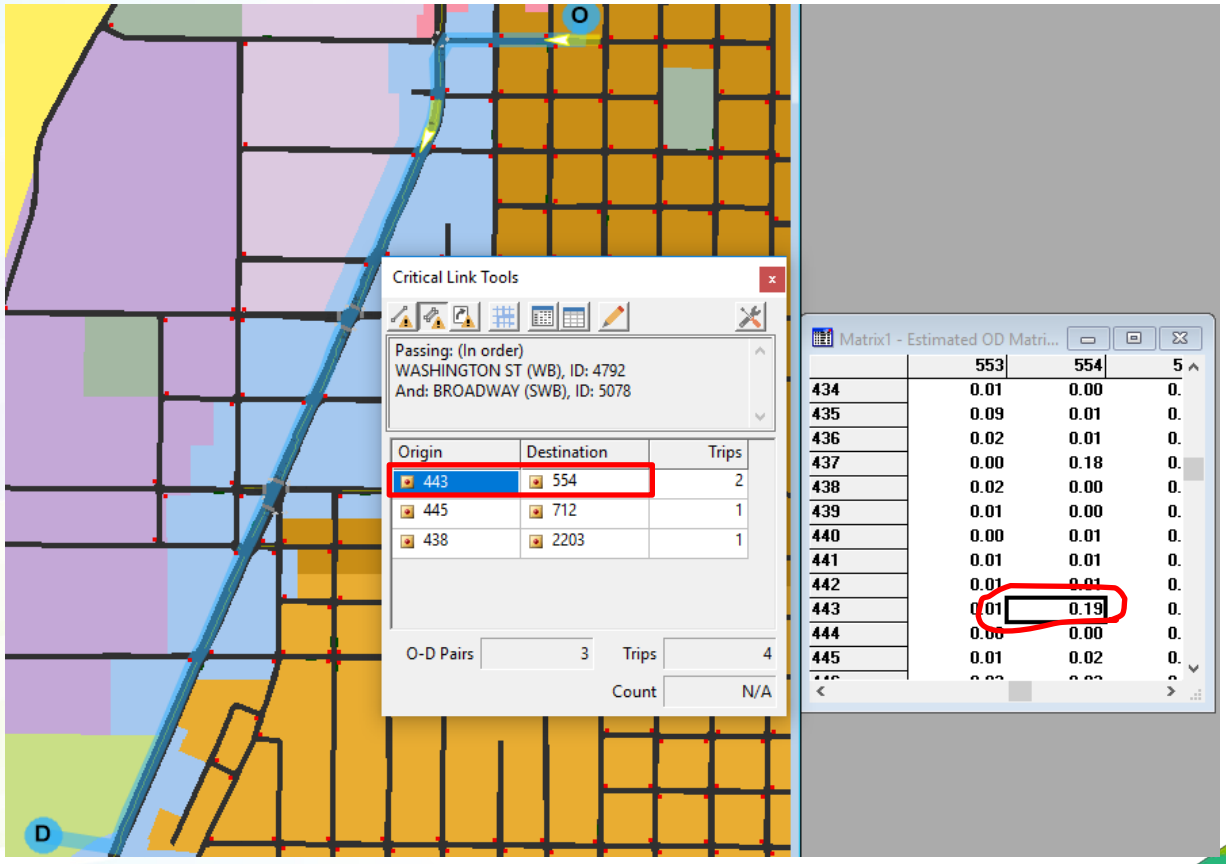
Critical Link Toolbox

- Editing a cell in the trip table (have the desired trip table open):



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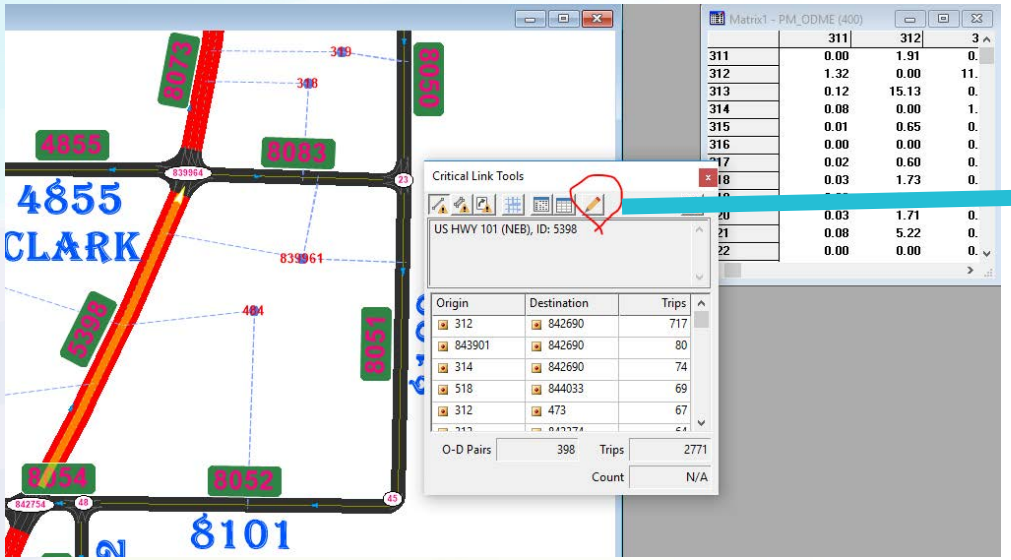
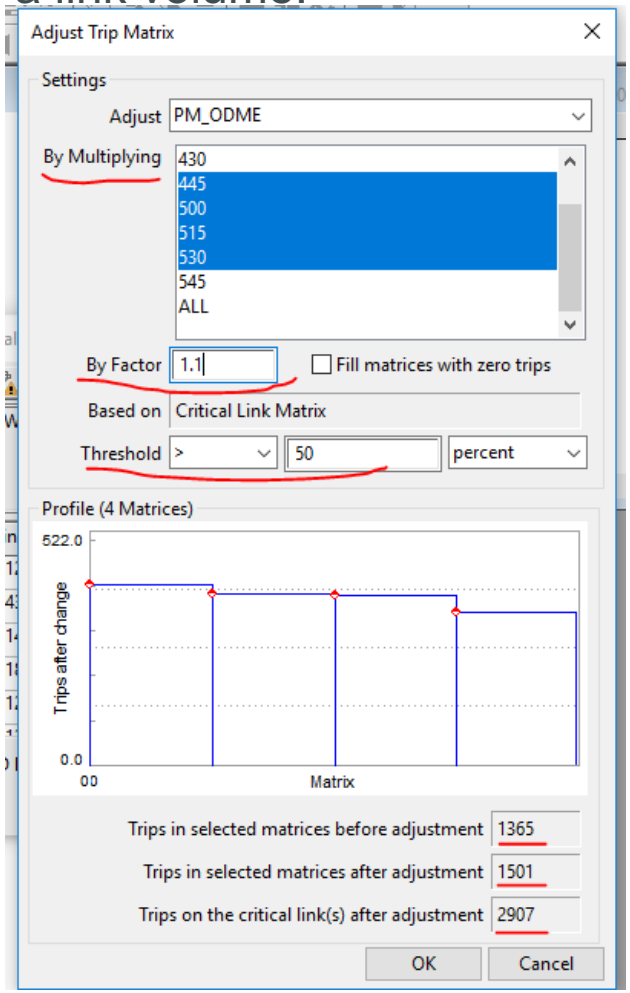
Critical Link Toolbox

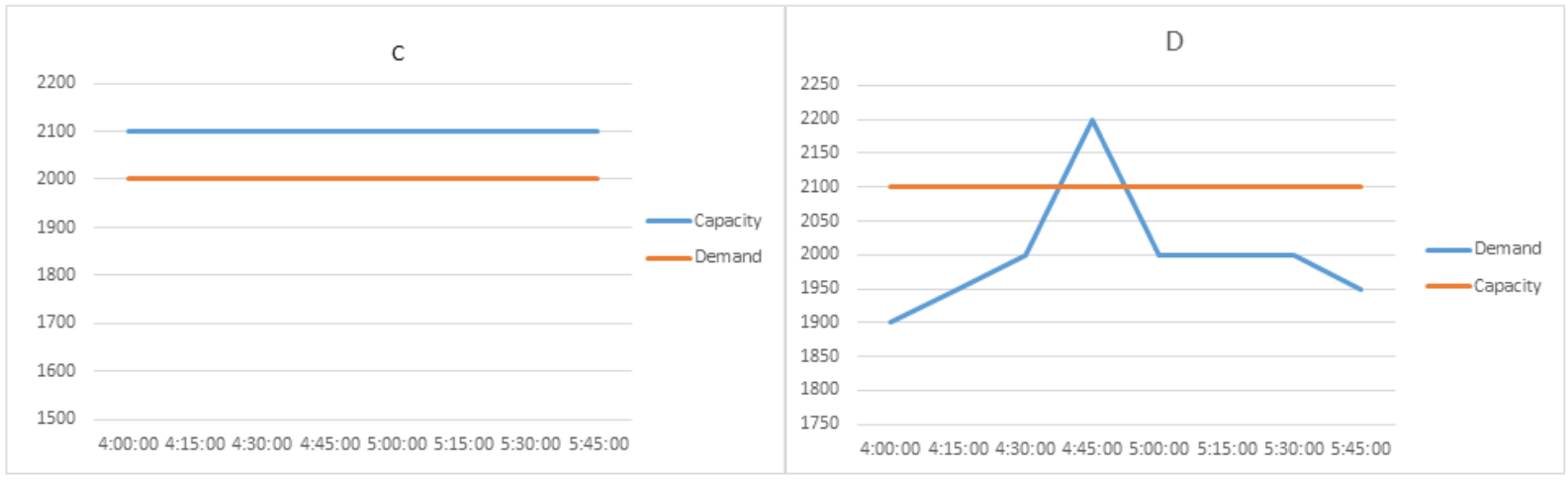
- Editing trip table(s) based on percent contribution to a link volume:





Importance of Slicing the Demand (and counts)

If demand exceed capacity even for a short period of time, queue forms, the smooth driving behavior will become stop and go, the capacity of the road drops and the difference between demand and capacity increases even more.

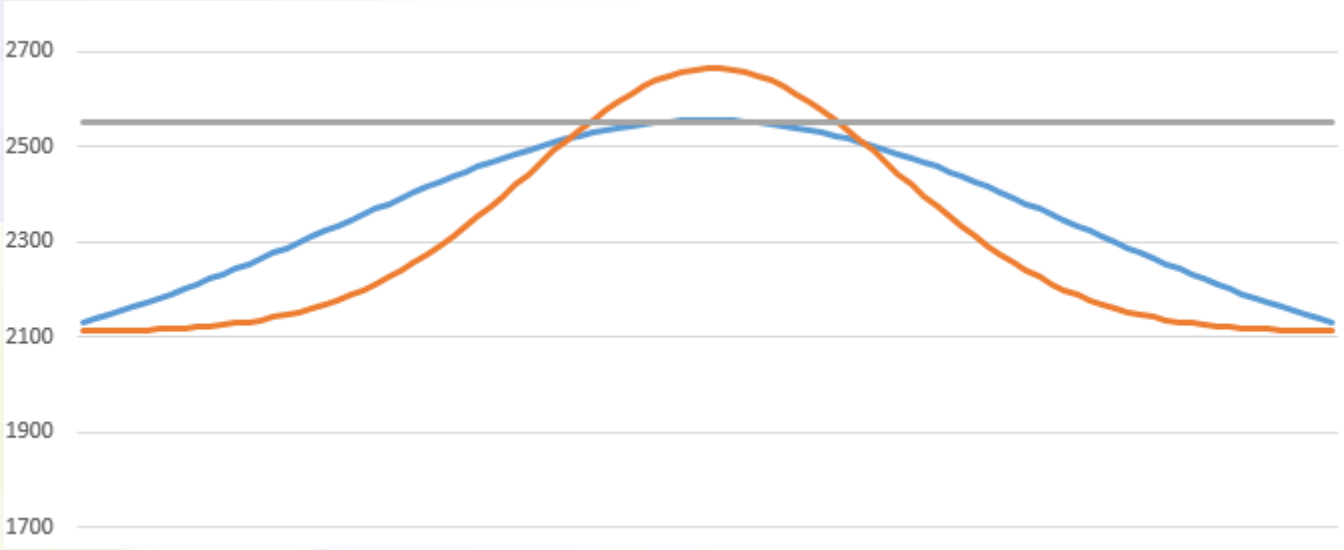


under demand pattern C, network performs at LOS of E, but performs at LOS of F under demand pattern D. In both cases, during 2 hours, the demand is 4,000 vehicle. But for one 15-minute interval in case D, the demand is greater than the capacity and delay significantly increases compare to demand pattern C.

Peak Spreading

The term peak spreading refers to the process of reducing the proportion of traffic demand in the most severely congested, or critical part of the peak period with corresponding increases in demand at time periods immediately before and after the critical peak.

It is a demand management strategy. Dynamic pricing tries to encourage the drivers to change their departure time to avoid high toll at the most congested period.



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Demand Settings

- Separate calculated 15-minute matrices after ODME need to be unified in a single .mtx file (Matrix→ Append) and be defined as Project Input
- Demand→ OD Matrix → Trip Matrix settings