



The Transit Market Analyst

User Guide

Albany Visualization And Informatics Lab (AVAIL)
Lewis Mumford Center, University at Albany, SUNY

Catherine T. Lawson, Ph.D.

Chair, Geography and Planning Department

Director, Lewis Mumford Center

Director, Masters in Urban and Regional Planning (MRP) Program

AS 218 1400 Washington Avenue

Albany, New York 12222

(518) 442-4775

lawsonc@albany.edu

CONTENTS

1	What is the Transit Market Analyst?	4
1.1	Background	4
1.2	Limitations.....	4
1.2.1	Non-Work Related Trips.....	4
1.2.2	Generating AM and PM Peak Times	4
1.2.3	Latent demand.....	4
1.2.4	Software bugs	5
2	Workshop Session 1 - Introduction to Web-Tool Dashboard	6
2.1	The Transit Market Analyst Homepage	6
2.1.1	Logging In	6
2.1.2	Getting to Know the Homepage	6
2.2	A Tour of the Tool - Atlantic City.....	7
2.2.1	Exploring Census ACS	7
2.2.2	Census Transportation Planning Products (CTPP)	11
2.2.3	LODES	13
2.3	Explore Agency Data	14
2.3.1	Survey.....	14
2.3.2	Farebox	16
3	Assemble Market Area.....	19
3.1	Upload Datasets.....	19
3.1.1	GTFS	19
3.1.2	US Census ACS 5-Year	21
3.1.3	CTPP	21
3.1.4	Survey.....	21
3.1.5	Farebox	22
3.2	Define a Market Area.....	23
3.3	Select Routes.....	24
3.4	Set Regression Model	26
4	Editing and Saving GTFS.....	27
4.1	The GTFS Editing Tool	27
4.2	Editing Existing GTFS	30

4.3	Setting schedule.....	33
4.4	Saving GTFS.....	34
4.5	Creating New Routes	36
4.6	Setting site-wide GTFS	39
5	Demand Modeling and Model Validation Analysis.....	40
5.1	Explore Models	40
5.1.1	Current Model.....	40
5.1.2	Run a Model.....	40
5.1.3	Set inputs	40
5.1.4	Analyze Model Output	41
5.1.5	Validate Your Model	43
5.2	Scenario Planning: Generalized MPO Forecast.....	44
5.3	Scenario Planning: Casino Closing.....	44
5.4	Scenario Planning: Evaluating 655 Route	45
5.4.1	655 Included.....	45
5.4.2	Validate 655-Included with Farebox data.....	48
5.4.3	655 Removed	49
5.4.4	Validate 655-Removed with Farebox data.....	49
5.4.5	Comparing 655-Included, 655-Removed, and Farebox data	49
5.5	Scenario Planning: The Future Forecast	52
5.5.1	MPO 2020 Forecast.....	52
5.5.2	Custom Forecast	52

1 WHAT IS THE TRANSIT MARKET ANALYST?

1.1 BACKGROUND

The **Transit Market Analyst** is an open source, web-based tool designed to assist small and medium-sized transit agencies explore transit market areas, understand factors that influence bus ridership to work, construct new transit market areas, plan bus service for these areas, and analyze potential changes in service levels, including regional forecasting, local land use changes, and the development of new routes within a transit market area.

The Transit Market Analyst combines the rich source of archived transit operations data (e.g., automatic farebox data), with new open data resources, particularly General Transit Feed Specification (GTFS) and US Census. It is web-based and open source, allowing for easy deployment and consistent non-proprietary upgrades. The Transit Market Analyst employs leaflet (<http://leafletjs.com/>) and D3.js (<http://d3js.org/>) to create interactive maps organized by census tract geographies. This collection of tools and methodologies are intended to allow planners to assess changing transit demand in customizable market areas defined simply by GTFS routes and census geographies. The web-tool aggregates a number of data sets which are universally available in the US, such as the American Community Survey (ACS), Census Transportation Planning Products (CTPP) and The Longitudinal Employment and Household Dynamics (LEHD) survey, with data generated by transit agencies like GTFS and ridership surveys. These data sets are then run through an algorithm to approximate public transportation ridership. Custom developed software combined with Open Trip Planner is then used to microsimulate ridership in a given market area. The collection of tools and methodologies together, illuminate dynamics of public transportation ridership in a given area and allow planners to investigate various market scenarios as well as write, edit and save GTFS.

1.2 LIMITATIONS

1.2.1 Non-Work Related Trips

The Transit Market Analyst demand modeling tool currently only accounts for bus-to-work ridership. Any analysis comparing Models to Farebox for validation must take into account the absence of non-work related trips. Future advancements to the demand modeling tools should include an analysis of agency survey data to create a ratio for each market area of the work to non-work related trips. To account for the full range of bus riders, an additional long term goal should be to include trip purposes other than work (e.g., shopping, medical). Those riders should be included in the trip table using point-based trip generation based on land-marks and employment and bus-stops related data.

1.2.2 Generating AM and PM Peak Times

The demand modeling trip tables are currently built using an assumed 8 hour work day. Future advancements of the tool should include means for setting AM and PM Peak times for model running so that the Peak times of the models more closely align with the Farebox data.

1.2.3 Latent demand

The current version of the Transit Market Analyst lacks sufficient underlying behavioral data to develop latent demand models based solely on socio-demographic data. Future research is needed to examine whether different probabilities should be applied for individuals in households previously unserved by

bus services to account for the likelihood of bus-ridership when bus service is introduced to previously underserved census geographies.

1.2.4 Software bugs

Dealing with software bugs. As a new technological approach to bus service planning, occasionally software bugs are discovered while users are performing functions. These bugs should be reported so they can be isolated and fixed. It is only through a thorough use of each component of the software that some bugs can be identified.

2 WORKSHOP SESSION 1 - INTRODUCTION TO WEB-TOOL DASHBOARD

2.1 THE TRANSIT MARKET ANALYST HOMEPAGE

2.1.1 Logging In

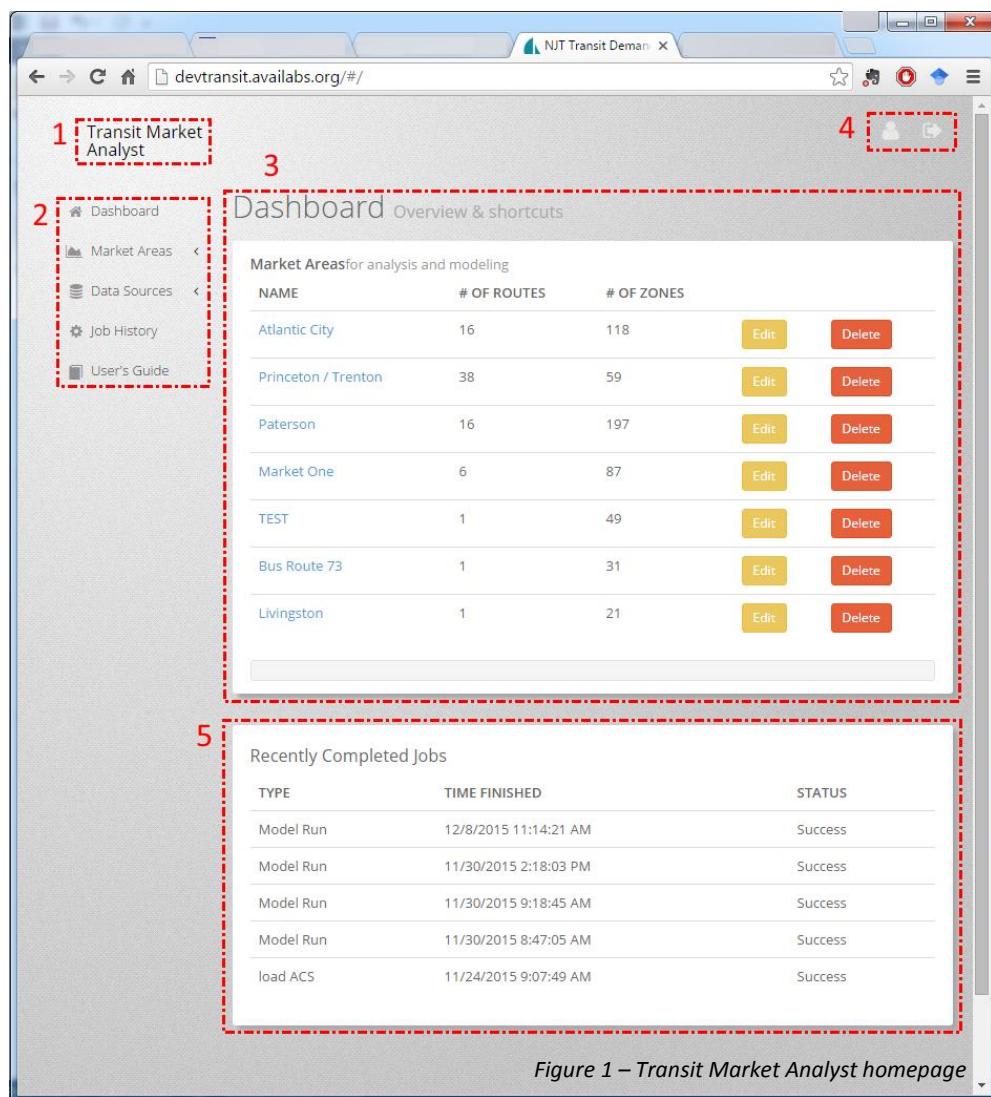
To get started enter the url <http://devtransit.availabs.org> into your web browser (Chrome and Firefox will work better than Explorer due to their advanced javascript engines). This will bring you to the login page.

Username: njtransit

Password: njtdm

2.1.2 Getting to Know the Homepage

After logging in you will see the Transit Market Analyst homepage (Figure 1):



The screenshot shows a web browser window for 'devtransit.availabs.org/#/' titled 'NJT Transit Demand'. The interface is divided into several sections:

- Top Left (1):** 'Transit Market Analyst' logo.
- Top Right (4):** User profile icon and settings.
- Left Sidebar (2):** Navigation menu with 'Dashboard', 'Market Areas', 'Data Sources', 'Job History', and 'User's Guide'.
- Middle Section (3):** 'Dashboard Overview & shortcuts' with a table of 'Market Areas for analysis and modeling':

NAME	# OF ROUTES	# OF ZONES	Actions
Atlantic City	16	118	Edit Delete
Princeton / Trenton	38	59	Edit Delete
Paterson	16	197	Edit Delete
Market One	6	87	Edit Delete
TEST	1	49	Edit Delete
Bus Route 73	1	31	Edit Delete
Livingston	1	21	Edit Delete

Bottom Section (5): 'Recently Completed Jobs' table:

TYPE	TIME FINISHED	STATUS
Model Run	12/8/2015 11:14:21 AM	Success
Model Run	11/30/2015 2:18:03 PM	Success
Model Run	11/30/2015 9:18:45 AM	Success
Model Run	11/30/2015 8:47:05 AM	Success
load ACS	11/24/2015 9:07:49 AM	Success

Bottom Center (6): A small number '6' indicating the page number.

Figure 1 – Transit Market Analyst homepage

A brief overview of what you're looking at in Figure 1:

1. **Transit Market Analyst Homepage Button.** This can return you to this homepage at any point in your use of the tool.
2. **Left Side-bar Navigator.** This includes links to the Dashboard, your saved Market Areas, your Data Sources, your Job History (a list of all the jobs you've performed using the tool), and a User Guide. You'll be using this navigator often so get to know it.
3. **Dashboard.** The dashboard contains a list of your saved Market Areas and their major features (# of routes and # of zones) as well as buttons to 'Edit' and 'Delete' them.
4. **Profile and Logout.** The little man shows your profile. The logout symbol logs you out.
5. **Recently Completed Jobs Table.** This shows you an abbreviated list of the jobs you've performed recently using the tool.

2.2 A TOUR OF THE TOOL - ATLANTIC CITY

2.2.1 Exploring Census ACS

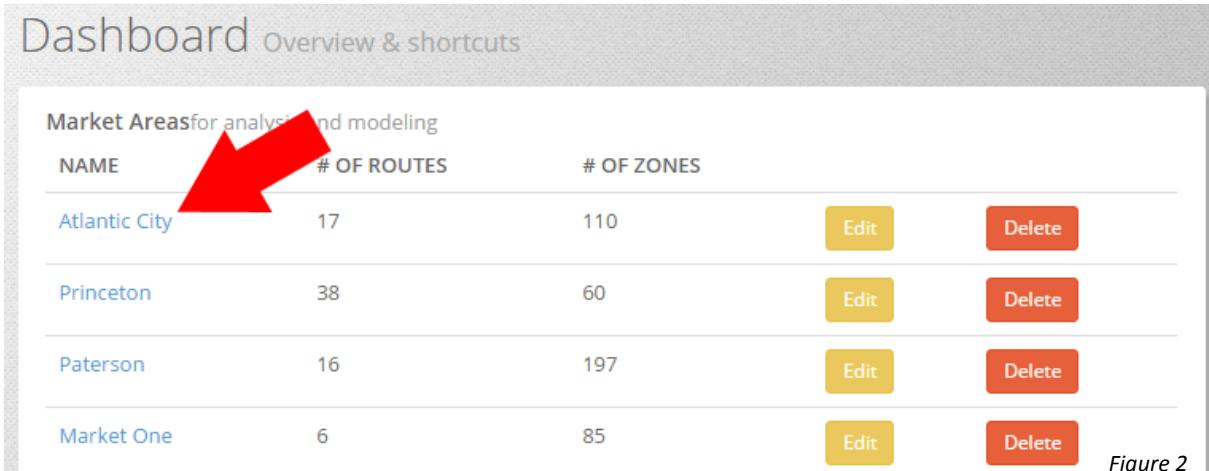
Let's explore the tool. We'll look at the Atlantic City market area to start.

1. **Choose a market area.** Click on 'Atlantic City' in the Dashboard. (Alternatively, you can select 'Atlantic City' from the Left Side-bar Navigator under 'Market Areas', 'Atlantic City', 'Overview').

What is the Census American Community Survey (ACS)?

It is a nationwide, continuous survey designed to provide communities with reliable and timely demographic, housing, social, and economic data every year.

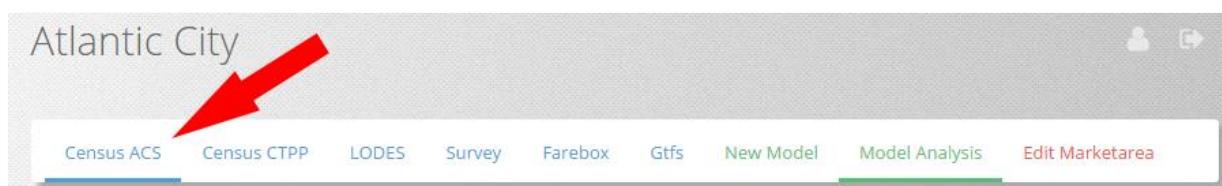
(<https://www.census.gov/programs-surveys/acs/about.html>)



Market Areas for analysis and modeling			
NAME	# OF ROUTES	# OF ZONES	
Atlantic City	17	110	<button>Edit</button> <button>Delete</button>
Princeton	38	60	<button>Edit</button> <button>Delete</button>
Paterson	16	197	<button>Edit</button> <button>Delete</button>
Market One	6	85	<button>Edit</button> <button>Delete</button>

Figure 2

2. **Choose demographic data.** The Census ACS demographics tab is selected as default.



- Census ACS
- Census CTPP
- LODES
- Survey
- Farebox
- Gtfs
- New Model
- Model Analysis
- Edit Marketarea

Figure 3

The boxes across the top of the page contain key statistics about the market area (outlined in red in Figure 4).

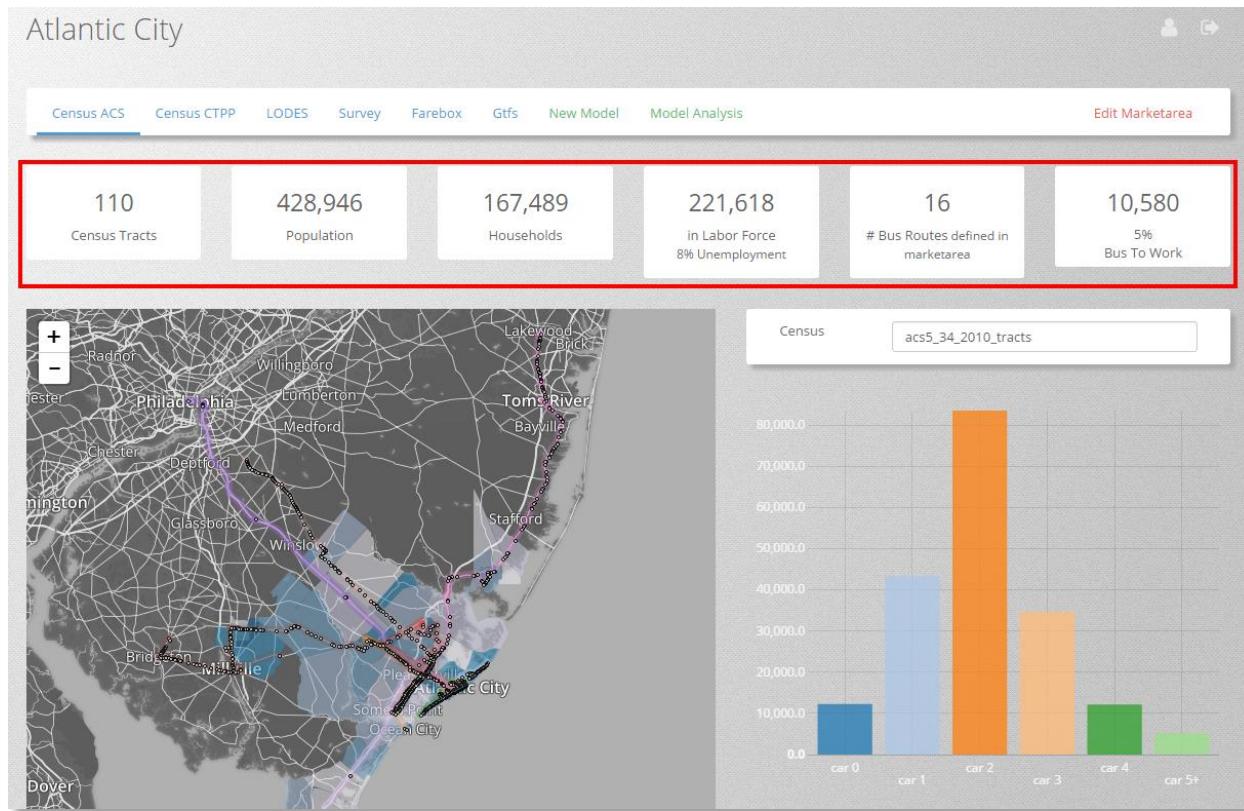


Figure 4

3. **View census tract details.** Scroll over the census tracts in the market area map to view the composition of each census tract for a given variable.
4. **Choose a dataset.** The ACS-5 Year datasets are released annually. Site-wide, the default dataset is the ACS 2010. To change the dataset year, click on the dropdown menu located above the right-side graph.
5. **Choose a category.** On the right side of the screen, below the demographics graph is the Census Category selector. Click on 'Vehicles Available' to view the list of available demographic categories (Figure 5).

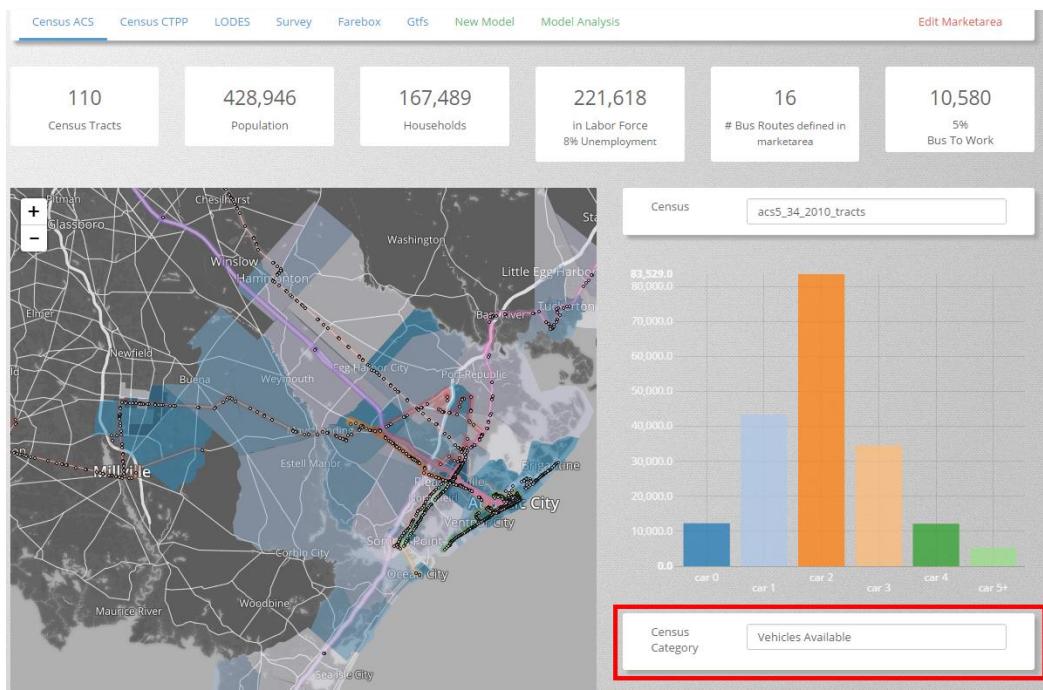


Figure 5

6. **View a category on the map.** Let's look at 'Income Categories'. Select 'Income Categories' from the Census Categories dropdown menu. Notice the market area census tract choropleth map interacts with the Census Category selection. The tracts are now colored by income.
7. **Use the legend.** The legend underneath the map (Figure 6) shows the default variable within the Census Category. The default variable is always the variable listed at the top of the category chart on the lower right side of the page.
 - a. To change the variable that is being displayed on the map (and in the legend), click on a variable in the chart located below the Census Demographic Graph on the right of the page (Figure 6). For example, select '20000 24999' and see how the map and legend change to visualize this specific range.



Figure 6

Feel free to explore the census tracts. Choose new variables in the chart and repeat the activity with other categories.

8. **Export.** Located in the chart and below, are buttons that allow you to download CSV, GeoJson, and ShapeFiles (Figure 7).

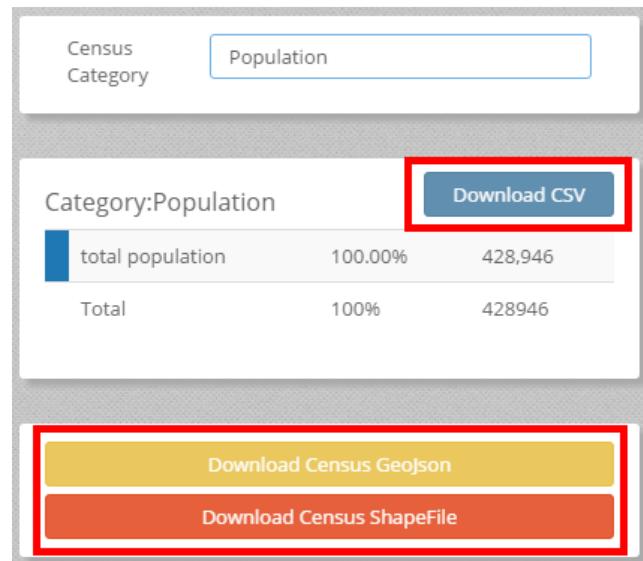


Figure 7

2.2.2 Census Transportation Planning Products (CTPP)

What is the Census Transportation Planning Products (CTPP) data set?

The CTPP is a set of special tabulations designed by transportation planners using large sample surveys conducted by the Census Bureau.

Census data on demographic characteristics, home and work locations and journey to work travel flows are key inputs to a variety of state, regional and local transportation policy and planning efforts. They also support corridor and project studies, environmental analyses and emergency operations management.

In 1990, 2000, and again in 2006, American Association of State Highway and Transportation Officials (AASHTO) partnered with all of the states on pooled fund projects to support the development of special census products and data tabulations for transportation. These census transportation data packages have proved invaluable in understanding characteristics about where people live and work, their journey to work commuting patterns and the modes they use for getting to work.

(<http://ctpp.transportation.org/Pages/default.aspx>)

- 1. Explore the Census Transportation Planning Products dataset. Select the 'Census CTPP' tab. The CTPP choropleth map shows bus to work trips by census tract (Figure 8).**

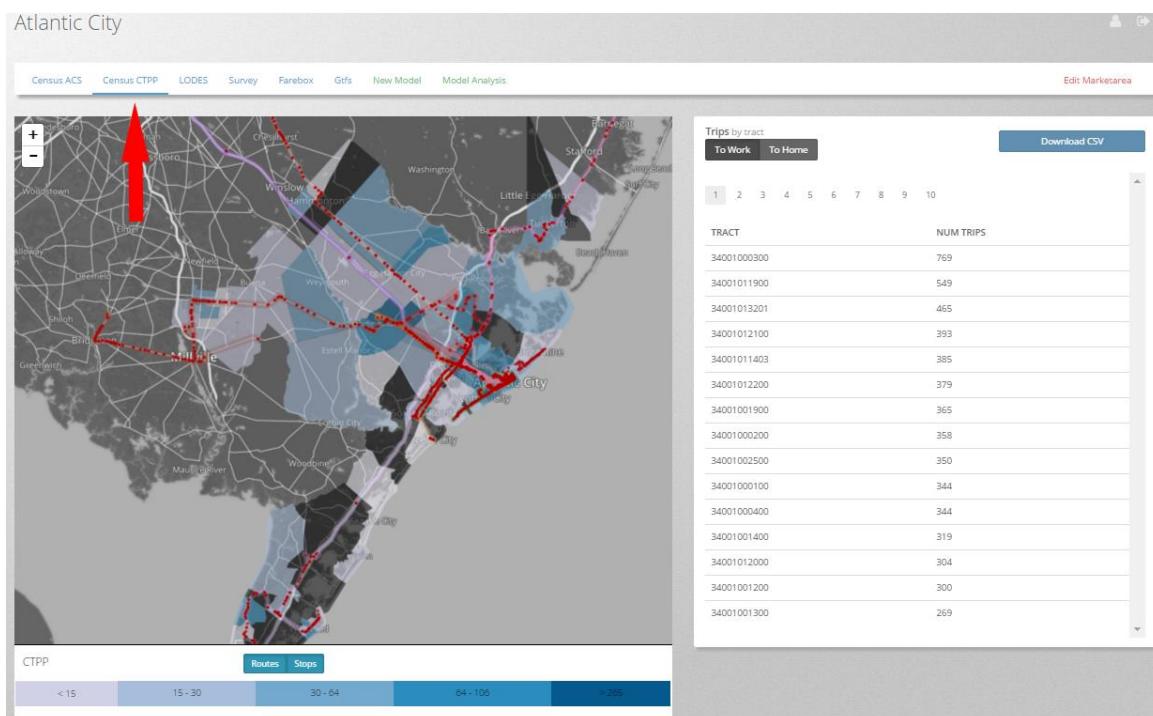


Figure 8

2. **View ‘To Work’ and ‘To Home’ bus trips.** At the top of the chart on the right is a toggle to switch between ‘To Work’ (bus to work trips originating in the census tract) and ‘To Home’ (bus to work trips by destination tract). Select ‘To Home’ and explore the map and chart.

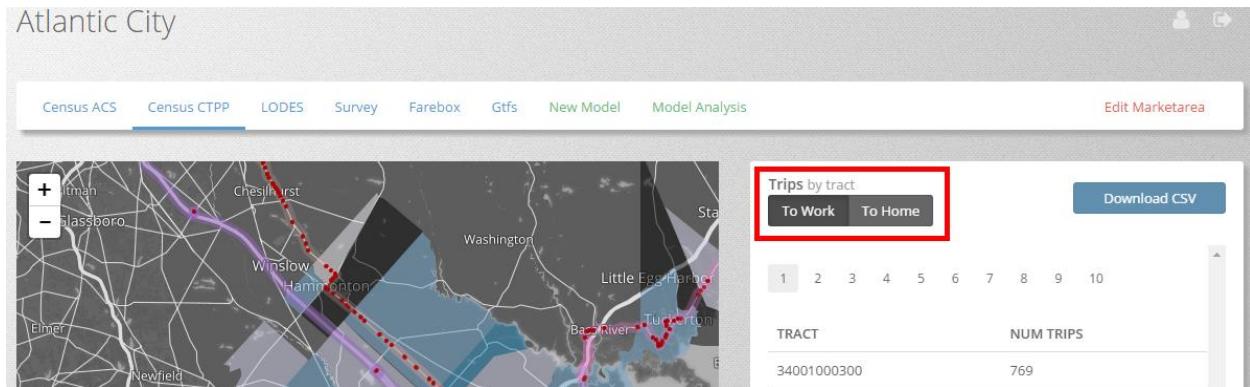


Figure 9

3. **View origins and destinations for a single census tract.** Click on Tract ‘34001001300’ (or any other tract you are interested in) to view O/D information for that census tract. Notice that the selected tract is outlined in black on the map (see Figure 10). You can also select a tract by clicking on it on the map. To display all tracts again click the ‘Clear’ button that appears below the ‘To Home’ ‘To Work’ toggle.

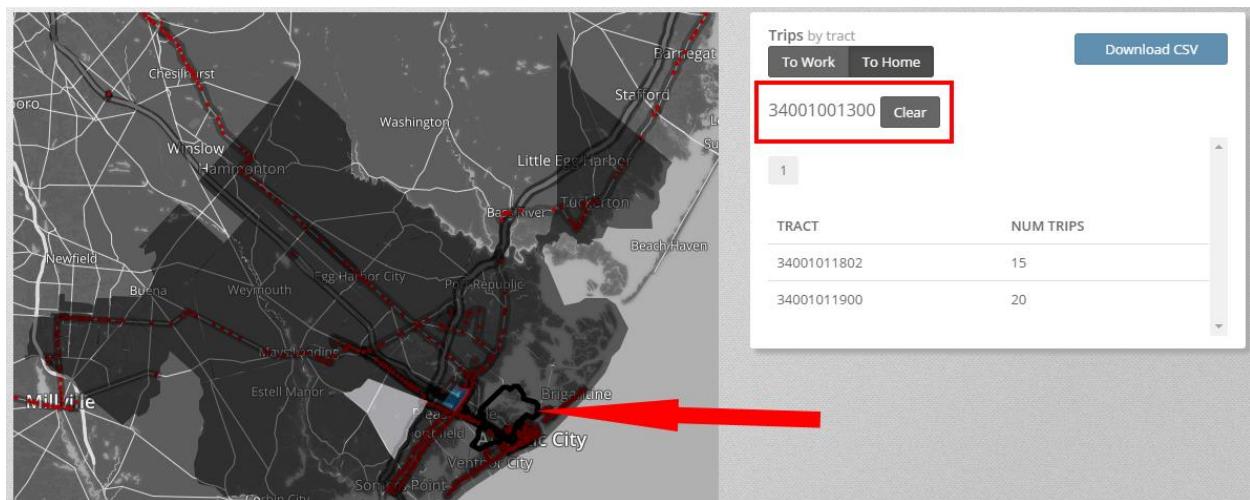


Figure 10

2.2.3 LODES

1. **Explore the Longitudinal Employer-Household Dynamics (LEHD) Origin Destination Employment Statistics (LODES) dataset.** Select the 'LODES' tab. The LODES choropleth map shows bus to work trips by census tract.
2. The LODES tools and options can be manipulated in much the same way as the CTPP. View To Work and To Home trips, select individual census tracts and observe how the map and graph change in response.
3. Below the map are buttons titled 'Route' and 'Stop.' These buttons allow you to toggle the display of bus routes and stops on the map (See Figure 11).

What is the LEHD Origin Destination Employment Statistics (LODES) data set?

The LODES are produced by the Longitudinal Employer-Household Dynamics (LEHD) program at the U.S. Census Bureau. The LODES data are an extract of the LEHD data infrastructure, which is composed of administrative records, census and survey data focused on the labor market, worker, and firm statistics. State unemployment insurance reporting and account information and federal worker earnings records provide information on employment location for covered jobs and residential information for workers, which form the basis of the LODES data product.

<ftp://ftp2.census.gov/ces/wp/2014/CES-WP-14-38.pdf>

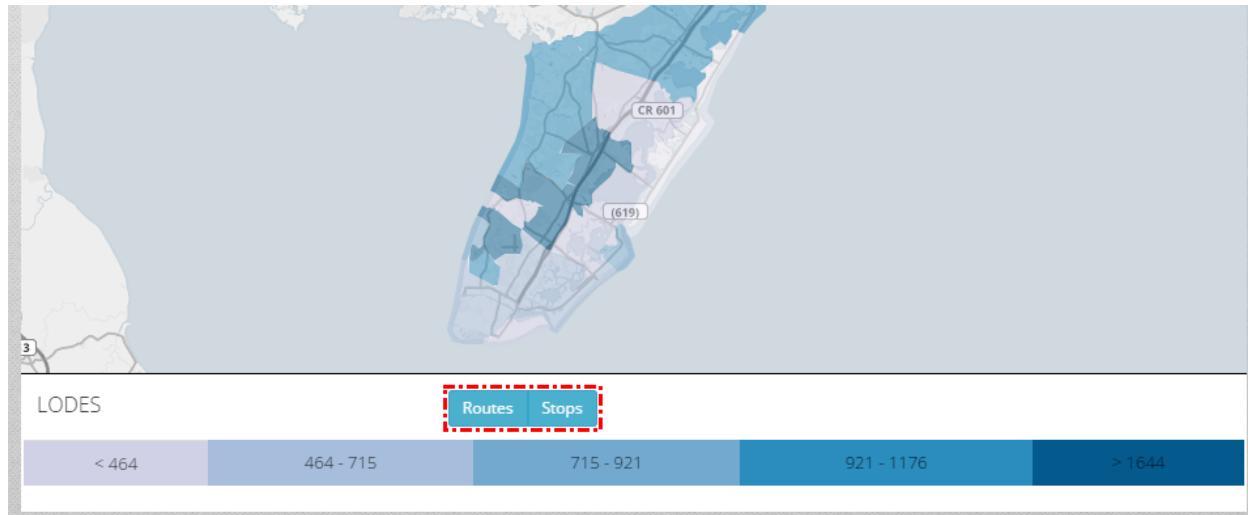


Figure 11

2.3 EXPLORE AGENCY DATA

The Transit Market Analysis Tool Suite also contains a section for analyzing agency collected datasets such as Farebox and Survey.

2.3.1 Survey

1. **Activate the survey data.** Click on the ‘Survey’ tab.
2. **View the routes.** The map on the left shows the market area routes in color. The colors of the routes on the map coordinate with bus route graphs on the right (Figure 12).

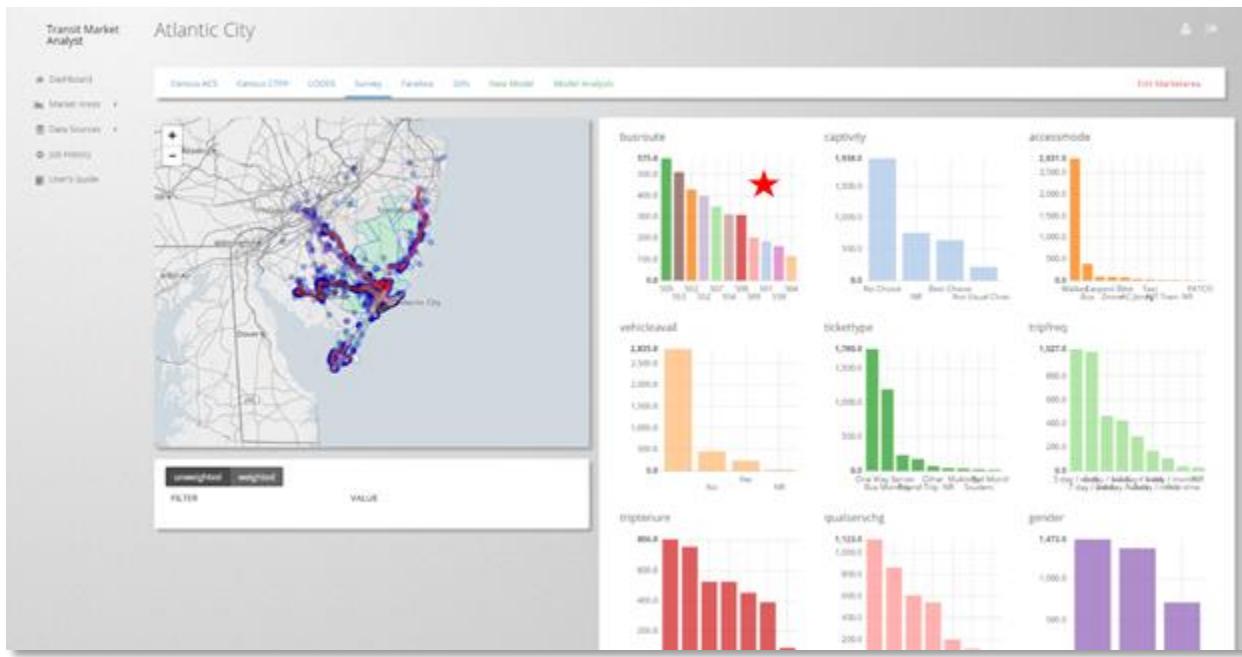


Figure 12

3. **Explore route 559.** Click the bar labeled ‘559’ in the ‘busroute’ graph.
4. **View specific route analysis.** Each of the graphs on the page and the O/D points on the map will filter to show only the survey results for route 559.
5. **View specific graphs.** Each and every graph can be filtered by clicking on a bar in the graph. To reset the map/graphs click on the ‘clear’ button below the map (Figure 13).
6. **Enlarge a graph.** Each graph can be viewed in a larger format by *clicking on the graph area around the bars*. (See Figure 12. We’ve placed a red star in the screenshot where you should click.)



Figure 13

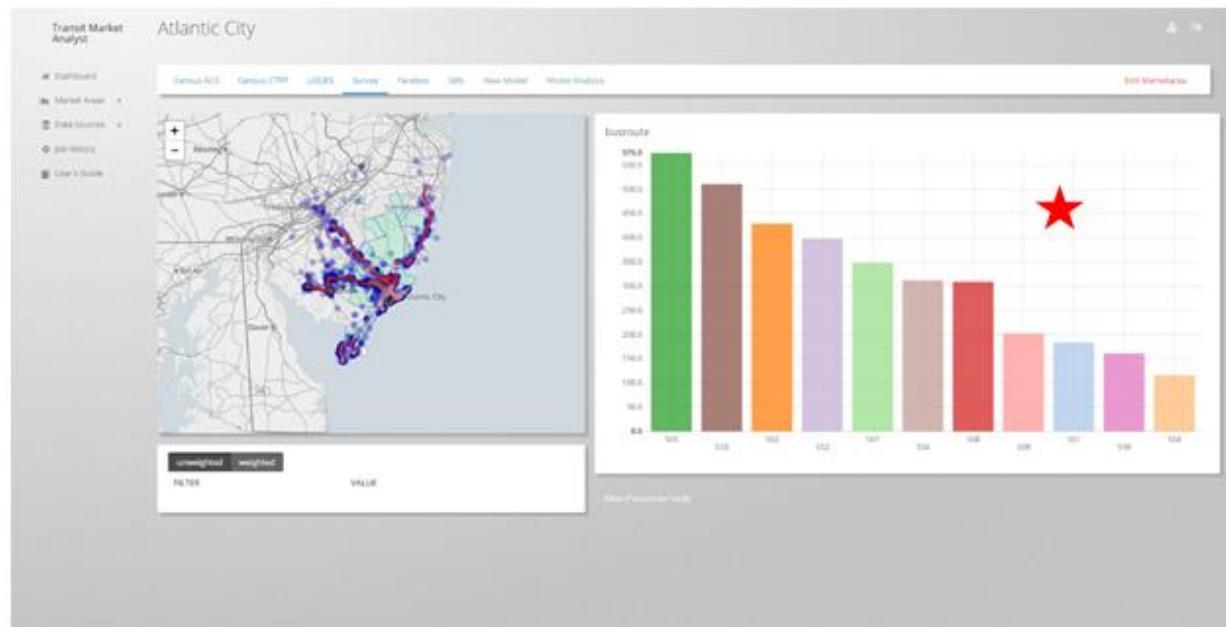


Figure 14

7. **Clear a graph.** To clear out of a single graph view and back to a view of all survey graphs click anywhere in the graph except for the bars (See Figure 14. We've placed a red start where you should click).
8. **Explore the graphs.** Add and remove as many filters as you'd like. Would you like to see the demographics of people who have been riding route 554 for 10 years or more? Click on Route 554, Trip Tenure 6.

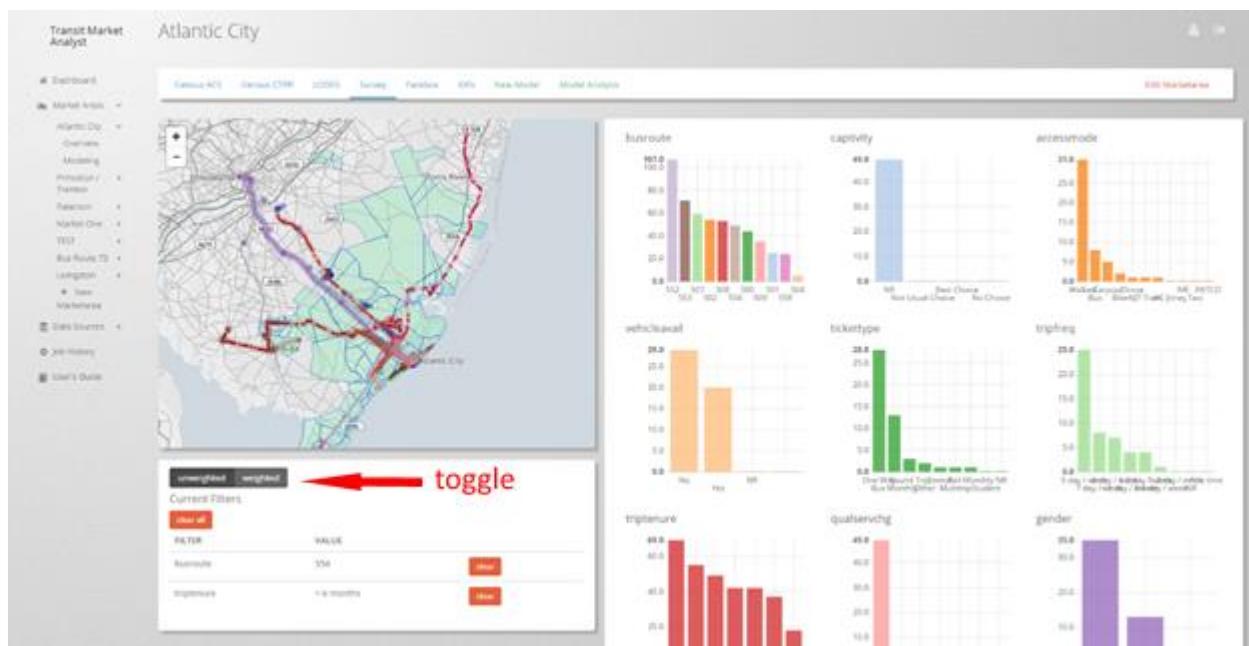
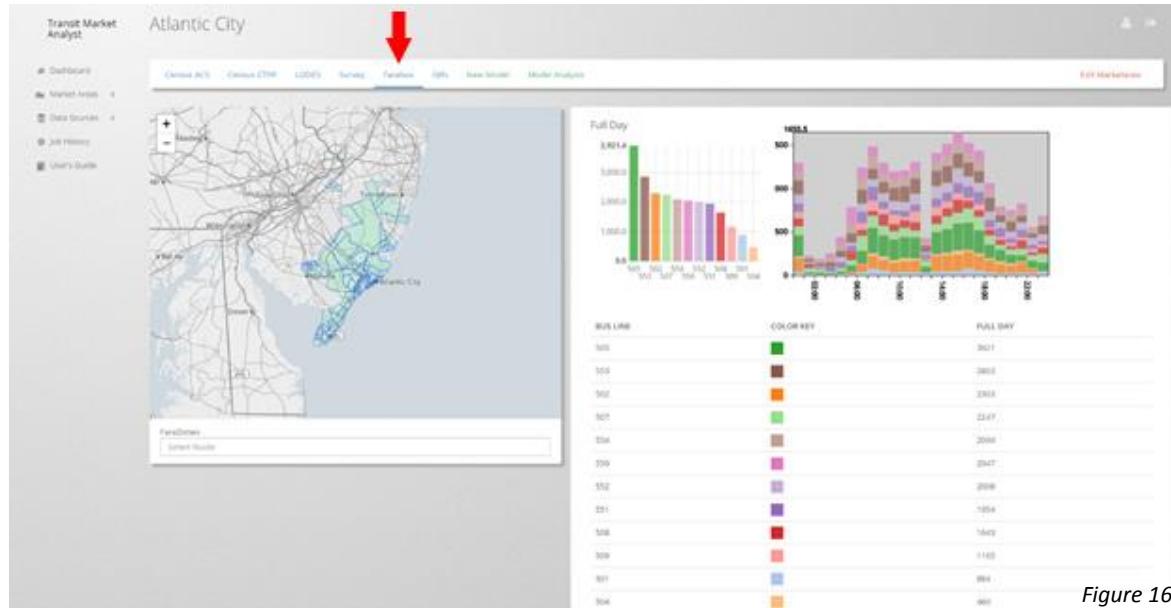


Figure 15

9. Also at any point you can toggle between unweighted (actual data) and weighted data by clicking the toggle located in the box below the map (See Figure 15).

2.3.2 Farebox

1. **Explore the ‘Farebox’ Section.** Click on the ‘Farebox’ tab. Two graphs and a chart display to the right of the map. The first graph shows average daily ridership by route; the second graph shows ridership by route by hour of the day; the chart lists ridership by route.



2. **Filter by time of day.** Notice the second graph (ridership by route by hour of day) has a black outline and a gray background. The black outline creates the outer parameters of a filter (see Figure 17). *Move your cursor over the right side of the black outline and the cursor will change to a bi-directional arrow. Select the outer edge and drag inwards to shrink the parameters of the filter.* This filters

your data by time of day. Play with the filter and see how the ridership graph and chart change in response.

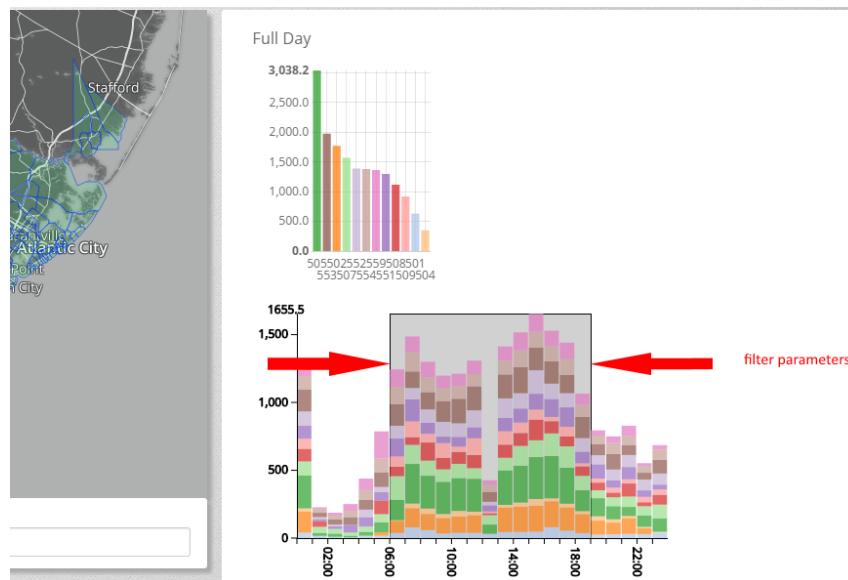


Figure 17

3. **Choose a route.** Below the map, click on the search box titled 'Select Route' and choose route 507 (see Figure 18). The map and accompanying charts and graphs now display ridership and route information for route 507.

4. **Filter farezones.**

Displayed below the 'Save Filter' button are the different farezones through which the 507 moves. Click on the colored box next to farezone '1' (See Figure 19). The filtered part of the route will be highlighted in red on the map. To remove the filter simply click the box again. Observe how the accompanying charts and graphs change in response to the filter.

5. **Saving a farezone filter.** After selecting the zones you'd like to filter out of the route click on 'Save Filter.' A dialogue box will pop up giving you the option to use a default filter name or to give your filter a name of your choosing. After selecting a name click 'Save Changes.' You will be able to apply this filter in the future by clicking 'Previous filters' and selecting your saved filter.

NOTE: To apply one Farezone Filter to the entire market area, you must save all of your route filters under one name. To build a Farezone Filter for your entire market area, make all route filter changes and farebox date filters before saving. If, after saving your Farebox Filter, you decide to add additional filters you must select your saved filter from the "previous filters" menu, make additional changes and re-save your Farebox Filter with a new name.

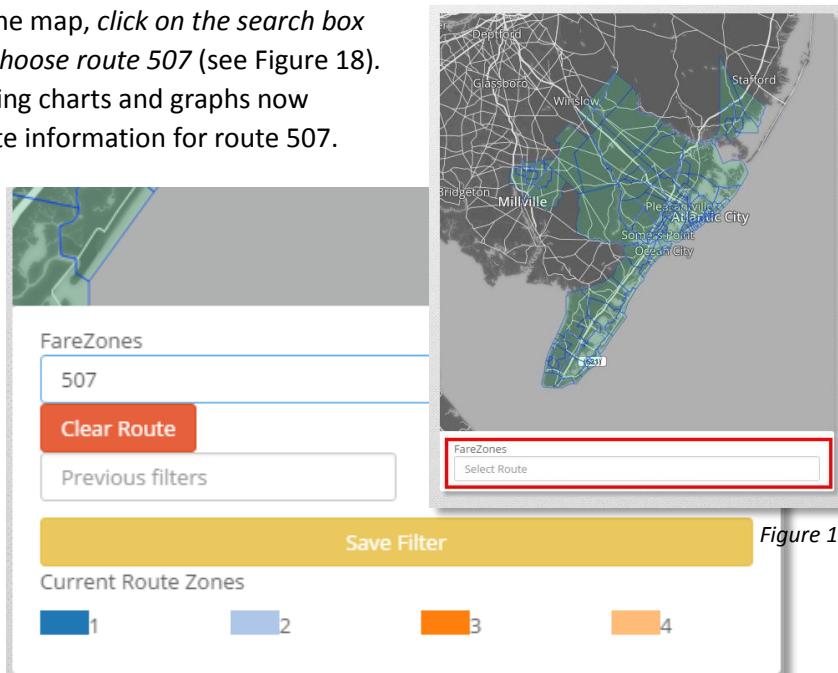


Figure 18

Figure 19

6. **Viewing available days of data.** At the bottom right of the farebox page, you'll see a calendar graph (see Figure 20). This calendar graph shows every day in a given year and is separated into months by bold boundaries. The days for which farebox data is entered in the web-tool are colored yellow to green. Dark green signifies more ridership on a day, yellow signifies less.
7. **Filter the data in the graphs using the calendar.** Click on a day in the calendar for which there is data available. Notice two things. First, the selected day turns to red in the calendar. Second, your selection populates a filter list. You can select any number of days and they will be added to this filter list. The data from those days will be averaged together. Observe how the accompanying graphs change in response to your filters.
8. **Clear the data.** The default for the farebox page is set to average together all of the farebox data for the market area. To remove the filter and return to the default click 'clear all.'
9. **Combining farezone filters and calendar filters.** You may want to filter both farezones and calendar days. These filters may be saved together. Select your farezone and calendar filters then use the 'Save Filter' button under the map. When prompted create a name for your filter. As mentioned above, if you would like to add more filters—be they farezone or calendar days—to a previously saved filter you must load that filter first, select the desired additional filters then save the filter under a new name.

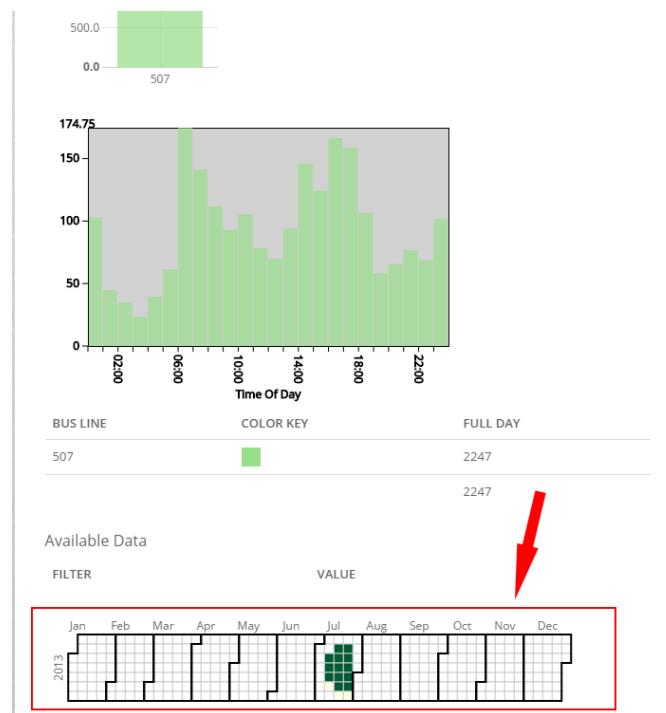


Figure 20

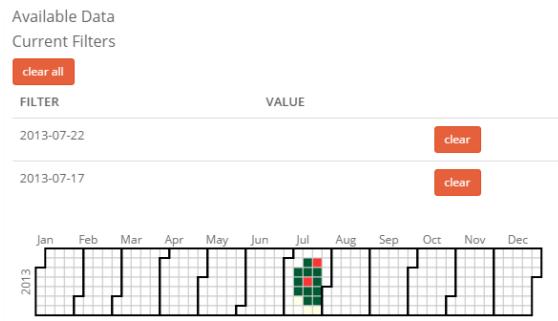
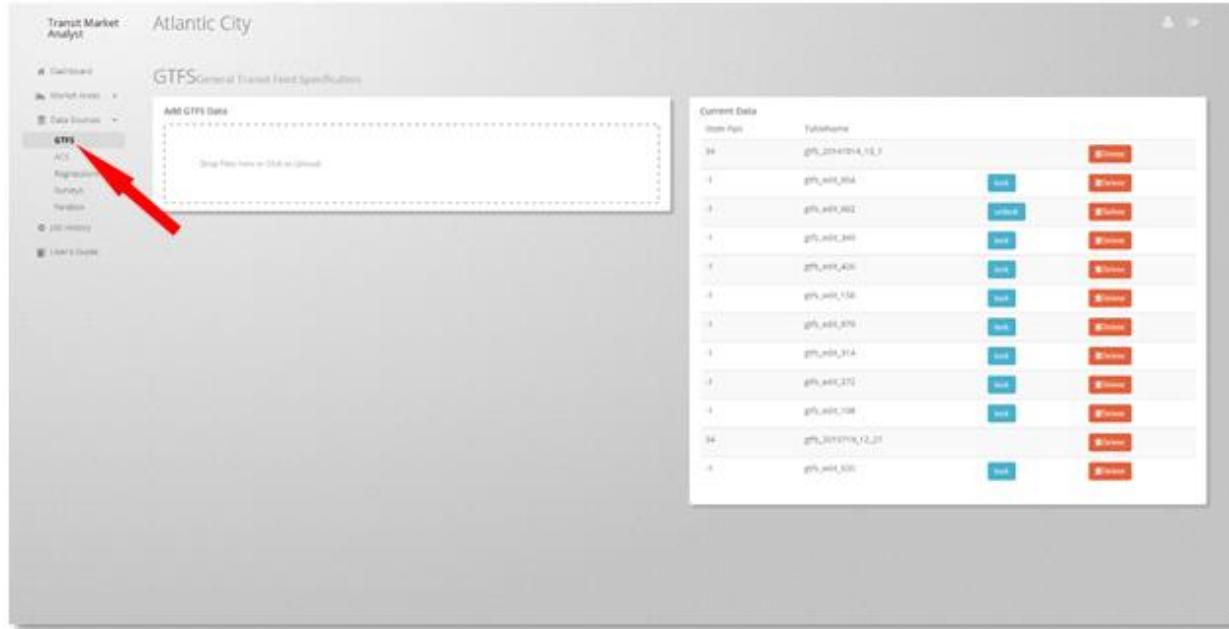


Figure 21

3 ASSEMBLE MARKET AREA

3.1 UPLOAD DATASETS

The Transit Market Analyst utilizes a number of datasets, including General Transit Feed Specification (GTFS), US Census American Communities Survey 5-Year (ACS), Census Transportation Planning Package (CTPP 2010), NJTransit Ridership Surveys, and NJTransit Fare Box.



3.1.1 GTFS

Figure 22

GTFS is the backbone of the tool in terms of setting geographic areas in the tool.

- Upload GTFS.** Click on the ‘Data Sources’ link in the left side bar and select ‘GTFS.’ (See Figure 22).

- View GTFS.**

The GTFS page shows two sections, currently loaded GTFS data on the right (Figure 24) under ‘Current Data’—which includes edited GTFS clones (more on that later)—and the ‘Add GTFS Data’ upload box on the left (Figure 23).

- Add GTFS.** You can add GTFS to Transit Market Analyst in one of two ways.

Current Data		
State Fips	TableName	
34	gtfs_20141014_13_1	
-1	gtfs_edit_954	
-1	gtfs_edit_662	

Figure 24



Figure 23

- a. Click on the 'Add GTFS Data' box to open up a file browser window and select your GTFS dataset.

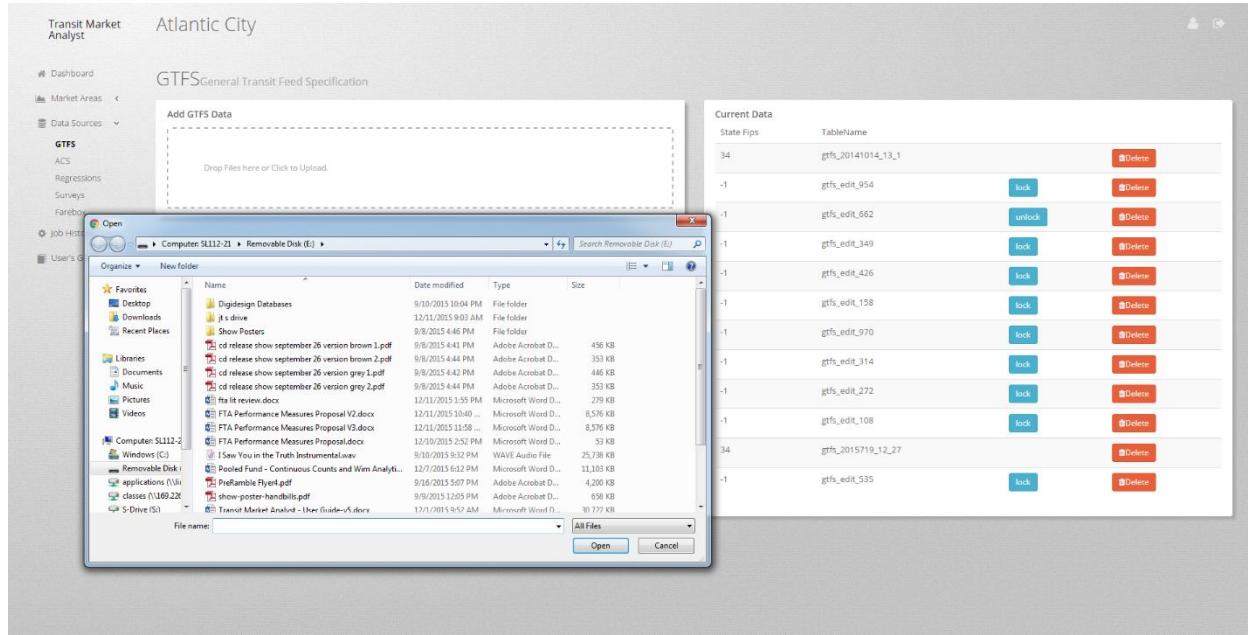


Figure 25

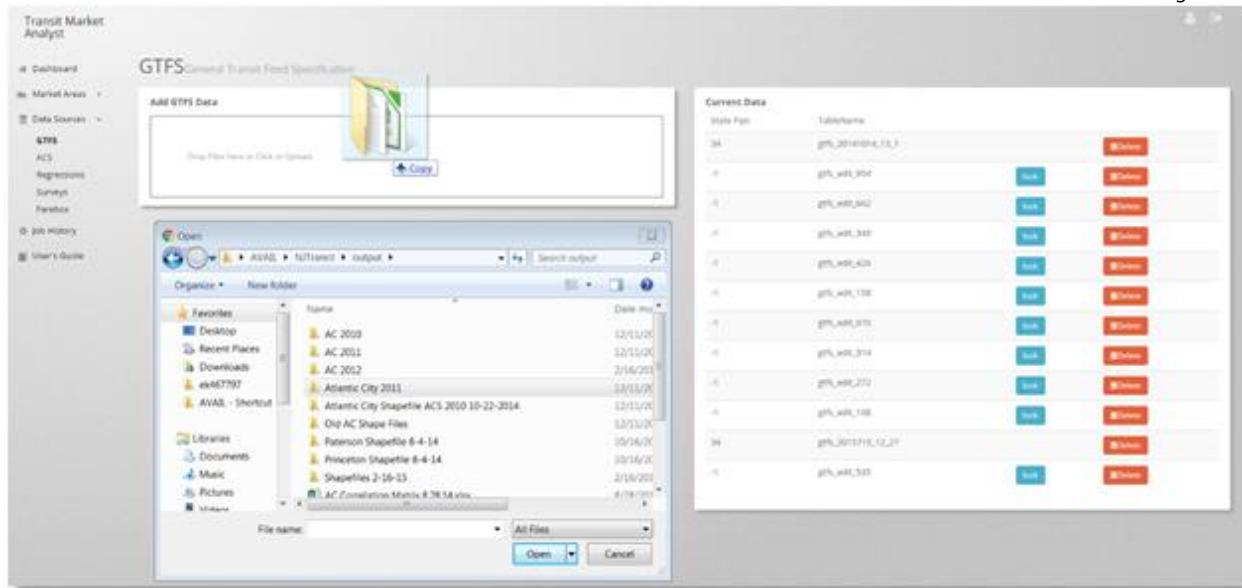


Figure 26

- b. Drag and drop file into Add GTFS Data box.

4. Locking feature.

All GTFS uploaded into the system is automatically locked. It cannot be directly edited within the tool.

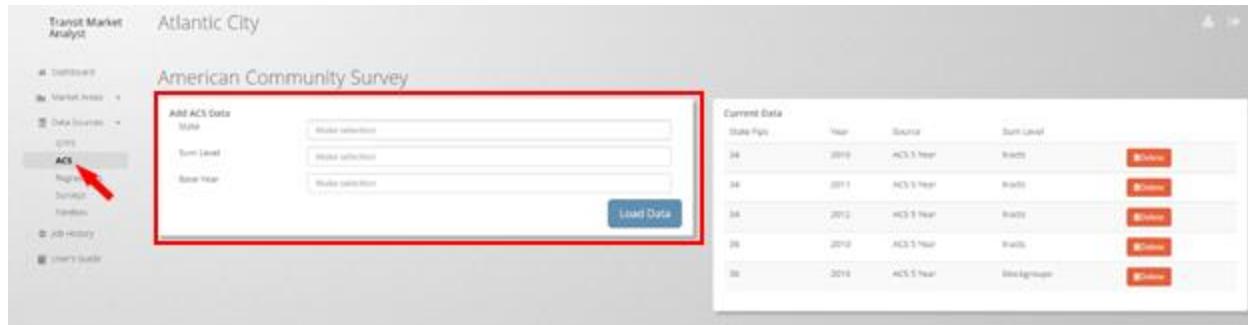
Current Data		
State Fips	TableName	
34	gtfs_20141014_13_1	
-1	gtfs_edit_954	
-1	gtfs_edit_662	

Figure 27

Instead, when you edit GTFS, a “clone” is made of the GTFS file and edits are made to the clone. You can then lock or delete these edited GTFS clones in the right side box.

3.1.2 US Census ACS 5-Year

1. **Upload ACS 5-Year.** Click on ‘Data Sources’ in the left sidebar then select ‘ACS.’ (See Figure 28).



State File	Year	Source	Geog Level
34	2010	ACS 5-Year	Blocks
34	2011	ACS 5-Year	Blocks
34	2012	ACS 5-Year	Blocks
34	2013	ACS 5-Year	Blocks
34	2014	ACS 5-Year	Blockgroups

Figure 28

2. **View ACS.** The ACS data is pulled from the US Census Bureau. Set the parameters of what data you’d like to pull down from US Census (See the rectangular box in Figure 28).
 - a. Select State
 - b. Select Geography Level: Census Tract or Block Group level
 - c. Select Base Year 2010 5-Year is 2006-2010, 2011 is 2007-2011
 - d. Click ‘Load Data’ to complete the action.

3.1.3 CTPP

There is currently no tool for uploading CTPP.

3.1.4 Survey

AVAIL is still building Survey upload tools.

3.1.5 Farebox

1. **Upload Farebox data.** Click on ‘Data Sources’ in the left sidebar then select ‘Farebox.’

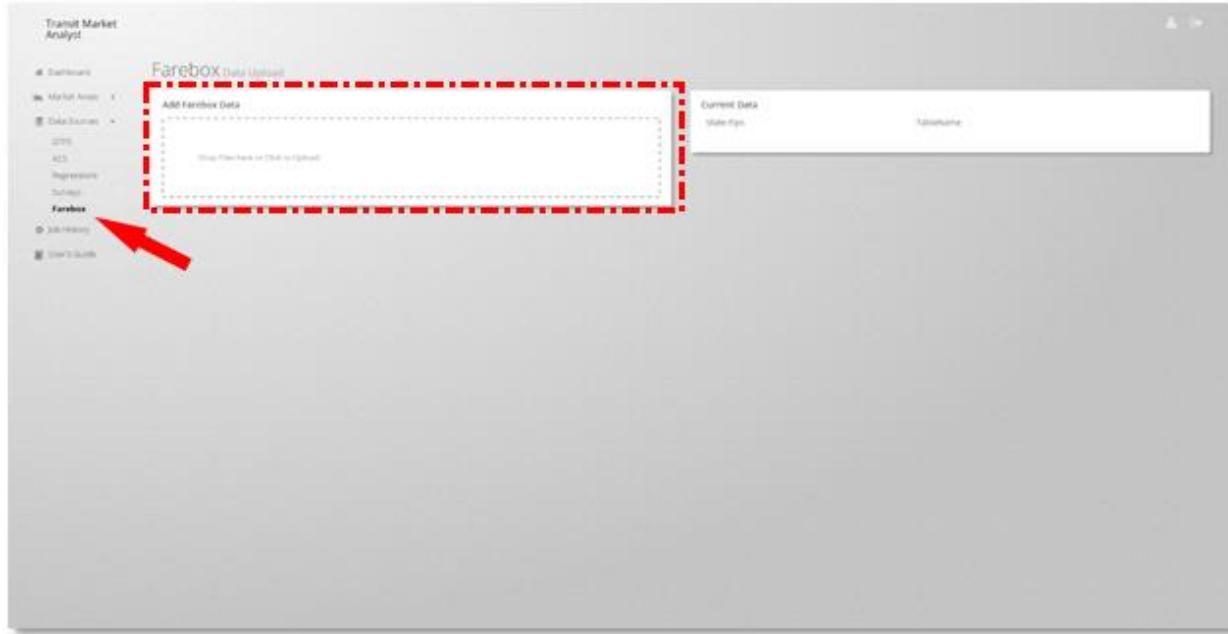


Figure 29

2. Just like with the GTFS uploader, you can either click on the upload box to open a file browser or you can drag and drop files into the box.

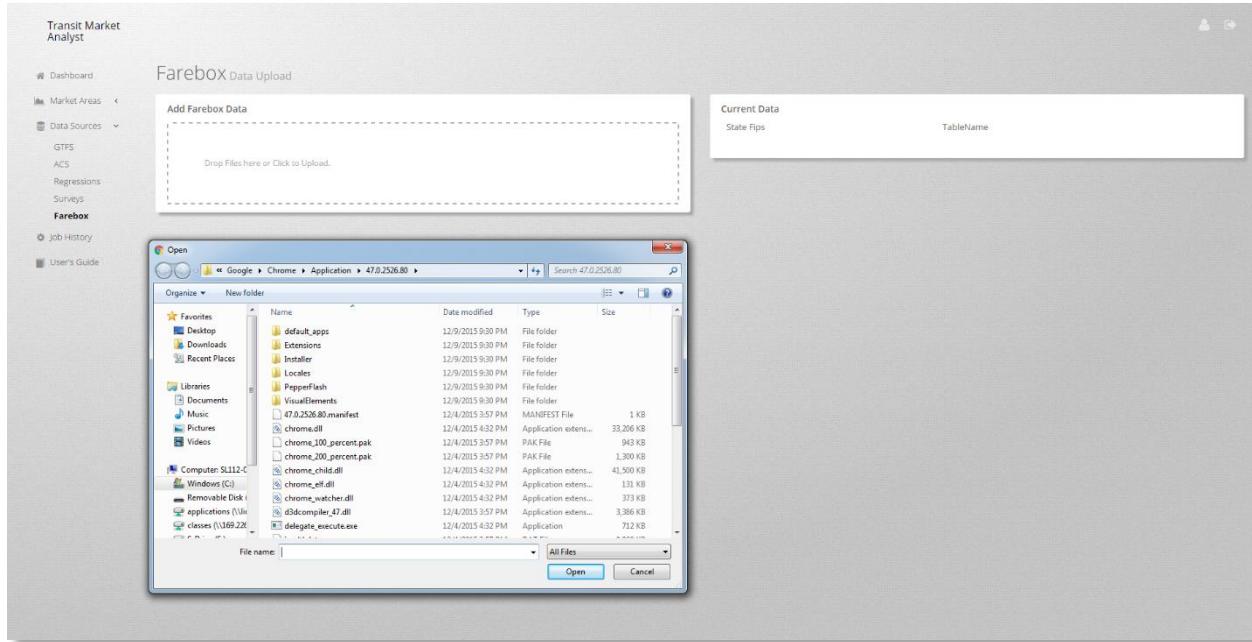
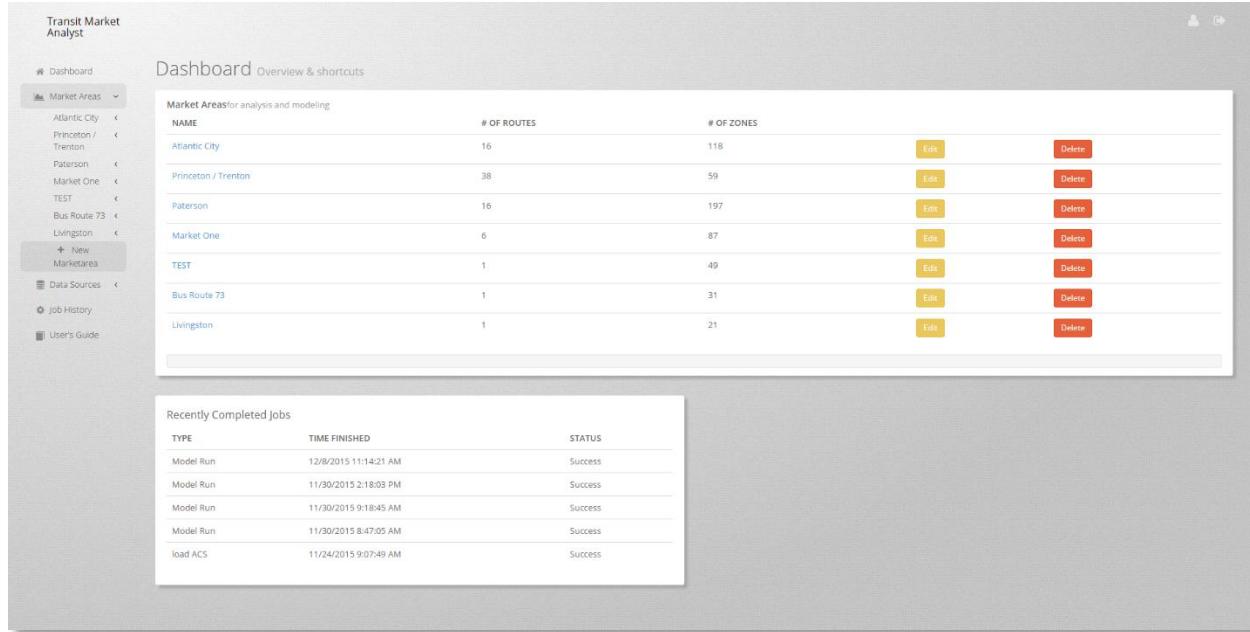


Figure 30

3. On the right side of the page are the Farebox settings (Farezones etc.) that were entered into the system through the Farebox tab.

3.2 DEFINE A MARKET AREA

1. **Building a market area** starts with bus routes. This web-tool selects census tracts associated with those bus routes, specifically census tracts with bus-stops located within.
2. **Start building a new market area.** Click on ‘Market Areas’ in the left sidebar.



The screenshot shows the 'Transit Market Analyst' interface. On the left, a sidebar menu includes 'Market Areas' (selected), 'Data Sources', 'Job History', and 'User's Guide'. The main content area has two sections: 'Market Areas for analysis and modeling' and 'Recently Completed Jobs'.

Market Areas:

NAME	# OF ROUTES	# OF ZONES	Edit	Delete
Atlantic City	16	118	<button>Edit</button>	<button>Delete</button>
Princeton / Trenton	38	59	<button>Edit</button>	<button>Delete</button>
Paterson	16	197	<button>Edit</button>	<button>Delete</button>
Market One	6	87	<button>Edit</button>	<button>Delete</button>
TEST	1	49	<button>Edit</button>	<button>Delete</button>
Bus Route 73	1	31	<button>Edit</button>	<button>Delete</button>
Livingston	1	21	<button>Edit</button>	<button>Delete</button>

Recently Completed Jobs:

TYPE	TIME FINISHED	STATUS
Model Run	12/8/2015 11:14:21 AM	Success
Model Run	11/30/2015 2:18:03 PM	Success
Model Run	11/30/2015 9:18:45 AM	Success
Model Run	11/30/2015 8:47:05 AM	Success
load ACS	11/24/2015 9:07:49 AM	Success

Figure 31

3. Click on “+ New Market Area.”
4. Select the GTFS Dataset (See Figure 32, 33) from the drop down menu. (If you have not loaded a GTFS Data set, see section 2.2.)



The screenshot shows the 'Create Market Area' page. The sidebar includes 'Market Areas' (selected), 'Data Sources', 'Job History', and 'User's Guide'. Below the sidebar, there are two sections: 'Model Run 97%' and 'Model Run 97%'. The main area features a map of a region with a network of roads and a form to enter a market area name. To the right, a red box highlights a dropdown menu labeled 'Select GTFS Dataset' with an option 'Make selection'.

Figure 32



Figure 33

3.3 SELECT ROUTES

5. **Add Routes** to your market area. Click on the 'Add Route' dropdown menu to select a route to add to your market area. (Refer to the boxes outlined in Figure 34 for actions taken in section 3.3)



6. Click the yellow "+" button.
7. **View the route.** The route will now appear on the map as a line of red dots. The red dots are the bus stops on that route.
8. **View census tracts.** The green census tracts are automatically included in your market area because they have bus stops contained within them.
9. **Tool census tract recommendations.** The purple census tracts are suggested census tracts based on your route selection. The route also appears in the box on the right side of the page.
10. **View the Market Area Statistics overview box.** These statistics will update as you add additional routes and census geographies to the market area.

Figure 34

11. Add another route.

12. **View all your routes.** The colors for each route you add to you market are randomly generated.

Check the color of the next route you add. If it is too similar to any of the other route colors (or is the same color) change the route color by *clicking on the color bar*. (See Figure 35)

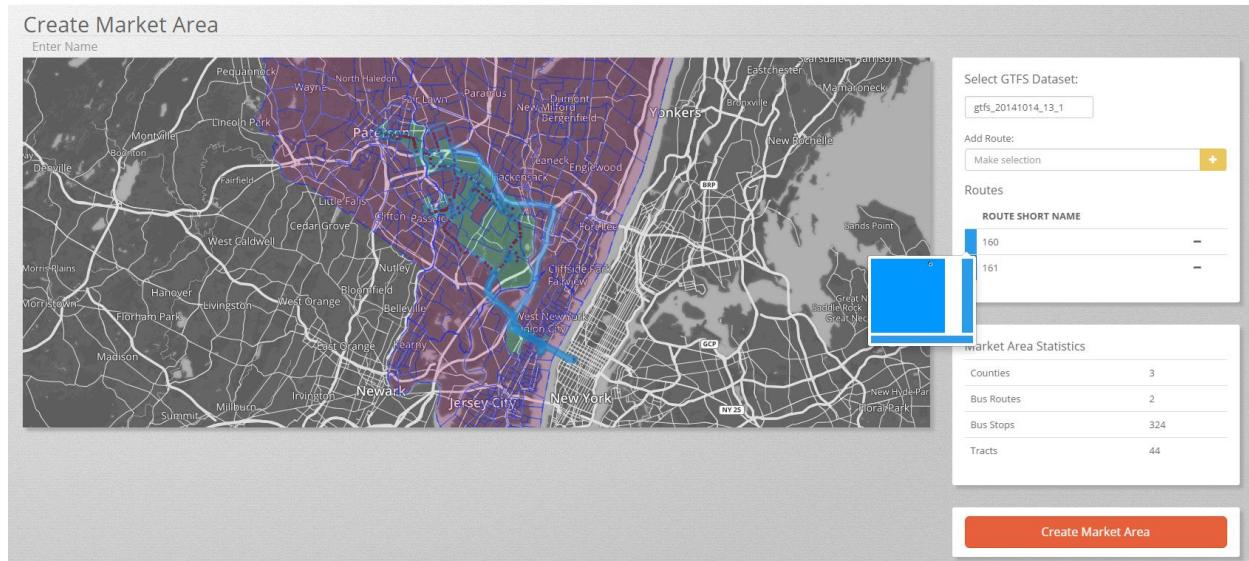


Figure 35

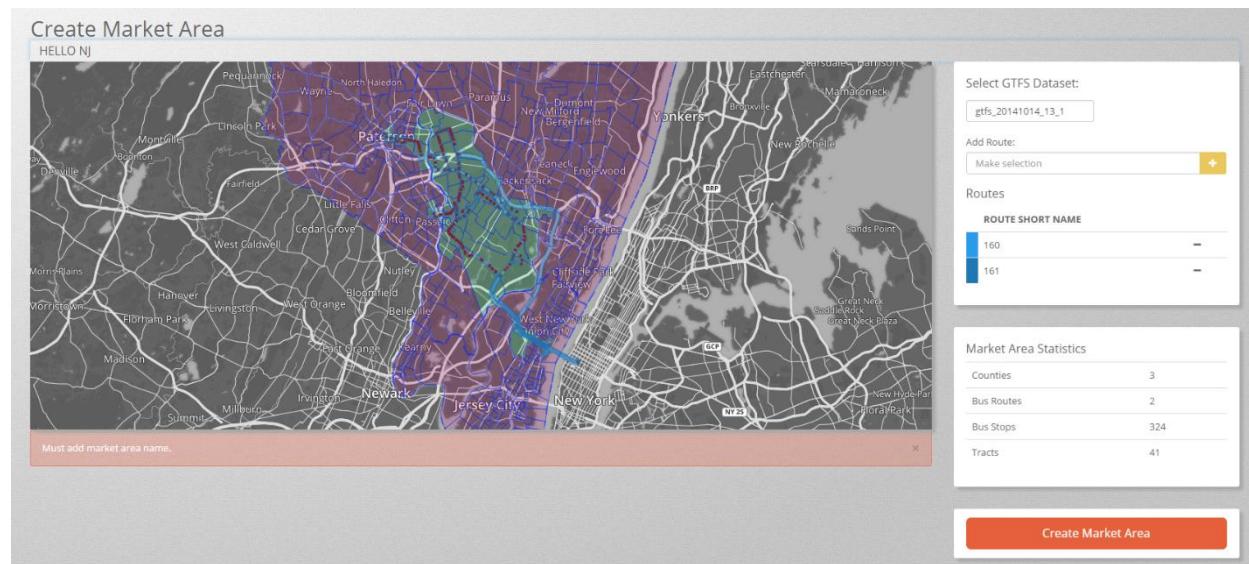


Figure 36

13. **Add additional census tract geographies** by using *control+left-click* on the desired census tracts.

14. Click 'Create Market Area' to complete the Market Area creation process.

15. The tool prompts you to name the area. Just above the map, below the Create Market Area title is a bar that says "Enter Name." *Enter your Market Area name here.*

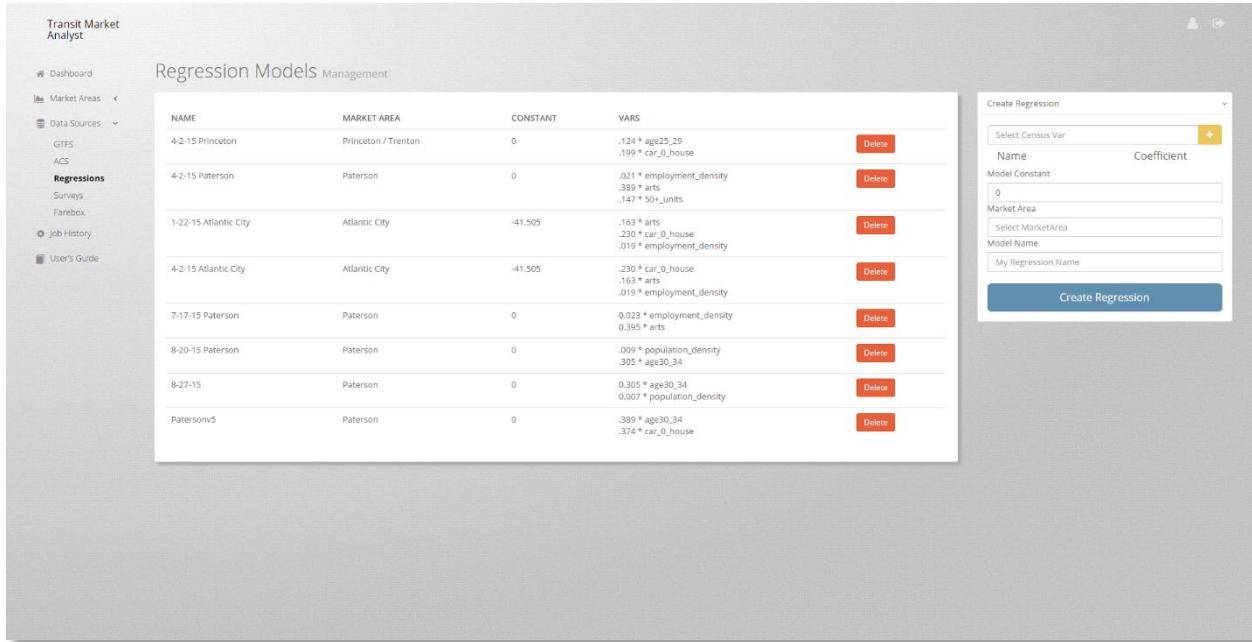


Figure 37

3.4 SET REGRESSION MODEL

One final thing to add to your market area is a regression model for your Transit Demand Modeling Tool. The tool does not run demographic regressions. All work developing regression models will need to be completed in a separate program like SPSS or Geoda.

- 16. Set your Regression Equation for your market area. Click on the left sidebar ‘Data Sources’ > ‘Regressions.’ (See Figures 38, 39)**



NAME	MARKET AREA	CONSTANT	VARS
4-2-15 Princeton	Princeton / Trenton	0	.124 * age25_29 .199 * car_0_house
4-2-15 Paterson	Paterson	0	.021 * employment_density .389 * arts .147 * 50+_units
4-22-15 Atlantic City	Atlantic City	-41,505	.163 * arts .220 * car_0_house .019 * employment_density
4-2-15 Atlantic City	Atlantic City	-41,505	.230 * car_0_house .163 * arts .019 * employment_density
7-17-15 Paterson	Paterson	0	0.023 * employment_density 0.395 * arts
8-20-15 Paterson	Paterson	0	.009 * population_density .305 * age30_34
8-27-15	Paterson	0	0.035 * age30_34 0.007 * population_density
Patersonv5	Paterson	0	.389 * age30_34 .374 * car_0_house

- 17. Click on the right side “Select Census Var” dropdown menu to select your variable and click the yellow “+”**

- 18. Add a variable coefficient.**
- 19. Add additional census variables and coefficients.**
- 20. Add a constant (if necessary).**
- 21. Choose the Market Area to apply this regression to.**
- 22. Name the Regression Model.**
- 23. Click ‘Create Regression.’**

Figure 38

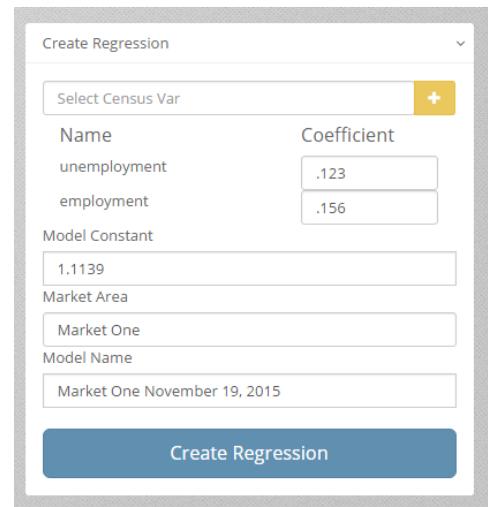


Figure 39

4 EDITING AND SAVING GTFS

4.1 THE GTFS EDITING TOOL

1. **Access the GTFS tool.** Click on the 'GTFS' tab under Atlantic City (Left sidebar 'Market Areas' > 'Atlantic City' > 'Overview' > 'GTFS'). See Figure 40.
2. **Select the GTFS file you plan to edit.** On the right side of the screen (see Figure 41), click on the box with the GTFS file to see a list of uploaded GTFS files. The GTFS file defaults to the latest GTFS in the system.



Figure 40

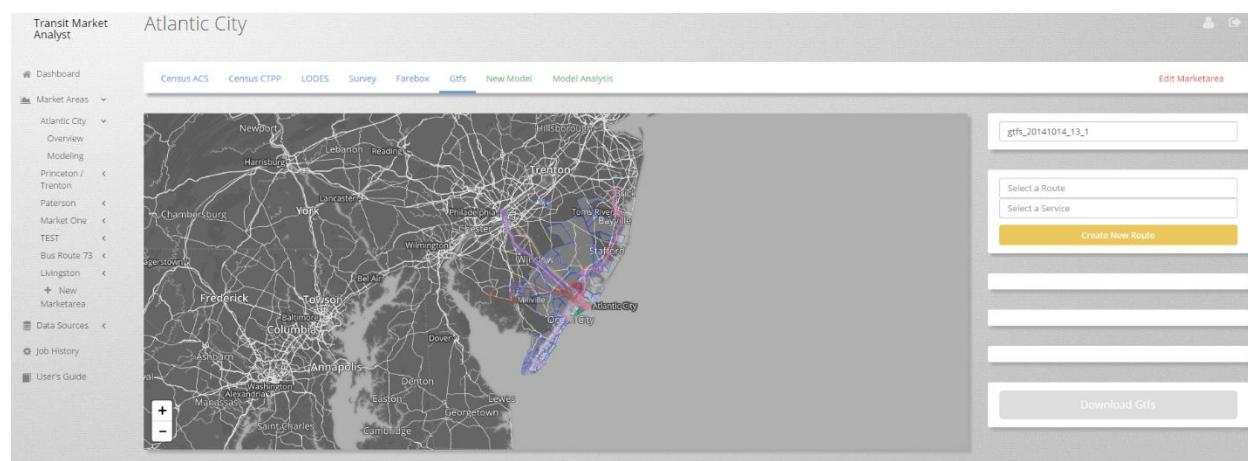


Figure 41

3. **Choose a route to edit.** You can either choose a route based on route number from the right side drop down menu (simply click on 'Select a Route') or by scrolling over the route on the map to highlight. Notice below the blue route is highlighted (Figure 42).



Figure 42

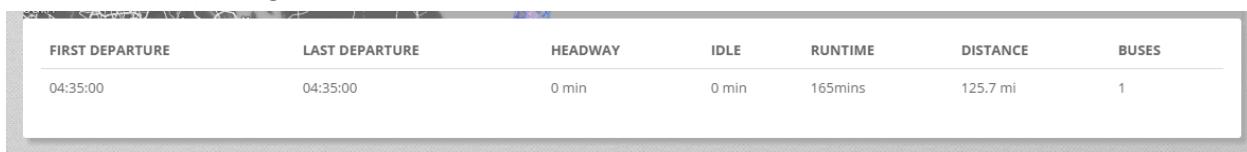
4. **Review your route.** The route will be highlighted yellow and all stops on the route will appear as white circles. Below, we've zoomed in to see a close-up of the route.



Figure 43

5. Introducing the GTFS Tool components.

- a. Notice the chart below the graph, this chart shows the time parameters of the route (see Figure 44).



The figure shows a table of route parameters:

FIRST DEPARTURE	LAST DEPARTURE	HEADWAY	IDLE	RUNTIME	DISTANCE	BUSES
04:35:00	04:35:00	0 min	0 min	165mins	125.7 mi	1

Figure 44

It is important here to note that the schedule is based on a set of parameters: The length and number of stops on the route, Time of First Departure, Time of Last Departure, Headway (the time between buses at each stop), and Idle time (the time the bus waits at each stop). As you build your GTFS, you can adjust each to the time parameters by clicking on the times in the chart.

You can adjust length and number of stops by clicking on the map.

- b. Notice the list on the right side of the page, in green and blue (Figure 45). This is a list of the various headsigns for the route. You can click on each headsign to adjust which route you are editing. For instance, in the image below, notice that the second headsign in the list has been chosen "1 – 319 JERSEY CITY VIA NEWARK." The map has adjusted to show the full extent of the

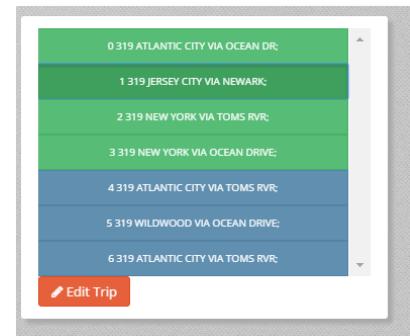


Figure 45

route and the schedule chart has changed to reflect the time parameters for this particular route.

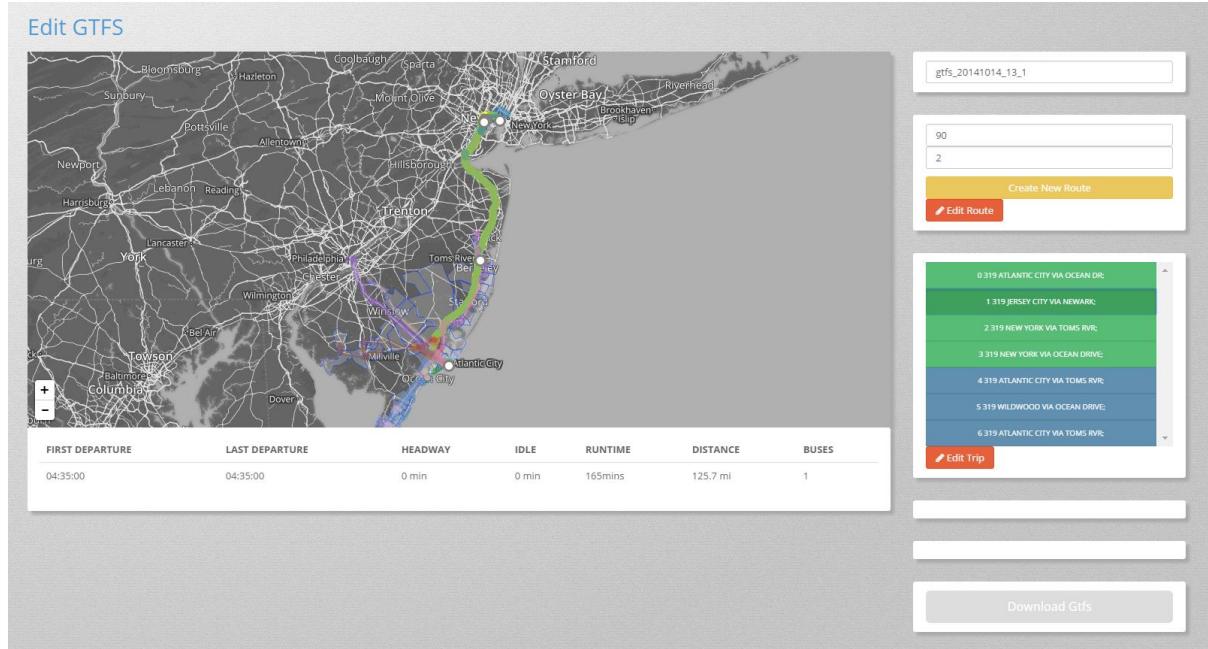


Figure 46

- c. Notice that there are two edit buttons now available: “Edit Route” and “Edit Trip” (See Figure 46). Edit Route allows you to click on the map or the time parameter chart to edit the route. Edit Trip allows you to edit the Route Name and Route ID.

4.2 EDITING EXISTING GTFS

6. Click on 'Edit Route' to start. The Route ID and Short Name appear in a box on the right side of the screen along with a yellow "edit" button. This allows you to edit the short name of the route.

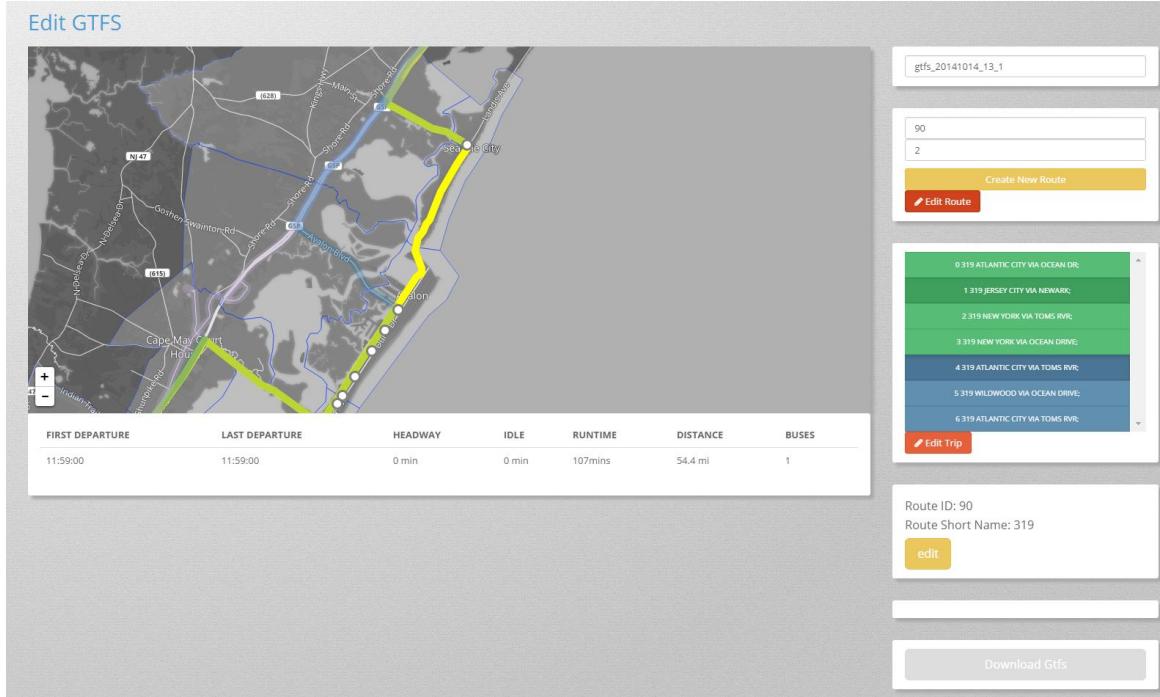


Figure 47

7. **Edit a route.** Zoom in to a bus stop that you'd like to move. Click on that bus stop to grab it. Now slide that bus stop to a new location and a box appears on the right side of the page with a yellow button labeled 'Save Changes.'

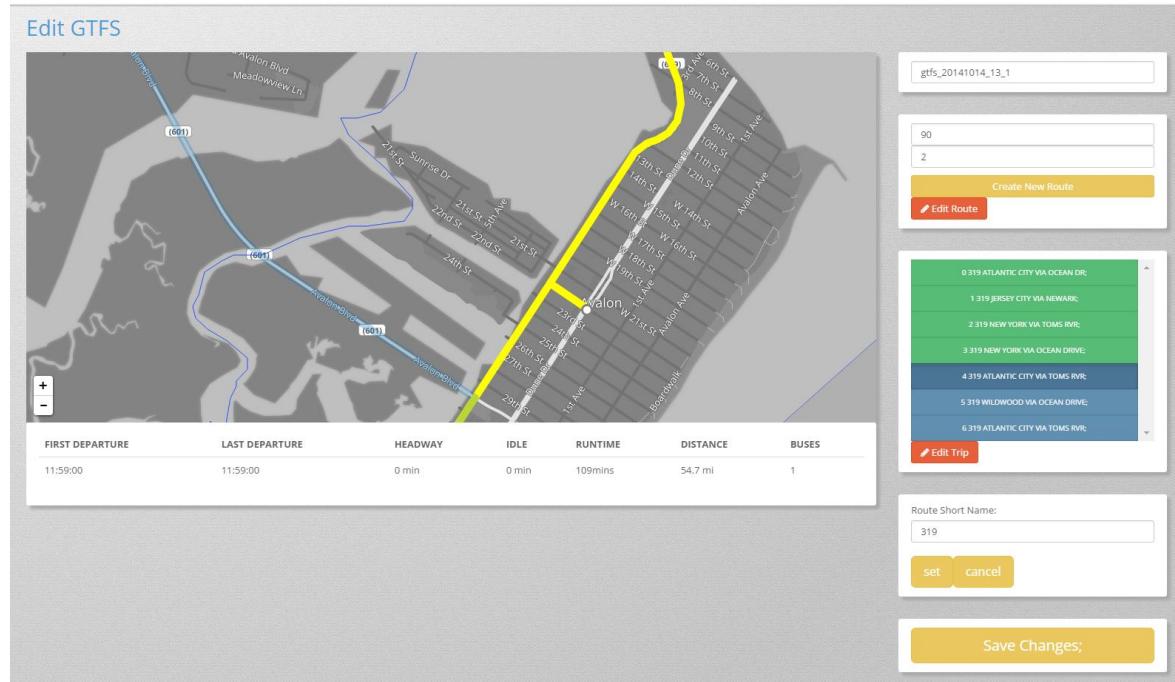


Figure 48

8. **Efficient routing.** Now let's move a second bus-stop and watch the route change to the most efficient route between those two points.



Figure 49

9. Add a new bus-stop. Click on the yellow route to add a new bus-stop.



Figure 50

a. Drag your new bus-stop around.



Figure 51

10. Remove a bus-stop. Control+click on the bus-stop to remove it from the route

4.3 SETTING SCHEDULE

- 11. Change the headway.** Click on the headway of one of the routes to change it from 60 minutes to 30 minutes and notice how the number of buses on the right change from 6 buses to 11 (see Figure 52).

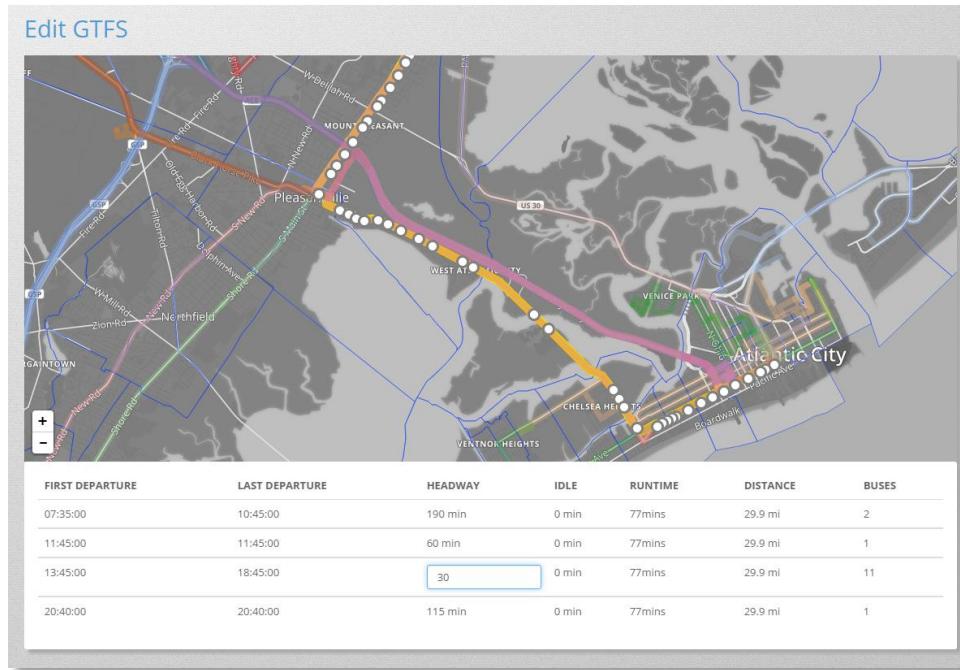


Figure 52

- 12. Change the departure times.** Change First Departure Time, Last Departure Time, and Idle time to explore how this affects the route schedule.

4.4 SAVING GTFS

- 13. Scrap your changes.** To scrap your changes, click on a different route in the market area. A prompt will appear at the top of the page. If you'd like to clear your work and start over click "OK," otherwise click cancel (See Figure 53).

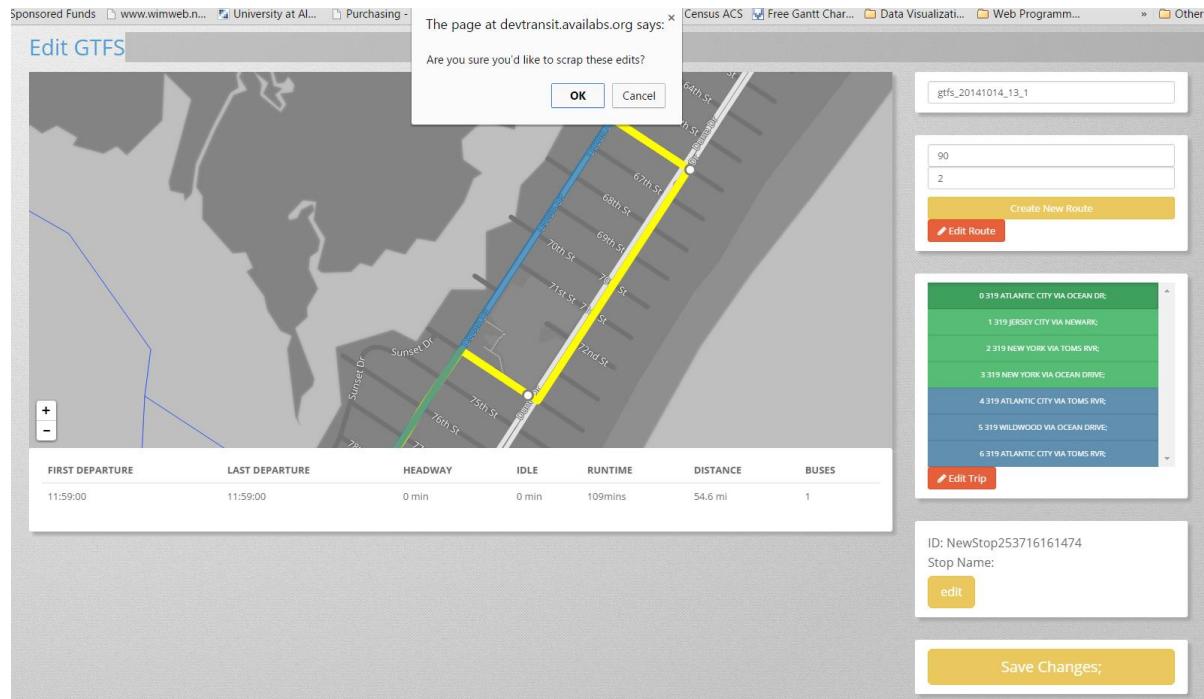


Figure 53

- 14. Save your changes.** Cancel the prompt. And click on the "Save Changes" button on the bottom right of the page (See Figure 53).

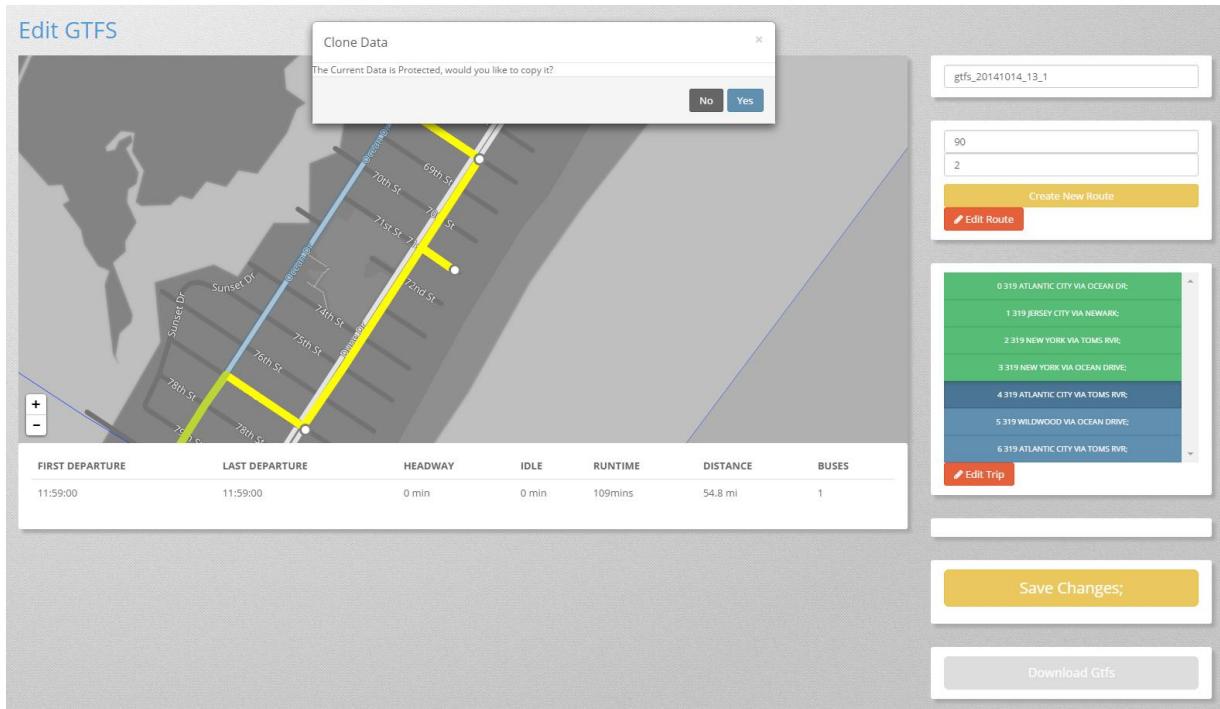


Figure 54

15. Create a clone. A new prompt appears notifying you that the GTFS files data is copy-protected and to ask you if you'd like to create a clone. *Click yes to save the GTFS edits you made*, this will also clone all of the other data contained in the original GTFS file (See Figure 54).

- On the left side of the screen you'll notice a progress bar appears with the name of the GTFS clone (Figure 56).

16. Select your clone. Once the GTFS clone is completed, you can *select it from the GTFS selector dropdown menu* on the right side of the page to continue editing that GTFS file.

17. Write-protected feature. All original GTFS files (uploaded by NJTransit or AVAIL) are write-protected. All clones are write-enabled. A future feature will be added to the data page allowing users to set GTFS as write-protected or enabled.

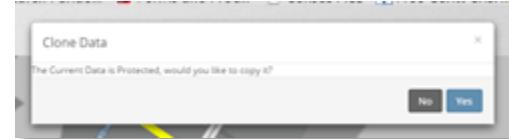


Figure 55

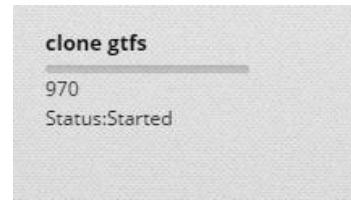


Figure 56

4.5 CREATING NEW ROUTES

- 18. Create a new route.** To begin creating a new route click on the yellow button labeled 'Create New Route.' (See Figure 57).

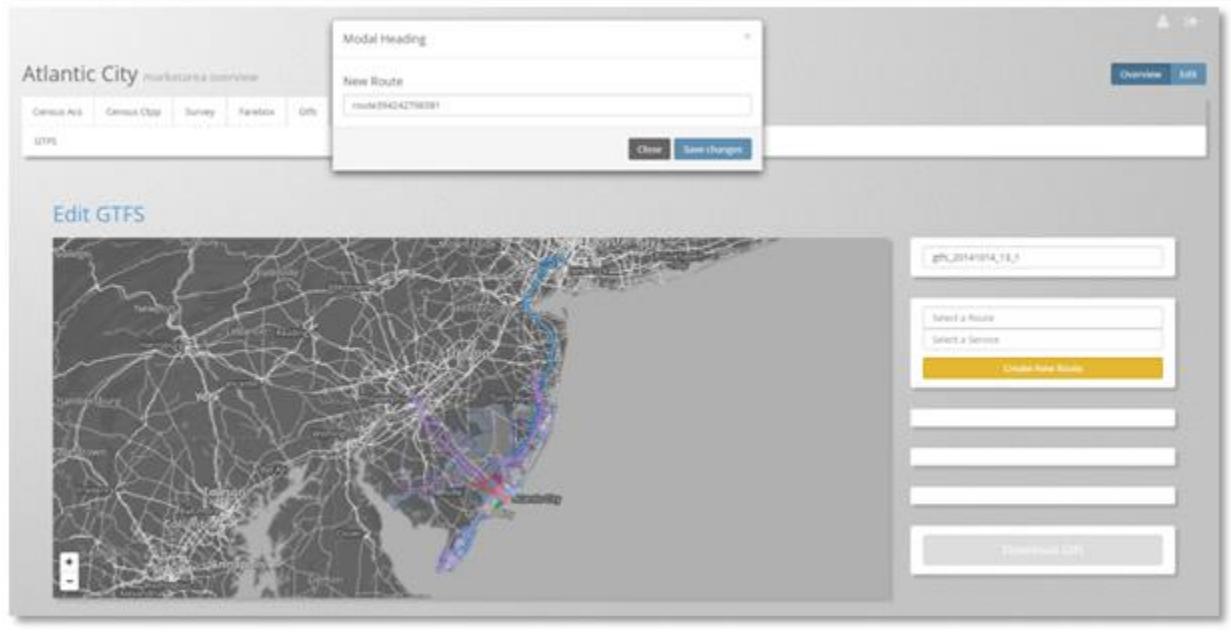


Figure 57

- 19. Name your route.** Enter the name of your new route into the prompt box and click save changes. The Edit GTFS tool will create for you a placeholder route name and route ID. (See Figure 57)

20. **Map your route.** You will be prompted with a black box saying “Click Me to Begin” (See Figure 58). This prompt is pointing toward the blue box on the right side of the screen. The blue box corresponds to the automatically generated route name. *Click on this blue box to start mapping your route.*

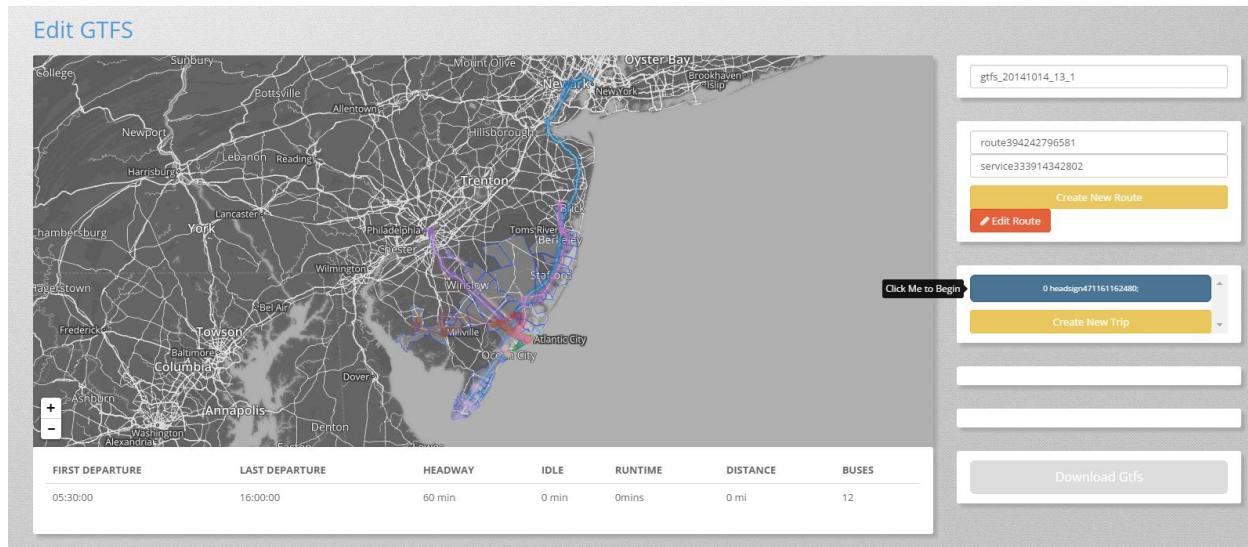


Figure 58

21. **Pick your points.** A second black box will appear prompting you to “Click Any 2 Points on the Map.” (See Figure 59).



Figure 59

22. Create your path. Click on two points to generate the outline of your route. You can always adjust the stops later.

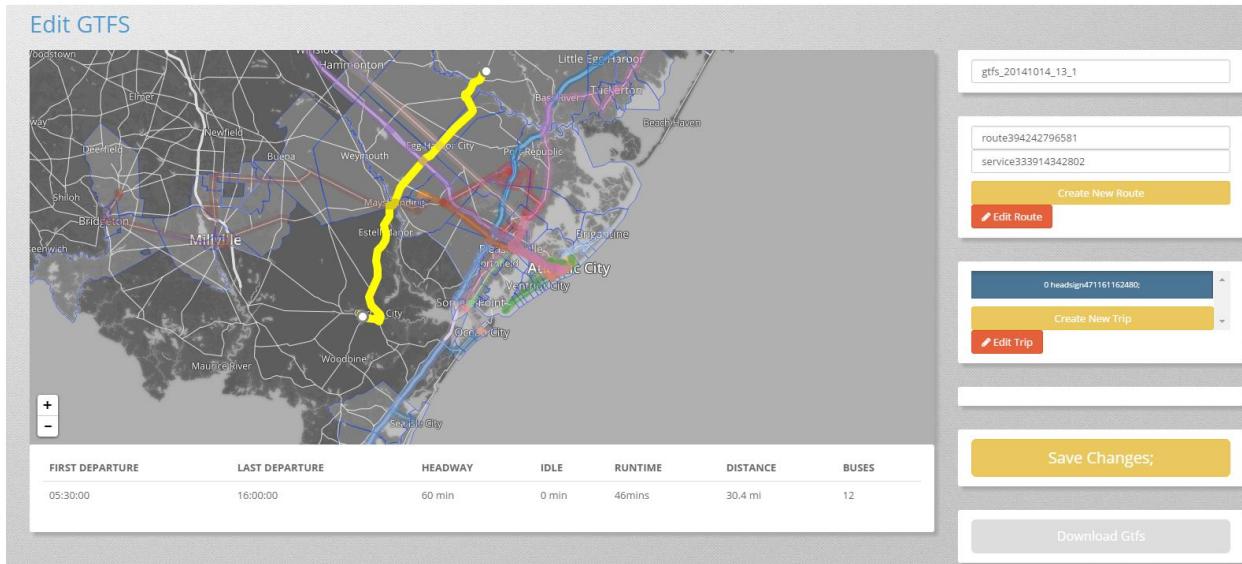
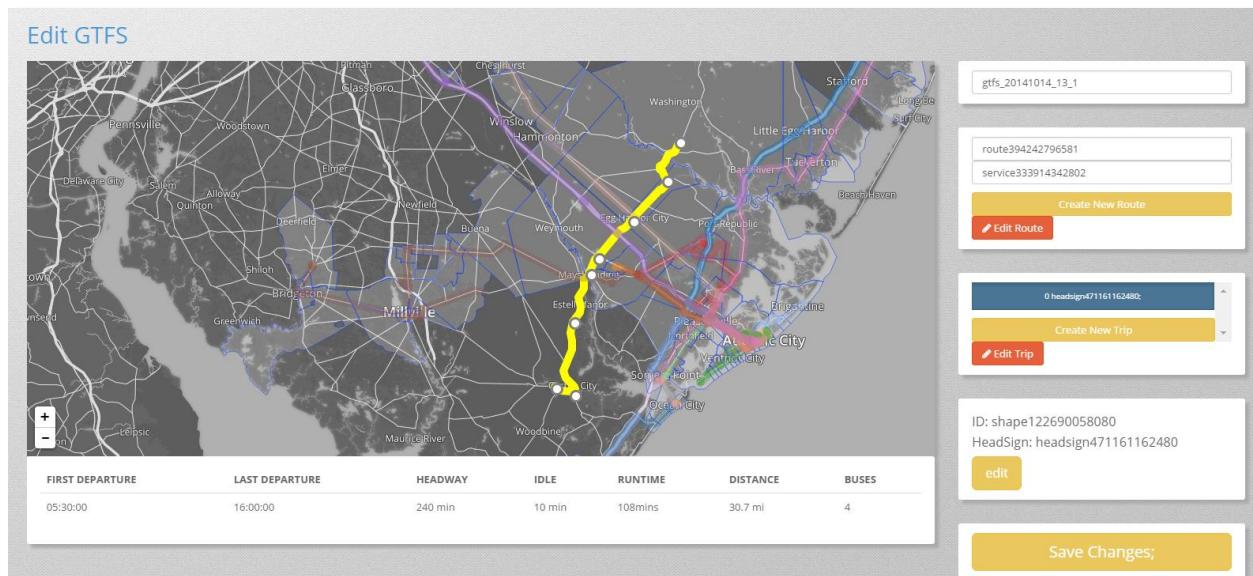


Figure 60

23. Add bus-stops. Click on the route to add bus-stops.

24. Set your schedule. Set the schedule of the new route by editing ‘First Departure’, ‘Last Departure’, ‘Headway’ and ‘Idle times’. The GTFS editor supplied you with a standard set of time parameters. Simply *click on the times to adjust*.



25. Save your route. Once you have your new route created, it is time to save the route. See section 4.4.

Figure 61

- 26. Add trips to your route.** After saving the GTFS clone, with your new route included, you can start to add trips to the route. First, you'll need to *select the newly created GTFS*, then *click on your route*. Click on the yellow button labeled 'Create New Trip.'
- A Prompt will appear allowing you to edit the Headsign

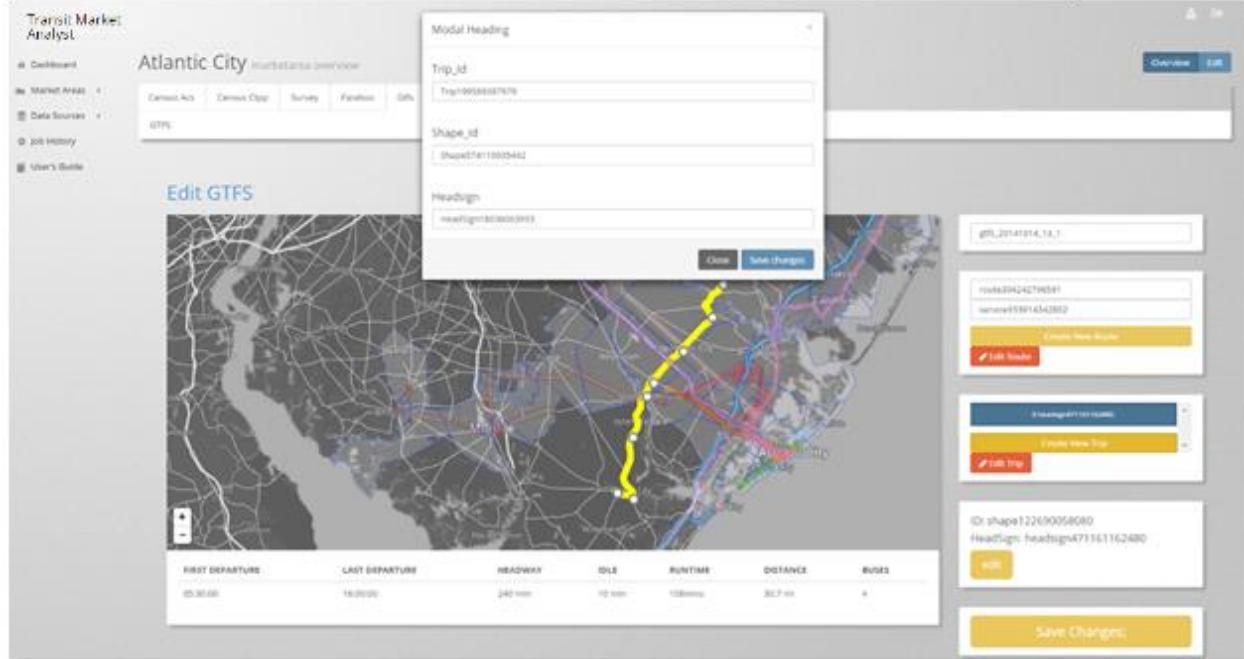


Figure 62

- 27. Add a schedule.** Set the schedule of your new route.
- 28. Save your changes.** If you are working off of your newly cloned GTFS file, the website will not ask you to clone your GTFS because your newly cloned GTFS is not write-protected. The site will simply save your changes. Refresh your web-browser to view your changes.

4.6 SETTING SITE-WIDE GTFS

Now it is time to set your newly edited GTFS as the GTFS for the site. This will allow you to view the various demographic datasets and to run models using your new GTFS.

Avail is currently working on what is the best workflow for setting GTFS. We will discuss these workflow issues in detail on the phone call.

5 DEMAND MODELING AND MODEL VALIDATION ANALYSIS

5.1 EXPLORE MODELS

In this tutorial, we'll see how to run a model for the Princeton Market Area.

5.1.1 Current Model

1. Click on 'Princeton/Trenton' in the left sidebar then click on 'Modeling.'

5.1.2 Run a Model

2. From the menu underneath 'Princeton / Trenton' select 'New Model.'

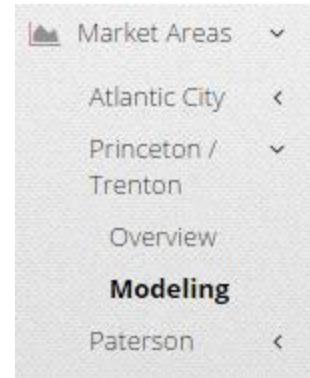


Figure 63

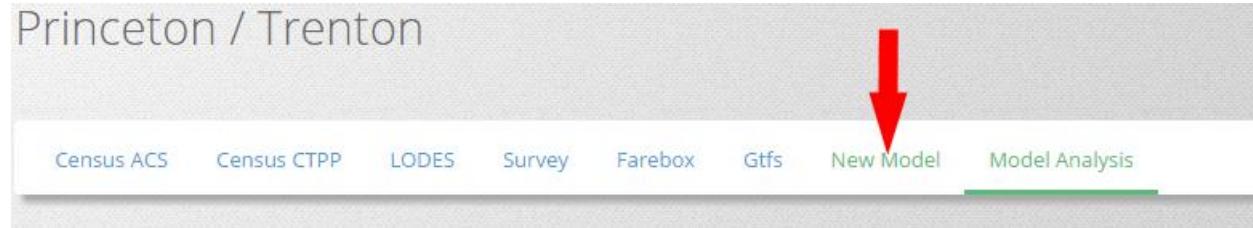


Figure 64

5.1.3 Set inputs

3. **Model inputs.** On the right side of the screen are a series of inputs for a model (See Figure 65).
 - a. Inputs include
 - i. Model Time: sets the time parameters of the model
 - ii. Model Type: allows a user to choose between a CTPP model and a Regression model.
 - iii. Regression Model: Allows a user to choose which regression model to run.
 - iv. Model OD: Allows a user to choose Origin and Destination points. Currently the only option is Bus Stops.
 - v. Model Forecast: Allows a user to choose between the current data and future projection data.
 1. The Future Forecast also comes with two options: MPO Forecast and Custom Forecast. The MPO Forecast contains population and employment projections. In custom, the user sets the projections by census tract (more on that later).

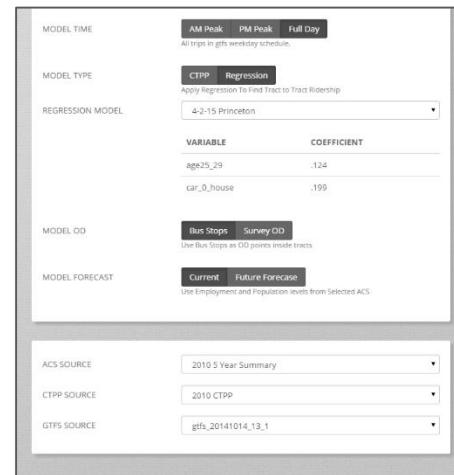


Figure 65

4. Set the inputs to Full Day, Regression (select a regression from the dropdown), Bus Stops, and Current.
5. Click 'Generate Trip Table' above the map to populate the microsimulation trip table.



Figure 66

6. Click 'Run Model.'
7. Review your inputs and click 'Run Model' again.

5.1.4 Analyze Model Output

1. Navigate back to Princeton/Trenton > 'Modeling' in the left sidebar to analyze model output.
2. In the menu underneath 'Princeton / Trenton' select 'Model Analysis.'



Figure 67

3. Select model from the drop down menu and hit the plus button on the right side of the dropdown.
 - a. The model will take up to a minute to load.

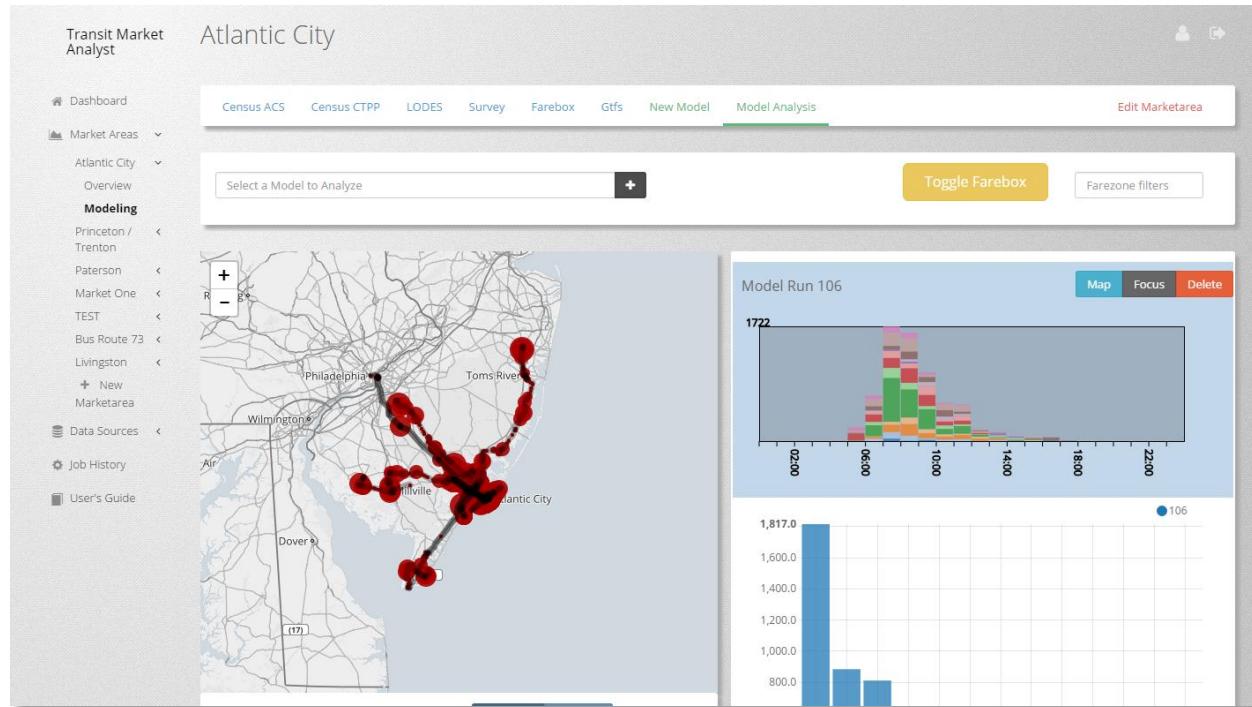


Figure 68

4. Explore the maps and graphs associated with this model.
5. Zoom in to the map to look at the stop by stop boarding and alighting details. To zoom in, put your mouse on the map and scroll up. Or, holding down the shift key, drag your cursor to create a square.
6. **Toggle between boarding and alighting.** Click the blue buttons labeled 'Boarding' and 'Alighting' in the map key.
7. On the right side of the page is a set of graphs (Figure 70).

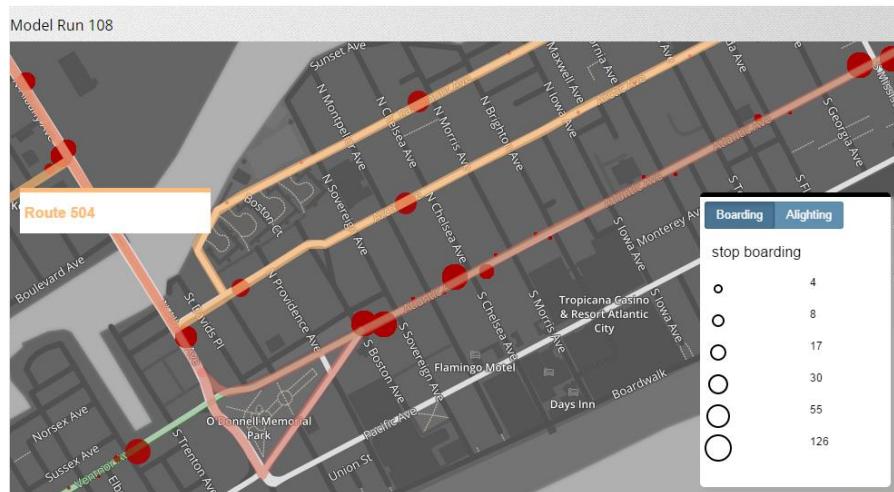
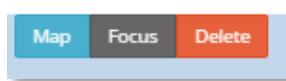


Figure 69

8. The graph on the top of the page is a stacked bargraph showing ridership by route by time of day.
9. The graph below it, shows the ridership by route.
10. Below that is a series of performance measures showing AM Peak, PM Peak and Full day model totals and AM, PM and Full Day as a percentage of farebox.
11. Click the "Focus" button to open up the graph on the top



12. This graph can be filtered in the same way as the farebox graph (see section 2.3.2) and filtering this graph additionally filters the map and other graphs.



Figure 70

5.1.5 Validate Your Model

1. **Validation using Farebox.** This web-tool uses Farebox data to validate models. Add Farebox data into the model analysis tools by *clicking the yellow button titled "Toggle Farebox."*
2. Compare Farebox to model run outputs.

3. Filtering comparisons. The Time of Day graph filter filters both the model and the Farebox data simultaneously.

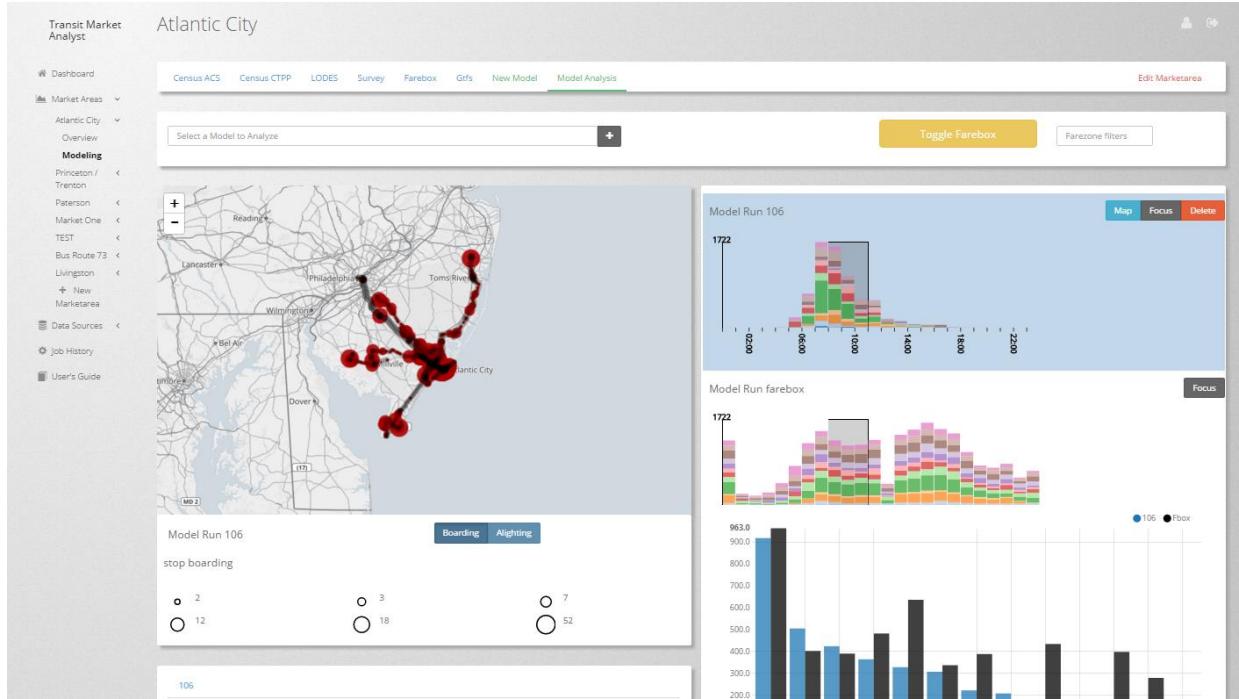


Figure 71

4. You can also click on AM Peak, PM Peak and Full Day to filter the visualizations.

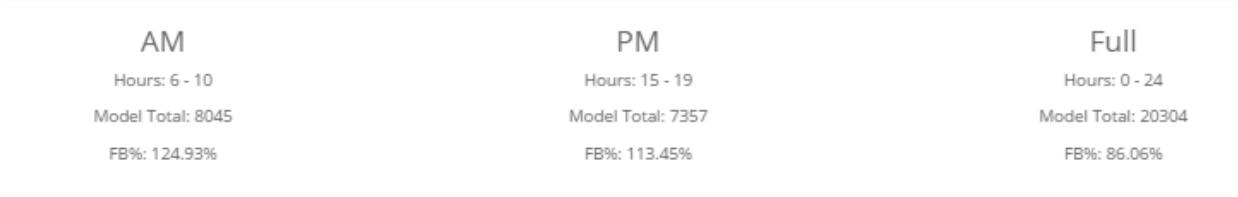


Figure 72

5.2 SCENARIO PLANNING: GENERALIZED MPO FORECAST
Currently under construction by our development team.

5.3 SCENARIO PLANNING: CASINO CLOSING
Currently under construction by our development team.

5.4 SCENARIO PLANNING: EVALUATING 655 ROUTE

The 655 Route is real-world scenario showcasing how to run models based on GTFS changes. The 655 Route was introduced to the Trenton/Princeton Market Area by NJTransit to address a perceived need but was later removed based on low performance.

We're going to run two models. In the first model we'll include the 655 in our Market Area. For the second model we'll remove the 655. Then we'll compare the outputs of the two models with the farebox data.

5.4.1 655 Included

- First, start by checking to see if Route 655 is currently included in the Princeton Market Area. Select 'Princeton' from the left sidebar then select 'Overview.' Furthest to the right in the menu underneath 'Princeton / Trenton' is a tab titled 'Edit Marketarea.' Select 'Edit Marketarea.'

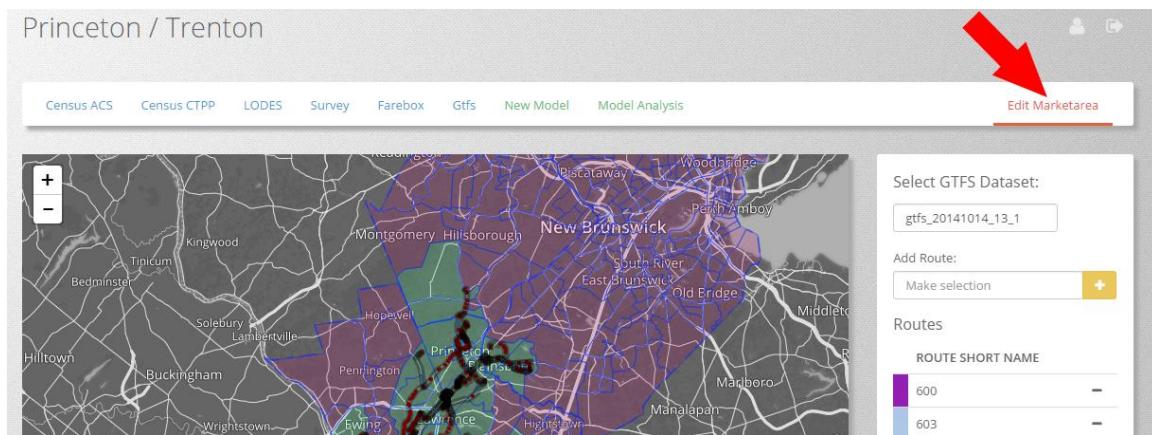


Figure 73

- If, under 'Route Short Name,' the 655 is listed then you can skip steps 3 and 4.

3. If, under 'Route Short Name,' the 655 is not included then *click in the box 'Make Selection'* under 'Add Route,' type in '655,' select it from the dropdown menu and click the yellow '+' button. (See Figure 74).



Figure 74

4. The 655 should now be listed under 'Routes.' Scroll down and *click the orange button labeled 'Update Market Area.'* This will update the GTFS information used in generating a model for your Market Area.

Important: if you add a route but fail to click 'Update Market Area' your changes will not be saved.

5. *Refresh your page.* Why? Just to make sure that the Farebox data for the Market Area is also updated to include the 655. This will be important when you compare your model output with the farebox data.
6. The 655 should be included in the Market Area for Princeton. Now, *select 'Princeton'* from the 'Market Areas' on the left sidebar and *click 'Modeling.'*

7. Run a model (refer to section 5.1 for instructions on how to run a model).

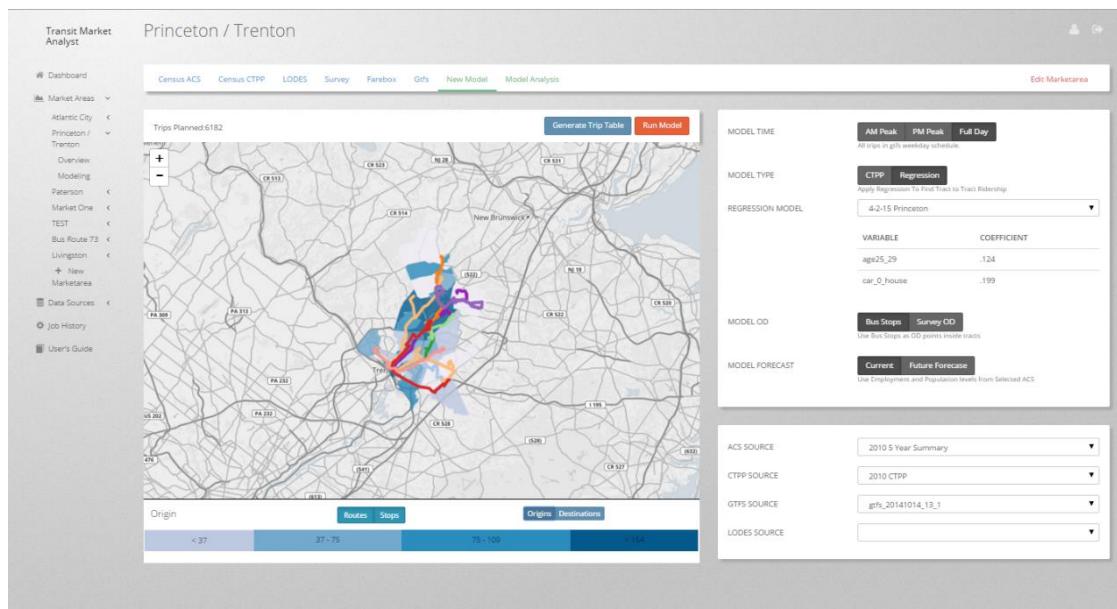
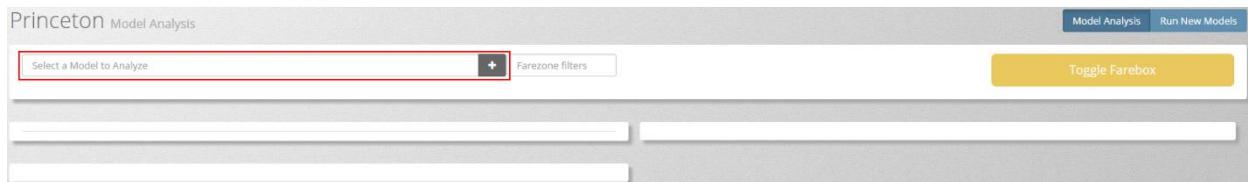


Figure 75

5.4.2 Validate 655-Included with Farebox data

Let's compare our 655-included model output with the farebox data.

1. Under 'Market Areas' on the left sidebar *expand 'Princeton'* then *select 'Modeling.'*
2. On the 'Model Analysis' tab *click on the dropdown menu labeled 'Select a Model to Analyze.'* (See Figure 76).



3. *Select the most recently generated model* at the bottom of the list. *Click the '+' button* to the right of the dropdown menu. The model may take up to a minute to load.
4. Once the model loads *click on the yellow box labeled 'Toggle Farebox.'*
5. Notice how the second graph listing ridership by route displays model output next to farebox data.

Figure 76

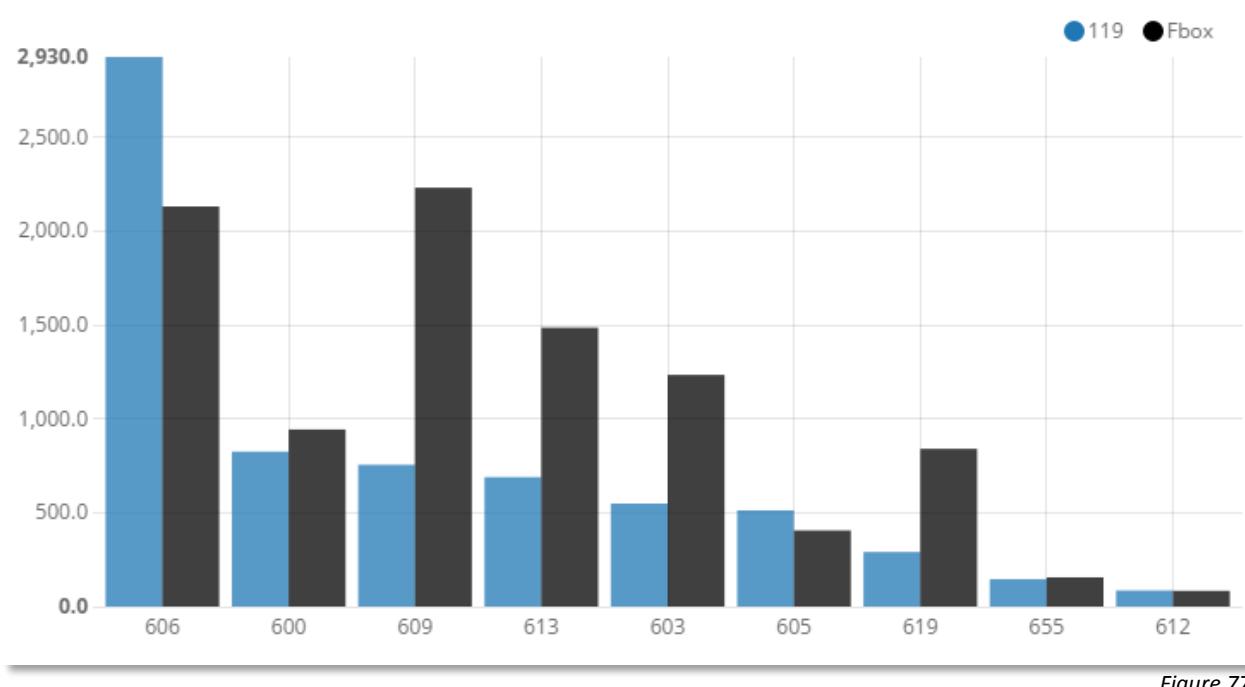


Figure 77

5.4.3 655 Removed

Next, we'll return to the Princeton Market Area Overview to run a second model without the 655.

1. Make sure you are on the page 'Market Area' > 'Princeton' > 'Overview' > 'Edit Marketarea.'

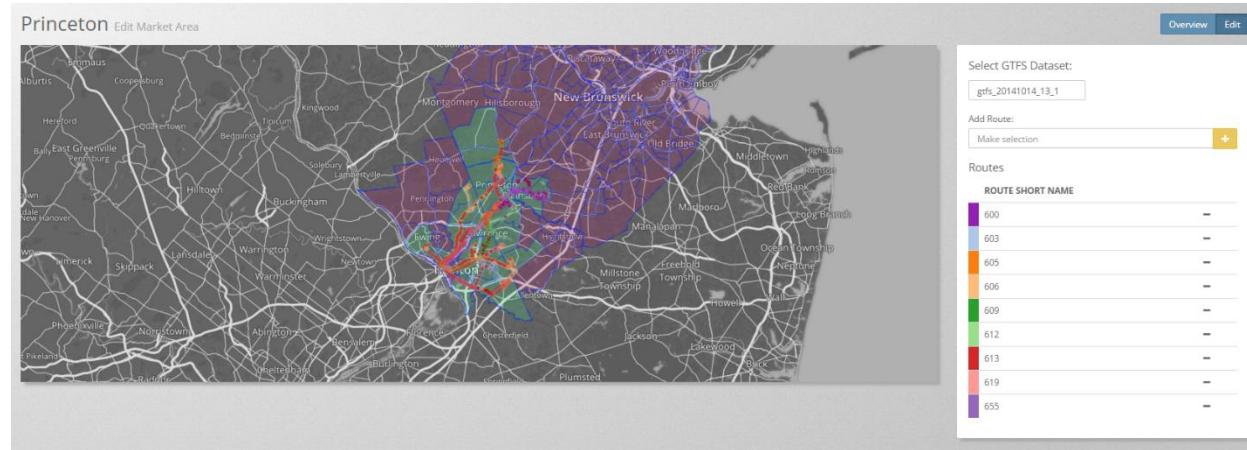


Figure 78

2. To remove a route simply *click on the '-' button* to the right of the route name *then click 'Update Market Area.'* Do this for the 655.
3. Once you've updated the market area *refresh your page*.
4. Again, follow the instructions in section 5.1 for running a model and *generate a model* for the Princeton Market Area without the 655.

5.4.4 Validate 655-Removed with Farebox data

1. As in 5.4.2 you will be going to the 'Model Analysis' page ('Market Area' > 'Princeton' > 'Modeling').
2. *Select the 655-Removed model* (the most recent model at the bottom of the dropdown menu).
3. *Add the model*.
4. *Toggle Farebox data* for comparison. Notice that the 655 is not in the graph that depicts ridership by route.

5.4.5 Comparing 655-Included, 655-Removed, and Farebox data

Now we're going to compare our two models with the Farebox data but first we need to make sure the Farebox data is updated in our Market Area to include the 655. If we ran our comparison now we would not see any Farebox data for the 655. So, let's return to edit the routes in the Princeton Market Area.



Figure 79

1. Make sure you are on this page: 'Market Area' > 'Princeton' > 'Overview' > 'Edit Marketarea.'
2. Remove the 655. Update the Market Area.
3. Once it is updated refresh the page.
4. Navigate to the 'Model Analysis' page ('Market Area' > 'Princeton' > 'Modeling').

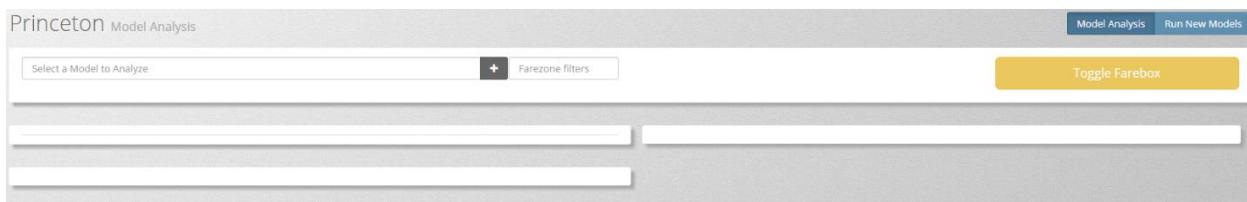


Figure 80

5. Select the second most recent model from the dropdown menu. Click the '+' to add the model for analysis.
6. Select the most recent model from the dropdown menu. Click the '+' to add the model for analysis. Notice the bar graph showing ridership by route displays both model outputs side-by-side.

7. Click 'Toggle Farebox.' Notice the bar graph and chart display both model outputs and the farebox data. (See Figure 81, 82).

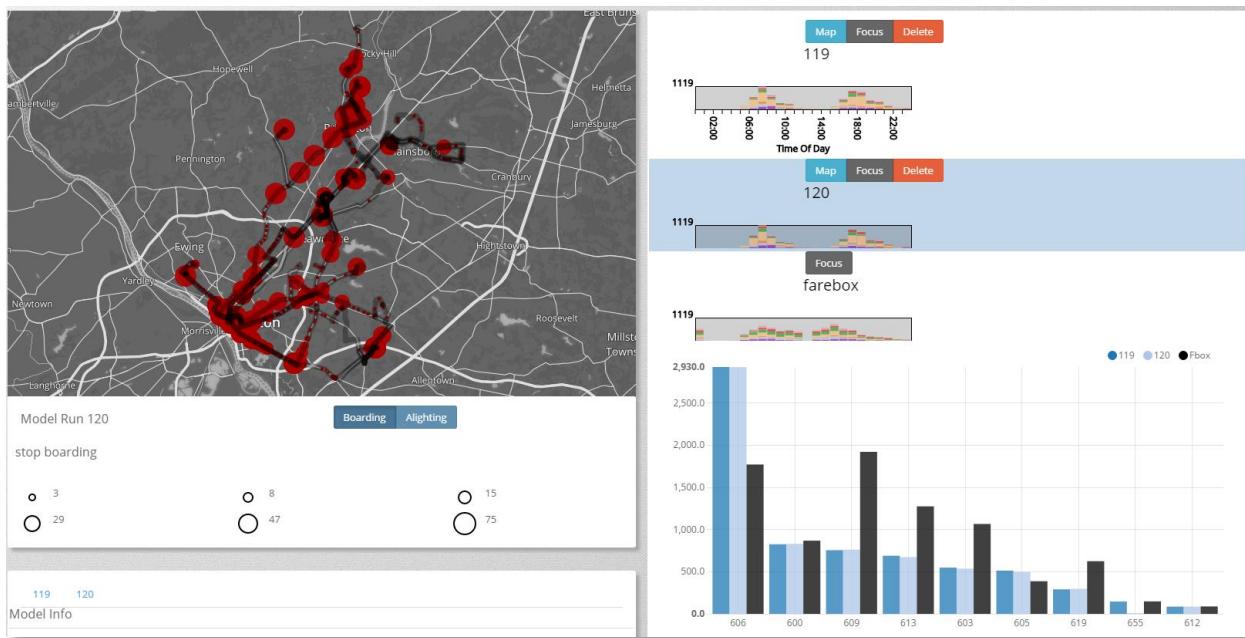


Figure 82

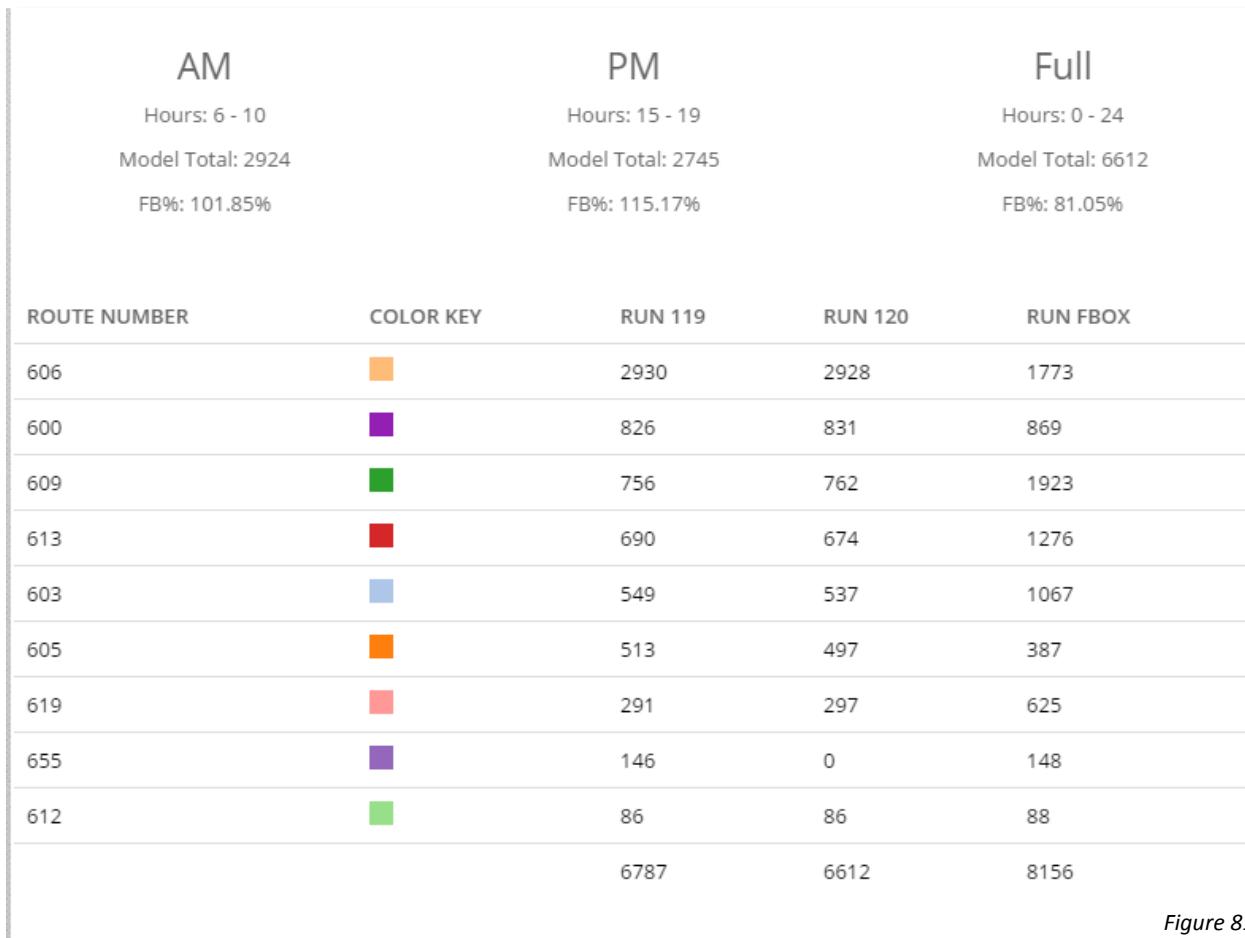


Figure 81

5.5 SCENARIO PLANNING: THE FUTURE FORECAST

Now, let's generate a Future Forecast Model. We'll use the Princeton / Trenton market area. First, we'll create a Future Forecast Model based on the MPO 2020 Forecast then we'll create a Custom Forecast.

5.5.1 MPO 2020 Forecast

1. Make sure you are on the 'New Model' tab for the Princeton / Trenton market area (Left sidebar > Market Areas > Princeton / Trenton > Overview > New Model tab).
2. In the box that contains the model inputs, next to where it says "Model Forecast," select 'Future Forecast.' (See Figure 83).
3. The Future Forecast input options will display. Select 'MPO 2020 Forecast.'
4. Adjust other model inputs as you see fit.
5. Click the 'Generate Trip Table' button above the map then click 'Run Model.'

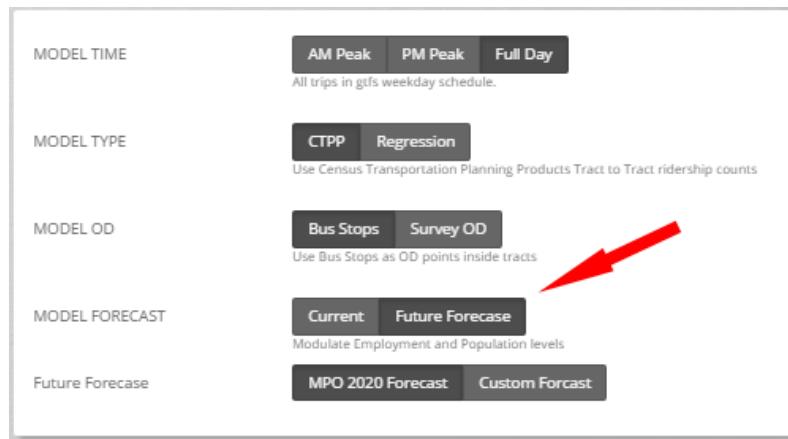


Figure 83

5.5.2 Custom Forecast

1. Make sure you are on the 'New Model' tab for the Princeton / Trenton market area (Left sidebar > Market Areas > Princeton / Trenton > Overview > New Model tab).
2. In the box that contains the model inputs, next to where it says "Model Forecast," select 'Future Forecast.' (see figure in section 5.5.1)
3. The Future Forecast input options will display. Select 'Custom Forecast.'
4. A new box entitled 'Custom Forecast Editor' displays (See Figure 84). You can use this box to save your settings or load saved settings. For now, we will create new settings for our custom forecast.



Figure 84

5. Scroll your mouse over a census tract on the map. Observe the tooltip containing origin and destination trips, bus to work data, and 2020 forecasts for population growth and employment growth. (See Figure 85).

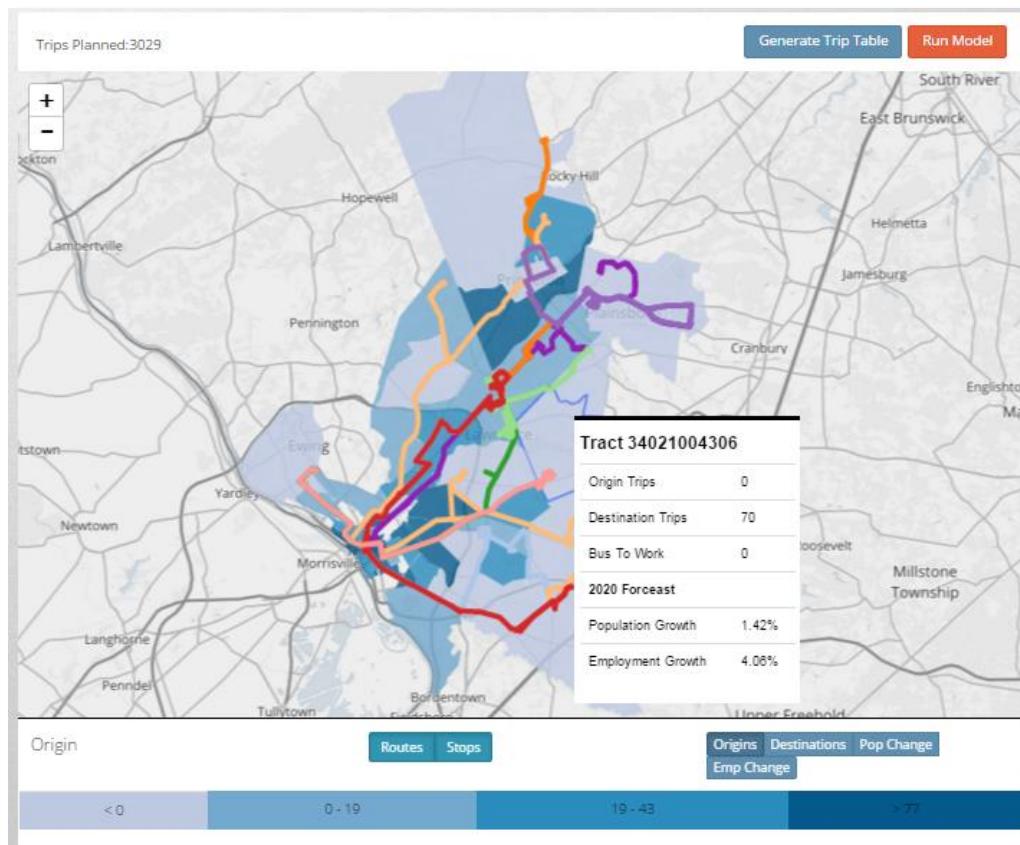
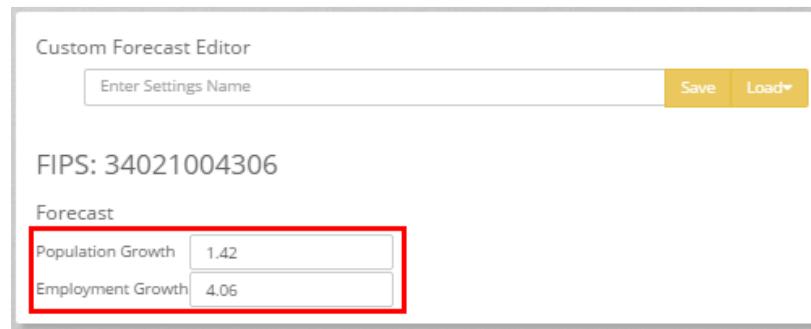


Figure 85

6. Select that tract. Observe the new settings available in the Custom Forecast Editor box (See Figure 86).
7. Manipulate these growth percentage settings by using the arrows that appear in the box or by manually entering your own numbers.
8. Give your settings a name in the 'Enter Settings Name' box and press 'Save.' If you want to manipulate population or employment growth in other tracts, select them from the map and adjust as you see fit. Then, press 'Save' again.
9. Be sure to adjust other model inputs as you see fit then run the model by selecting 'Generate Trip Table' then 'Run Model.'



Forecast	Value
Population Growth	1.42
Employment Growth	4.06

Figure 86

10. Note: to make changes to settings that have already been saved click 'Load' in the Custom Forecast Editor and select your previously saved settings from the dropdown list. Then, make your changes and 'Save.'