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List of Acronyms

ACS   American Community Survey
APC   Automatic Passenger Counter
BCT   Broward County Transit
BRT   Bus Rapid Transit
CTPP  Census Transportation Planning Products
FDOT  Florida Department of Transportation
FEC   Florida East Coast
FIU   Florida International University
FTA   Federal Transit Administration
GTFS  General Transit Feed Specification
JTW   Journey-to-Work
HBO   Home-Based Work
HBW   Home-Based Other
MDT   Miami-Dade Transit
MPO   Metropolitan Planning Organization
NHB   Non-Home Based
SERPM Southeast Florida Regional Planning Model
STOPS Simplified Trips-on-Project Software
1. Introduction

AECOM and Connetics Transportation Group (CTG) were retained by FDOT District 4 to implement a STOPS planning model for the tri-county region of Southeast Florida (SEFL STOPS planning model). The model covers West Palm Beach, Broward and Miami-Dade Counties. As part of this effort, the team developed an user interface to automate the preparation of certain STOPS input files for any fixed-guideway transit project in the tri-county region. In addition, the user interface also helps in extracting tables from the STOPS output report file for post-processing in Microsoft Excel.

This user guide mainly describes how to use the interface developed for SEFL STOPS planning model. This user guide is meant to be used in conjunction with the official STOPS user guide available on FTA’s website. All users are expected to have a basic understanding of modeling in STOPS and the terminologies associated with it. A separate calibration memo has been developed which describes the data used to develop the SEFL STOPS planning model along with the calibration results.

For illustration purposes, this user guide also describes few example scenarios where the SEFL STOPS planning model was applied using the user interface on different fixed guideway transit corridors in the tri-county region. Also, results from some sensitivity tests performed on various STOPS parameters and inputs are included.
2. User Interface

The user interface ("South_Florida_STOPS_Model_Interface_v0.90.xlsx") is an Excel macro developed using VBA scripts. The interface as well as STOPS requires the ArcMap and Python software for internal processing of files. The setup also comes with a folder called ‘Model Data’ which contains the various input files required by STOPS for South Florida region. For the user interface to work, both the Excel macro file and the ‘Model Data’ folder should be in the same folder, as shown in Figure 1.

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<thead>
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<th>Name</th>
<th>Date modified</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Data</td>
<td></td>
<td>File folder</td>
</tr>
<tr>
<td>South_Florida_STOPS_Model_Interface_v0.90</td>
<td>6/1/2016 4:50 PM</td>
<td>Microsoft Excel Macro-En...</td>
</tr>
<tr>
<td>STOPSTablestoExtract</td>
<td>6/1/2016 4:16 PM</td>
<td>TXT File</td>
</tr>
<tr>
<td>STOPSTablestoPrint</td>
<td>4/1/2016 6:56 PM</td>
<td>TXT File</td>
</tr>
</tbody>
</table>

Figure 1: User Interface – Folder Setup

Figure 2 shows the user interface when the Excel macro is opened. It contains two modules:

1. A “STOPS Input Module” which can be used to prepare preliminary input files for a specific project; and
2. A post processing module which extracts selected tables from the STOPS output report file into Excel for easier processing.
2.1 STOPS Input Module

This section describes the STOPS Input Module. Clicking on the corresponding button opens the window shown in Figure 3.

The different parameters of the Input Module are:

- **Select GIS Engine**: This corresponds to the location of the ArcMap executable file. This program is typically located at C:\Program Files (x86)\ArcGIS\Desktop10.x\bin\ArcMap.exe
- **Select Python Engine**: This corresponds to the location of the python executable file. This program is typically located at C:\Python27\ArcGIS10.x\pythonw.exe
- **Scenario Name**: The user has to specify a name for the scenario as shown in Figure 3. This name will be used as the name of the folder which will contain all the files associated with the STOPS run for that particular scenario.
- **STOPS Control File Name**: The user has to specify a name for the STOPS control file for the scenario as shown in Figure 3. This control file is created in the folder created using the ‘Scenario Name’ as mentioned above.

*Figure 3: STOPS Input Module*
• **Select Geographic Region:** Here the user selects the geographic region to model. The associated dropdown box has four options:
  - All Three Counties (Broward, Miami-Dade and Palm Beach)
  - Broward County
  - Miami-Dade County
  - Palm Beach County

The geographic region chosen here directly impacts the input files that will be generated. It should also be noted that Tri-Rail GTFS files will be copied into the scenario folder only if the ‘All Three Counties’ option is selected. This step also directly impacts the calibration process, which in turn determines the forecasted ridership on any given transit project. The user should select the ‘All Three Counties’ option if the answer to any of the following four questions is yes:

1. Does the project traverse more than one county?
2. Would you expect any meaningful ridership on the project from more than one county?
3. Does the underlying corridor bus connect with transit services from other counties, and is this connection expected to have a meaningful impact on the project?
4. Do you need Tri-Rail for your analysis?

One of the main reasons for choosing one specific county over the ‘All Three Counties’ option is to save computer run time and to provide the ability to enhance county-level calibration where detailed ridership data is available. Running STOPS for the entire tri-county region can take up to 7 hours, which can be cut down to as little as 1.5 hours depending on the project and county chosen.

After all the above parameters are defined, the user can click the ‘Prepare Input Files’ button. This will result in a folder being created in the directory where this user interface resides. The folder’s name will correspond to the ‘Scenario Name’ defined in the input module. This folder will contain the following sub-folders and files:

1. A sub-folder named ‘Districts’ which contains the district definition for the tri-county region. These districts have been pre-defined for the SEFL STOPS planning model which the user need to update for their project.
2. A sub-folder named ‘Inputs’ which contains all the inputs needed to run STOPS and also correspond to the geographic region selected in the input module. The following files will always be copied irrespective of what geographic region was selected:
   - ACS Part I, II and III files. It is assumed that all users will be using the latest ACS data in place of the 2000 CTPP data. STOPS 2.0 does provide the option to use the CTPP data as well. If the user wishes to run their project by using the CTPP data, then they have to copy the appropriate Part I, II and III files.
   - Census blocks boundary files
   - ACS state shape layer files
   - Auto skim file
   - MPO population and employment data

The following files will depend on the geographic region selected:

- **GTFS folders:** If a specific county is selected, only the GTFS files associated with the transit agency serving that county will be copied (MDT for Miami-Dade, BCT for Broward and Palm Tran for Palm Beach). There’ll be three identical sets of GTFS files for the existing, no-build and build conditions. These will be denoted by an EXIST, NOB and BLD suffixes respectively. If the ‘All Three Counties’
option is selected in the input module, then the GTFS files for Palm Tran, BCT, MDT and Tri-Rail will be copied.

o **STOPS stations shape layer (STOPSStations.shp):** This will have all the existing fixed guideway stations and bus stops in the tri-county region for which stop level APC data is currently available. It should be noted that ridership data was only available for BCT at a route level. Depending on the geographic region selected, the ‘STOPSTYPE’ field in the shape file, which indicates whether or not the stop is active for this scenario, will be adjusted accordingly. The following adjustments are made depending on the geographic region selected:

β Palm Beach County: Only the stops associated with Palm Tran will be active for calibration in this scenario. Tri-Rail stops will not be active.

β Broward County: Since the database does not include any BCT stops due to lack of APC data, none of the stops will be active for calibration in this scenario.

β Miami Dade County: Only the stops associated with MDT, including Metrorail and Metromover will be active for calibration in this scenario. Tri-Rail stops will not be active.

β All Three Counties: Only the stops associated with Tri-Rail and MDT, including Metrorail and Metromover will be active for calibration in this scenario. Ideally, even the Palm Tran stops should be active in this scenario. But, STOPS has a limit of 10,000 stops that can be active in a given scenario and including the Palm Tran stops would result in going over this limit. Hence, Palm Tran stops are excluded here.

3. A sub-folder named ‘STOPSMenu’ which contains the actual STOPS setup and executable files.

4. A control file, corresponding to the STOPS control file name defined in the input module.

In addition to the above changes, the magnitude of the region-wide unlinked transit trips will also be updated depending on the geographic region selected. The user can manually update the number by using the STOPS menu if needed. Figure 4 shows the folder structure after the input files have been prepared.

<table>
<thead>
<tr>
<th>Name</th>
<th>Date modified</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Districts</td>
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<td>File folder</td>
</tr>
<tr>
<td>Inputs</td>
<td>3/30/2016 1:50 PM</td>
<td>File folder</td>
</tr>
<tr>
<td>STOPSMenus</td>
<td>3/30/2016 1:49 PM</td>
<td>File folder</td>
</tr>
<tr>
<td>Miami.CTL</td>
<td>3/30/2016 1:50 PM</td>
<td>CTL File</td>
</tr>
</tbody>
</table>

**Figure 4: Folder Structure after Input Files are Prepared**

Once the files have been prepared, clicking the ‘Open STOPS Menu’ button will open the STOPS menu as shown in Figure 5. The user can now open the control file created using the STOPS Input Module.
**Additional steps:** Once the basic input files have been prepared using the user interface, the user still has to develop files corresponding to the specific transit project for which forecasts are being developed. This section describes these additional steps needed before STOPS can be run.

The first thing the user has to do is to code the operating plan of the transit project in the GTFS build files. Any underlying transit service changes that might happen before the project gets built will have to be incorporated in the GTFS no-build files. Any further transit changes once the project gets built will have to be incorporated in the GTFS build files. In addition, the user will have to add the new stops corresponding to the transit project in the STOPSStations.shp file. This can be accomplished by clicking on the ‘2. Specify Station Locations’ button on the STOPS menu. The official STOPS user guide has detailed steps on how to edit GTFS files and add new stops.

Table 1 provides a summary of the GTFS files used by STOPS.
Table 1: Summary of GTFS Files Used by STOPS

<table>
<thead>
<tr>
<th>GTFS file</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar.txt</td>
<td>Contains a listing of valid dates and days-of-week</td>
</tr>
<tr>
<td>Calendar_dates.txt</td>
<td>Contains a listing of dates and exceptions to the schedule previously defined in the calendar.txt file</td>
</tr>
<tr>
<td>Stops.txt</td>
<td>Contains a list of stop locations</td>
</tr>
<tr>
<td>Routes.txt</td>
<td>Contains a list of routes</td>
</tr>
<tr>
<td>Trips.txt</td>
<td>Contains a list of trips; one record for each bus or rail trip</td>
</tr>
<tr>
<td>Stop_times.txt</td>
<td>Contains time point information for each stop and trip</td>
</tr>
<tr>
<td>Frequencies.txt</td>
<td>Defines the start and end time interval during which a trip is repeated according to the headway specified in this file</td>
</tr>
<tr>
<td>PNR.txt</td>
<td>Contains a list of park-and-ride locations</td>
</tr>
<tr>
<td>Editlist.txt</td>
<td>Contains commands to adjust the GTFS files</td>
</tr>
</tbody>
</table>

Next, the user has to check the current year and define any additional forecast years. After running the ‘STOPS Input Module’, the current year is set to 2015 and the 20-year forecast year is set to 2040. The 2015 population and employment data has been obtained by interpolating the 2010 and 2040 MPO data developed for SERPM 7.061. The year 2015 serves as the base year for the SEFL STOPS planning model as well. To use a different forecast year, the user has to develop the data corresponding to that year.

Next, the fixed guideway visibility factor should be adjusted, depending on the transit project for which forecasts are to be generated. In general, the visibility factor of 1.0 for commuter rail and heavy rail projects, 0-0.5 for BRT projects and 0.5-0.75 for streetcars should serve as the starting point. But, users should co-ordinate with FTA in figuring out the visibility factor for their project.

Finally, the user will have to define new districts in the project corridor. The default district file will have the districts developed for the regional model. The user will have to define finer districts in the corridor, making sure to use district numbers that are different from the existing ones. The STOPS user guide developed by FTA has detailed steps on how to do this. The user can leave the districts farther from the corridor as is. Further, creating new districts might also require creation of new stop groups in the STOPSStations.shp file. Currently, the bus stops are grouped depending on the district in which these stops fall. All bus stops in a given district are coded with the same station group.

2.2 Post Processing Module

This section describes the Post Processing Module. STOPS generates over 1,000 tables, and it can be time consuming to individually go through these tables and post process them in Excel. The Post Processing Module automates this process by extracting the user-specified set of tables into Excel. Clicking on the ‘Post Processing Module’ button opens the window shown in Figure 6.
Clicking the ‘Select a STOPS Output Report File’ button will allow the user to point to the STOPS output report file containing all the tables. The user then lists the table numbers needed for post processing in the ‘STOPSTablestoExtract.txt’ file located in the same directory as the user interface. Next, the user clicks on the ‘Extract Desired Report Table(s)’ button, opening the window shown in Figure 7.

The user can then click on the ‘Import’ button and point to the STOPSTablestoExtract.txt file containing the list of all the table numbers. Clicking the ‘Extract tables into workbook’ button will extract the tables in the list into the spreadsheet containing the user interface. There will be one new worksheet created in the Excel Interface for every table in the list. ‘Delete the extracted tables from workbook’ button deletes all the extracted sheets from the workbook. The ‘Clear’
button can be used to highlight a specific table in the imported list and be removed before extracting into the workbook.

Extracted tables and any other worksheets can also be printed to PDF format in a batch mode. This can be done by clicking on the ‘Print Desired Worksheet(s)’ button in the Post Processing Module. This opens the window shown in Figure 8. This functions in the same way as extracting tables from the report file. The user can specify the names of the worksheets to be printed to PDF format in the ‘STOPSTablestoPrint.txt’ file and import the list. It should be noted that the user needs to set up the print format for each worksheet by clicking on the ‘page set-up’ tab in Excel before executing this print function.

![Figure 8: Print Worksheets Interface](image-url)
3. Example Scenarios

This chapter demonstrates how the user interface can be applied to three fixed guideway transit projects being studied in the tri-county region. The operating plans, station locations, project related details etc shown in this chapter are purely for demonstration purposes only and in no way reflect the actual project details. The district definitions shown are also for demonstration purposes only and any user who might work on one of these projects should in no case consider the districts defined here to be final. Further, the various STOPS parameters, such as the group calibration approach, visibility factor etc are also for demonstration purposes only and do not reflect the actual values that users should use for that project.

3.1 Tri-Rail Interim Service to Downtown Miami (Tri-County)

Project Description: This project is an extension of the existing Tri-Rail service to downtown Miami via the Iris rail connection. The alternative modeled here has the following components:

- A service with a 60/120 peak/off-peak headway between Mangonia Park and Miami Airport along the existing Tri-Rail alignment.
- A service with a 60/120 peak/off-peak headway between Mangonia Park and Miami Government Center by utilizing the Iris connection. The trains would follow the existing alignment till the Metrorail transfer station and turn east on the Iris connection before turning south on the FEC tracks serving two stations at the Miami Design Center and Miami Government Center.
- A service with a 60/120 peak/off-peak headway between the Metrorail transfer station and Miami Airport. These trains will be time-transferred to meet the trains serving downtown Miami.

Figure 9 illustrates the proposed interim service to downtown Miami.
**STOPs Input Module:** In the STOPs Input module, the ‘All Three Counties’ option was selected for this project. Figure 10 shows the Inputs folder immediately after the ‘Prepare Input Files’ button is clicked on the user interface. In this case, no changes were made to the underlying bus services in either the no-build or build scenarios. Only the TRLBLD GTFS folder was edited to reflect the schedule for the interim service.
Figure 11 and Figure 12 show the STOPS parameter file and year definition. The weekday unlinked regional transit trips reflect all the boardings in the tri-county region across the four transit agencies.
Figure 11: Tri-Rail Interim Service – STOPS Parameter File

Figure 12: Tri-Rail Interim Service – STOPS Year Definition
**GTFS Files:** The GTFS files were edited in the TRLBLD folder to reflect the interim service. This is a manual step that the user has to do after the ‘STOPS Input Module’ has been run in the user interface. In order to properly update the GTFS files, the user should refer to the official STOPS user guide.

**STOP Locations and Districts:** The other manual step involves adding the new stop locations to the STOPSStations.shp file and creating new district definitions. For this project, no new districts or stop groups were added to the default districts and stop groups that get copied when the input files are prepared in the user interface. Figure 13 shows the districts and station locations.

![Figure 13: Tri-Rail Interim Service – STOPS Districts and Station Locations](image)
3.2 Flagler BRT (Miami-Dade County)

**Project Description:** This BRT route runs along Flagler Street from the FIU main campus to Downtown Miami. The modeled route has a length of 11.8 miles with an average operating speed of 16.5 miles per hour and 10/20 peak/off-peak headway.

Figure 14 illustrates the alignment of the proposed Flagler BRT service.

![Figure 14: Flagler BRT Alignment](image)

**STOPs Input Module:** In the STOPs Input module, the ‘Miami-Dade County’ option was selected for this project. Figure 15 shows the Inputs folder immediately after the ‘Prepare Input Files’ button is clicked on the user interface. In this case, changes were made to the underlying bus services in the build scenarios of MDT GTFS files. MDTBLD folder was edited to reflect the schedule for the proposed BRT service and the changes to the underlying bus services.
Figure 15: Flagler BRT – STOPS Inputs Folder Structure

Figure 16 and Figure 17 show the STOPS parameter file and year definition. The weekday unlinked regional transit trips reflect all the boardings on MDT.
Figure 16: Flagler BRT – STOPS Parameter File

Figure 17: Flagler BRT – STOPS Year Definition
**GTFS Files:** Some of the GTFS files were edited in the MDTBLD folder to reflect the Flagler BRT service. This is a manual step that the user has to do after the ‘STOPS Input Module’ has been run in the user interface. In order to properly update the GTFS files, the user should refer to the official STOPS user guide.

**STOP Locations and Districts:** The other manual step involves adding the new stop locations to the STOPSSStations.shp file and creating new district definitions. For this project, new districts and hence new stop groups were added to the default districts and stop groups that get copied when the input files are prepared in the user interface. Figure 18 shows the districts and station locations.

3.3 **WAVE Streetcar (Broward County)**

**Project Description:** This project is a streetcar in downtown Fort Lauderdale. The alternative has a length of approximately 3 miles (one way) with an average speed of 10.4 miles per hour and 8/16 peak/off-peak headway

Figure 19 illustrates the proposed alignment for the Wave streetcar.
**STOPS Input Module:** In the STOPS Input module, the “Broward County” option was selected. Figure 20 shows the Inputs folder immediately after the ‘Prepare Input Files’ button is clicked on the user interface. In this case, changes were made to the underlying bus services in the build scenario of BCT GTFS files. BCTBLD folder was edited to reflect the schedule for the proposed WAVE streetcar service and the changes on the underlying bus services.
Figure 20: Wave Streetcar – STOPS Inputs Folder Structure

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<tr>
<th>Name</th>
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<th>Type</th>
<th>Size</th>
</tr>
</thead>
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<td>File folder</td>
<td></td>
</tr>
<tr>
<td>BCTEXIST</td>
<td>3/30/2016 4:43 PM</td>
<td>File folder</td>
<td></td>
</tr>
<tr>
<td>BCTNO8</td>
<td>3/30/2016 4:44 PM</td>
<td>File folder</td>
<td></td>
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<td>3/30/2016 4:55 PM</td>
<td>CTL File</td>
<td>1 KB</td>
</tr>
</tbody>
</table>

Figure 21 and Figure 22 show the STOPS parameter file and year definition. The weekday unlinked regional transit trips reflect all the boardings on BCT.
Figure 21: Wave Streetcar – STOPS Parameter File

Figure 22: Wave Streetcar – STOPS Year Definition
**GTFS Files:** Some of the GTFS files were edited in the BCTBLD folder to reflect the Wave Streetcar service. This is a manual step that the user has to do after the ‘STOPS Input Module’ has been run in the user interface. In order to properly update the GTFS files, the user should refer to the official STOPS user guide.

**STOP Locations and Districts:** The other manual step involves adding the new stop locations to the STOPSSStations.shp file and creating new district definitions. For this project, new districts and hence stop groups were added to the default districts and stop groups that get copied when the input files are prepared in the user interface. Figure 23 shows the districts and station locations.

![Figure 23: Wave Streetcar – STOPS Districts and Station Locations](image_url)