# Guidebook for Florida STOPS Application

Orlando, Florida

November 14, 2016

Florida Department of Transportation
Office of Freight, Logistics and Passenger Operations
Public Transit Office

# Welcome!

# Topics: Welcome!

- Purposes of the Workshop
- Agenda
- Logistics
- Staff and Attendee Introduction

# Purposes of the Workshop

High-level overview of STOPS for planning directors and project managers

Insights to help streamline the development of Florida STOPS applications

Overview of STOPS' reporting and mapping features

Demonstration of using STOPS for FTA's New/Small Starts project evaluation

# Our Agenda

| Session | Time |
|---|---|
| 1-Introduction to STOPS | 8:30 AM – 9:45 AM |
| *BREAK* | *9:45 AM – 10:00 AM* |
| 2-Application Approaches | 10:00 AM – 10:30 AM |
| 3-Implementing STOPS | 10:30 AM – 12:00 PM |
| *LUNCH* | *12:00 PM – 1:15 PM* |
| 4-Reporting and Mapping Features | 1:15 PM – 2:15 PM |
| 5-Analyzing Results for Capital Investment Grant ("New/Small Starts") | 2:15 PM – 3:15 PM |
| *BREAK* | *3:15 PM – 3:30 PM* |
| 6-Recent Florida STOPS Applications & Experiences | 3:30 PM – 4:30 PM |
| 7-Wrap-up & Summary | 4:30 PM – 5:00 PM |

# Logistics

- Cell phones
- Restrooms
- Breaks
- Questions and comments



# Instructors

## Chris Wiglesworth

- Facilitator
- Florida Department of Transportation, Tallahassee, Florida

## David Schmitt, AICP

- Director, Travel Modeling and Analytics
- Connetics Transportation Group, Orlando, Florida

## Jeanette Berk

- Senior Consultant
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## Ashutosh Kumar

- Senior Project Manager, Travel Modeling and Analytics
- Connetics Transportation Group, Ft. Lauderdale, Florida

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# Attendees

- My name is…<name>
- I'm the <title> at <organization>

# Acronyms

- ACS – American Community Survey
- APC – Automatic Passenger Counter
- APTA – American Public Transportation Association
- ASCII – American Standard Cost for Information Interchange
- BRT – Bus Rapid Transit
- CIG – Capital Investment Grant
- CRT – Commuter Rail Transit
- CTPP – Census Transportation Planning Package
- FTA – Federal Transit Administration
- FTDE – Florida Transit Data Exchange
- GTFS – General Transit Feed Specification
- HBO – Home-Based Other
- HBW – Home-Based Work
- HRT – Heavy Rail Transit
- JTW – Journey-to-Work
- KNR – Kiss-and-Ride

# Acronyms (contd.)

- LRT – Light Rail Transit
- LRTP – Long Range Transportation Plan
- MDT – Miami-Dade Transit
- MPO – Metropolitan Planning Organization
- NHB – Non-Home Based
- NTD – National Transit Database
- NTI – National Transit Institute
- PNR – Park-and-Ride
- PMT – Person Miles Traveled
- SERPM – Southeast Florida Regional Planning Model
- STOPS – Simplified Trips on Project Software
- TAZ – Traffic Analysis Zone
- TCAR – Transit Concept and Alternatives Review
- TBEST – Transit Boardings Estimation and Simulation Tool
- VMT – Vehicle Miles Traveled

# 1-Introduction to STOPS

# Topics: Introduction to STOPS

- Description and Purpose
- Ancillary Purposes
- Resources
- Required & Optional Inputs
- Outputs

# What is STOPS?

Simplified Trips On Project Software

- Stand-alone computer program
- Applies a set of travel models to predict transit travel patterns for user-specific scenarios
- Simplified method to predict ridership and automobile VMT changes

Developed and maintained by FTA

Originally released in 2013, updates provided every 6-12 months

# FTA Resources

- User Guide (most recent version: April 2015)
- Presentation slides from the 2015 STOPS Workshop
- STOPS software
- Example STOPS application

- All are available on the FTA STOPS web page
  - https://www.transit.dot.gov/funding/grant-programs/capital-investments/stops-%E2%80%93-fta%E2%80%99s-simplified-trips-project-software

# Other Resources

- This course and the guidebook!
- National Transit Institute will offer a course: "Ridership Forecasting with STOPS for Transit Project Planning"
  - Will be offered from time to time in 2017
  - Detailed, multi-day
  - Designed for experienced travel forecasters

# STOPS' Primary Purpose

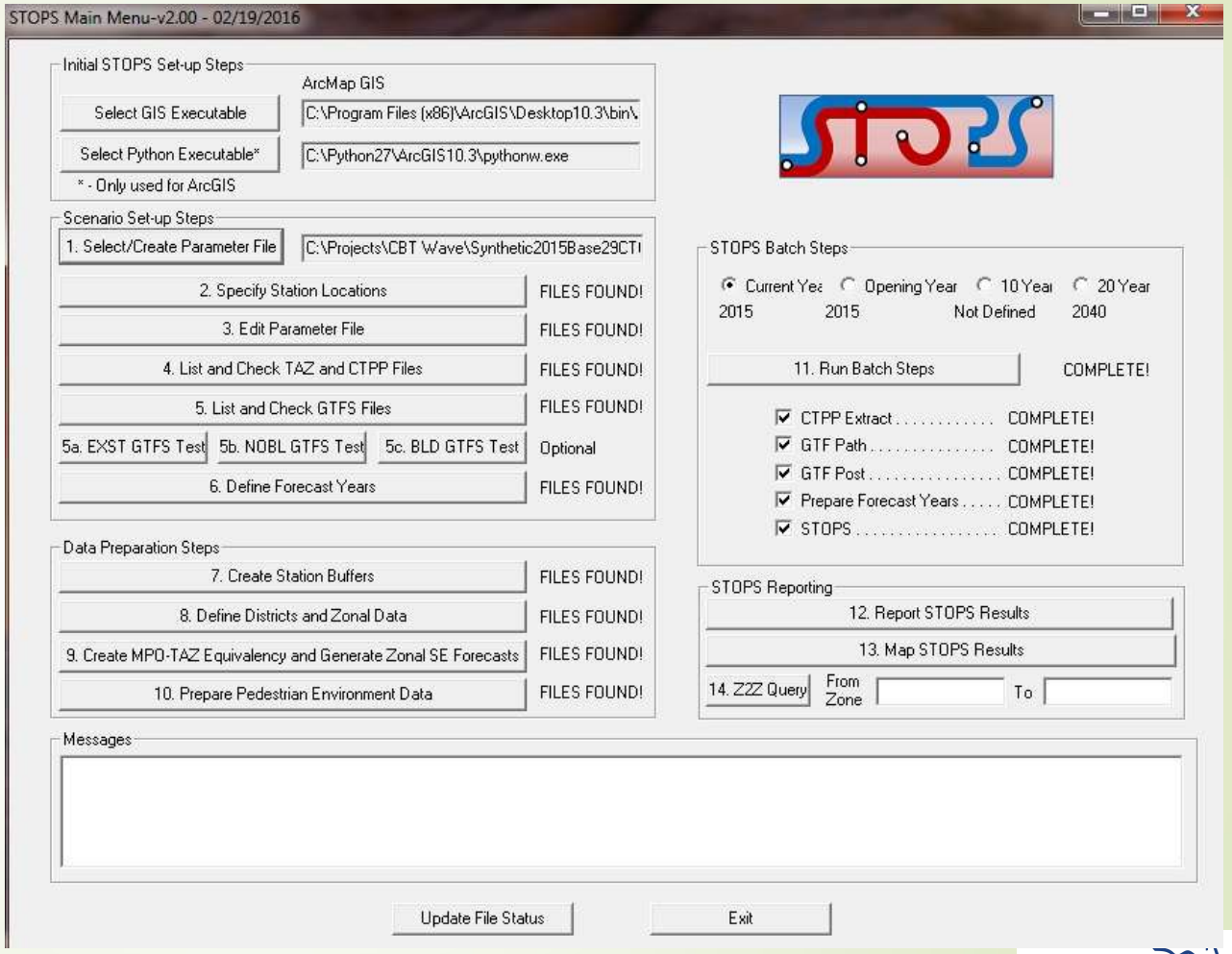
- To provide a simplified method to produce measures for fixed-guideway projects applying for FTA's Capital Investment Grant funding

- **Design, nomenclature and implementation tightly focused on purpose:**
  - Reflects ridership experiences from fixed-guideway projects around the country (over 30 projects reflecting streetcar, BRT, LRT, heavy rail and commuter rail modes)
  - Does not utilize a roadway network
  - Designed to "No Build" and "Build" scenarios, where "Build" typically reflects a transit corridor project
  - Some reports and maps specifically tailored to project trips, with less detail available for the remaining transit system

# Using STOPS Beyond Its Primary Purpose…

1. QA/QC ridership forecasts
2. Systems planning
3. Service planning
4. Sizing of stations and mode-of-access facilities
5. Before-After comparisons

# The STOPS Main Menu



# Advantages of Using STOPS
(over regional travel or incremental models)

1. FTA requires substantially less review time of STOPS ridership forecasts for CIG projects

# Scrutiny Level of Submitted Forecasts

| Source of Forecast | FTA review of submitted forecasts | | | |
|---|---|---|---|---|
| | Transit rider survey data | Properties of the travel model | Validation vs. current riders | Plausibility of forecasts |
| Regional model | ● | ● | ● | ● |
| Incremental model | • | • | ● | ● |
| STOPS | | | ● | ● |

● Substantial scrutiny

● Modest scrutiny

• Limited scrutiny

*Note that these reviews pertain to formally submitted forecasts. They do not reflect any technical assistance that FTA may have provided to sponsors during the development of forecasting methods or forecasts.*

*From FTA's STOPS Workshop, Atlantic City, NJ, May 17, 2015*

# Timelines for Submittal of Travel Forecasting Information

(in months in advance of anticipated ratings request)

| Information for FTA Review | STOPS | Regional Model |
|---|---|---|
| Documentation of the model methodology | -- | 4 |
| Documentation of model testing | -- | 4 |
| Documentation of project-specific inputs | 2 | 3 |
| Final draft forecasts for the project | 1 | 2 |

*Source: https://www.transit.dot.gov/funding/grant-programs/capital-investments/travel-forecasts, accessed September 7, 2016.*

**FTA forecast review effectively cut in half, from 4 to 2 months**

# Advantages of Using STOPS
(over regional travel or incremental models)

1. FTA requires substantially less review time of STOPS ridership forecasts for CIG projects

2. STOPS models can typically produce more analyses than regional travel models within the same time

# Comparison of STOPS and Regional Travel Model Running Times

| Region | STOPS Run Time (recent experience) | Regional Travel Model Run Time (No Build + Build) |
|---|---|---|
| **Jacksonville / Northeast Florida** | <1 hour | 8-16 hours |
| **Miami / Southeast Florida** | 3-5 hours | 3 days (full run) |
| **Orlando / East Central Florida** | 1-2 hours | 8-12 hours |
| **Tampa / West Central Florida** | 1-2 hours | 4.5-7 hours |

# Advantages of Using STOPS
(over regional travel or incremental models)

1. FTA requires substantially less review time of STOPS ridership forecasts for CIG projects

2. STOPS models can typically produce more analyses than regional travel models within the same time

3. STOPS has embedded mapping routines that easily display and communicate results
   (more on this in Session 4)

# Advantages of Using STOPS
(over TBEST)

1. STOPS accounts for auto congestion, and future changes in auto congestion
   - TBEST does not account for auto congestion

2. STOPS accounts for travel movements
   - TBEST is a direct demand model, so demand directly determined from supply characteristics (population, transit service, etc.)

# Limitations to Using STOPS

1. STOPS does not provide the same level of reporting detail to local buses or non-project stations as it does for project trips
2. STOPS does not provide a direct interaction with the roadway network
3. The GTFS editing process can be cumbersome
4. STOPS' representation of non-work trips is less certain than its representation of work trips
5. STOPS is limited in its ability to analyze alternatives beyond its supplied metrics (Example: transit capacity analysis has to be performed offline)
6. Future year travel patterns are based on existing patterns and the user-supplied population and employment forecasts (Other variables such as accessibility are not considered)

# Resources

## Hardware

- 8GB RAM required
- 4- or 8-core processor
- 40-100GB of hard disk storage per project

## Software

- Windows 7 or later
- ArcMap version 10.1+
- Good text editor
- Good spreadsheet software
- GTFS visualizer

## Personnel/Staff

- Understanding of travel forecasting
- Experience with GIS packages
- Familiarity with the transit system and local area

# 1 STOPS "run" = 3 scenarios x 1 analysis year

- Scenarios
  - "Existing"
  - "No Build"
  - "Build"
- Analysis Years
  - "Current"
  - Opening
  - 10-year horizon
  - 20-year horizon

# Scenarios and Analysis Years

**SCENARIOS**

| Scenario | Description |
|---|---|
| "Existing" | All existing conditions for which the most recent data is available, typically 0-2 years before the present year |
| "No Build" | Reflects the changes in conditions from the 'existing' scenario |
| "Build" | Reflects the changes in conditions from the 'No Build' scenario |

**ANALYSIS YEARS**

| Analysis Year | Description |
|---|---|
| "Current" Year | The year for which the most recent data is available, typically 0-2 years before the present year |
| Opening Year | The year the Build project is expected to be in revenue operation, typically 2-7 years after "current" year |
| 10-year horizon | Medium-term future year; user-specified |
| 20-year horizon | Long-term future year; usually region's LRTP year |

**1 STOPS "model run" = ≤3 scenarios X 1 analysis year = ≤3 alternatives**

# Input Data

| # | Data Type | Source Agency (Site) |
|---|---|---|
| 1 | Census Transportation Planning Package | The Census Bureau via FTA's website (https://www.transit.dot.gov/funding/grant-programs/capital-investments/stops-data-census) |
| 2 | GTFS data | Transit agency's website or Florida Transit Data Exchange (http://www.ftis.org/Posts.aspx) |
| 3 | Average weekday system-wide unlinked trips | Transit agency, NTD (https://www.transit.dot.gov/ntd/transit-agency-profiles), or APTA (http://www.apta.com/resources/statistics/Pages/ridershipreport.aspx) |
| 4 | Average weekday boardings by station/stop (if available) | Transit agency's count program |
| 5 | TAZ-level population, employment and highway impedances from the regional travel model | The region's MPO or local FDOT district |
| 6 | Representation of the No Build and Build scenarios in GTFS | Study team, transit agency, MPO or other agency |
| 7 | Park-ride lot information | Transit agency's website, or contact the transit agency directly |
| 8 | Transit travel surveys (optional) | Transit agency, MPO or FDOT district |

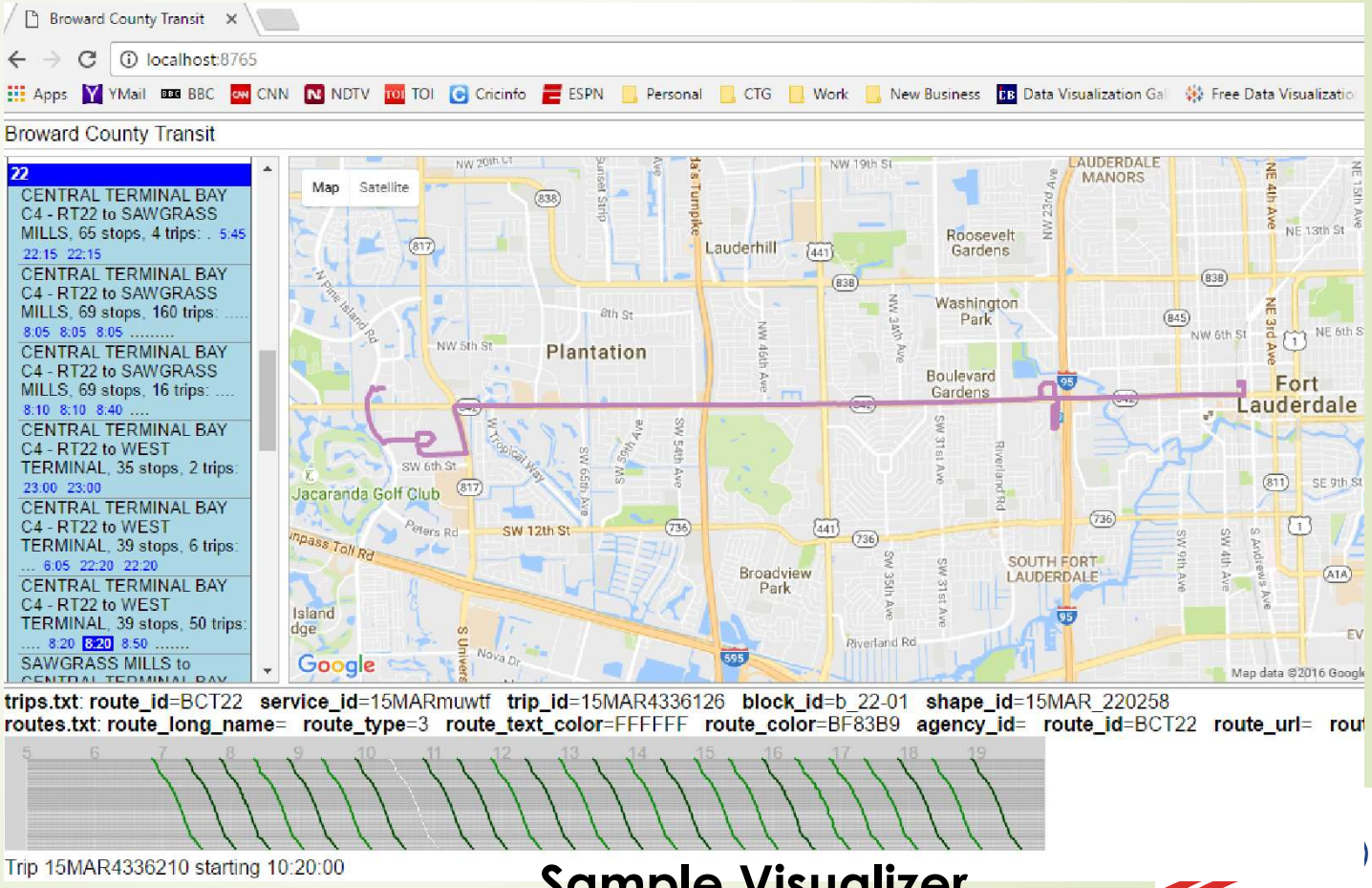
# General Transit Feed Specification

Contents
- agency.txt
- calendar.txt
- calendar_dates.txt
- fare_attributes.txt
- fare_rules.txt
- feed_info.txt
- frequencies.txt
- routes.txt
- shapes.txt
- stops.txt
- stop_times.txt
- transfers.txt
- trips.txt

\+

PNR.txt
Editlist.txt

STOPS Specific




**Sample Visualizer**

# Outputs

1. Maps that can be produced in ArcGIS
   - User-selected options
   - More in Session 4

2. Report files in ASCII (text) format
   - One report file per analysis year
   - Extremely large files: 10+ MB; 150,000+ lines
   - Approximately 3,000 tables

# 3 Application Approaches

**"Synthetic"**

Relies on CTPP travel patterns and aggregate ridership information

**"Synthetic with Special Markets"**

Uses "synthetic" approach with additional distinct travel patterns

**"Incremental"**

Relies on transit travel patterns from a rider survey, in lieu of CTPP


## Session Summary

- STOPS was developed primarily for New/Small Starts projects, but it can be used for other purposes
- STOPS has many advantages, and some limitations
- STOPS requires resources that are relatively easy to obtain

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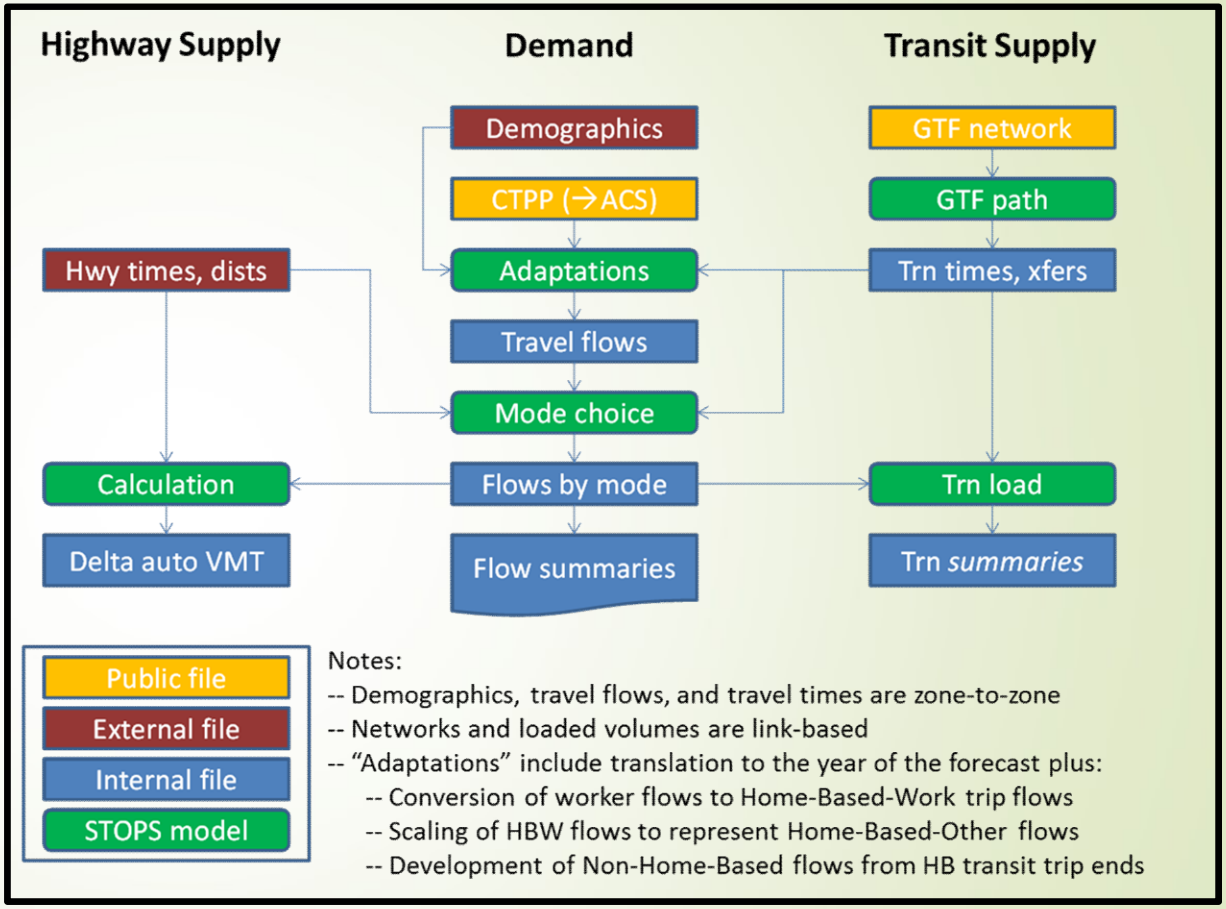
# 2-Application Approaches

# Topics: Application Approaches

- "Synthetic" approach
- "Synthetic with Special Markets" approach
- "Incremental" approach
- Deciding on an approach

# "Synthetic" Approach

- Relies on CTPP travel patterns and aggregate transit information to determine existing transit trips
- Uses experience from 30 fixed-guideway projects to estimate ridership
- Requires up to 9 data items




Source: FTA's STOPS Workshop, held at the 15th TRB Planning Applications Conference in Atlantic City, NJ, May 17, 2015.

# "Synthetic" STOPS Data Items

| # | Data Type | Required | Optional | Recommended |
|---|---|---|---|---|
| 1 | CTPP travel flows | √ | | |
| 2 | Roadway travel times and distances (TAZ-to-TAZ) | √ | | |
| 3 | Population and employment (TAZ-level) | √ | | |
| 4 | GTFS files | √ | | |
| 5 | Park-ride lot information | √ | | |
| 6 | Total weekday systemwide unlinked trips | √ | | |
| 7 | No Build and Build representation in GTFS and park-ride files | √ | | |
| 8 | Average weekday boardings by station/stop | | √ | √ |
| 9 | Total linked transit trips, stratified by trip purpose and auto ownership | | √ | √ |

# "Synthetic with Special Markets" Approach

- Special Markets: unique travel markets not accounted in "synthetic" approach
  - CTPP data is unaware of travel:
    - To/from activity centers that is not routine
    - Not made by residents (mostly)
    - Not scaled to jobs
  - Examples: air passengers, universities, tourist areas
- Particular attention needed when travel from special markets is significant in the corridor / study area
- Application is same as "synthetic" approach, but additional person trip table provided by user

# Developing Special Market Trip Tables

- Sources:
  - Special market intercept surveys,
  - Special market travel models,
  - Special market records from a transit rider survey, and/or
  - Other data sources

- User may specify different trip tables for current and future analysis years

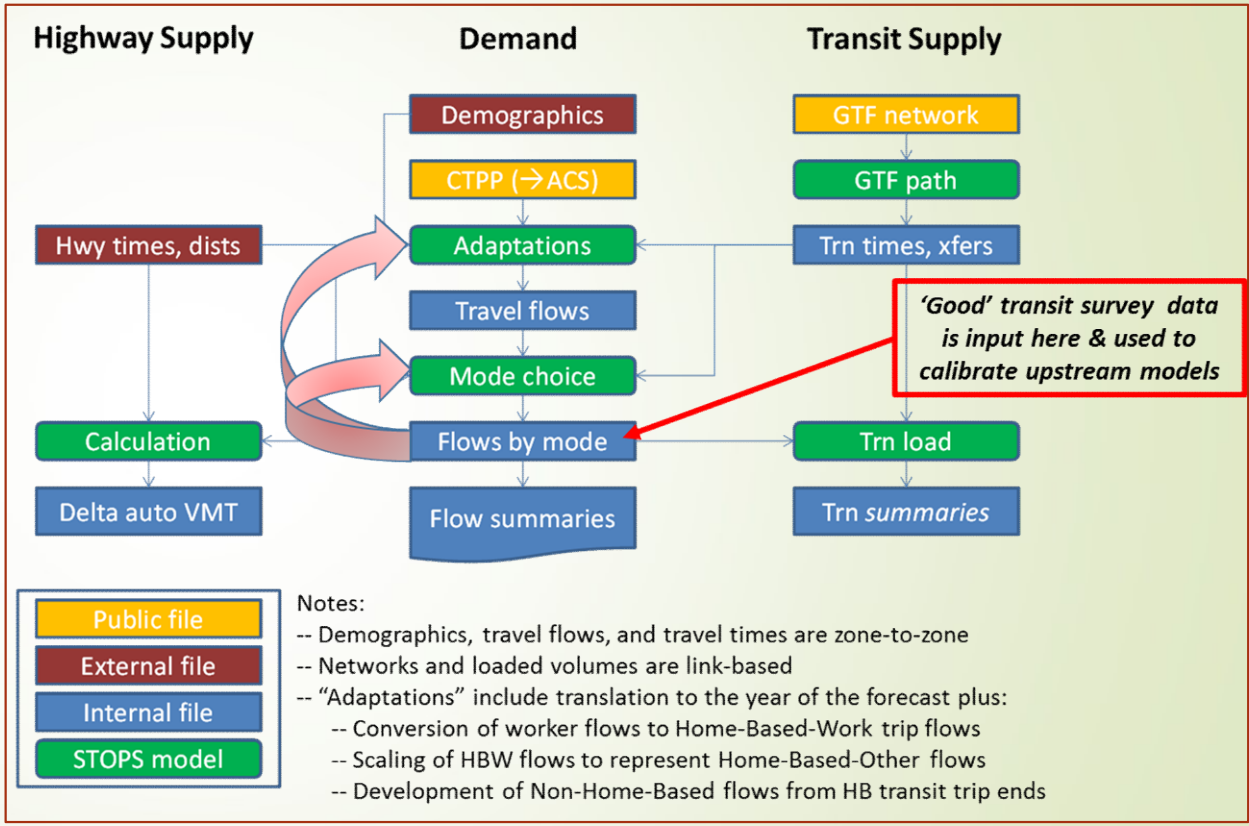

Keep it
simple
Think about special markets only if they're large enough and are actually "special"!

# "Synthetic with Special Markets" STOPS Data Items

| # | Data Type | Required | Optional | Recommended |
|---|---|---|---|---|
| 1 | CTPP travel flows | √ | | |
| 2 | Roadway travel times and distances (TAZ-to-TAZ) | √ | | |
| 3 | Population and employment (TAZ-level) | √ | | |
| 4 | GTFS files | √ | | |
| 5 | Park-ride lot information | √ | | |
| 6 | Total weekday systemwide unlinked trips | √ | | |
| 7 | No Build and Build representation in GTFS and park-ride files | √ | | |
| 8 | Special market trip flows | √ | | |
| 9 | Average weekday boardings by station/stop | | √ | √ |
| 10 | Total linked transit trips, stratified by trip purpose and auto ownership | | √ | √ |

# "Incremental" Approach

- Relies on data from a 'good' transit survey to develop travel patterns
- Uses experience from 30 fixed-guideway projects to estimate ridership
- Requires up to 9 data items




Source: FTA's STOPS Workshop, held at the 15th TRB Planning Applications Conference in Atlantic City, NJ, May 17, 2015.

# Characteristics of a 'Good' Rider Survey

1. Conducted within the past 5-6 years or conducted when transit service coverage and levels were similar to existing transit service coverage and levels,
2. Includes a useful number of samples that provide meaningful statistical accuracy levels for trip flows,
3. Free of response and sampling biases,
4. Expanded to existing ridership levels, and
5. Includes the following data items:
   - Accurate production/attraction trip information geocoded to TAZ or latitude/longitude coordinates,
   - Trip purpose segmentation that is translatable into HBW, HBO, and NHB purposes,
   - Auto ownership segmentation by at least 0, 1, 2+ autos owned per household categories,
   - Mode of access categories that can be organized into walk, park-ride and drop-off access modes,
   - Transit transfer activity

# "Incremental" STOPS Data Items

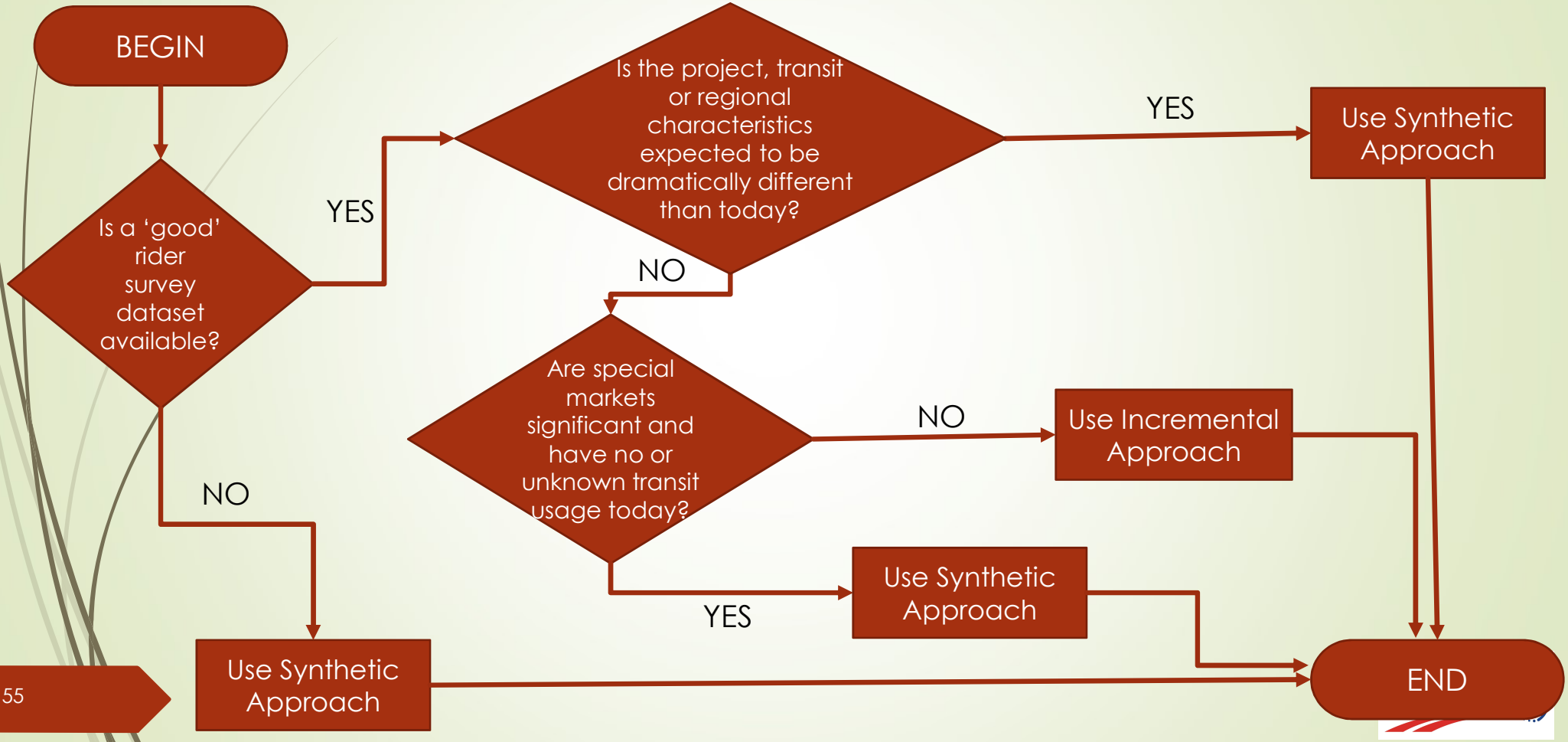
| # | Data Type | Required | Optional | Recommended |
|---|---|---|---|---|
| 1 | CTPP Travel Flows | √ | | |
| 2 | Roadway travel times and distances (TAZ-to-TAZ) | √ | | |
| 3 | Population and employment (TAZ-level) | √ | | |
| 4 | GTFS files | √ | | |
| 5 | Park-ride lot information | √ | | |
| 6 | Total weekday systemwide unlinked trips | √ | | |
| 7 | No Build and Build representation in GTFS and park-ride files | √ | | |
| 8 | Average weekday boardings by station/stop | | √ | √ |
| 9 | Transit trip flows stratified by trip purpose and auto ownership | √ | | |

# Situations That May Favor One Approach

| Category | "Synthetic" Approach | "Incremental" Approach |
|---|---|---|
| **Available transit data** | Unavailable 'good' rider survey;<br><br>Minimum transit rider information available | 'Good' rider survey available or forthcoming |
| **Corridor or study area characteristics** | Limited transit service currently provided (hourly or lower frequencies);<br><br>Large demographic or service coverage changes expected in near- or long-term;<br><br>Modest ridership | Transit service levels are robust and cover well-developed areas;<br><br>Known ridership responses to past improvements;<br><br>No large demographic or service changes expected in near- or long-term |
| **Project characteristics** | Project represents significant change or increase from existing services (e.g., local bus only to rail, doubling of service area, strong service in currently under-developed area) | Project represents evolutionary change from existing services (e.g., local bus to BRT) |

# Deciding on an "Synthetic" vs. "Incremental" Approach

## *One Way to Address the Decision*



# Session Summary

- There are 3 approaches to using STOPS: "synthetic", "synthetic with special markets", and "incremental"
- The availability of a good, recent rider survey helps determine whether a "synthetic" or "incremental" approach is preferable
- Special markets can be handled within STOPS

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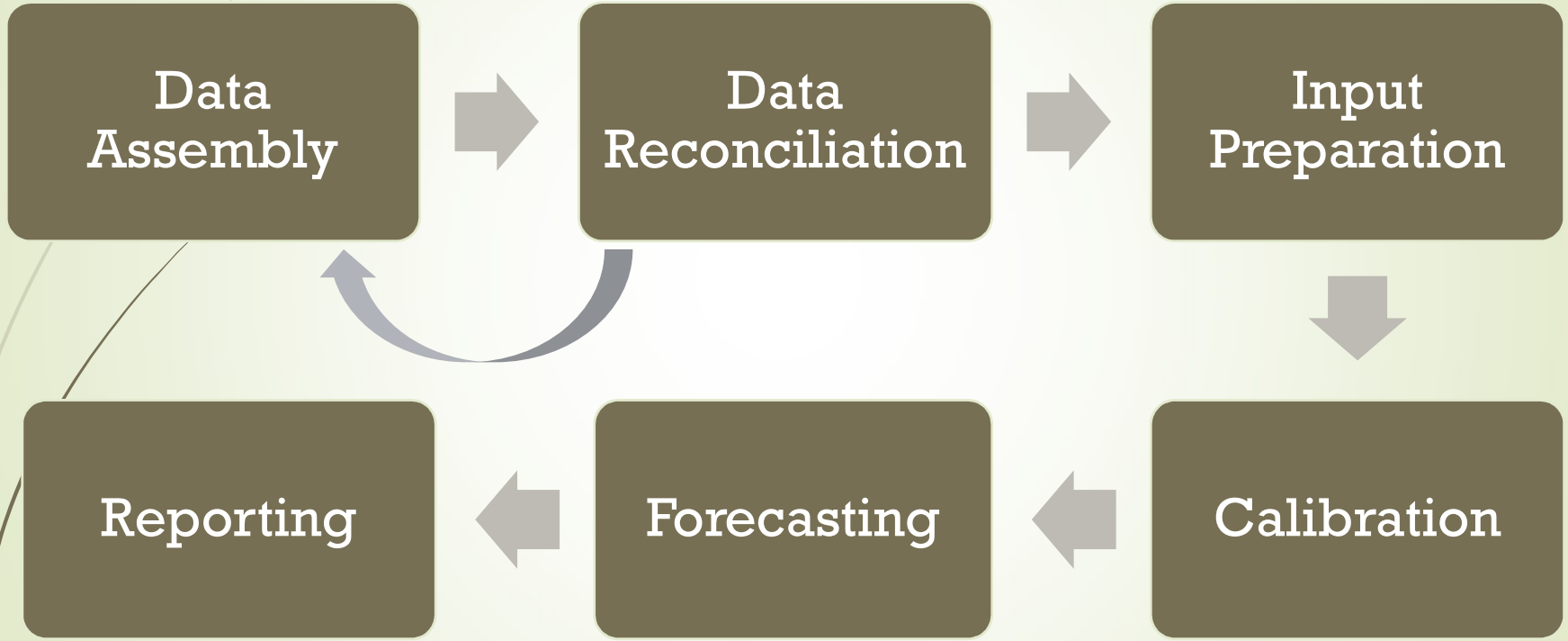
# 3-Implementing STOPS

# Topics: Implementing STOPS

- Timeframes & Schedule Drivers
- Data Preparation
- Calibration
- Forecasting
- Observations

# Application Development

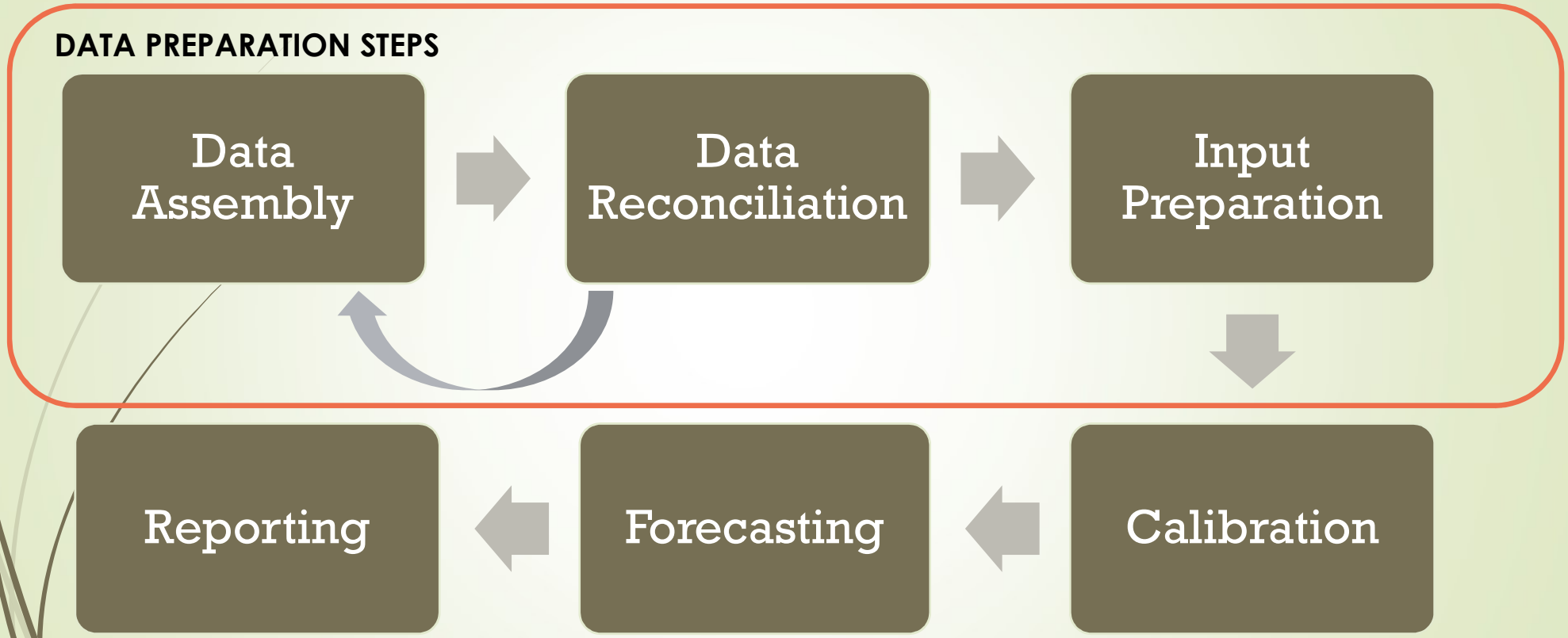


# Potential STOPS Development Timeframes & Schedule Drivers

(Applies to all approaches)

| | Potential Timeframes | Schedule Drivers | Circumstances That Can Significantly Affect Schedule Beyond Potential Timeframes |
|---|---|---|---|
| **Hardware / Software Acquisition** | Varies | Purchase agreements | If not already available, hardware and GIS software costs can exceed $15,000, which may require lengthy procurement procedures |
| **Data Preparation / Reconciliation** | 1-2 months | Data availability and consistency | Basic transit, GTFS data or rider survey is not available;<br><br>Data items are not consistent in terms of ridership levels and do not correspond with GTFS networks;<br><br>Special market data collection effort is needed |
| **Calibration** | 1-2 months | Availability of stop-level count data;<br>Special markets;<br>Data inconsistencies | Special markets may adversely impact calibration if they are significant in key corridors, and may require additional data collection and analysis;<br><br>Data inconsistencies previously unforeseen in the data preparation stages |
| **Forecasting** | 1-2 months | Extent of GTFS coding required for No Build and Build networks;<br>Transfer connections | Significant differences between existing, No Build and Build networks, or between existing and future year networks;<br><br>Previously unforeseen 'broken' transfer connections in No Build and Build alternatives;<br><br>More than 1-2 Build alternatives |
| **Total** | 3-6 months plus hardware / software acquisition | | |

# Application Development



# Data Preparation

- Required data can originate from 5-6 different agencies

- The required 9-10 data items ~~may not~~ probably are inconsistent (see next slides)

# Common Data Issues (1 of 2)

| Data Type | Common Issues / Problems |
|---|---|
| **Census Transportation Planning Package (2000 or ACS)** | No issues. Download by state. The Florida file for CTPP 2000 is 288 MB. |
| **GTFS data** | Transit agencies typically alter service 2-3 times a year. So the GTFS file needs to correspond with the ridership data |
| **Average weekday system-wide unlinked trips** | Inconsistencies in reporting. This information must be consistent with the GTFS information, model boundary and other ridership data |
| **Average weekday boardings by station/stop** | Count data should reflect average weekday boardings over a broad period of time, preferably weeks or months, to avoid over-stating individual fluctuations or special events. Count data may have missing or extraneous information that the user will have to address before running STOPS.<br>This information must be consistent with the GTFS information and other ridership data.<br>Count data may include significant ridership from special markets. If these markets are substantial, then ridership from those markets should be deducted from the counts until they are reflected accurately in STOPS (see Chapter 4.2 of the guidebook). |

# Common Data Issues (2 of 2)

| Data Type | Common Issues / Problems |
|---|---|
| **TAZ-level population, employment and highway impedances from the regional travel model** | Need 2000 or 2008 MPO population and employment data consistent with base and horizon year population and employment data.<br>MPOs do not generally make their existing population and employment data methods backward-compatible. |
| **Representation of the No Build and Build scenarios in GTFS** | Editing GTFS networks must occur in a database, spreadsheet and/or text editor program. |
| **Park-ride lot information** | Must be developed by user. Park-ride locations should correspond with stop/station counts and GTFS information. |
| **Transit travel surveys (optional)** | Older surveys may be significantly "out of date" given changes in travel behavior, economic conditions and/or transit service.<br>Surveys may need to be re-expanded to be consistent with other ridership data.<br>Surveys should be geocoded to the same zone system used for population and employment data for consistent observed/estimated comparisons. |

# Data Preparation

- Required data can originate from 5-6 different agencies
- The required 9-10 data items ~~may not~~ probably are inconsistent

- Solution:
  - 1st step: perform review of timeframe and systemwide ridership reported by each piece of data
  - 2nd step: reconcile the data to a common year, service level and/or systemwide ridership

# Data Reconciliation Options

- Scale stop/station APC to the "current" ridership
- Interpolate population, employment and highway impedance data to the "existing" year
- Re-expand rider survey data to "current" ridership
- Use slightly older GTFS networks consistent with "current" ridership

- Depending on circumstances, other options exist

# Data Inconsistencies: Example

| Data Item | Data From… |
|---|---|
| **"Existing" GTFS information** | December, 2011 |
| **Transit survey** | March – May, 2011 |
| **Stop/station count data** | October, 2010 – January, 2011 |
| **Systemwide boarding data** | December, 2011 – April, 2012 |

# Data Inconsistencies: Example

- Solution
  - Reconcile different ridership count estimates to create a "consensus" ridership estimate by route
  - Re-expand survey to consensus ridership
  - Adjust APC counts to match consensus
  - Use consensus to create STOPS inputs: system-wide unlinked trips, linked trips by purpose and auto ownership, and stop/station counts

ESTIMATED DELAY: 2.5 WEEKS

# Calibration Issues

- Calibration: process of matching STOPS results to local conditions
- Calibration begins once the data preparation steps have been completed

- There is no definitive "step by step" process for calibrating a STOPS application; this can take time and uncover data inconsistencies

# Recommended STOPS Calibration Strategy

| # | Issue (in order of importance) | Description | Possible Calibration Improvement Strategies |
|---|---|---|---|
| 1 | Purposes | Ensure STOPS accurately reflects the amount of observed HBW, HBO and NHB trips | Provide transit linked-trip information to STOPS (via rider survey);<br>Adjust person-trip rates;<br>Add special-market flows |
| 2 | Flows | Ensure STOPS accurately reflects the observed transit trip flows | Calibrate to attraction and production transit shares;<br>Use "incremental" approach (requires "good" rider survey) |
| 3 | Access modes | Ensure STOPS accurately reflects transit trips by access mode (walk, park-ride, kiss-ride) | Add time penalties by access mode that reflect un-included/qualitative impedances or behaviors |
| 4 | Transfers | Ensure STOPS accurately reflects the number of linked transit trips or percentage of linked trips that transfer | Adjust transfer penalty (0-10 minutes, default is 5 minutes) |
| 5 | Fixed-guideway share | Ensure STOPS accurately reflects existing share of transit trips that use fixed-guideway modes | Adjust visibility factor |
| 6 | Groups | Ensure STOPS applies minimal adjustment factors to achieve reasonable representation of station-group ridership | Review GTFS, PNR and stop/station files for accuracy;<br>Enable station-group calibration |
| 7 | Routes | Ensure STOPS accurately reflects routes in corridor (higher scrutiny) and outside corridor (lower scrutiny) | Review GTFS, PNR and stop/station files for accuracy;<br>Add time penalties to stops to reflect substantial fare differences among services or routes;<br>Further detailed or complex adjustments may be needed |
| 8 | Stations | Ensure STOPS accurately reflects station boardings, in total and by access mode, within the corridor | |

# The Fixed-Guideway Visibility Factor

- Setting that approximates the differentiation of fixed-guideway alternatives and regular bus service within a corridor or study area
- Direct impact on forecasting ridership
- Used in the calibration step only if BRT, rail or streetcar service is currently in operation
- Always used in forecast
- FTA expectation: visibility factors remain within a well-known range: $0.0 < VF \leq 1.0$

# Potential Range of Visibility Factors

| Transit Mode | Selected Characteristics | Initial Visibility Factors |
|---|---|---|
| BRT ("Corridor-based") | Peak hour/period exclusive lanes/right-of-way; Defined stations; TSP/QJ for transit vehicles; "Schedule-free service" | 0.0-0.2 |
| BRT ("Robust") | 'Corridor-based' BRT characteristics plus All-day exclusive lanes or reliably faster travel times; Separate and consistent branding | 0.3-0.5 |
| Streetcar | Railcar operating in mixed-flow or exclusive lanes plus 'Corridor-based' BRT characteristics | 0.5-0.75 |
| LRT/HRT/CRT | Railcar operating in mixed-flow, exclusive lanes or railroad right-of-way | 0.6-1.0 |

# Forecasting Issues

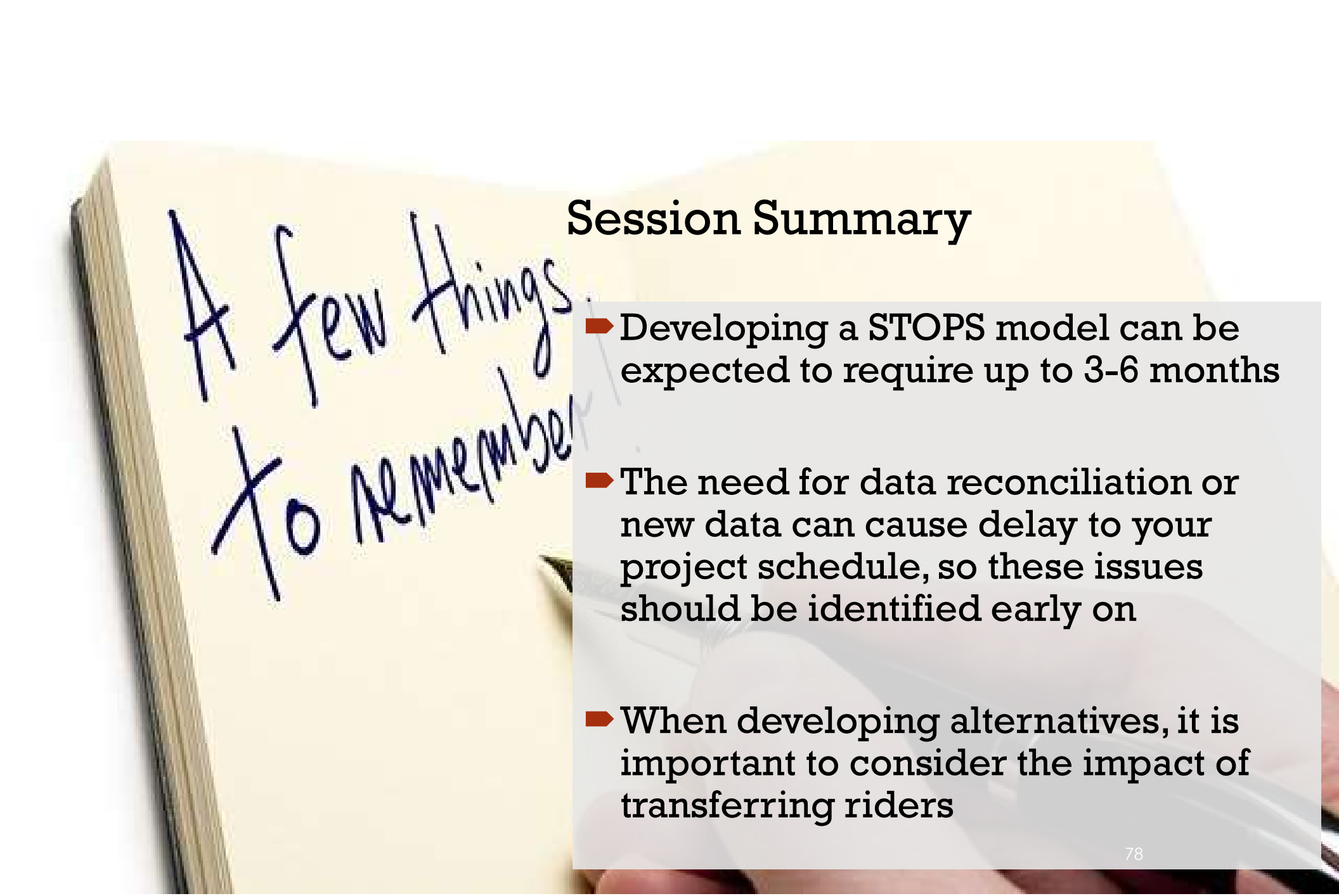
- GTFS networks are very detailed: precise stop-to-stop coding of travel times, precision location of stops, enumeration of individual bus runs
- This level of detail is not always available for forecasting
- STOPS provides a planning-level of detail for GTFS:
  - End-to-end travel times, instead of stop-to-stop travel times
  - Frequency-based service, instead of individual bus runs
- Issues arise when both GTFS- and planning-level of detail are used for horizon year forecasts

# Example of Differences in GTFS- and Planning-levels of Detail
## (Assuming Identical End-to-End Travel Time)

| | GTFS-level of detail | Planning-level of detail | Notes |
|---|---|---|---|
| **Description** | Precise stop locations<br>Precise stop times<br>Enumeration of all bus runs | Precise stop locations<br>Interpolated stop times<br>Average frequency + start time | |
| **Beginning of Trip** | 6:53 | 7:00 | |
| **Arrival Transfer Center** | **7:35** | **7:42** | |
| **Connecting Routes depart at…** | 7:40 | 7:40 | Connecting routes are unchanged from agency's GTFS file |
| **STOPS Result** | **5-minute transfer time to connecting routes** | **Riders miss connection** | Can result in loss of transit trips and poor ridership results |

# How to Avoid GTFS- and Planning-Level Coding Issues?

- Perform detailed review of connections are key transfer points
- Ensure end-to-end travel times reflect expected delays from congestion or other sources
- Within GTFS files, convert corridor routes to planning-level coding before calibration




# Session Summary

- Developing a STOPS model can be expected to require up to 3-6 months
- The need for data reconciliation or new data can cause delay to your project schedule, so these issues should be identified early on
- When developing alternatives, it is important to consider the impact of transferring riders

# Questions?

# Data Inconsistency and Proposed Solutions: Examples

| | Question 1 | Question 2 | Question 3 |
|---|---|---|---|
| **"Existing" GTFS Information** | Fall 2016 | Fall 2016 | Spring 2016 |
| **Transit survey** | n/a | Spring 2013 | Fall 2010 |
| **Stop/station count data** | n/a | n/a | Fall 2015 |
| **Systemwide boarding data** | 2013 | 2014 (NTD) | 2013 (NTD) |
| **Proposed "Existing" Year & Action Items** | | | |

# Your poll will show here

1

Install the app from
pollev.com/app

2

Make sure you are in
Slide Show mode

Still not working? Get help at pollev.com/app/help

*or*

Open poll in your web browser

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2

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1

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2

Make sure you are in
Slide Show mode

Still not working? Get help at pollev.com/app/help

*or*

Open poll in your web browser

# 4-Reporting and Mapping Features

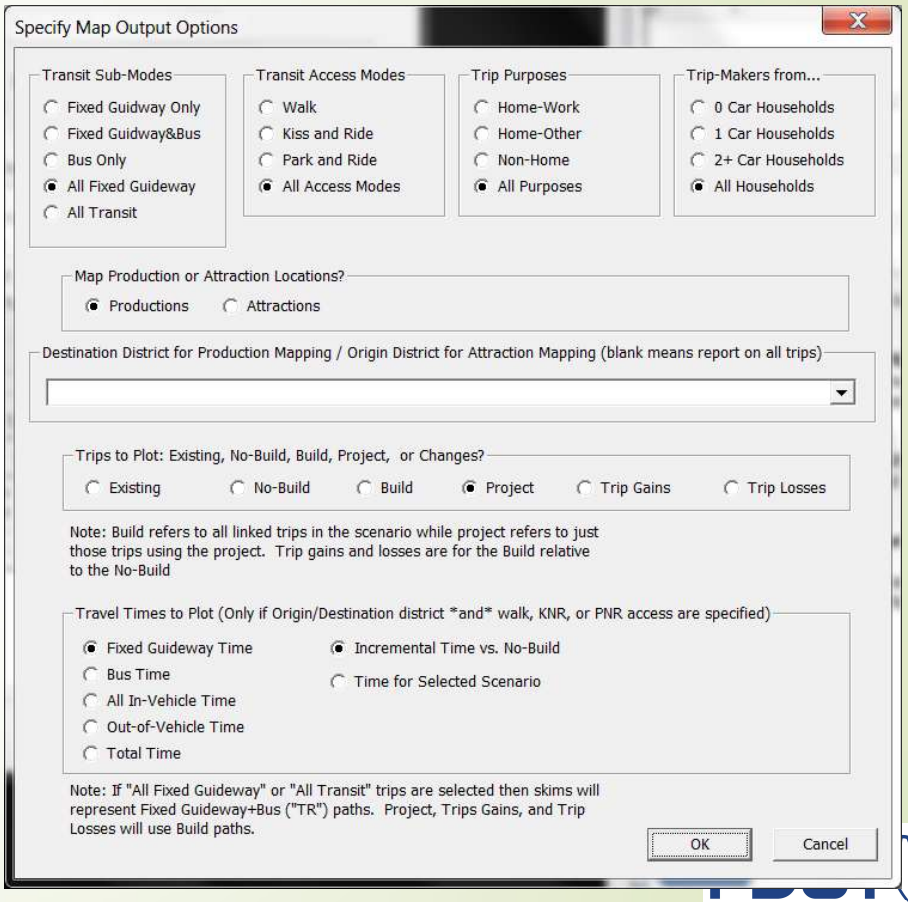
# Topics: Reporting and Mapping Features

- Mapping Features
- Results Report
- CIG Project Evaluation Criteria
- Extract CIG Project Evaluation Criteria from STOPS

# Maps!

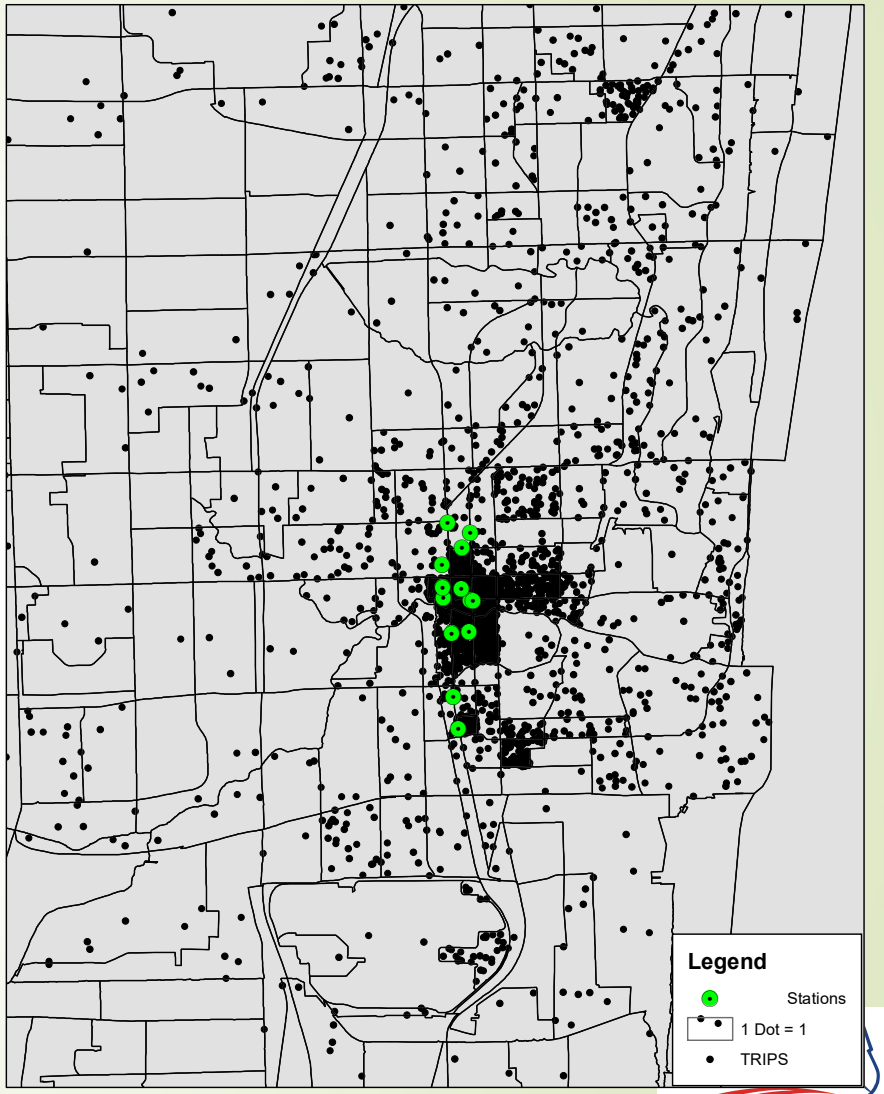
- Thematic and dot-density maps can be developed from STOPS menu
- Maps are created within minutes in user's GIS package
- Does not require transitioning the data to different users or programs

- Options include:
  - Travel times to/from specific locations
  - Changes in travel times between No Build and Build scenarios
  - Trip gains/losses
  - Trip productions and attractions
  - Locations of trips made by transit-dependent households



# Example: Dot Density Plot

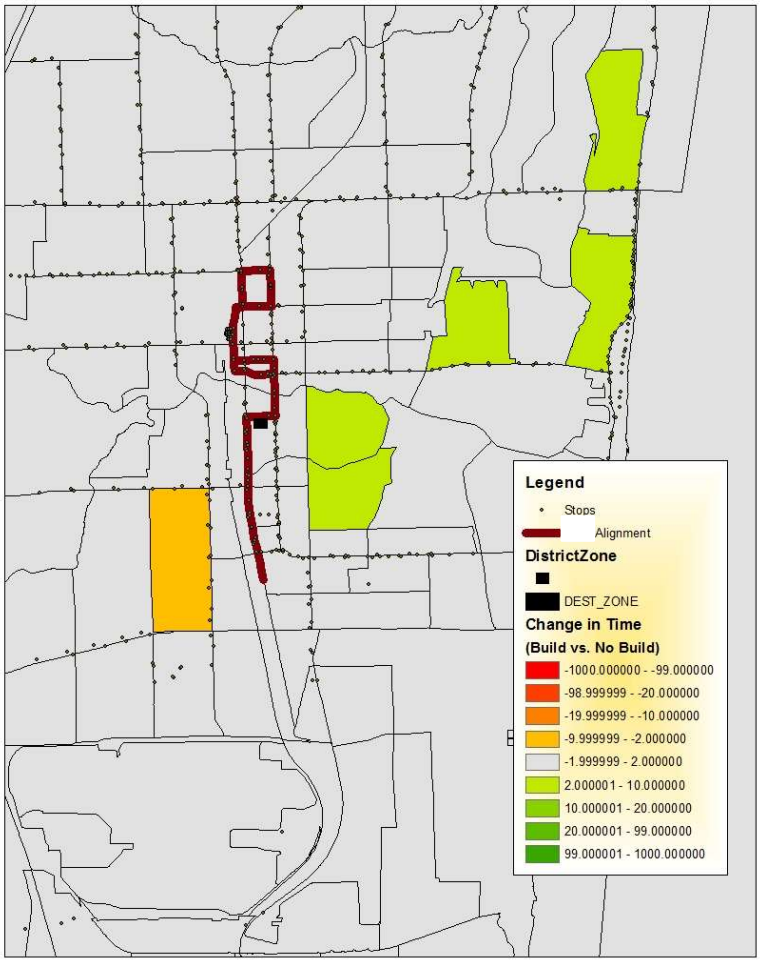
*Project trip attractions (work/shop locations)*




For Illustration purposes only

# Example: Thematic Map

*Change in travel time (build vs. no build)*




For Illustration purposes only

# Report File

- One text report file per analysis year (existing, opening, 10-year, 20-year)
- VERY long file: 150,000+ lines
- Over 3,000 tables reporting:
  - District to district and station to station trips (most of the 3,000 tables are these)
  - Boardings by each stop/station and route
  - District to district roadway speeds and distances
  - Setup parameters

# Partial Listing of STOPS Tables in Report File

FGO=Fixed Guideway Only, FGB=Fixed Guideway+Bus, BUS=Bus Only, TRN=All Transit, FG=All Fixed Guideway, AllMode=All Person Trips Input to Model

| SCENARIO | PURPOSE | CARS | FGO-WLK | FGO-KNR | FGO-PNR | FGO-All | FGB-WLK | FGB-KNR | FGB-PNR | FGB-All | BUS-WLK | BUS-KNR | BUS-PNR | BUS-All | TRN-WLK | TRN-KNR | TRN-PNR | TRN-All | FG-WLK | FG-KNR | FG-PNR | FG-All | AllMode |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing | HBW | 0 | 15.01 | 16.01 | 17.01 | 18.01 | 19.01 | 20.01 | 21.01 | 22.01 | 23.01 | 24.01 | 25.01 | 26.01 | 27.01 | 28.01 | 29.01 | 30.01 | 31.01 | 32.01 | 33.01 | 34.01 | 35.01 |
| District | | 1 | 36.01 | 37.01 | 38.01 | 39.01 | 40.01 | 41.01 | 42.01 | 43.01 | 44.01 | 45.01 | 46.01 | 47.01 | 48.01 | 49.01 | 50.01 | 51.01 | 52.01 | 53.01 | 54.01 | 55.01 | 56.01 |
| to | | 2 | 57.01 | 58.01 | 59.01 | 60.01 | 61.01 | 62.01 | 63.01 | 64.01 | 65.01 | 66.01 | 67.01 | 68.01 | 69.01 | 70.01 | 71.01 | 72.01 | 73.01 | 74.01 | 75.01 | 76.01 | 77.01 |
| District | | All | 78.01 | 79.01 | 80.01 | 81.01 | 82.01 | 83.01 | 84.01 | 85.01 | 86.01 | 87.01 | 88.01 | 89.01 | 90.01 | 91.01 | 92.01 | 93.01 | 94.01 | 95.01 | 96.01 | 97.01 | 98.01 |
| Linked | HBO | 0 | 99.01 | 100.01 | 101.01 | 102.01 | 103.01 | 104.01 | 105.01 | 106.01 | 107.01 | 108.01 | 109.01 | 110.01 | 111.01 | 112.01 | 113.01 | 114.01 | 115.01 | 116.01 | 117.01 | 118.01 | 119.01 |
| Trips | | 1 | 120.01 | 121.01 | 122.01 | 123.01 | 124.01 | 125.01 | 126.01 | 127.01 | 128.01 | 129.01 | 130.01 | 131.01 | 132.01 | 133.01 | 134.01 | 135.01 | 136.01 | 137.01 | 138.01 | 139.01 | 140.01 |
| | | 2 | 141.01 | 142.01 | 143.01 | 144.01 | 145.01 | 146.01 | 147.01 | 148.01 | 149.01 | 150.01 | 151.01 | 152.01 | 153.01 | 154.01 | 155.01 | 156.01 | 157.01 | 158.01 | 159.01 | 160.01 | 161.01 |
| | | All | 162.01 | 163.01 | 164.01 | 165.01 | 166.01 | 167.01 | 168.01 | 169.01 | 170.01 | 171.01 | 172.01 | 173.01 | 174.01 | 175.01 | 176.01 | 177.01 | 178.01 | 179.01 | 180.01 | 181.01 | 182.01 |
| | NHB | 0 | 183.01 | 184.01 | 185.01 | 186.01 | 187.01 | 188.01 | 189.01 | 190.01 | 191.01 | 192.01 | 193.01 | 194.01 | 195.01 | 196.01 | 197.01 | 198.01 | 199.01 | 200.01 | 201.01 | 202.01 | 203.01 |
| | | 1 | 204.01 | 205.01 | 206.01 | 207.01 | 208.01 | 209.01 | 210.01 | 211.01 | 212.01 | 213.01 | 214.01 | 215.01 | 216.01 | 217.01 | 218.01 | 219.01 | 220.01 | 221.01 | 222.01 | 223.01 | 224.01 |
| | | 2 | 225.01 | 226.01 | 227.01 | 228.01 | 229.01 | 230.01 | 231.01 | 232.01 | 233.01 | 234.01 | 235.01 | 236.01 | 237.01 | 238.01 | 239.01 | 240.01 | 241.01 | 242.01 | 243.01 | 244.01 | 245.01 |
| | | All | 246.01 | 247.01 | 248.01 | 249.01 | 250.01 | 251.01 | 252.01 | 253.01 | 254.01 | 255.01 | 256.01 | 257.01 | 258.01 | 259.01 | 260.01 | 261.01 | 262.01 | 263.01 | 264.01 | 265.01 | 266.01 |
| | ALL | 0 | 267.01 | 268.01 | 269.01 | 270.01 | 271.01 | 272.01 | 273.01 | 274.01 | 275.01 | 276.01 | 277.01 | 278.01 | 279.01 | 280.01 | 281.01 | 282.01 | 283.01 | 284.01 | 285.01 | 286.01 | 287.01 |
| | | 1 | 288.01 | 289.01 | 290.01 | 291.01 | 292.01 | 293.01 | 294.01 | 295.01 | 296.01 | 297.01 | 298.01 | 299.01 | 300.01 | 301.01 | 302.01 | 303.01 | 304.01 | 305.01 | 306.01 | 307.01 | 308.01 |
| | | 2 | 309.01 | 310.01 | 311.01 | 312.01 | 313.01 | 314.01 | 315.01 | 316.01 | 317.01 | 318.01 | 319.01 | 320.01 | 321.01 | 322.01 | 323.01 | 324.01 | 325.01 | 326.01 | 327.01 | 328.01 | 329.01 |
| | | All | 330.01 | 331.01 | 332.01 | 333.01 | 334.01 | 335.01 | 336.01 | 337.01 | 338.01 | 339.01 | 340.01 | 341.01 | 342.01 | 343.01 | 344.01 | 345.01 | 346.01 | 347.01 | 348.01 | 349.01 | 350.01 |
| Existing | HBW | 0 | 15.02 | 16.02 | 17.02 | 18.02 | 19.02 | 20.02 | 21.02 | 22.02 | 23.02 | 24.02 | 25.02 | 26.02 | 27.02 | 28.02 | 29.02 | 30.02 | 31.02 | 32.02 | 33.02 | 34.02 | |
| Sta-Sta | | 1 | 36.02 | 37.02 | 38.02 | 39.02 | 40.02 | 41.02 | 42.02 | 43.02 | 44.02 | 45.02 | 46.02 | 47.02 | 48.02 | 49.02 | 50.02 | 51.02 | 52.02 | 53.02 | 54.02 | 55.02 | |
| Total | | 2 | 57.02 | 58.02 | 59.02 | 60.02 | 61.02 | 62.02 | 63.02 | 64.02 | 65.02 | 66.02 | 67.02 | 68.02 | 69.02 | 70.02 | 71.02 | 72.02 | 73.02 | 74.02 | 75.02 | 76.02 | |
| Flows | | All | 78.02 | 79.02 | 80.02 | 81.02 | 82.02 | 83.02 | 84.02 | 85.02 | 86.02 | 87.02 | 88.02 | 89.02 | 90.02 | 91.02 | 92.02 | 93.02 | 94.02 | 95.02 | 96.02 | 97.02 | |
| | HBO | 0 | 99.02 | 100.02 | 101.02 | 102.02 | 103.02 | 104.02 | 105.02 | 106.02 | 107.02 | 108.02 | 109.02 | 110.02 | 111.02 | 112.02 | 113.02 | 114.02 | 115.02 | 116.02 | 117.02 | 118.02 | |
| | | 1 | 120.02 | 121.02 | 122.02 | 123.02 | 124.02 | 125.02 | 126.02 | 127.02 | 128.02 | 129.02 | 130.02 | 131.02 | 132.02 | 133.02 | 134.02 | 135.02 | 136.02 | 137.02 | 138.02 | 139.02 | |
| | | 2 | 141.02 | 142.02 | 143.02 | 144.02 | 145.02 | 146.02 | 147.02 | 148.02 | 149.02 | 150.02 | 151.02 | 152.02 | 153.02 | 154.02 | 155.02 | 156.02 | 157.02 | 158.02 | 159.02 | 160.02 | |
| | | All | 162.02 | 163.02 | 164.02 | 165.02 | 166.02 | 167.02 | 168.02 | 169.02 | 170.02 | 171.02 | 172.02 | 173.02 | 174.02 | 175.02 | 176.02 | 177.02 | 178.02 | 179.02 | 180.02 | 181.02 | |
| | NHB | 0 | 183.02 | 184.02 | 185.02 | 186.02 | 187.02 | 188.02 | 189.02 | 190.02 | 191.02 | 192.02 | 193.02 | 194.02 | 195.02 | 196.02 | 197.02 | 198.02 | 199.02 | 200.02 | 201.02 | 202.02 | |
| | | 1 | 204.02 | 205.02 | 206.02 | 207.02 | 208.02 | 209.02 | 210.02 | 211.02 | 212.02 | 213.02 | 214.02 | 215.02 | 216.02 | 217.02 | 218.02 | 219.02 | 220.02 | 221.02 | 222.02 | 223.02 | |
| | | 2 | 225.02 | 226.02 | 227.02 | 228.02 | 229.02 | 230.02 | 231.02 | 232.02 | 233.02 | 234.02 | 235.02 | 236.02 | 237.02 | 238.02 | 239.02 | 240.02 | 241.02 | 242.02 | 243.02 | 244.02 | |
| | | All | 246.02 | 247.02 | 248.02 | 249.02 | 250.02 | 251.02 | 252.02 | 253.02 | 254.02 | 255.02 | 256.02 | 257.02 | 258.02 | 259.02 | 260.02 | 261.02 | 262.02 | 263.02 | 264.02 | 265.02 | |
| | ALL | 0 | 267.02 | 268.02 | 269.02 | 270.02 | 271.02 | 272.02 | 273.02 | 274.02 | 275.02 | 276.02 | 277.02 | 278.02 | 279.02 | 280.02 | 281.02 | 282.02 | 283.02 | 284.02 | 285.02 | 286.02 | |
| | | 1 | 288.02 | 289.02 | 290.02 | 291.02 | 292.02 | 293.02 | 294.02 | 295.02 | 296.02 | 297.02 | 298.02 | 299.02 | 300.02 | 301.02 | 302.02 | 303.02 | 304.02 | 305.02 | 306.02 | 307.02 | |
| | | 2 | 309.02 | 310.02 | 311.02 | 312.02 | 313.02 | 314.02 | 315.02 | 316.02 | 317.02 | 318.02 | 319.02 | 320.02 | 321.02 | 322.02 | 323.02 | 324.02 | 325.02 | 326.02 | 327.02 | 328.02 | |
| | | All | 330.02 | 331.02 | 332.02 | 333.02 | 334.02 | 335.02 | 336.02 | 337.02 | 338.02 | 339.02 | 340.02 | 341.02 | 342.02 | 343.02 | 344.02 | 345.02 | 346.02 | 347.02 | 348.02 | 349.02 | |
| No-Build | HBW | 0 | 351.01 | 352.01 | 353.01 | 354.01 | 355.01 | 356.01 | 357.01 | 358.01 | 359.01 | 360.01 | 361.01 | 362.01 | 363.01 | 364.01 | 365.01 | 366.01 | 367.01 | 368.01 | 369.01 | 370.01 | 371.01 |
| District | | 1 | 372.01 | 373.01 | 374.01 | 375.01 | 376.01 | 377.01 | 378.01 | 379.01 | 380.01 | 381.01 | 382.01 | 383.01 | 384.01 | 385.01 | 386.01 | 387.01 | 388.01 | 389.01 | 390.01 | 391.01 | 392.01 |
| to | | 2 | 393.01 | 394.01 | 395.01 | 396.01 | 397.01 | 398.01 | 399.01 | 400.01 | 401.01 | 402.01 | 403.01 | 404.01 | 405.01 | 406.01 | 407.01 | 408.01 | 409.01 | 410.01 | 411.01 | 412.01 | 413.01 |
| District | | All | 414.01 | 415.01 | 416.01 | 417.01 | 418.01 | 419.01 | 420.01 | 421.01 | 422.01 | 423.01 | 424.01 | 425.01 | 426.01 | 427.01 | 428.01 | 429.01 | 430.01 | 431.01 | 432.01 | 433.01 | 434.01 |
| Linked | HBO | 0 | 435.01 | 436.01 | 437.01 | 438.01 | 439.01 | 440.01 | 441.01 | 442.01 | 443.01 | 444.01 | 445.01 | 446.01 | 447.01 | 448.01 | 449.01 | 450.01 | 451.01 | 452.01 | 453.01 | 454.01 | 455.01 |
| Trips | | 1 | 456.01 | 457.01 | 458.01 | 459.01 | 460.01 | 461.01 | 462.01 | 463.01 | 464.01 | 465.01 | 466.01 | 467.01 | 468.01 | 469.01 | 470.01 | 471.01 | 472.01 | 473.01 | 474.01 | 475.01 | 476.01 |
| | | 2 | 477.01 | 478.01 | 479.01 | 480.01 | 481.01 | 482.01 | 483.01 | 484.01 | 485.01 | 486.01 | 487.01 | 488.01 | 489.01 | 490.01 | 491.01 | 492.01 | 493.01 | 494.01 | 495.01 | 496.01 | 497.01 |
| | | All | 498.01 | 499.01 | 500.01 | 501.01 | 502.01 | 503.01 | 504.01 | 505.01 | 506.01 | 507.01 | 508.01 | 509.01 | 510.01 | 511.01 | 512.01 | 513.01 | 514.01 | 515.01 | 516.01 | 517.01 | 518.01 |
| | NHB | 0 | 519.01 | 520.01 | 521.01 | 522.01 | 523.01 | 524.01 | 525.01 | 526.01 | 527.01 | 528.01 | 529.01 | 530.01 | 531.01 | 532.01 | 533.01 | 534.01 | 535.01 | 536.01 | 537.01 | 538.01 | 539.01 |
| | | 1 | 540.01 | 541.01 | 542.01 | 543.01 | 544.01 | 545.01 | 546.01 | 547.01 | 548.01 | 549.01 | 550.01 | 551.01 | 552.01 | 553.01 | 554.01 | 555.01 | 556.01 | 557.01 | 558.01 | 559.01 | 560.01 |
| | | 2 | 561.01 | 562.01 | 563.01 | 564.01 | 565.01 | 566.01 | 567.01 | 568.01 | 569.01 | 570.01 | 571.01 | 572.01 | 573.01 | 574.01 | 575.01 | 576.01 | 577.01 | 578.01 | 579.01 | 580.01 | 581.01 |
| | | All | 582.01 | 583.01 | 584.01 | 585.01 | 586.01 | 587.01 | 588.01 | 589.01 | 590.01 | 591.01 | 592.01 | 593.01 | 594.01 | 595.01 | 596.01 | 597.01 | 598.01 | 599.01 | 600.01 | 601.01 | 602.01 |
| | ALL | 0 | 603.01 | 604.01 | 605.01 | 606.01 | 607.01 | 608.01 | 609.01 | 610.01 | 611.01 | 612.01 | 613.01 | 614.01 | 615.01 | 616.01 | 617.01 | 618.01 | 619.01 | 620.01 | 621.01 | 622.01 | 623.01 |
| | | 1 | 624.01 | 625.01 | 626.01 | 627.01 | 628.01 | 629.01 | 630.01 | 631.01 | 632.01 | 633.01 | 634.01 | 635.01 | 636.01 | 637.01 | 638.01 | 639.01 | 640.01 | 641.01 | 642.01 | 643.01 | 644.01 |
| | | 2 | 645.01 | 646.01 | 647.01 | 648.01 | 649.01 | 650.01 | 651.01 | 652.01 | 653.01 | 654.01 | 655.01 | 656.01 | 657.01 | 658.01 | 659.01 | 660.01 | 661.01 | 662.01 | 663.01 | 664.01 | 665.01 |
| | | All | 666.01 | 667.01 | 668.01 | 669.01 | 670.01 | 671.01 | 672.01 | 673.01 | 674.01 | 675.01 | 676.01 | 677.01 | 678.01 | 679.01 | 680.01 | 681.01 | 682.01 | 683.01 | 684.01 | 685.01 | 686.01 |
| No-Build | HBW | 0 | 351.02 | 352.02 | 353.02 | 354.02 | 355.02 | 356.02 | 357.02 | 358.02 | 359.02 | 360.02 | 361.02 | 362.02 | 363.02 | 364.02 | 365.02 | 366.02 | 367.02 | 368.02 | 369.02 | 370.02 | |
| Sta-Sta | | 1 | 372.02 | 373.02 | 374.02 | 375.02 | 376.02 | 377.02 | 378.02 | 379.02 | 380.02 | 381.02 | 382.02 | 383.02 | 384.02 | 385.02 | 386.02 | 387.02 | 388.02 | 389.02 | 390.02 | 391.02 | |
| Total | | 2 | 393.02 | 394.02 | 395.02 | 396.02 | 397.02 | 398.02 | 399.02 | 400.02 | 401.02 | 402.02 | 403.02 | 404.02 | 405.02 | 406.02 | 407.02 | 408.02 | 409.02 | 410.02 | 411.02 | 412.02 | |
| Flows | | All | 414.02 | 415.02 | 416.02 | 417.02 | 418.02 | 419.02 | 420.02 | 421.02 | 422.02 | 423.02 | 424.02 | 425.02 | 426.02 | 427.02 | 428.02 | 429.02 | 430.02 | 431.02 | 432.02 | 433.02 | |
| | HBO | 0 | 435.02 | 436.02 | 437.02 | 438.02 | 439.02 | 440.02 | 441.02 | 442.02 | 443.02 | 444.02 | 445.02 | 446.02 | 447.02 | 448.02 | 449.02 | 450.02 | 451.02 | 452.02 | 453.02 | 454.02 | |
| | | 1 | 456.02 | 457.02 | 458.02 | 459.02 | 460.02 | 461.02 | 462.02 | 463.02 | 464.02 | 465.02 | 466.02 | 467.02 | 468.02 | 469.02 | 470.02 | 471.02 | 472.02 | 473.02 | 474.02 | 475.02 | |

Each number refers to a table later in the report file

# Report File

We strongly recommend using good text editor and spreadsheet to read and interpret tables

# FTA's Capital Investment Grant Program

Provides funding for fixed-guideway investments such as new and expanded rapid rail, commuter rail, light rail, streetcars, bus rapid transit, and ferries, as well as corridor-based bus rapid transit investments that emulate the features of rail.

Four categories:

- New Starts
- Small Starts
- Core Capacity
- Programs of Interrelated Projects

*Primary categories, and discussed here*

*From FTA's CIG factsheet*

# New and Small Starts Categories

## New Starts

- Total project cost is $300+M or CIG funding $100+M
- New fixed guideway system (light rail, commuter rail etc.)
- Extension to existing system
- Fixed guideway BRT system

## Small Starts

- Total project cost is <$300M and CIG funding <$100M
- New fixed guideway systems (light rail, commuter rail etc.)
- Extension to existing system
- Fixed guideway BRT system
- Corridor-based BRT system

*From FTA's CIG factsheet*

# Projects Are Rated

**These criteria use results directly from STOPS applications**

- Project Justification (50%)
  - Mobility improvements
  - Cost effectiveness
  - Congestion relief
  - Environmental benefits
  - Land use
  - Economic development
- Local Financial Commitment (50%)
  - Financial plan
  - Project O&M <5% of current operations
  - Sponsor in financial good condition
  - % CIG funding

# CIG Measures

| CIG Category | Measure from Travel Forecast |
|---|---|
| **Mobility Improvements** | Trips on Project from transit-dependents;<br>Trips on Project from non-transit-dependents |
| **Cost-Effectiveness** | Total Trips on Project |
| **Congestion Relief** | Incremental linked transit trips<br>(Build vs. No Build) |
| **Environmental Benefits** | Change in Auto VMT |

# Terminologies

Trips on Project: Any trip that uses the project stations for any part of their journey

Transit Dependent Trips: Trips made by someone residing in a household with no available automobiles (0-car)

Incremental Linked Transit Trips: The number of trips shifting from auto to transit between the No Build and Build scenarios

# STOPS Tables for CIG Applications

| CIG Category | Measure from Travel Forecast | STOPS Table Number & Description |
|---|---|---|
| **Mobility Improvements** | Trips on Project from transit-dependents;<br>Trips on Project from non-transit-dependents | This information is placed in the CIG spreadsheet templates by trip purpose and transit/non-transit dependents<br><br>**Table 702.03**, HBW project trips from 0-car HHs<br>**Table 765.03**, HBW project trips from all HHs<br>(note: subtract total of 702.03 from 765.03 to compute non-transit-dependents)<br><br>**Table 6.03**, All project trips from 0-car HHs<br>**Table 4.03**, All project trips from all HHs<br>(note: subtract total of 702.03 from 6.03 to compute non-work trips from transit-dependents; subtract total of 765.03 from 4.03, then subtract the total of 6.03 from that difference to compute non-work trips from non-transit-dependents) |
| **Cost-Effectiveness** | Total Trips on Project | |
| **Environmental Benefits** | Change in Auto VMT | **Table 8.01**, Incremental District-to-District PMT<br>(note: the results will need to be scaled by an average auto occupancy factor to compute VMT; this value is 1.2-1.3) |
| **Congestion Relief** | Incremental linked transit trips<br>(No Build vs. Build) | **Table 4.02**, Incremental Linked Transit Trips |

# New/Small Starts Travel Forecasts Template

*Travel Forecasts Worksheet (Upper Half Shown)*

Table 702.03

Difference of Tables 765.03 & 702.03

Difference of Tables 6.03 & 702.03

(Tables 4.03 – 6.03) – (Tables 765.03 – 702.03)

Table 4.02

| | | | Trips on the Project | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Daily linked trips | | | Annual linked trips (daily trips * annualization factor) | | |
| Line | Transit market | Trips made by: | Current Year () | Horizon () | Annualization factor | Current Year () | Horizon () | Brief description of the process used to develop travel forecasts (e.g., local model, FTA simplified national model, incremental data-driven method, direct demand model) |
| 1a | Modeled trips: home-based work (HBW) | Non-transit dependents | | | | 0 | - | ravel Forecasts field of Project Description Template) |
| 1b | | Transit dependents | | | | 0 | - | |
| 2a | Modeled trips: all other trip purposes | Non-transit dependents | | | 0 | 0 | - | ravel Forecasts field of Project Description Template) |
| 2b | | Transit dependents | | | | 0 | - | |
| 3a | Special market 1 (specify) | Non-transit dependents | | | | 0 | - | |
| 3b | | Transit dependents | | | | 0 | - | |
| 4a | Special market 2 (specify) | Non-transit dependents | | | | 0 | - | |
| 4b | | Transit dependents | | | | 0 | - | |
| 5a | Special market 3 (specify) | Non-transit dependents | | | | 0 | - | |
| 5b | | Transit dependents | | | | | | |
| 6a | Special market 4 (specify) | Non-transit dependents | | | | | | |
| 6b | | Transit dependents | | | | | | |
| 7a | Subtotal (lines 1 through 6) | Non-transit dependents | | | | | | |
| 7b | | Transit dependents | | | | | | |
| 8a | **Total annual linked trips with special markets (lines 7a through 7b)** | | | | | 0 | - | |
| 8b | **Total daily linked trips without special markets (lines 1a through 2b)** | | 0 | - | | | | |
| 9 | New transit trips | | | | | | | |

# New/Small Starts Travel Forecasts Template

*Travel Forecasts Worksheet (Lower Half Shown)*

| Vehicle-Miles of Travel (VMT) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Daily VMT | | | | Annualization factor | Annual VMT (for automobile, calculation is daily VMT * annualization factor; for transit, source is service plans for each mode/technology) | | | | VMT change (Build minus No-build VMT) | |
| | | Current Year (2015) | | Horizon (20 Years) | | | Current Year (2015) | | Horizon (20 Years) | | | |
| Line | Mode / Technology | No-build | Build | No-build | Build | | No-build | Build | No-build | Build | Current Year (2015) | Horizon (20 Years) |
| 10 | Automobile | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Diesel bus | [redacted] | | | | | | | | | 0 | 0 |
| 12 | Hybrid bus | | | | | | | | | | 0 | 0 |
| 13 | CNG bus | | | | | | | | | | 0 | 0 |
| 14 | Electric bus | | | | | | | | | | 0 | 0 |
| 15 | Heavy rail [1] | | | | | | | | | | 0 | 0 |
| 16 | Light rail / streetcar [1] | | | | | | | | | | 0 | 0 |
| 17 | Commuter rail (new diesel locomotive or DMU) [1] | | | | | | | | | | 0 | 0 |
| 18 | Commuter rail (used diesel locomotive) [1] | | | | | | | | | | 0 | 0 |
| 19 | Commuter rail (electric or EMU) [1] | | | | | | | | | | 0 | 0 |

Table 8.01 scaled to reflect VMT


# Session Summary

- STOPS generates all of the travel forecast information required for CIG project evaluation criteria

# Questions?

# 5-Analyzing Results for CIG Project Evaluation

# Example Project: Streetcar

- 6 miles, 20 stations
- Service Frequency: every 5 minutes
- 40 minute loop
- Existing- (2015) & 20-year horizon (2035) forecasts needed for CIG application

# Task: Extract Data for CIG Project Evaluation

| Transit market | Trips made by | Daily linked trips | |
|---|---|---|---|
| | | Current Year | Horizon Year |
| Modeled trips: home-based work (HBW) | Non-transit dependents | | |
| | Transit dependents | | |
| Modeled trips: all other trip purposes | Non-transit dependents | | |
| | Transit dependents | | |
| New transit trips | | | |

# Task: Extract Data for CIG Project Evaluation (Contd.)

| Analysis Year | Scenario | Daily VMT |
|---|---|---|
| Current Year | No-Build | |
| | Build | |
| Horizon Year | No-Build | |
| | Build | |

# Task: Analyze the Results

# Questions?

# 6-Recent Florida STOPS Applications & Experiences

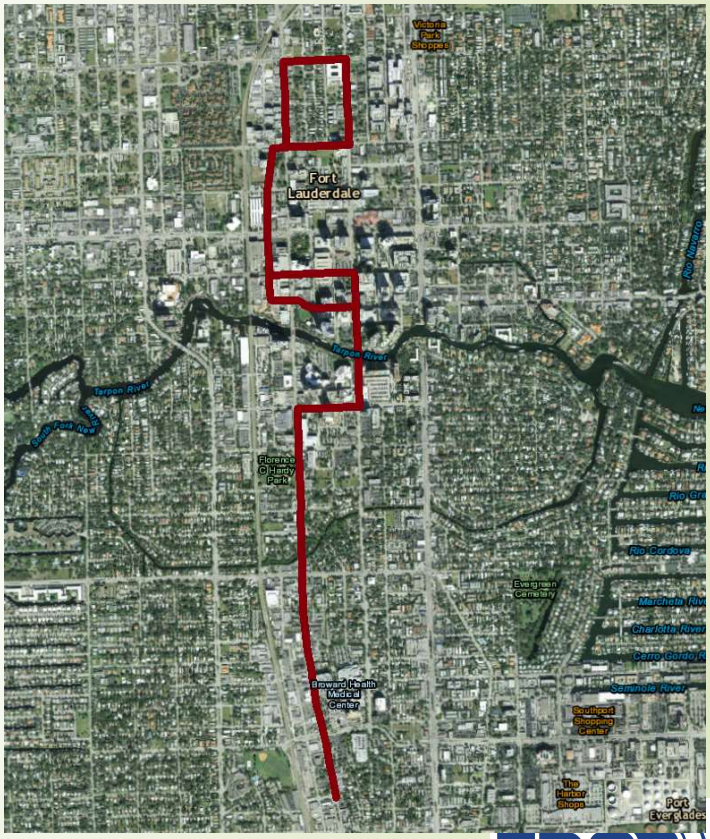
# Example STOPS Applications

- Known Florida STOPS Applications
- Small Starts Project Evaluation
- Using STOPS beyond its primary purpose

# STOPS Applications in Florida

# Small Starts Project Evaluation: Ft. Lauderdale Streetcar

- Ridership forecasts for Small Starts Application
- Development time: <4 weeks
- Budget: ~$30,000
- Model run time: ~1 hour



# Data Preparation Issues

## Data reconciliation

- 2015 ridership data (route-level), 2010 rider survey data
- System-wide unlinked trips and modeling geography

## GTFS files downloaded, with some adjustments

- Removed express buses that serve travel markets outside study area
- Added two missing bus circulators

## Stop-level count data unavailable, so additional 3-month data collection effort conducted

# Using STOPS Beyond Its Primary Purpose…

1. QA/QC ridership forecasts: Tri-Rail Coastal Link
2. Systems planning
3. Service planning
4. Sizing of stations and mode-of-access facilities
5. Before-After comparisons

# QA/QC Ridership Forecasts

*Why Use STOPS *and* A Local Model?*

- Multiple models + same alternative = helpful insights
  - New mode to region → large unknowns
  - Large project → large unknowns
- Previous history of inaccurate New Starts forecasts in Florida
- STOPS is straightforward to set up and run, but need higher fidelity for detailed cost/benefit and other evaluations
  - Example: Traffic impacts in and around stations & grade crossings

→ Use STOPS for 'big-picture check' of local model forecasts and project uncertainties

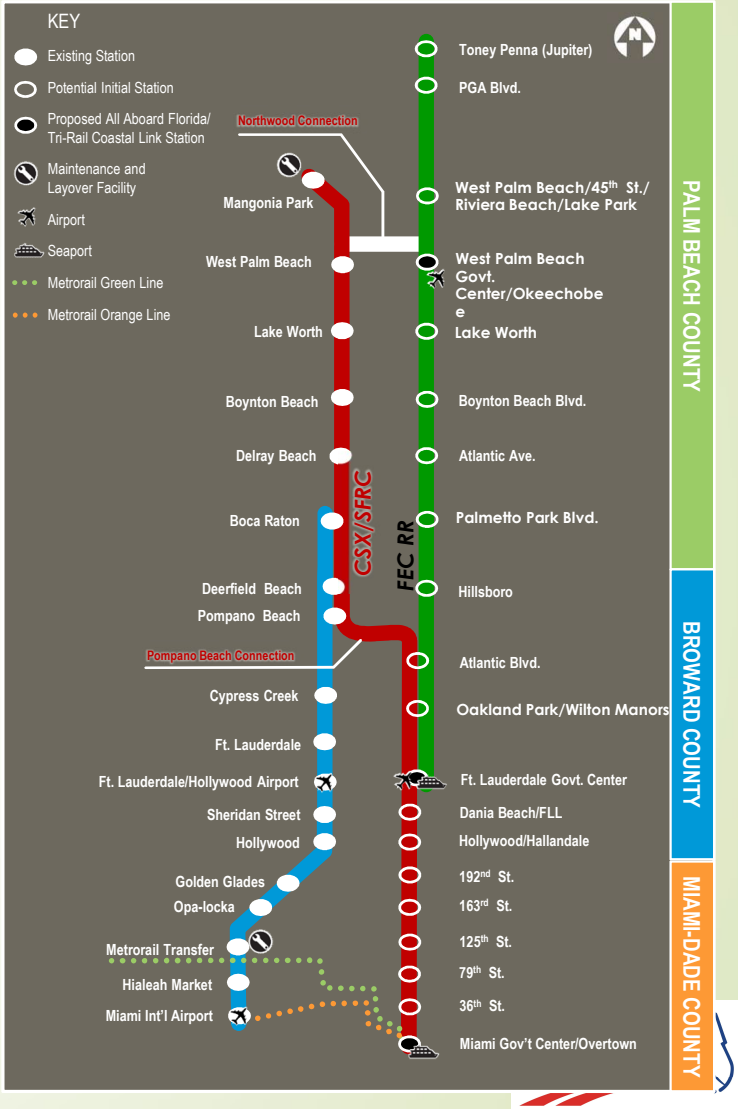
→ Use local model for detailed evaluations

# Tri-Rail Coastal Link (TRCL)

- Commuter rail extension

  85 miles; 20-25 stations

- SERPM 6.7: local model infused with insights from 5 transit systemwide surveys and strong validation



# TRCL Project: STOPS Efforts

- Original effort (spring 2014)
  - 10 weeks, 400 person-hours, $48k (an early STOPS model)
  - Includes 4+ weeks of identifying issues with legacy versions
- v1.50 update (Spring 2015), <1 day
- Major issue: data reconciliation!
  - Ridership data from 2013
  - 4 transit agencies, each with surveys collected in different years (2004, 2010, 2013)

# Ridership

- SERPM and STOPS are two different models used to determine behavioral changes in ridership
  - Current year: 12,400-17,200
  - Opening year: 13,650-18,200
  - Horizon year: 19,600-21,500

# Perspectives & Thoughts

- STOPS is easy to setup and run → having a QA/QC forecast is "low-hanging fruit"
- Comparable STOPS forecasts eased clients' fears about a potentially prolonged FTA model review

- Very helpful to compare results
  - Local model forecasts gain credibility with sponsor/FTA when forecasts are similar/have explainable differences
  - Defines bounds of uncertainty impacts
  - Heightens scrutiny of uncertainty sources

# Using STOPS Beyond Its Primary Purpose…

1. QA/QC ridership forecasts
2. Systems planning: Southeast Florida STOPS Model
3. Service planning
4. Sizing of stations and mode-of-access facilities
5. Before-After comparisons

# General Planning Purposes: SE Florida STOPS Model

Develop a calibrated planning STOPS model for South Florida covering Miami-Dade, Broward and Palm Beach Counties

Used for Systems Planning or as a basis for corridor studies

Development time: 4 months

Budget: $65,000

Model run time

- ~5 hours for Tri-County model
- ~3 hours for Miami-Dade County only
- ~1-2 hours for Broward County only or Palm Beach County only

# Model Development: Key Items

'Good' rider survey not available for all 3 counties → "Synthetic" approach

3 of 4 agencies have stop-level APC data available → detailed calibration for the 3 agencies

Problem: STOPS has 10,000 transit stop maximum → option to run one county model

# Using STOPS Beyond Its Primary Purpose…

1. QA/QC ridership forecasts
2. Systems planning: TCAR
3. Service planning
4. Sizing of stations and mode-of-access facilities
5. Before-After comparisons

# Transit Concept and Alternatives Review

- STOPS is recommended for early alternative screenings and evaluations
- Step 1: can be used in transit market analysis, system planning, and COAs
- Step 2: can be used in…
  - Project Description (3)
  - Purpose & Need (4)
  - Existing & Future Conditions Assessment (5)
  - Develop & Evaluate Alternatives (8)

1. Planning & Community Support
2. Programming & Alternatives
3. FDOT Transit PD&E / FTA PD Phase
4. (a) FDOT Transit Design
4. (b) Funding
5. Construction & Operation

# Questions?

# 7-Wrap-up & Summary

# Topics

- Final Observations
- Resources
- Q&A Session

# Final Observations

- FTA developed STOPS primarily for FTA's CIG project evaluation
- Good data is required to calibrate STOPS locally, and it may not be readily-available
- Data reconciliation is (almost) inevitable
- Simplified ≠ Sloppy

# Resources

- FTA's STOPS resource page
  - https://www.transit.dot.gov/funding/grant-programs/capital-investments/stops-%E2%80%93-fta%E2%80%99s-simplified-trips-project-software
- Census and CTPP data
  - https://www.transit.dot.gov/funding/grant-programs/capital-investments/stops-data-census
- GTFS files
  - http://www.ftis.org/Posts.aspx
  - https://code.google.com/archive/p/googletransitdatafeed/wikis/PublicFeeds.wiki

# Resources (continued)

- GTFS visualizer
  - https://code.google.com/archive/p/googletransitdatafeed/downloads
- Good text editor (free)
  - https://notepad-plus-plus.org/
- National Transit Database
  - http://www.ftis.org/index.html
  - https://www.transit.dot.gov/ntd/transit-agency-profiles
- APTA Ridership Reports
  - http://www.apta.com/resources/statistics/Pages/ridershipreport.aspx
- National Transit Institute's upcoming course in 2017: "Ridership Forecasting with STOPS for Transit Project Planning"

# Final Questions?

Thank you for attending this workshop!