

CEE 123 Transport Systems 3: Planning & Forecasting

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The Miasma Beach Transportation Model

Task 5. DEMAND FORECASTING: TRIP ASSIGNMENT

The last task applied a trip distribution model to obtain trip tables for the three trip purposes of the generation models. Subsequent trip table adjustments included PA to OD conversion, factoring by time-of-day, and conversion of person to vehicle trips for highway assignment. In this task, interactions with the external area are introduced and the base year highway network is loaded.

5.1 External Station Trip Interchanges

All demand analysis completed thus far has pertained to the internal zones (TAZs) only. The Miasma Beach network contains two external zones (zones 7 and 8) which serve as control points for interaction across the study boundary. The modeling of external trips (trips crossing the boundary) has been completed based on O/D and Cordon Surveys. The results indicate: (a) a significant number of trips between the external stations; (b) significant interactions between external stations and internal zones (made by both residents and non-residents); (c) internal trips made by non-residents; and (d) internal trips made by trucks, taxis, and other non-personal vehicles. These trips, identified in Table 8, correspond to total 1-hour **PM-peak hour (5-6 PM)** vehicle trips in O/D format.

Append External Station Trip Interchanges

Open the OD Matrix (o-dfinal.mtx). **Add** the external trips (see Table 8) to your O-D matrix. These external trips represent all trip purposes combined. **Report** this final O-D matrix.

Table 8. 2020 External O-D Table (1-hour PM peak vehicle trips)*

ORIG\DEST	1	2	3	4	5	6	7	8
1	10	25	25	25	0	0	50	100
2	25	10	10	10	0	0	50	100
3	25	10	10	50	0	0	50	50
4	25	10	50	10	0	0	100	200
5	0	0	0	0	0	0	50	50
6	0	0	0	0	0	0	100	100
7	0	0	50	0	50	100	0	1000
8	50	50	50	0	0	0	1100	0

* For 1-hour PM peak hour (5-6 pm) (combined trip purposes)

5.2 User Equilibrium Assignment

Assign the base O-D matrix to the network via User Equilibrium Assignment (UE). This matrix now reflects internal vehicle trips generated, distributed, and factored in prior model steps, as well as IE, EI, and EE trips appended in Task 5.1, producing the full **PM-peak hour (5-6 PM)** vehicle trip O-D matrix. **Report** this final matrix.

5.2.1 Perform Trip Assignment

Determine the User Equilibrium (UE) solution using iterative trip assignment. The default method is the N-Conjugate Modification of the Frank-Wolfe (FW) algorithm, which starts with an initial All-or-Nothing (AON) Assignment using initial minimum path skim trees. The solution procedure iteratively applies: (a) link

performance functions (to update link travel times), (b) a minimum path algorithm (to update network paths), and (c) an All-or-Nothing (A-o-N) Assignment (to compute a new assignment). A line search using the current AoN loadings and the prior assignment is used to determine the weight by which to combine these two sets of link flows into a new solution for the next iteration. While a variety of convergence indices can be applied, use Relative Gap (RG). The default RG is 0.01 but you should evaluate the results using a 0.001 RG value.

Discuss the convergence process.

Assign the final **PM-peak** hour (5-6 PM) vehicle-trip O-D matrix to the base Miasma Beach highway network using **User Equilibrium Assignment**.

HELP: Executing UE Trip Assignment

If assistance is needed in executing trip assignment, then [Click HERE](#).

5.2.2 Evaluating the Assignment Results

Trip Assignment provides the flows (volume and travel time) for each direction of a link. A link's A-node and B-node must be identified to distinguish between AB_Flow and BA_Flow. This node information should be associated with each link in the **Highways/Streets** layer.

HELP: Appending Direction Information to Links

Open the **Highways/Streets** layer and Click on the [New Dataview] button to open its dataview table. Go to **Dataview / Formula Fields**. Click Node Fields to display the Node Formula Fields dialog box. Select ID under node fields and "From and To" under Options; click OK. The "to" and "from" nodes should appear in the dataview. Save the joined dataview of Highways/Streets + TASSIGN as *baseasgn.dvw*.

The *tcw_rep.txt* contains summary information on the assignment, including the Total VHT (Vehicle-Hours-Traveled) and Total VMT (Vehicle-Miles-Traveled) that are important performance measures for the Highways/Streets network. Save this file *tcw_rep.txt* to the work directory. In each required report, **include** these trip assignment outputs. Theme maps should also be created to graphically display network flows and to identify congested links.

HELP: Displaying Theme Maps

If assistance is needed in creating and displaying theme maps, then [Click HERE](#).

5.2.3 Report the Assignment Results

Report and **discuss** the assignment results, including appropriate network maps, tables, and summary statistics.

- a. **Tabulate** link volumes, resultant travel times, and volume/capacity (V/C) ratios
[as always, **sort** by facility type]
- b. **Plot** link volumes, resultant travel times, and V/C ratios
[optionally, color-code V/C ratio ranges]
- c. **Tabulate** network summary statistics (e.g., VMT, VHT, average speeds)
- d. **Discuss** model convergence (relative gap, number of iterations, etc.)

5.3 Validation of Network Performance

Compare your base assignment with the observed network flow pattern displayed in **Figure 5** (volumes in vph). There are several levels at which model validation should be assessed:

1. System-level Measures

System-level measures include outputs such as total vehicle miles traveled (VMT), total vehicle hours

traveled (VHT), average travel time or average speed, etc. Travel time and speed results can be presented by link-types, mode-types, or even for selected O-D pairs. These measures begin to get at impacts on overall network delay (e.g., changes in travel time, changes in average speed, or estimated versus free flow travel times, on a link-type or network level). Also, summaries of total, interzonal, and intrazonal trips can be provided, by purpose, mode, and time-of-day.

2. Corridor-level Measures

Screenlines provide a validation of overall travel in the study area. Application of screenlines in key corridor locations provides an assessment the ability of the model to replicate aggregate flows. Total observed flows across screen lines in both directions are compared with corresponding volumes estimated by the model system. It is still necessary to assess the overall performance of the network with system-level measures.

3. Link-level Measures

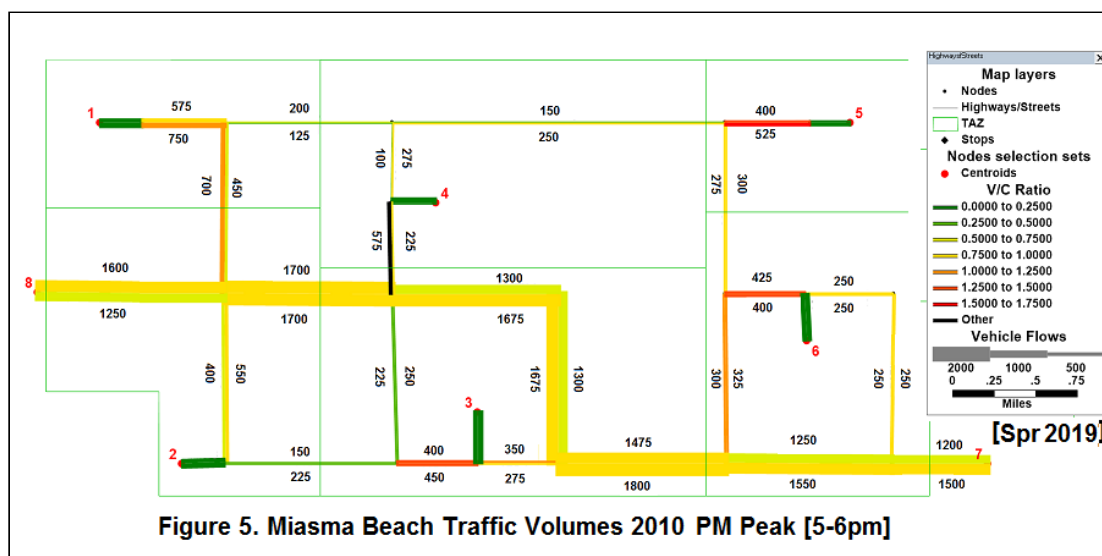
These measure are developed for selected sets of links or link-types (e.g., all links in a specific area, all arterial links). Measure involve speed and travel time results, as well as volume capacity ratios. Theme maps can display links with travel times, speeds, or VC ratios over certain thresholds. Intersection turning movement can also be estimated (these estimates in turn can be used to assess intersection performance using Highway Capacity Manual techniques and/or software). Turning movement analysis may be done for selected intersections. ***These Link-level Measures are optional for Miasma Beach.***

Include the following items in your validation analysis:

- Report** and **compare** system-level summary statistics for observed flows and the estimated model results.
- Construct** a minimum of three screen lines across which total flows are measured and compared. These screen lines, for example, might capture all flow across the network from east to west, or all flows into the downtown zones (1 and 2). **Justify** your choice of screen lines. Provide screen line summary maps and tables, clearly identifying the screen lines and the associated traffic volumes. Report deviations between observed and estimated volumes, by direction. Include goodness of fit measures.
- Discuss** the accuracy of the overall model system: Is the model system validated? Justify.

HELP: Creating and Report Screenlines

If assistance is needed in creating and reporting screenlines, then [Click HERE](#).



5.4 Prepare Task 5 Documentation

Prepare Task 5 documentation, including all TransCAD maps, dataviews, and layouts. Append a project **Glossary** containing at least four key terms from the Task 5 analysis (extending the Glossary from Task 4). Follow all Project Report Format [Guidelines](#) in the preparation of this documentation. This material will be submitted as part of the second **Interim Report** (see Task 5.5).

5.5 Model Validation Interim Report 2

Submit a **Project Interim Report** containing reports for Tasks 3 through 5 reporting model development and validation results. This information should be presented in graphical, tabular, and text format. **Clearly** identify current network supply deficiencies that may have to be remedied. You will base decisions on the generation of Alternate Solutions on future (2030) network performance (see Task 6).

Miasma Beach Project -- Task 5

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