



Regional Transportation Technical Advisory Committee
Modeling Subcommittee (RTTAC-MS)

Meeting Agenda

March 18, 2016 – 10:00 AM to 12:00 PM

Stephen P. Clark Center
111 NW 1st Street
CITT Conference Room
10th Floor
Miami, FL 33128

Call-in information: 1.877.829.8910
Pin: 2114574

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- I. Call to Order
 - II. Approval of the February 24, 2016 Meeting Minutes* (5 minutes)
 - III. Pilot Survey Update – John Lafferty (15 minutes)
 - IV. SERPM 8.0 Model Development Scope of Services* (60 minutes)
 - V. Member Comments
 - VI. Adjournment*

*Action Item



Regional Transportation Technical Advisory Committee Modeling Subcommittee (RTTAC-MS)

February 24, 2016 Meeting

Action Item List

- Pilot Survey Update:
Action Item: Distribute Pilot Survey results to meeting attendees Friday, March 4th
Responsible Party: John Lafferty, Parsons Brinckerhoff

Action Item: Prepare memorandum on recruitment rate based upon Pilot Survey results by Tuesday, March 15th.
Responsible Party: Josh DeLaRosa SRBI
- Regional Household Survey – Attitudinal Survey
Action Item: Attitudinal Survey Questionnaire revisions are due Friday, March 11th
Responsible Party: RTTAC MS members
- Regional Household Survey – Sampling Plan
Action Item: Continue to revise Sampling Plan to a final draft for RTTAC-MS review for the March 30th RTTAC-MS meeting
Responsible Party: Anarug Komanduri / Jay Evans, Cambridge Systematics
- Origin and Destination Discussion
Action Item: Provide Transportation district definitions, one for personal travel and one for commercial (i.e., truck) travel by Thursday, March 17th.
 - For person travel there should be no more than 100 districts region-wide.
 - For commercial travel, no more than 200 districtsResponsible Party: Miami-Dade; Broward and Palm Beach MPOs
- SERPM 8.0 Model Development
Action Item: Schedule special meeting for Friday, March 18th for the Scope of Services discussion and approval.
Responsible Party: Neil Lyn, FDOT



Regional Transportation Technical
Advisory Committee (RTTAC)
Modeling Subcommittee
February 24, 2016 Meeting Minutes

The following is a summary of the RTTAC Modeling Subcommittee (RTTAC MS) meeting held on February 24, 2016 at the Florida Department of Transportation (FDOT) District 4.

MEETING TIME AND LOCATION

FDOT District 4
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309

MEETING ATTENDEES

1. Wilson Fernandez, Miami-Dade MPO, wfernandez@miamidademppo.org
2. Paul Flavien, Broward MPO, flavienp@browardmpo.org
3. Buffy Sanders, Broward MPO, sanders@broward.po.org
4. Luke Lambert, Palm Beach MPO, llambert@palmbeachmpo.org
5. Shi-Chiang Li, FDOT D4, shi-chiang.li@dot.state.fl.us
6. Hui Zhao, FDOT D4, hui.zhao@dot.state.fl.us
7. Fang Mei, FDOT D6, fang.mei@dot.state.fl.us
8. Neil Lyn, FDOT D6, neil.lyn@dot.state.fl.us
9. Lois Bush, FDOT D4, Lois.Bush@dot.state.fl.us
10. Mike Brown, Transportation Planning Service, Inc., tps.mike.brown@camcast.net
11. Aditya KatraGadda, The Corradino Group, akatragedda@corradino.com
12. Thuha Lyew, via planning, Inc.,
13. Jay Evans, Cambridge Systematics, jevans@camsys.com
14. Anurag Komanduri, Cambridge Systematics, AKomanduri@camsys.com
15. John DeLaRosa, abt SRBI, j.delarosa@srbi.com
16. Anders Hansen, abt SRBI, A.Hansen@srbi.com
17. John Lafferty, Parsons Brinckerhoff, lafferty@pbworld.com
18. Rosella Picado, Parsons Brinckerhoff, picado@pbworld.com

MEETING NOTES

Below is a summary of items discussed during the meeting. Action items and motions are underlined.

I. Call to Order

Neil Lyn called the meeting to order. All attendees introduced themselves, including the people attending via teleconference.

II. Approval of January 22, 2016 Meeting Minutes

Buffy Sanders made a motion for approval. The motion was seconded by Luke Lambert and unanimously approved by the RTTAC MS.

III. Pilot Survey Update

Neil Lyn introduced the agenda item. John Lafferty informed the committee the pilot survey (4,500 letters) was mailed out on President's Day weekend. It is anticipated the survey will be mailed to some vacant or invalid households. Both the survey webpage and toll free number were activated prior to the mail out. On March 4th reminder postcards will be sent to those not having yet responded to the recruitment survey. The survey will remain open until March 10th after which public school spring break begins. The consultant team has the ability for real time reporting of results. As of this date, 38 surveys have been completed to include both the recruitment survey. It is estimated that half of the people who took the recruit survey would complete the travel diary. Furthermore, we have found that surveys are being completed in less than 15 minutes which includes those larger households of five or more members. The specific breakdown of survey respondents are as follows: 1.) Miami-Dade County 26 respondents; 2.) Broward County six respondents; and, 3.) Palm Beach County six respondents.

Our target is to receive 80 completed samples and the consultant would have expected to achieve this target if incentives were in place for the pilot survey. Typically with an incentive the survey recruitment rate would be higher than 4% however, without an incentive it is much less than 4%. Currently, the pilot survey is recording a 1% recruitment rate. Research also indicates that low income minority block groups are more encouraged to participate with a survey incentive.

It was noted that if the pilot survey response does not meet the sample target and the directive remains not to offer an incentive for the full survey, then a much larger distribution of samples will be necessary to increase the recruitment rate. This will result in an, increase in printing and distribution costs which may exceed the amount of budget currently authorized.

John Lafferty informed the committee that an update on the pilot survey will be distributed on Friday, March 4th. A technical memorandum will also be prepared at the end of the pilot survey which closes on 3/10.

IV. Regional Household Survey Update

Attitudinal Survey: Presentation by Jay Evans. A hard copy of the attitudinal survey was distributed at the meeting and an electronic copy for editing was made available in Projectsolve. The attitudinal survey currently represents 45 questions and the objective is to revise so there are no more than 22 questions in total.

Hui Zhao, asked about the scale of the ranking system (1 to 10) and to consider simplifying to 1 through 5. Anurag responded that the fewer categories we have the less variation of the survey results which could create as positive bias. If we simplify the scale then we will have less variation. Neil asked about the objective of this exercise and if the focus is to combine questions to capture multiple goals and objectives to provide input for model. Anurag clarified that the intent is to get a broad understanding of attitudes that drive transportation. Anurag explained that the categories identified are based upon critical behaviors from a synthesis of extensive research on the subject matter.

A request was made to the RTTAC MS to review and provide comments on the attitudinal survey by March 11th. The 22 questions would be added onto the existing survey instrument which would be made available on the survey webpage and toll free number.

Sampling Plan: An overview of the sampling plan was provided by both Jay Evans and Anurag. Based upon input received at previous RTTAC MS meetings four area types have been identified:

- Area Type 1: High Transit / Auto Deficient Household;
- Area Type 2: Large Households;
- Area Type 3: High Income Household
- Area Type 4: Everything Else.

Wilson explained that the three counties were evaluated at a block group level to illustrate the three area types. The objective is to maintain some type of geographical control to assure we are not concentrating on only one or two area types in a county. One approach is to look at this on a TAD level to control the target levels for the three area types according to geography. Initially back in November, area type 1 was separated into two distinct area types – high transit and auto deficient households. However out of concerns of duplicity between these two categories that was confirmed with analysis of block groups these have been combined into one area type. A new area type category has been identified to include high income household. This is currently under evaluation to determine whether there is any duplicity with the other area types such as larger households. If there is duplicity area type 4 would become area type 3

Mike Brown asked how to distinguish between non choice and choice riders. Jay explained that this would be defined in the survey response. Jay stated that in terms of focusing on geographic setting it may set you up for non success from various segments of the population. SRBI will need to respond as to the limitations of a geographic sample from these area type targets. Jay also emphasized that the focus remains on the model input not necessarily the geography. Mike Brown asked if these area types could be used in future planning efforts. Anurag stated that the area types are used to set a reasonable target for the household survey and nothing more

This approach will be further explored, refined and finalized by the March 30th RTTAC MS meeting.

V. Origin and Destination Discussion

For purposes of the origin and destination survey the latest Transportation Analysis Districts (TAD) data from each of the three counties is required. It was noted that for Miami-Dade County the SERPM model is not representative of the TAD's for the county. Wilson stated that Miami-Dade County has a total of 42 TAD's.

The consultant's preference is to have defined TAD's which will be an aggregation of TAZ boundaries rather than having a TAZ splitting across a district. For the region, we are looking to divide personal travel into 100 districts with a preference to have these uniformly defined throughout the region. Commercial travel will be divided into 200 districts for the reason of having the ability to identify various truck generators. It was noted that a data point is the expansion of data which will be done on the basis of traffic counts. However, we need to identify locations to identify traffic counts and avoid duplication. Approximately 100 traffic data collection points also need to be identified. The consultant will follow-up with an email request for TAD information to the RTTAC-MS.

VI. SERPM 8.0 Model Development

Shi-Chiang informed the RTTAC MS that a draft scope of services was circulated to each of the three MPO's on Tuesday, February 23rd. Verification will be necessary from each of the MPOs based upon confirmation of the latest UPWP's to verify funding commitments.

The selection committee will be comprised of seven members to include representatives from each of the three MPOs and four representatives from FDOT. Hui will distribute a draft schedule as a follow-up to the scope of services. The scope will be finalized for the planned FDOT advertisement date of March 21st. Shi-Chang asked if the RTTAC MS can approve the scope of services at the next meeting scheduled for March 30th. Wilson Fernandez referred to the SERPM MOU and stated that the RTTAC MS committee must approve the scope of services prior to the advertisement date. Neil Lyn proposed an alternative meeting date for March 18th for purposes of approving the Scope of Services before March 21st.

VII. 2045 Population Control Totals or FDOT 2045 SIS Unfunded Needs

Lois Bush provided a brief overview of the SIS data needs based upon an analysis of BEBR and LRTP data sets for the three counties. The general trend is that the new BEBR numbers would form the basis of the SIS analysis by applying the mid range BEBR data.

Wilson questioned about using the BEBR data as an indicator based upon previous experience with this data set. Paul commented that the mid-range BEBR dataset was previously used and not an issue. Wilson is concerned using the BEBR data without having started the 2045 socio-economic data effort at the MPO level. Mike Brown explained that the exercise included an extrapolation of the MPOs 2040 LRTP data and then apply the more refined BEBR data once it becomes available.

Wilson asked about a statewide approach. Lois explained that this is undetermined however we are able to conduct a regional level of analysis. Shi-Chiang Li added that there is no guidance from Central Office but that it is the District's responsibility.

VIII. SERPM 7.0 Plus Network Discussion

Wilson reminded the committee that the SERPM 7.0 plus network was adopted at the previous RTTAC MS meeting. At this time, there are no projects that we are prepared to bring forward. One suggestion is to better define what is considered a significant change that warrants the Plus Network and relevant projects to be updated. Hui Zhao mentioned that for changes to socio-economic data we will bring to the subcommittee for approval since this constitutes the "plus" that is applied to the network. It was agreed that there is one network but two socio-economic data.

IX. Member Comments

The next RTTAC MS meeting is to be scheduled for March 18th.

X. Adjournment

The meeting was adjourned by Neil Lyn at 12:16pm.

ATTACHMENT "A"

Scope of Services

DEVELOPMENT AND APPLICATION SUPPORT OF
SOUTHEAST FLORIDA REGIONAL PLANNING MODEL, VERSION 8.0

FM Number: 428942-3-12-01 & 428942-3-22-01

PURPOSE

To develop a 2015 based Southeast Florida Regional Planning Model (SERPM) to cover the Miami Urbanized Area, which is from Florida City in Miami-Dade County to Tequesta in Palm Beach County, and bounded by the Everglades to the west and the Atlantic Ocean to the east. The model also includes the Palm Beach urbanized area in the vicinity of Lake Okeechobee.

In addition, this contract may be applied for the CONSULTANT to provide model application support services.

The goals of the project are:

- To update the activity-based SERPM 7 Model using travel patterns and trip characteristics identified as part of the recent Southeast Florida Regional Travel Survey;
- To provide an analytic tool to assess existing, emerging and future transportation policies and technologies;
- To logically describe the attributes of the motorized and non-motorized trip making and mode choice behaviors affected by the land use intensity and accessibility;
- To make the model sensitive to the trip destination end land use characteristics and transportation services, such as density, transit availability and service intensity, walk-ability, parking availability and parking cost;
- To accurately reflect the travel demand patterns and markets for major regional transit and highway projects, and make the model ready for long range transportation plan updates, and prioritizing transportation projects across different modes;
- To make the modeling theories, assertions, justifications, algorithms and their ranges of applicability transparent to users via direct links to model scripting and coding;

- To optimize model usability and friendliness, and to summarize complex data in a simplified user friendly manner through graphics, summary reports, etc.;
- To provide training, technical support, model warranty and maintenance service.

The 2015 SERPM 8.0 Model shall be developed:

- Using the 2015 Census as the base demographic data;
- Using the travel behavior findings from the recent Southeast Florida Regional Travel Survey, Public Use Micro data Samples (PUMS) of the American Community Survey (ACS), National Household Travel Survey (NHTS), and other locally available travel characteristics studies;
- Using the findings from the available facility specific travel survey data, such as the trip origin-destination surveys of I-95, I-595, and I-75; transit on-board surveys of Miami-Dade Metrorail, Metrobus, Broward County Transit, Palm Tran, Tri-Rail and 95 Express Bus; and data available from SunPass;
- Using all available field data including roadway characteristics, traffic operations, traffic counts, travel time and spot speeds such as HERE data, transit AVL and APC data, and transit on-board surveys;
- To report a comprehensive set of performance measures on modeling modules, meaningfully depict the inputs and the outputs of the module in graphic and tables;
- Using the latest 64-bit version of Cube software; compatible with Citilabs' Cube Cloud module and Sugar platform.

PROJECT ADVISORY COMMITTEE

Per the SERPM Memorandum of Understanding (MOU), the Regional Transportation Technical Advisory Committee - Modeling Subcommittee (RTTAC-MS) serves as the Project Advisory Committee (PAC). The DEPARTMENT Project Manager serves as the representative of the PAC to direct all the CONSULTANT work.

TASKS

The Scope of Services under FM# 428942-3-12-01 is comprised of four tasks:

- Task 1. Model Estimation, Design and Development
- Task 2. Data Collection, Compilation and Development
- Task 3. Model Calibration, Validation and Sensitivity Tests
- Task 4. Model Support Services

Task 1 will focus on estimating model parameters using the latest survey data and enhancing the existing activity-based modeling structure. Task 2 defines the work on data collection, cleaning, compilation and the development of model inputs. Task 3 will focus on model calibration and validation for the 2015 based year SERPM 8.0 model as well as developing a 2040 SERPM 8.0 model for the exclusive purpose of sensitivity tests and reasonableness checks. Task 4 includes the post model development services to educate and to support model users.

The Scope of Services under FM# 428942-3-22-01 is for project traffic development and corridor traffic analysis.

Task 1. Model Estimation, Design and Development

1.1 Model Estimate: The SERPM 8.0 shall be of a goal oriented design and possess solid capabilities to inform decision making for the direction of transportation investments, which emphasizes transit developments, user-fee-based investments, optimization of operations, and to foster sustainable land use and redevelopment patterns. Therefore, the model must have the properties capable of responding to the policy alternatives associated with the respective new transportation investment directives. The CONSULTANT will apply the state-of-the-art modeling methodologies that have desirable properties and proven to be user friendly and valid for Southeast Florida travel behavior. The CONSULTANT shall develop/estimate model parameters using the recent Southeast Florida Regional Travel Survey data.

1.2 Model Design and Development: SERPM 8.0 shall be designed to conform to Florida Model Task Force (MTF) guidelines available at the time of defining SERPM 8.0 structure. The FSUTMS data fields and variable naming convention should be strictly followed.

Citilabs' Cube/Voyager, the standard FSUTMS software platform, should be the primary but not necessarily the exclusive, software engine. Software and language choice for each of the modeling modules and sub modules should be decided independently taking the software functionality, run time, and stability into consideration. Cube Base will be the user interface and Cube Voyager should be the primary software. However, it is not mandatory to use Citilabs' software exclusively for SERPM 8.0 development. The use of "external programs" nevertheless, shall still need to follow the structured model development process defined in the next section, and the input parameters to the external programs shall be specified only through Cube Base. The scripting and/or programming codes of each module should directly link to its module description sheet (MDS), so, the theory and specifications of the module can be immediately referenced. Robust warning and error trapping should be incorporated into scripting and programming to ensure no illogical modeling inputs and outputs can be hidden or ignored by

model users. Further, model parameters and the acceptable data logical check ranges should be specified as input keys and not “hot-wired” in the scripts.

The CONSULTANT will proceed to script the modeling modules once the entire model design is completed and the design of each module has been specified and clearly documented on its respective module description sheet (MDS), which should be reviewed and approved by a CONSULTANT quality assurance authority. Description for the purpose of each module and its mathematical formulation(s), statistical justification, algorithm flowchart, and input data limitations should all be presented on its respective MDS. The names of the individuals who script and review the MDS should also be presented on the sheet. The MDS is also required for each of the supplementary programs to be integrated into the SERPM 8.0 program set, not just those scripted or coded by the CONSULTANT.

Whenever possible, cluster computing should be implemented. The model should also be developed to be “Cloud” compatible and take advantage of the virtually unconstrained scalability of the Cloud to minimize model run time. The CONSULTANT shall be familiar with the maturity and the functionalities of the Cloud platform prior to the model design and make at least one of the SERPM 8.0 model streams capable of running on the Cloud.

The Windowed Area Model (WAM) stream will be designed to accelerate model run time by aggregating the network and TAZs outside a prescribed windowed area. Finer resolution TAZ splits and intra TAZ network may also be introduced, as needed, to facilitate the modeling for Transit Oriented Designs. The finer resolution modeling outputs should possess accuracy and cohesiveness that can be morphed further for Dynamic Traffic Assignment (DTA). A DTA pilot for a windowed area should be part of model development and the integration of DTA needs to be tested for proof of concept. The WAM should also allow for users to choose whether or not the transit components are to be run to further expedite model run time.

1.3 On-Line documentation for the Model: Explain the motivation and logic behind the methodology, describe the intended behavior, reference the justifying observations, and describe the mathematical and statistical formulations; and describe parameter value ranges and their elasticity. Provide logic flow charts, (not the Cube/Voyager native flowchart which does not depict the logical algorithms of the scripts) on the Module Description Sheets. The limitations of the applicability should also be documented.

1.4 Model Design Review and Modular Reporting Workshop: The development of SERPM 8.0 will be defined collectively by the CONSULTANT and the RTTAC-MS. The intent of this workshop is to review the model design based on model estimation using the recent Southeast Florida Regional Travel Survey data, and to define what and how the input summaries, and output

statistics and their graphics of each modeling module should be reported. These summaries and graphics should be designed from a user's perspective to be intuitively understood by elected officials and the general public. A Systemwide Performance Report, such as the standard FSUTMS HEVAL report that summarizes systemwide and countywide statistics of VMT, VHT, Air Quality, and other key statistics including mode shares and transit-specific statistics will also be defined.

Each modeling module should be "beta" tested by a CONSULTANT reviewer to ensure it performs as specified. The CONSULTANT shall also "stress test" the module by applying the maximum likely input through the module and see if the module produces reasonable outputs.

Task 2. Data Collection, Compilation and Development

2.1 Zonal Data: The purpose of this task is to collect and organize the 2015 base year data for model calibration and validation. The model will use the 2010 Traffic Analysis Zone (TAZ), Micro Analysis Zone (MAZ) and Traffic Analysis District (TAD) structure. The 2015 TAZ household and population data is expected to be grown from 2010, however, depending on the SERPM 8.0 model structure, the CONSULTANT may be required to obtain additional residential housing unit data elements from tax assessors' datasets. The CONSULTANT will acquire the Census Longitudinal Employer-Household Dynamics (LEHD) and the Florida Department of Motor Vehicle Registration data set and geo-code the vehicle ownership TAZ to develop or verify the zonal auto ownership. The CONSULTANT should analyze and properly define the zonal data, so the model parameters would not be estimated with bias.

The CONSULTANT will be responsible for compiling the 2015 employment and other trip destination attraction data and have them structured in line with the SERPM 8.0 model design. The CONSULTANT may be required to review the TAZ attraction data set, such as the TAZ employment data using the raw source data including the InfoUSA and the ES-202 file from Florida's Agency for Workforce Innovation. Similarly, the CONSULTANT is responsible for compiling the quantity of hotel and motel rooms, as well as the enrollments of each level of the schools in each TAZ. Further, the CONSULTANT will acquire airport enplanements, seaports, cruise ship embarkations (if applicable) and major freight distribution centers' goods volumes and truck traffic data. In addition, the CONSULTANT will acquire and formulate parking cost data. The CONSULTANT may be required to collect other trip attraction/destination data, such as building gross floor area and commercial property lease rates, in addition to or in lieu of the aforementioned data. The data requirements should be such that local staff can expeditiously update and maintain the data used by the model. The CONSULTANT should generate job/worker destination choice model based strongly upon results from the OD survey results as part of the recent Southeast Florida Regional Travel Survey.

2.2 Network Data: In the past generations of the SERPM, the network description has been much expanded from the original simple FSUTMS Facility Type/Area Type structure. These enhancements were designed to improve the fidelity of the network description using physical and operational attributes, such as posted speeds and functional classifications. The network should also incorporate features or attributes for pedestrians and bicycles. These features or attributes are essential for modeling non-motorized trips and modeling transit accessibility. The CONSULTANT shall also incorporate intersection and roadway median attributes into the SERPM network even though these attributes may not be directly used for SERPM macro modeling. They could be extracted out in the future for mesoscopic or microscopic simulations.

2.3 Traffic Operation Data: The CONSULTANT is responsible for acquiring highway operational attribute data such as signal phasing, timing, and progression coordination and incorporating such to the highway network. The CONSULTANT is also responsible for collecting school zones, toll schedule for the fixed rate Florida's Turnpike, Miami-Dade Expressway Authority (MDX) facilities, and toll bridges, as well as average time of day rates in newest Express Lane operation policies and formatting them for modeling. In addition, the CONSULTANT will compile ramp metering data as recently implemented on I-95 in Miami-Dade County and incorporate that into the SERPM network.

2.4 Travel Time/Speed Data: Since highway speed and capacity relationships influence transit benefit assessment as well as air quality assessment, accurately representing the free-flow speed and congested speed of each type of facility at different levels of congestion and the influence of highway congestion on transit travel time is a critical element of the model calibration. The DEPARTMENT has collected some travel time data in the recent years for SERPM 7 validation and for other efforts, such as the Transportation System Management and Operation (TSM&O). There are also ongoing initiatives and programs to collect speed data from ITS and traffic counters. The CONSULTANT is responsible for collecting and compiling all the available travel time and spot speed data and evaluating their completeness for model travel time and speed calibration. In addition, the CONSULTANT shall acquire additional travel time data from [internet] commercial traffic data sources; or develop and implement a very cost-efficient, travel time data collection program, to collect needed additional travel time data to complement the available data from public agencies. A threshold should be established through the RTTAC-MS to evaluate coverage of speed data on the network. The CONSULTANT shall demonstrate the sufficiency of travel time and speed data on geographic, facility type, posted speed classes, and time span coverage for model calibration.

2.5 Traffic Counts: The CONSULTANT shall compile all the available traffic counts within the region for model calibration and model validation. The counts shall be converted to AADT if necessary. The CONSULTANT shall also review the 2015 and later counts with historical counts

station by station and identify if there are anomalies. The CONSULTANT shall present these anomalies to MPO staff and propose appropriate count estimates to replace the anomalies.

2.6 Transit Ridership Data: The CONSULTANT will acquire 2015 transit ridership statistics for each of the transit operators in the SERPM modeling area. The data should reflect the 2015 weekday operations. The CONSULTANT shall also acquire the most recent transit on-board survey data sets, including Palm Tran, Broward County Transit (BCT), Miami-Dade Transit (MDT) Metrorail and Metrobus, 95 Express, and Tri-Rail on-board survey data sets. The CONSULTANT is responsible for expanding the on-board survey to the ridership population, if needed. Some or all of these may already be available from other transit investment studies.

2.7 Transit Operational Data: The CONSULTANT will acquire 2015 transit operation data from each of the transit operators in the modeling area. In addition to the operation time span, schedule and headways, as well as fares structure, the CONSULTANT shall ascertain the actual operation fleet sizes. Again, the 2015 transit operational data may have been compiled for other transit projects and could be readily transferrable for SERPM 8.0. The CONSULTANT is responsible for overlaying 2015 transit services in the modeling area onto the SERPM 8.0 highway network.

2.8 Travel Behavior Data: All the available travel behavioral data for Southeast Florida data shall be studied and analyzed for model structure development and for model parameter estimations. The travel behavioral data sets, as a minimum, should include the recent Southeast Florida Regional Travel Survey, American Community Survey (ACS), National Household Travel Survey (NHTS), as well as the 2000 Southeast Florida Travel Characteristics Study (if applicable). The CONSULTANT shall perform statistical analysis to assess if there are any significant variations of travel characteristics as found from these data sets and if so, how the differences should be reconciled. The CONSULTANT shall perform an extensive review of trip generation and distribution results. In addition, the CONSULTANT will acquire the profile of SunPass users and assess if the managed lane and the turnpike users have a different income and profile as well as different travel behavior in comparison to the general public. These insights should help for modeling travel choices of using toll facilities and managed lanes.

Task 3. Model Calibration, Validation and Sensitivity Testing

The CONSULTANT shall follow the model estimation, calibration, validation and sensitivity testing procedure as described in the FHWA/TMIP's *Travel Model Validation and Reasonability Checking Manual, Second Edition*, September 24, 2010. The model shall be calibrated to the corridor level for the major investment corridors as specified in the current Southeast Florida LRTPs, TIPS, and in the SIS program.

It is anticipated that model estimation will occur during Task 1 Model Estimation, Design and Development. The targets of model calibration will also be defined once the structure for each of the modeling modules is determined. After the completion of Task 1, the CONSULTANT will prepare a Model Calibration Plan, documenting the targets to be met at different components of the model. The Model Calibration Plan will serve as the check list for model calibration. The CONSULTANT will keep the RTTAC-MS updated on the progress of the model validation with weekly or bi-weekly web or face-to-face meetings.

The CONSULTANT should calibrate and validate transit model components at modal and major corridor levels. In the past decade, Southeast Florida has had some major transit service changes, including Tri-Rail double tracking and BCT route structure change. These services changes serve as good scenarios for model validation and should be effectively used to identify if there are any hidden transit modeling issues to be addressed and resolved. The CONSULTANT shall develop technically sound formulations of highway speed/capacity versus transit travel time formulations to be able to calibrate and validate to both observed highway loadings and transit ridership at a corridor level.

There are two stages of the model sensitivity tests: the "single-variable" tests and the "two-variable" tests. The single-variable tests should be performed concurrently with Task 1.2 Model Development to ensure the model's sub-modules perform as designed and the propensity for each of the variables is as documented as the graphs on the Module Description Sheets. For the "two-variable" tests, selection of a number of pairs of related variables should be carried out by the CONSULTANT. These variables should affect the same outcome commonly of interest to the model users. For example, transit fare and service frequency have their respective impacts on ridership so a "two-variable" test should be designed to identify the combined ridership effect from variations of these two variables. The CONSULTANT will propose a set of two-variable tests and their test scheme to the RTTAC-MS for review and comment. Once agreed to by the RTTAC-MS, the CONSULTANT will carry out the tests and document the results. The test results should be displayed in graphic form and electronically linked to the Module Description Sheets. Not all the data points on the single- and two-variable test graphs need always be derived from model runs. They may be predicted from the mathematic formulas where the variables are being applied. However, model runs would still be needed for selected data points to verify if the model performed as predicted.

In addition, the CONSULTANT will develop a 2040 SERPM 8.0 model, which should include the currently adopted version of the 2040 Long Range Transportation Plans of the Southeast Florida MPOs. This model will be used for model forecast reasonableness checks, especially at the corridor level. The CONSULTANT shall demonstrate that this model has the behavioral properties as found from the various surveys and as the calibrated 2015 model; and can be applicable for future New Start projects and LRTP Updates.

Task 4. Model Support Services

The CONSULTANT is responsible for assisting the DEPARTMENT and the MPOs on deploying and applying the SERPM 8.0.

4.1 Workshop

The CONSULTANT will prepare a presentation and a hands-on workshop to the model development team and LRTP consultant users. The presentation will introduce to the users the concept of SERPM model streams and the modules. The workshop will focus on applying the new methodologies and new processes for model application analyses. Upon completion of the model development, the CONSULTANT will offer a workshop to general SERPM users.

4.2 Warranty Service

The CONSULTANT is responsible to correct any of the following errors identified prior to December 31, 2019 at no additional cost to the DEPARTMENT or the MPOs of Miami-Dade, Broward, and Palm Beach:

- Scripting or coding not consistent with the intent and/or not performed as described on the Module Description Sheets.

The CONSULTANT is not responsible for the incompatibility of SERPM 8.0 to the newer version(s) of FSUTMS/Cube Voyager beyond June 30, 2019, (or a newer version decided to be use at the outset of Task 1.2).

4.3 Model Scenario Management

The CONSULTANT is responsible for establishing the SERPM 8.0 scenario management system and is responsible for its four times/year updates until the expiration of this contract. The management systems should be capable of dynamically generating and achieving various versions of "Existing plus Committed" highway and transit networks using a transportation improvement project depository and without repetitive manual network coding for the same project. For the 2045 MPO LRTP Updates of Miami-Dade, Broward, and Palm Beach, the CONSULTANT shall update the needs plan datasets, prepare the E+C and final cost feasible networks, and summarize results for the various scenarios in support of the LRTP update efforts.

4.4 Model Application Support

The CONSULTANT is responsible for providing technical support to the SERPM 8.0 users upon the concurrence of the DEPARTMENT. The support may include, but not be limited to, providing technical guidance and troubleshooting model runs, scripting and applying ad-hoc model application processes for analyses. The CONSULTANT may be required to carry out the supporting work at FDOT or MPO offices. The CONSULTANT shall set up a working model in each of the MPOs and the DEPARTMENT. Appropriate equipment needs to be provided by the MPOs and the DEPARTMENT.

Task 5. Project Traffic Development/Corridor Traffic Analysis

The CONSULTANT shall perform this task under FM# 428942-3-22-01. The CONSULTANT will be required to develop traffic demand forecasts for proposed facility designs. The work required for this task may include but is not limited to preparing Design Traffic Reports for PD&E Studies, Interchange Access Requests, and design projects. The CONSULTANT will be required to project future Annual Average Daily Traffic (AADT), design hour traffic volumes, and turning movements using travel demand models, historical traffic growth, land use data, or other appropriate traffic forecasting methodologies.

The CONSULTANT will be required to prepare and/or review various corridor traffic operational studies such as level of service analysis, capacity calculations, and other transportation/traffic studies for Concept Development projects, PD&E studies and Design projects. The CONSULTANT may be required to forecast and analyze demands for all modes of transportation facilities at different horizon years and provide engineering guidance on traffic mitigation measures to achieve an acceptable level of service.

Documentation

A large portion of the documentation is accomplished by following the model development process and producing the Module Description Sheets as described in Task 1 of this project. Additional documentation, however, would be needed to summarize the entire modeling process and to serve as the reference for modelers and non-modelers who are not directly engaging computers on model runs. Thus, the following documents should be produced as the project progresses:

Technical Report No. 1 (TR-1), Model Estimation and Design Report: This document should clearly describe the estimation and development of model parameters using the recent

Southeast Florida Regional Travel Survey, and concepts of SERPM modeling processes. The document should have comprehensive details about the algorithms of modeling modules and their input variables for readers' reference. The model's Module Description Sheets should also be included as appendices.

Technical Memorandum No. 1 (TM-1), Model Calibration, Validation and Sensitivity Test Plan: The CONSULTANT shall prepare this memorandum prior to the onset of Task 3 for the RTTAC-MS's comment and concurrence. The document will establish the calibration targets for model variables, the specific approach for model validation, and the sensitivity/propensity tests of modeling variables.

Technical Report No. 2 (TR-2), SERPM 8.0 Calibration, Validation, and Sensitivity Tests: This document will summarize the input data, calibrated parameters, comparisons of calibrated parameters to other areas, and model accuracy statistics. Statistics for selected corridors as defined in the model calibration and validation stages should also be presented. The propensity of selected model variables, and the combined propensity if two variables should be documented in this TR. This document will also include all the data summaries compiled and developed in Task 2. The sensitivity tests report may be submitted as a separate document.

Technical Report No. 3 (TR-3), SERPM 8.0 Model User's Guide: This document will serve as the manual on how to operate and apply the model. The document should be written from an average model user's perspective. It should also describe the reasonableness checks of inputs and outputs. The TR should list error traps built into the model scripts and explain their likely causes for trouble shooting.

MEETINGS

There are three types of meetings. The first type is workshops dealing with model estimation and model design as defined in Task 1. This series of the workshops will be held face-to-face. The CONSULTANT is expected to offer two (2) workshops during the model development. Additional workshops may be requested through the RTTAC-MS. The second type of project meetings is a series of project progress meetings. This series will occur bi-weekly or monthly after the Task 1 workshops. When deemed necessary, additional progress meetings may be called by the DEPARTMENT Project Manager. The progress meetings may be conducted via teleconference. However, no two progress meetings should be held consecutively via teleconference. The face-to-face meetings will be held at the FDOT District Four Office or an alternate agreed-upon location in Palm Beach, Broward, or Miami-Dade County, Florida. The CONSULTANT is responsible for preparing all the meeting materials and ensures the RTTAC-MS fully understand the status and the details of the model under development. The third type is the

face-to-face RTTAC-MS meetings. The CONSULTANT shall provide administrative functions to the RTTAC-MS.

SCHEDULE

The CONSULTANT shall complete Tasks 1 to 3 by December 15, 2017, Task 4.1 by March 15, 2018, and Tasks 4.2 to 4.4 by December 31, 2019, or the expiration of this contract.

PROGRESS REPORTING

The CONSULTANT shall meet with the DEPARTMENT as required and shall provide a written a monthly progress report and payout curve that describes the work performed on each task. Invoices shall be submitted after the DEPARTMENT approves the monthly progress report and the payout curve. The Project Manager will make judgment on whether work of sufficient quality and quantity has been accomplished by comparing the reported percent complete against actual work accomplished.

COPYRIGHTS

All the scripts and program codes developed for this project are public domain property. The CONSULTANT shall also ensure that all the modeling elements, including source data and third party modeling programs and their source codes, excluding those commercially copyrighted (i.e., Cube/Voyager), can be distributed and be modified for future model developments by FDOT, the MPOs of Palm Beach, Broward and Miami-Dade and their designees who may or may not be the original scripting authors or programmers.

RESPONSIBILITIES OF THE CONSULTANT

- A. The CONSULTANT shall provide a Project Manager, who will be the primary point of contact for the CONSULTANT for scope, schedule, staffing, and negotiation of task man-hours. The CONSULTANT Project Manager is responsible for quality assurance and quality control, and timely completion of all Task Work Orders. The CONSULTANT may be required to develop proposals for Task Work Orders. The Project Manager shall communicate with the DEPARTMENT Project Manager on a regular basis (refer to the section of "MEETINGS") and shall provide monthly progress reports by Task Work Order. These progress reports shall be the basis for evaluation and processing of invoices for payment.

- B. The CONSULTANT shall provide and maintain qualified staff as proposed, negotiated and assigned to this project for specific Task Work Orders. In addition to their technical expertise, all staff must possess superior listening, verbal, and written communication skills, be capable of fully understanding the intent of the scope of service, work assignment, summarizing workshop and meeting conclusions and accurately translate such to work products, making intuitively understandable presentations and thorough documentation.

For all classifications, rates will be negotiated prior to beginning the contract. Any changes to any staff during the course of the project must be timely reported to and approved by the DEPARTMENT. If, at any time, the DEPARTMENT's Project Manager determines that the number or expertise of particular staff assigned to a specific task is inadequate, the Project Manager shall coordinate with the CONSULTANT Project Manager to remedy the situation so as to ensure the timely completion of the work with quality.

- C. The CONSULTANT may be required in Task 4 to provide staff for technical support in the DEPARTMENT and the MPOs as defined in Task Work Orders.
- D. The CONSULTANT shall perform all analyses, develop recommendations, and document all work within the required time schedule as defined in the Task Work Orders.
- E. The CONSULTANT will perform all tasks in accordance with all FDOT Guidelines and Standards, applicable Florida Statutes, and other State laws and policies.

INVOICING

Payment for the work accomplished will be in accordance with Method of Compensation of this contract. Invoices shall be submitted to the DEPARTMENT, in a format prescribed by the DEPARTMENT. The DEPARTMENT Project Manager and the CONSULTANT shall monitor the cumulative invoiced billings to insure the reasonableness of the billings compared to the project schedule and the work accomplished and accepted by the DEPARTMENT.

The CONSULTANT will provide a list of tasks, key events and deliverables associated with total percentage of work considered to be complete chronologically. This list and percentages shall be approved by the DEPARTMENT and will be used to control invoicing. Payments will not be made that exceed the percentage of work and/or the deliverables have actually been submitted by the CONSULTANT and deem acceptable to the DEPARTMENT.