CEE 123 Transport Systems 3: Planning & Forecasting
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The Miasma Beach Transportation Model

Task Descriptions for 2020 Update to the MB Transportation Model


There are six Traffic Analysis Zones (TAZs) in Miasma Beach and two external stations. Zone 1 forms the "Old Town" Central Business District (CBD) and urban residential areas, reflecting the historic employment center in the City. Zones 2 and 3 form a beachside community, a residential area with some retail activity along Coast Highway. Zone 4 is an agricultural area, with packing and processing industries, east of the CBD and north of Zone 3. Zones 5 and 6 are developing residential zones located east of the Miasma wetlands. Zones 7 and 8 are External Stations: Zone 7 is at the east end of Coast Highway where SR-1 heads toward the City of Miasma; Zone 8 is at the west end of Miasma Blvd where SR-1 heads into the Miasma Mountains toward Port Miasma. The six TAZs are attached by single 0.25 mile centroid connectors. Network characteristics are in Table 1.

```
             Table 1. Miasma Beach Speed-Capacity Table
     ---------------------------------------------------------------
        Link Type            Speed   Lanes  Capacity/Lane   Color
     ---------------------------------------------------------------
     1.  Freeway              60       2        1800        Purple
     2.  Primary Arterial     60       2        1200        Red
     3.  Major Arterial       45       2         900        Dark Green
     4.  Minor Arterial       45       1         600        Lght Green
     5.  Collector Street     30       1         600        Blue
     6.  Local Street         15       1         300        Cyan
     7.  Other Street          -       -           -        Yellow
     8.  Ramp                 30       1         600        Pink
     9.  Centroid Connector   25       9        1000        Orange
     ---------------------------------------------------------------
```

Task 1. VALIDATE 2020 BASE YEAR NETWORK

Two sets of TransCAD files are provided: **mb2020.*** and **Taz.***. The first contains the GIS layer of the coded transportation network; the second contains the Traffic Analysis Zone (TAZ) layer (demographics and trip data). The first task is to create a TransCAD map file and to validate the zone system and network structure. This 2020 data set does not correctly represent either the 2000 or the 2020 Miasma Beach area (see Figure 1); it merely provides a starting point to build the correct 2020 network representation, as detailed in the steps below.

Figure 1. 2010 Miasma Beach Transportation Network (uncorrected)
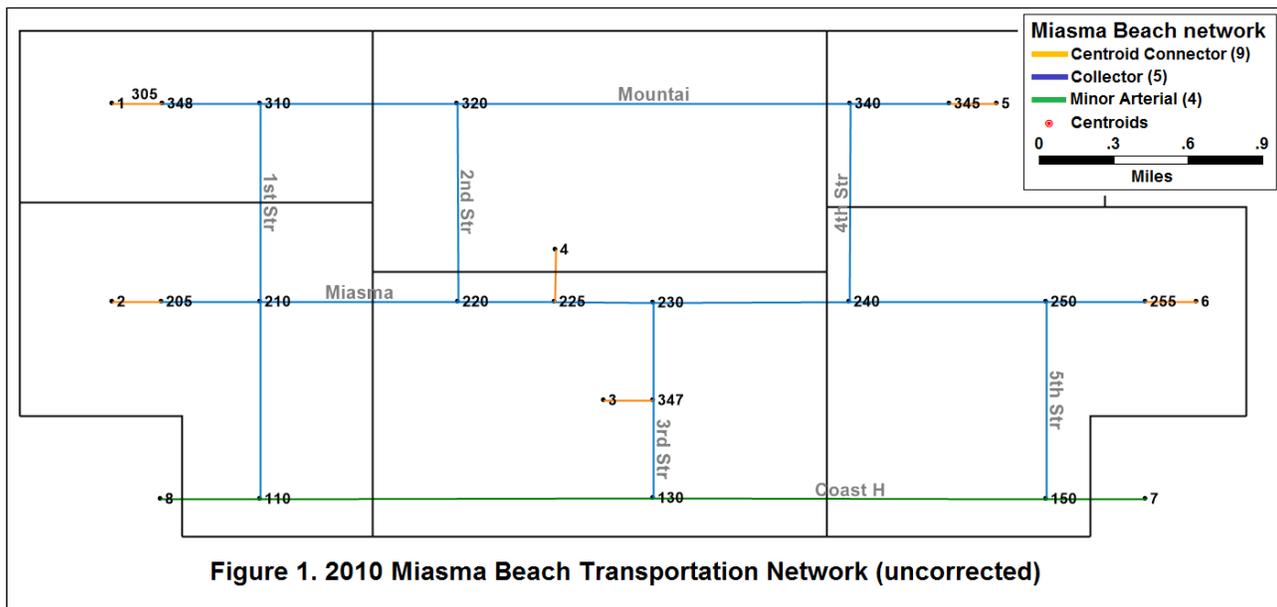
GIS/Modeling Concepts: Why so many files with similar names?
To efficiently manage information pertaining to a layer, a GIS separates the information into multiple files, all of which are required to generate the Miasma Beach network in TransCAD.
If you move to a new working folder, **copy all files to the new folder**.

1.1 Create Base Miasma Map

Construct the TransCAD file that contains the GIS data for the draft 2020 Transportation System **T** and the Activity System **A**.

FILE ORGANIZATION:
Before you start preparing your maps and editing your networks, make sure to have a folder **Just for the Databases** MB2020.* and TAZ.*. Name it something like "geo_bases". Also create a folder named **"maps"**.

1.1.1 Open a Geographic File
Go to **File / Open**. In the **File Open** dialog box, select the folder where you placed the Miasma Beach TransCAD data set (MB2020.zip, that contains **MB2020.*** and **Taz.***). Select **Geographic File** under the **List Files of Type**. You should see **MB2020.DBD** and **TAZ.DBD** in the file box. Select **MB2020.DBD** and click **OK**.

A "stick" network should be displayed. The network does not display end or intersection points. To see them, go to **Map / Layers**. In the **Layers** dialog box, under **Layers in Order of Display**, select **Nodes** (it is hidden now) and click the **Show Layer** button. Close this dialog box.

1.1.2 Add Another Layer
Go to **Map / Layer** again. Click the **Add Layer** button. In the **File Open** box, open the Geographic File of **TAZ.DBD**. You should now see the TAZ layer being added to your map. Some parts of the TAZ layer may be displayed outside of the window. Go to **Map / Scale** and on the Map Scale dialog box, select **Show the Entire Layer of *TAZ*** and **Selection Set *All Features***.

GIS/Modeling Concepts: Working Layer (or Current Layer)
When you have more than one layer in your map, there is always one layer designated as the **Working Layer** (or **Current Layer**). All the manipulations on the map (such as labeling or querying) apply to the working layer only.

There is also the concept of a "pile of layers" involved, so if there is an element of a layer right on top of an element of a second layer, the latter will be hidden under the one on top of

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it and you won't be able to see it.

Examine the Map
Examine the map and compare it with **Figure 1**. Familiarize yourself with this map and the characteristics of the various link, node, and zone attributes.

1.1.3 Save the Map
After you set up the display of the map to the way you want (which should be labeled properly), go to **File / Save As**. In the **Save As** dialog box, select the folder where you store your files. Select **Map File** under the **List Files of Type**. Type in *MB2020* under **File Name** for your map and click **OK**.

> **GIS/Modeling Concepts: What is a *.map file?**
> A *.map* file contains information about the *settings* of the map such as, which layers are in the map, the color and style of each layer, texts, labels, and freehand items (markers) on top of the map, and the scale of the map. It is important to know that the *.map* file itself does not contain databases for the layers. It only tells TransCAD where to find these databases and how to display them. Without the geographic files, the map file alone can not generate maps.

VIDEO: For a **video** example of how to **create the map**, click HERE.

1.2 Network Updates

The input 2020 map has been incorrectly coded. Update the network to reflect the base 2000 network as well as network improvements planned in 2000 that have been implemented and must be reflected in the base 2020 network. **Your network should match that depicted in Section 1.6**. This may involve deleting links, adding or updating links, and/or moving centroids. Select **Highways/Streets** as the Working Layer to implement all network corrections identified below. Use **Tools / Map Editing** to adjust link attributes.

For a **video** example of how to edit a line network, click HERE

1. 1st Street: a collector street from Mountain Ave to Coast Hwy
2. 2nd Street: a local street between Mountain Ave and Miasma Blvd (new)
3. 2nd Street: a local street between Miasma Blvd and Coast Highway
4. 3rd Street: a local street from Miasma to Coast
5. 4th Street: a local street from Mountain to Miasma (new)
6. 4th Street: a major arterial from Miasma to Coast (update)
7. 5th Street: a local street from Coast and Miasma

8. Mountain Ave is a collector street west of 1st Street
9. Mountain Ave is a local street between 1st and 2nd
10. Mountain Ave is a local street east of 4th (new)
11. Miasma Blvd is a major arterial west of 4th Street (update, new from 3rd to 4th)
12. Miasma Blvd is a local street east of 4th Street
13. Coast Highway is a major arterial from 4th Street to ES 7 (update)
14. Coast Highway is a local street from 2nd Street to 4th street
15. Coast Highway is a collector street from 1st Street to 2nd street (update)

16. Centroid 1: is located 0.25 miles west of the western end of Mountain Blvd
17. Centroid 2: is located 0.25 miles west of the end of Coast Highway (update)
18. Centroid 3: connects to the midpoint of Coast Highway between 2nd and 3rd streets (update)
19. Centroid 4: connects to 2nd Street 0.5 miles north of Miasma Blvd (update)
20. Centroid 5: is located 0.25 miles east of the eastern end of Mountain Blvd
21. Centroid 6: connects to the midpoint of Coast Highway between 4th and 5th streets (update)
22. Ext Sta 7: is located at the eastern end of Coast Highway
23. Ext Sta 8: is located at the Western end of Miasma Blvd (update)

Verify that your network, including all link characteristics, matches the **Section 1.6** network.

1.2.1 Delete Links

To delete a link, go to **Tools / Map Editing** (set the *Working Layer* to **Highways/Streets**). The **Map Editing** tool box appears. Select the **Delete** button and click on the link to be deleted (e.g., **(1)** above). The color of the link changes and the **Red Light** and **Green Light** buttons appear in the Map Editing tool box. Be sure you've selected the correct link, and select the Green Light and the change will be saved with the link being removed from the map (if you've selected the wrong link, click the Red Light and the change will not be saved). Note: Be careful to select only the link section desired -- you may need to split a link first.

1.2.2 Add Links

To add a section of 4th Street between Coast Highway and Miasma Blvd, first "split" the current link to add a node where the new link will connect.

> **HELP: Settings for Splitting Links:**
> **If** assistance is needed in splitting links, **then** Click HERE
>
> **VIDEO:** For a **video** on editing, click HERE (at the 1:00 min timestamp).

Joining Links: Select the **Join Line** button and click on both links to join them into a single link. As long as there are no node penalties or turn prohibitions, you can leave old nodes (they may be of use in the future).

Click on the **Split Line** button. Click on the midpoint of Mountain Blvd. between 2nd and 4th Streets. This should split this segment to two 1 mile stretches. Click on the info tool and then click on Mountain Boulevard between 3rd and 4th to adjust H_DIST as necessary. Repeat for other required split links. Select **Add Line** in the Map Editing toolbox and add links (single click on the start node, drag the mouse (a dash line appears) to the desired end node and double click). Click on the new line and fill in link attributes as appropriate. Follow the same procedure to add other sections, as required.

1.2.3 Move Centroid

To change the centroid location, split the section of Coast Highway between the added section of 2nd Street and 3rd Street at the midpoint (0.5 miles west of 3rd Street). Then add a line from the new split point to Centroid 3. Use the **Pointer Tool** (arrowhead) to drag the centroid to a point 0.25 miles north of the new split point. Use the **Info Tool** to edit this new line to match the attributes of other centroid connectors. Finally, delete the old connector.

1.2.4 Edit Link Attributes

To change attributes of network links, use the **Info Tool**. To change node numbers, you must select the node layer and open a node data view.

1.3 TAZ Updates

The TAZ.* files contain information regarding the traffic analysis zones in Miasma Beach, including demographic data. The zonal information stored in this TransCAD network is incomplete, you must fill in a few entries. Set TAZ as your working layer, and open the dataview.

VIDEO: For a **video** on how to edit an area network, click HERE.

Make the following updates/corrections:

1. For Zone 2, change the Population (POP) value from 0 to 1550
2. For Zone 5, change the Other Employment (EOTH) value from 0 to 50
3. For Zone 5, change the Total Employment (ETOT) value from 0 to 150
4. For Zone 6, change the Household Income (HHInc) value from 3800 to 38,000
5. For Zones 1-6, increase Household Income by 50 percent to reflect income growth from 2000 to 2020
6. For External Stations 7 and 8, set area (AREA) to 0 (they're doors, not TAZs)

GIS Concepts: Editing in a GIS
A GIS usually does not allow you to undo editing changes. This is because managing geographic information is more complicated than just managing text and numbers. To help prevent users from inadvertently changing the database, TransCAD asks for confirmation (via choice of the Red Light or Green Light buttons) before a change is saved.

GIS Concepts: Spatial Query
A GIS let you retrieve information pertaining to a geographic entity on the map. This function is sometimes referred to as **Spatial Query**. You can use the spatial query tools (such as the *i* button in the **Tools** box) to review and edit the entity's attribute data.

1.4 Formulate Attributes

After network editing is complete, calculate the free flow travel time for both directions of each link. It is easier to do this task in a **Dataview** (a spreadsheet-like table that displays data for the entire layer) than using the Info tool because all links must be updated, not just a few.

HELP: Formulating Link Travel Times:
If assistance is needed in Formulating Link Travel Times, **then** Click HERE

VIDEO: For a **video** explanation, click HERE.

GIS Concepts: Link Direction
In the network dataview, **Dir** stands for direction and indicates if the street is one-way or two-way. In Miasma Beach, **Dir** link values are all 0 indicating that they are all two-way links. Thus, on a link record (i.e., a row in the dataview), there are two fields corresponding to each attribute (e.g., speed, capacity, number of lanes). **AB_SPEED** contains free flow speed for one direction; **BA_SPEED** contains that for the opposite direction. This allows link attributes to vary by link directions. The direction that the link was created is AB and the opposite is BA. For example, the end nodes of link 25 are (A) 310 and (B) 320. If this link is drawn from 310 to 320, then 310 to 320 is the AB link and the link from 320 to 310 is the BA link.

The direction a GIS draws a link is the **topological** direction of a link. This information exists internally in the database (e.g., in the MB2020 files). If you want to see a link's topological direction in Dataview, set **Highways/Streets** as the working layer and go to **Dataview / Formula Fields**. In the **Formula (Dataview: Highways / Streets)** dialog box, click on the **Node Fields** button. Another dialog box **Node Formula Fields** appears. Highlight **ID** and click **OK**. Two fields, **[From ID]** and **[To ID]**, are added to the dataview. [From ID] is the ID of the link beginning node; [To ID] is the ID of the ending node.

- **VIDEO:** For a **video** note on topology in TransCAD, click HERE
- **VIDEO:** For a **video** on how to access link start/end node information, click HERE

1.5 Enhance Miasma Map

Select Color Themes. With the *Highway/Streets* layer active, select the **Color Theme Map Wizard**. Select *Link_Type* under **Field** and *List of Values* under **Method**, then select the *Styles* tab to select colors. Use the link color theme from **Table 1**. You may also select line styles that will also distinguish link types. Label at least one link on each street with its name (Hint: Use **Layers** dialog Box).

VIDEO: For a **video** tutorial on how to make make a color themed map, click HERE.

1.6 Print Miasma Map

After you have verified that your network is correct, print the final map layers and generate reports documenting all data for inclusion in the interim report. Note that link ID alone is not suitable means to identify links in a table. Please include A-Node, B-Node, and/or link name.

Figure 2. 2010 Miasma Beach Transportation Network (corrected)   [Spring 2018]
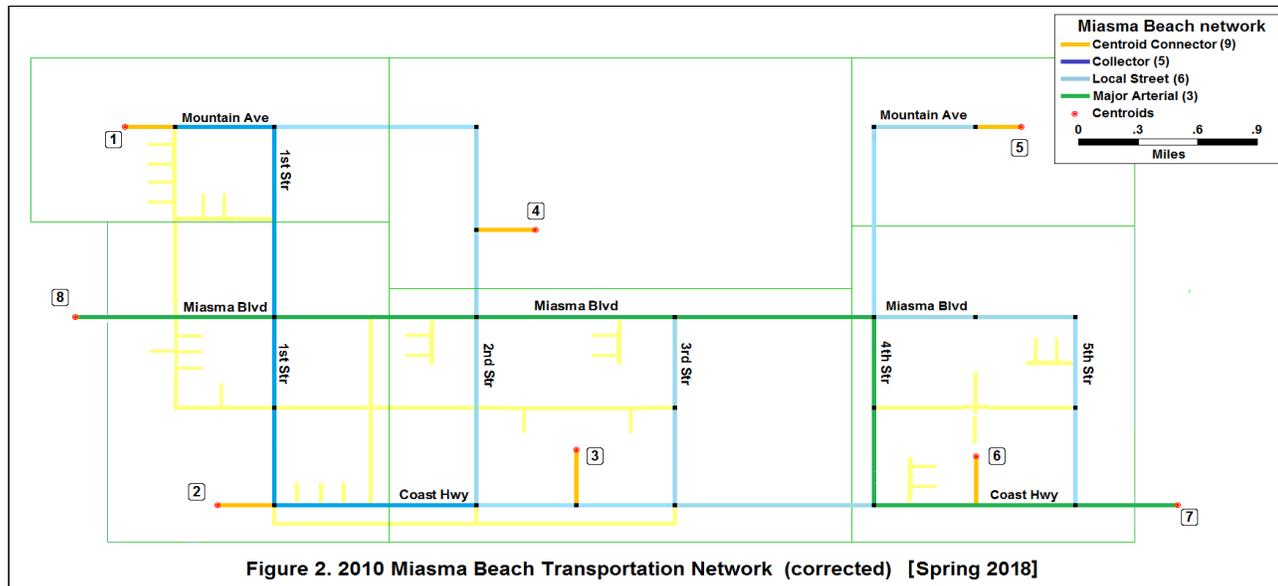
1.7 Prepare Task 1 Documentation

Please label the first section **Introduction** and provide a brief summary of the prior Miasma Beach transportation study, including what planned improvements were actually implemented in the intervening 10 years. Label subsequent sections **Chapter 1** through **Chapter 6**, corresponding to defined project work tasks. The last section should be labeled **Summary and Recommendations**.

Prepare Task 1 documentation, including TransCAD maps and tables. Append a project **Glossary** containing at least four key terms from the Task 1 analysis (the Glossary will be extended in each subsequent task). Use graphic capture and rendering tools. Follow Format Guidelines in the preparation of this document. This material will be submitted as part of the first **Interim Report** (see Task 2).

Video Summary:

- Building a map
- Editing a line layer
- Editing an area layer
- Formulating atributes
- Start and end nodes of a link
- Color themed maps

Miasma Beach Project -- Task 1   [back to top]