

GTFS: Three Steps to Online Trip Planning

October 2, 2024 October 9, 2024 **October 16, 2024**

National RTAP
Rural Transit Assistance Program

FTA
U.S. Department of Transportation
Federal Transit Administration

Speaker (Re-) Introductions



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GIS
Specialist

Roadmap

Week 1, Oct 2

Why GTFS?

Required Tools/Setup

Data Entry

How to Map Stops

Week 2, Oct 9

Routes vs. Trip Groups

Schedules_V3 (one trip)

Generate a GTFS Feed

NTD Reporting via Weblink

Week 3, Oct 16

Validation / Hosting

Deeper Dive: NTD

Shapes (optional)

Fares (optional)

On-Demand workaround

GTFS Builder Guidebook: Checklist



National RTAP GTFS Builder Checklist

Agency Name: _____ Staff Contact: _____

Task	Guidebook Section	Time Estimate	Begin Task Date	End Task Date	Notes
REQUIRED TASKS					
If Google Transit is the preferred trip planner, confirm the agency can agree to the Google Licensing Agreement.		60 min.			
Download Google Earth Desktop to the PC for this project	1	15 min.		X	
Configure project folder for macros	1	10 min.		X	
Complete the ImportExport tabs: agency, calendar, calendar dates and routes	2,3,4,5	60 min.		X	
Determine if agency bus stop coordinates are available from other organizations. If so, obtain them.	6	30 min.		X	
If not, identify bus stop coordinates from MyMaps and/or Google Earth.	6	60 min.		X	
Enter bus stop coordinates from MyMaps or Google Earth or file into the ImportExport stop tab.	7	20 min.		X	
Complete the Schedule Generator file Schedules_V3 tab by entering timetable/schedule, stop by stop.	8	30 min. (per route)		X	
Complete the ImportExport tab: feed_info.	10	5 min.		X	
OPTIONAL TASKS					
In the ImportExport file complete the transfers tab.	13	5 min.			
In the ImportExport file complete the fares and fare_attributes tabs.	13	20 min.			
Using MyMaps or other tools, create trip shapes.	14	20 min. (per shape)	X		
Copy the shape files into the ImportExport shapes tab (by trip)	14	10 min.	X		
Confirm the shape_id is entered in the Schedules_V3 tab	14	5 min.	X		
REQUIRED TASKS					
In the Schedule Generator file, using the macro generate stop_times and trips data.	8	2 min.		X	
Copy/paste data in the stop times & trips tabs in Schedule Generator into the similarly named ImportExport file tabs.	9	2 min.		X	
If shapes were created, calculate distance between stops and shape.	14	10 min.			
In the ImportExport file, using the macro, generate GTFS text files.	10	2 min.		X	
Compress (.zip) the text files.	12	2 min.		X	
Validate the .zip & resolve all errors/evaluate warnings	12	10 min.		X	
Upload fully valid GTFS .zip to trip planner	16	10 min.			

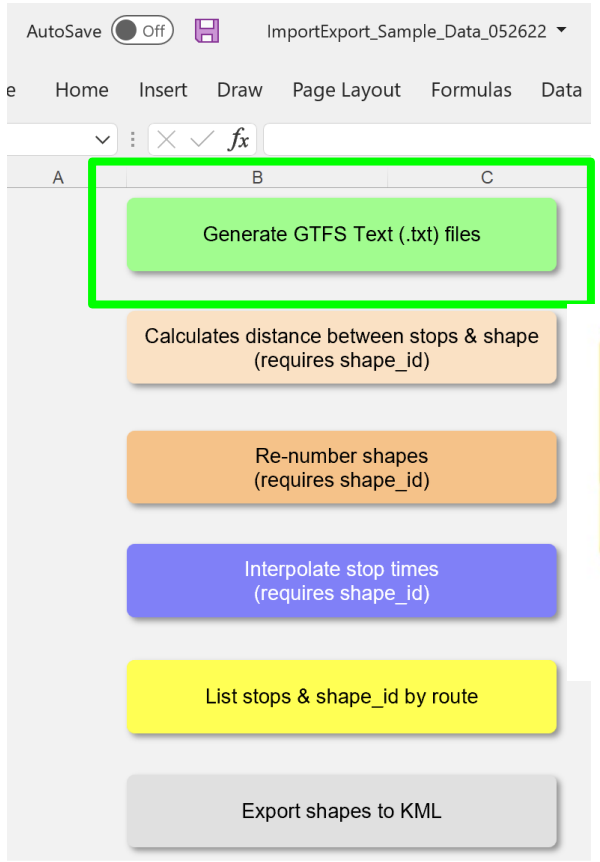
ImportExport: Generate GTFS > “Notes” tab

Schedule Generator

stop_times & trips

ImportExport

ImportExport.xlsm



feed

agency
calendar
calendar_dat
fare_attribute
fare_rules
feed_info
routes
shapes
stop_times
stops
transfers
trips

Compress/ zip (all)

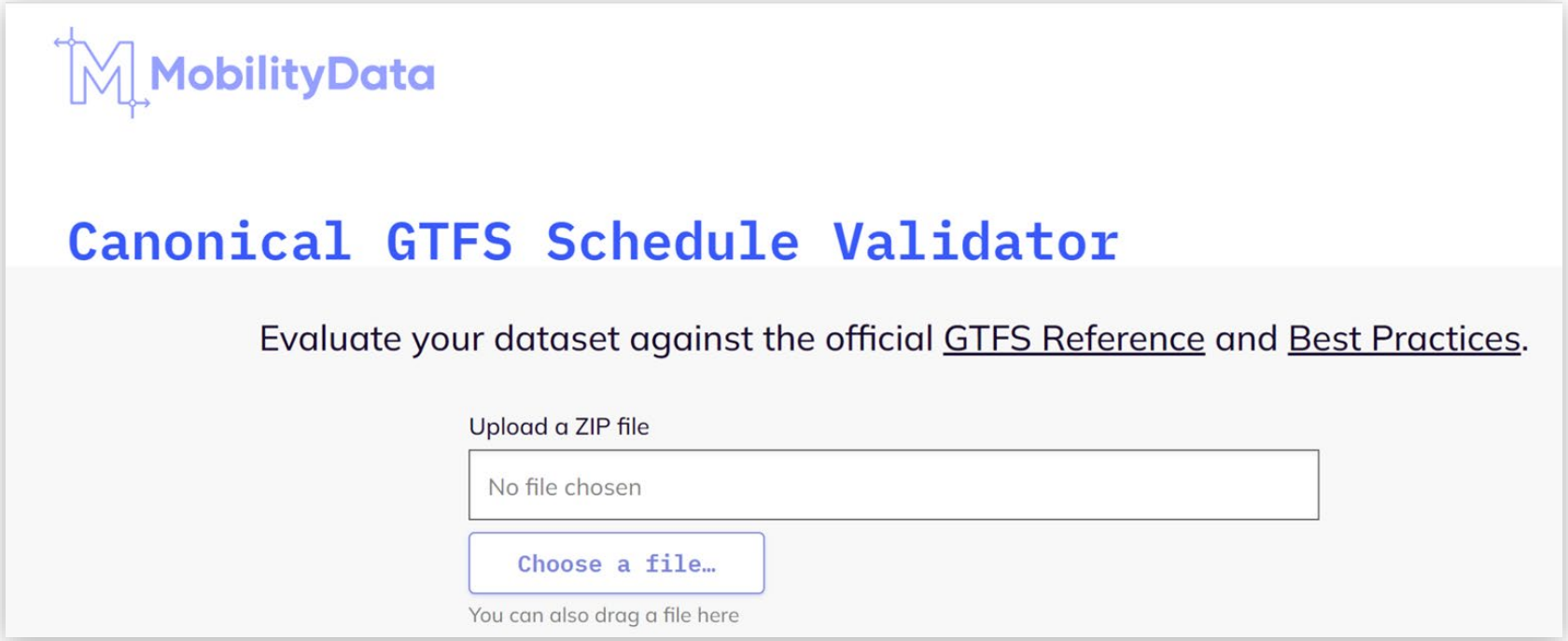
jta_WA_gtfs.zip

Re-cap: October 9

1. Schedule Generator file: Generate one route or a trip group
    a. Reference route_id, service_id and stop_id from ImportExport file
    b. Create trip groups or patterns for consecutive stops assigned to service_id
    c. Generate and copy two tabs: stop_times and trips into ImportExport file
    d. Highlighted three trip groups - as sample data (day of week or variation add/remove stop)
2. ImportExport file: Generate GTFS and compress (.zip)
3. All Required Data Completed!
4. Validate and Resolve Errors - review warnings
5. Hosting Options

Validation

Confirm Data is Internally Consistent or Valid

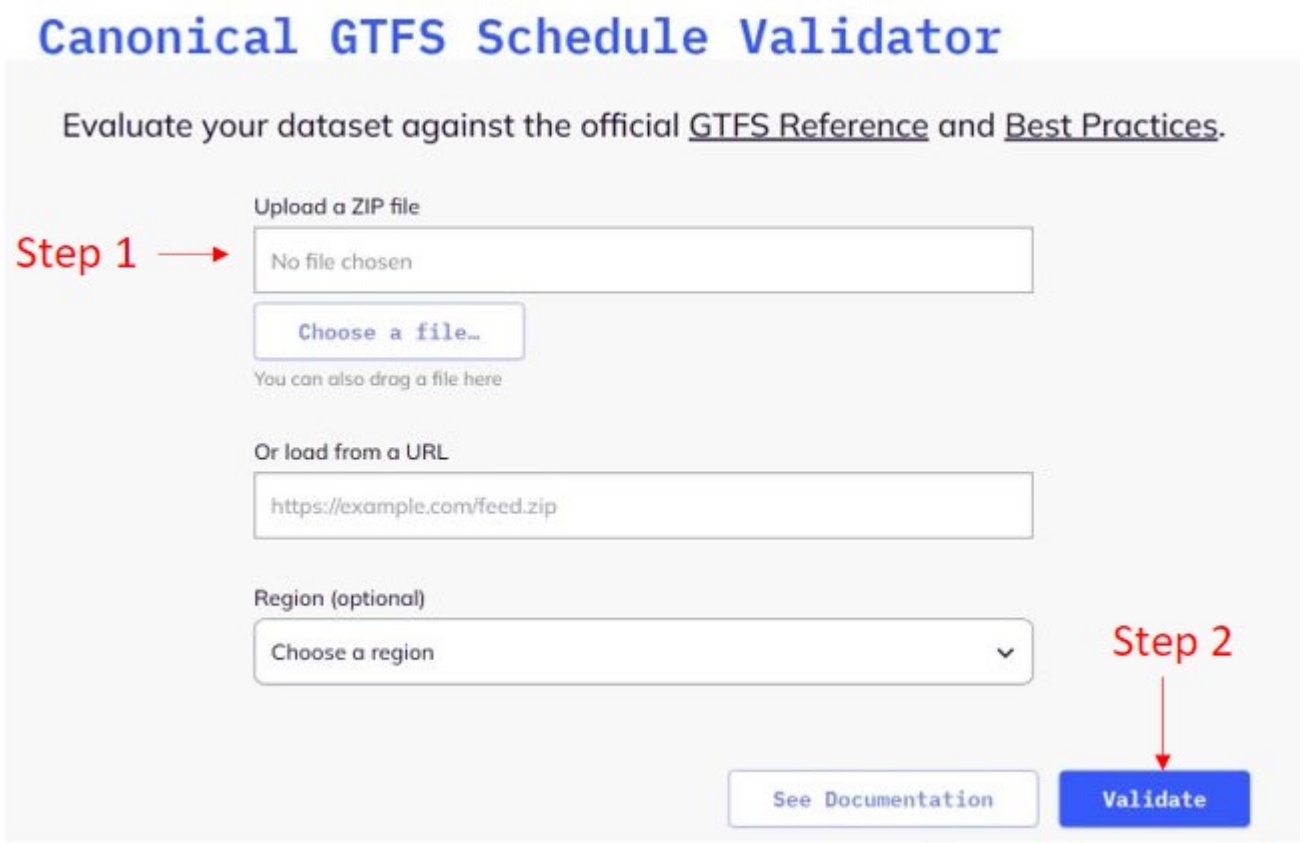


Validation Tool https://gtfs-validator.mobilitydata.org/

What does MobilityData GTFS Validator do?

The GTFS Validator tool will test your GTFS data for compliance with the GTFS Schedule Reference and GTFS Best Practices

You input a GTFS zip file, and the validator outputs a report with a list of notices about inaccuracies it found in the GTFS data.



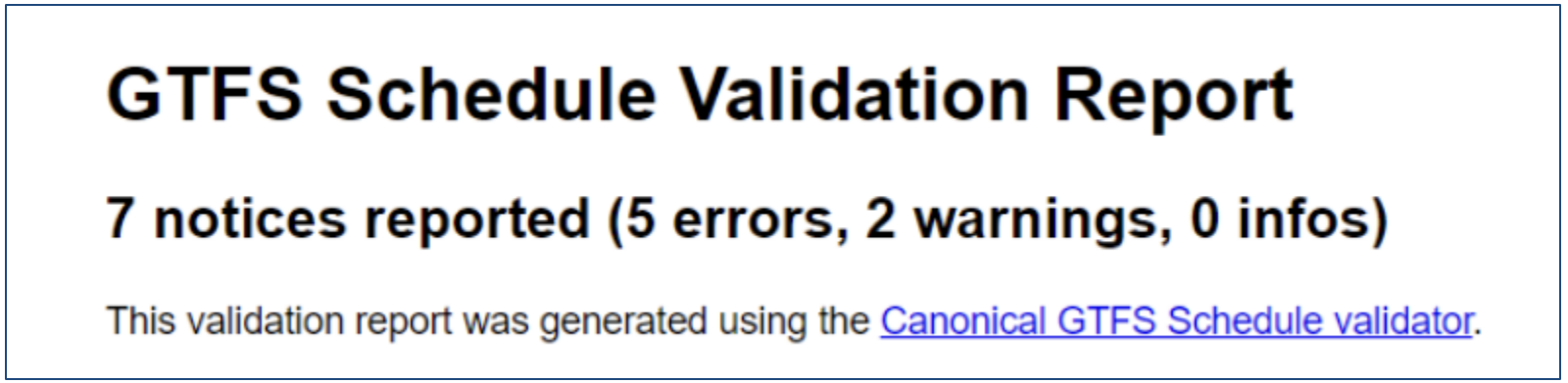
Interpreting the MobilityData Validation Report

1) Errors: Critical problems that must be addressed to be compliant with GTFS reference standards.

2) Warnings: Problems that do not conform to GTFS best practices but does not invalidate your data.

3) Info: Items that may affect the quality of your feed.

Validation Results: Warnings vs. Errors



Errors: Must be resolved

Warnings: Review and resolve if appropriate

- too fast travel
- stops too far from shape

FTA's GTFS Validation Essentials

- Validation of your agency's GTFS feed is a necessary step to make sure your GTFS is "good to go": all the files are there, the data makes sense, and the GTFS can be mapped

- NTD analysts extract your agency's weblinks from the F50 form and validates thembefore they are accepted for NTD

- Some "Errors" identified by analysts are sent to your agency for resolution in an email
  - If you use RTAP resources to produce your GTFS feed, you should have few if any errors!

MUST fix Errors for NTD Reporting, Pt. 1

- Errors that point to missing data are the most severe errors

- For example, if the error “missing_required_file” appears, the NTD analyst will send an email to your agency to get all required files in the GTFS feed reported on the P-50 form:

missing_required_file	**A required file is missing.** If this notice is triggered for every core file, it might be a problem with the input. To create a zip file from the GTFS .txt files: select all the .txt files, right-click, and compress. Do not compress the folder containing the files.

MUST fix Errors for NTD Reporting, Pt. 2

- There are **four errors** that will get a GTFS feed reported in your P-50 sent back by NTD to your agency's analyst for resolution:

1) **empty_file** : a file is empty
2) **missing_required_column** : a required column in a file is not included
3) **missing_required_field** : a required field in a file is not included
4) **missing_required_file** : a required file is not included in the GTFS .zip

Creating the Weblink

Also Known as Hosting

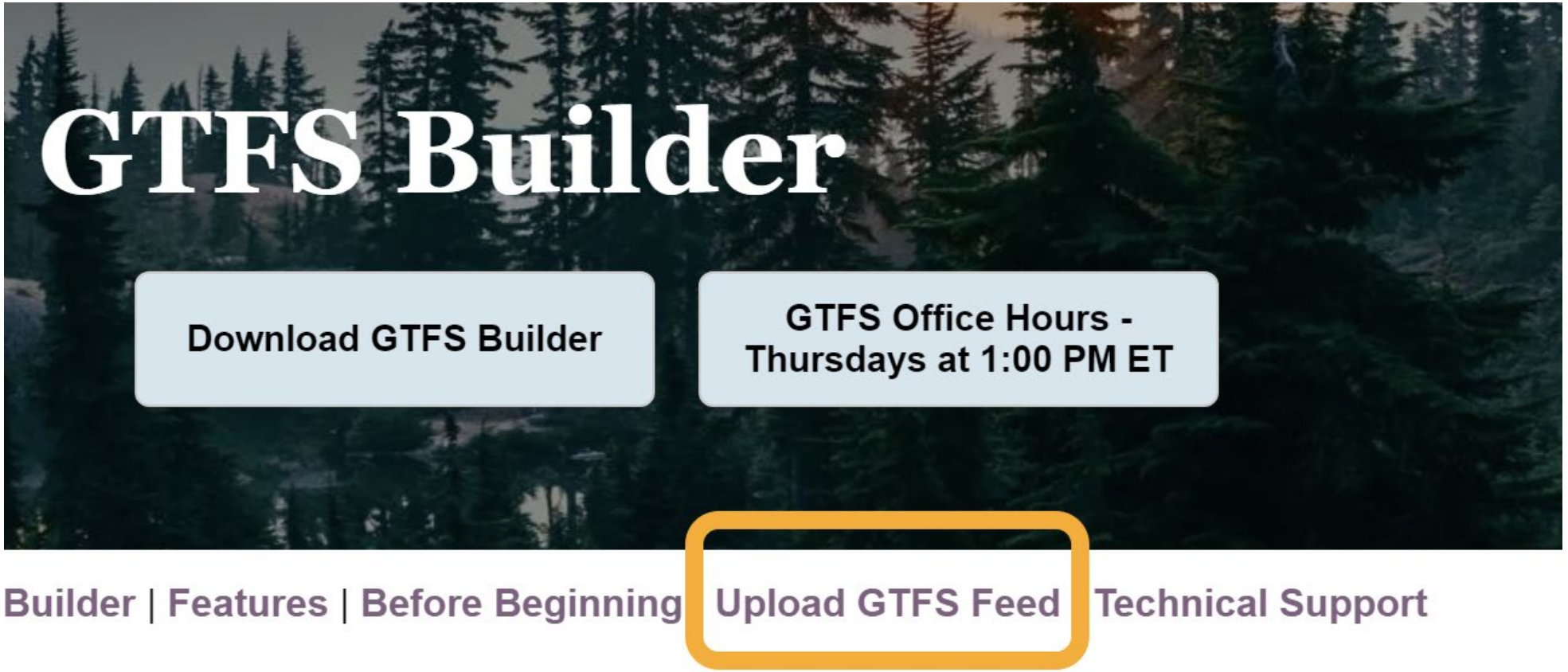
Same File Name: A Stable URL > Needed for NTD



agency_ST_gtfs

	Your Agency Website
	Through your National RTAP Cloud Account
	Other Secure hosting

Hosting GTFS at National RTAP



https://www.nationalrtap.org/Technology-Tools/GTFS-Builder#UploadGTFS

Publish and Host Your Valid GTFS file: Unchanged File Name

Free Hosting option @

- National RTAP



Upload GTFS Zip File

National RTAP offers a stable URL for your standardized, GTFS data. This service is free and optional. You may post this URL at your website so trip planners or mobile app can download your most current GTFS data.

To access this service, you will need to create an account with National RTAP. Once you create/access your account, you will be redirected to a page to upload GTFS data and obtain a URL.

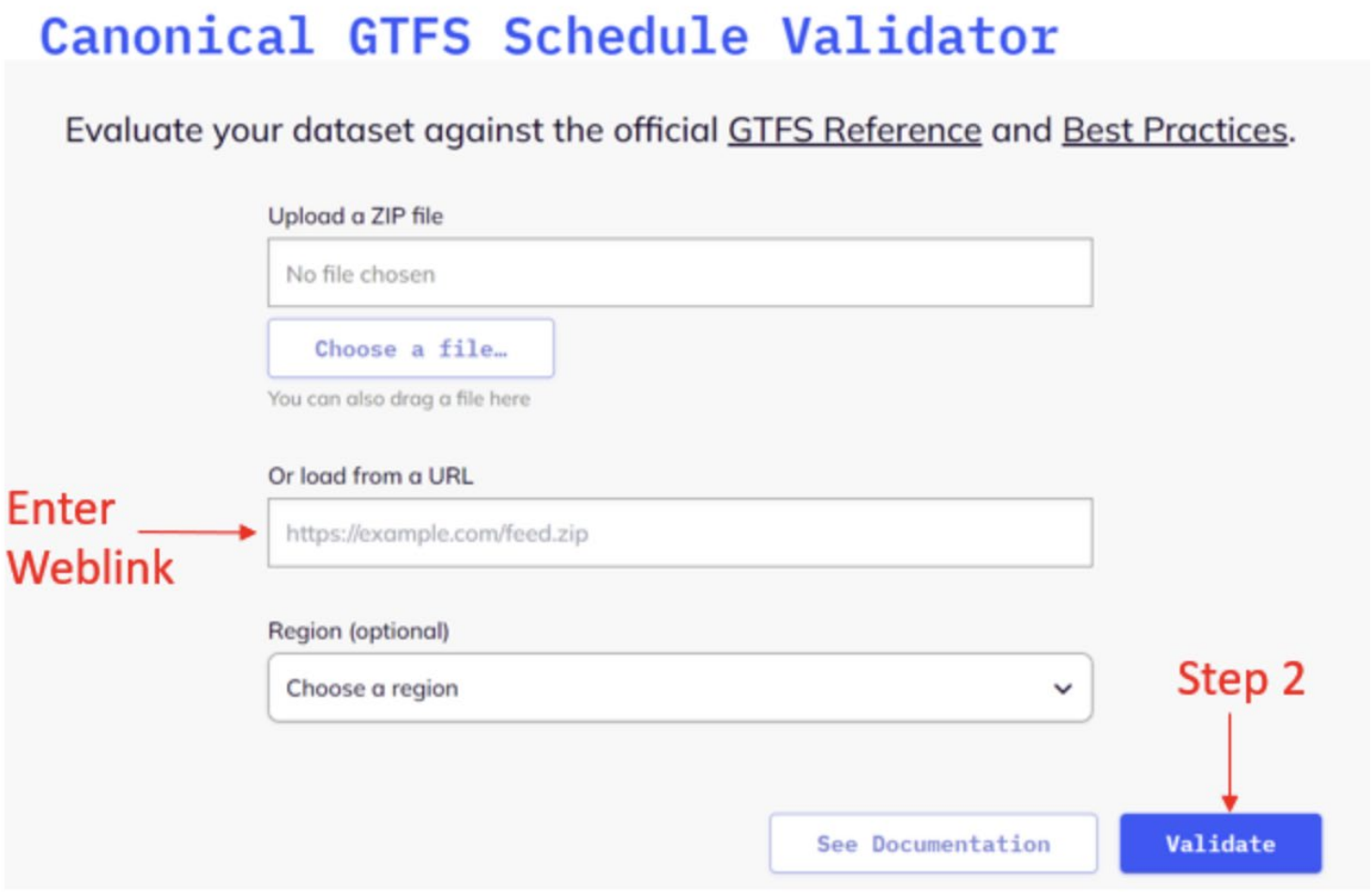
Create/Access NRTAP Account

https://rapid.nationalrtap.org/GTFSFileManagement/UserUploadFiles/5007/jta_WA_gtfs.zip

Must keep this zipped file name consistent e.g. "agency_ST_gtfs"

Testing the Weblink at the GTFS Validator

Test your Weblink, confirms same valid results



GTFS > Hosting > NTD, National Transit Map + Apps



agency_ST_gtfs

unchanged filename

URL / Web link

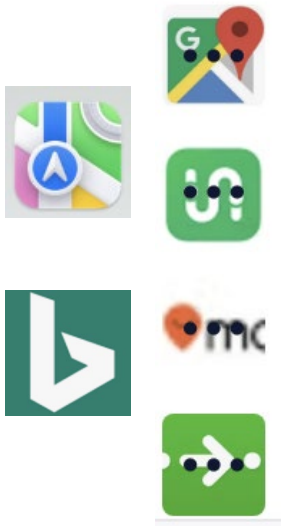
https://myagencyurl.org/jta_WA_gtfs.zip

https://rapid.nationalrtap.org/GTFSFileManagement/userUploadFiles/1234/jta_WA_gtfs.zip

Publish / Link to

NTD: FACES login

National Transit Map Data



Maps & Apps

Feed Registries

Feed Registries

Publish at Trip Planners, Apps & The National Transit Map

Feed Registries that check your link daily:

Transitland: https://www.transit.land/

Mobility Data: https://mobilitydatabase.org/

NTD/FTA: Annually updated

US Department of Transportation (DOT) **National Transit Map**
https://geodata.bts.gov/datasets/usdot::national-transit-map-routes/explore

Going Forward with GTFS Data

Staffing

- Incorporate GTFS maintenance as part of an internal job description
- Cross-train multiple staff
- University students/Senior Projects

Good Practice

- Log-in/passwords
- Establish naming conventions for consistency
- Update routes/website + GTFS

NTD P-50 Reporting

Appian Walkthrough

NTD GTFS Waiver Outreach

- NTD Validation Team conducted outreach to the group of agencies that received waivers for the GTFS requirement in Report Year (RY) 2023.
- The purpose of this outreach was to categorize progress towards meeting this requirement and gather information on where each agency is in GTFS development.
  - **Option A:** We are currently working on our GTFS feed and anticipate meeting the requirement with our RY24 Original Submission.
  - **Option B** : We have a plan in place to begin working on our GTFS feed or have begun working on our GTFS feed but anticipate needing some technical assistance to meet the requirement.
  - **Option C** : We do not have a plan in place at this time and anticipate needing significant technical assistance to meet the requirement.
- **Goal:** Connect reporters who identified with Option B and Option C with more GTFS resources to fulfill the requirement with their RY2024 report.

Demand Responsive NTD Reporting

“Geospatial” Reporting - for Demand Responsive

(1) Do you serve residents in another State besides your State?

(2) Select the Counties that you serve…

part, where you pick up residents for a new trip origination.

(3) Select Census `Places' served in these counties; indicate whether these Places (*e.g.,* Township) are served, and whether these Places are partially or wholly served.

(4) Is your demand response service intended to meet the Americans with Disabilities Act (ADA) complementary paratransit requirements for a fixed route system?

(5) If yes to #4, is your service area limited to the ADA complementary paratransit distance for:

a. Your own NTD Reporter ID; or

b. Select all those that are not your NTD Reporter ID.

(6) Within your service area, do you have different passenger eligibility requirements or different terms and conditions of

(7) How many days per week do you operate?

(8) For each day of the week, what are your hours of operation, and is your service open to:

a. Only those persons found eligible for complementary paratransit under the ADA through your local eligibility process?

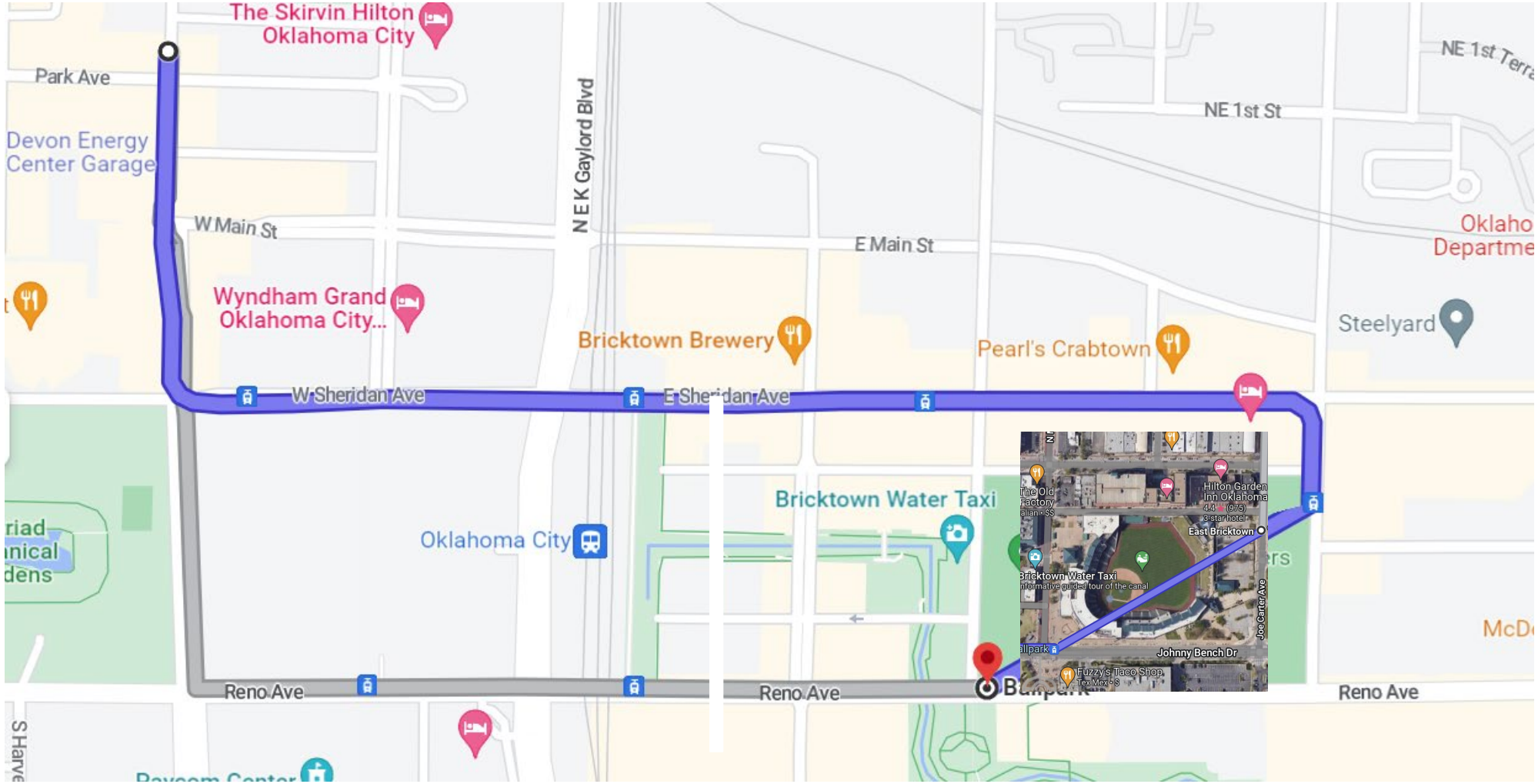
b. Another specific segment of the population defined by age or disability?

9) What is the minimum advanced reservation time for your service? Select days or hours.

(10) What is the fare charged?

Shapes

Display Trip Group Path on The Road: “Shapes”



National RTAP's GTFS Builder Support/Guidebook

https://www.nationalrtap.org/Web-Apps/GTFS-Builder/Support

14. Optional - Complete Shapes Tab - Guidebook page 35

14. Optional – Complete shapes Tab

On a map, a shape helps snap the trip to roads. Without shapes the route often displays the trip "stop to stop" with straight lines over buildings, rivers and parks. Shapes are associated with trip groups, and consist of a sequence of points on a map through which a vehicle passes in a unique stop order. Establishing and entering shape data into the **shapes** tab is optional and may be time consuming. However, shapes are required elements and must be established if continuous pick-up and drop-off are allowed on a trip group or route. Similar to establishing bus stop locations, Google MyMaps and Google Earth are used to detail the trip's shape. The shape data also assures that all the stops on that trip are in the correct stop order. Agencies can use other mapping software if available. Some prior experience with Google Maps "MyMaps" products may be helpful.

A shapes "line" is generated in .kml. The kml data is entered in the ImportExport file in the **shapes** tab as a list of points (latitude and longitude) which define the path of a trip.

Shapes points along a trip do not need to intersect the location of stops exactly, but all stops on a trip should lie within a short distance of the shape for that trip. GTFS Builder checks the distance between the stops and the trip shape, and provides an alert if the stop is located over 30 meters (approximately 100 feet) from the trip shape. It is recommended a shape_point be located ahead of the stop within 30 meters. Instructions on how to test the proximity of stops to trip shapes, and make corrections, are described below.

To observe and follow the steps of creating a new shape, refer to the *Creating Trip Group Shapes and Complete the Shapes Tab in the ImportExport File* video.

14.1. Instructions

1. Open the ImportExport file and **shapes** tab.
2. Go to mymaps.google.com
    a. Select the map used to establish the bus stop coordinates in *Section 6 Identify Bus Stop Locations.*

Shapes: Overview with How-to Video: Creating Trip Group Shapes

1. Sketch Route in MyMaps
2. Output KML > Drop in Google Earth
3. Copy Globe > Paste to ImportExport Blank Row Shapes Tab with shape_id
4. Name Shape_id, Add shape_id to Schedule Generator for the Trip Group
5. Select Trip tab, Double Click Trip and view/edit in Google Earth
6. Edit Google Earth where > 50 meters
7 Copy Globe > Paste to ImportExport Blank Row Shapes Tab with shape id

Fares

National RTAP's GTFS Builder Support/Guidebook

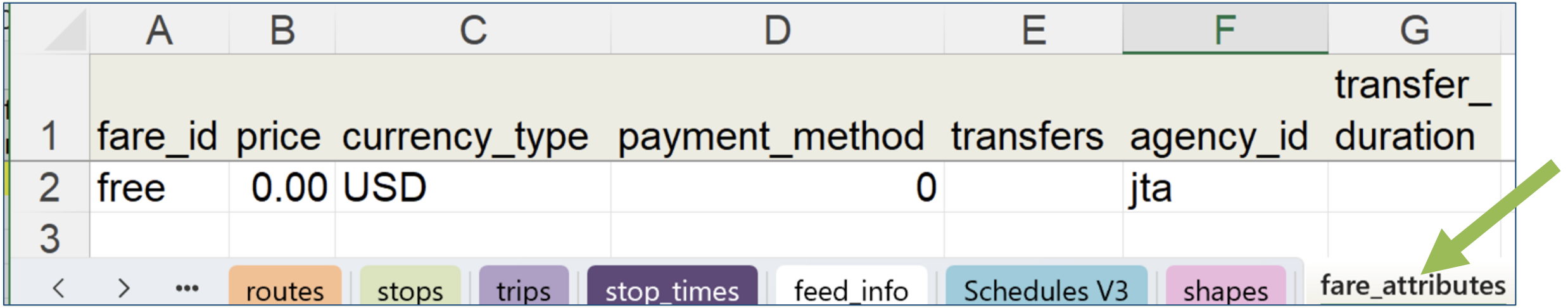
https://www.nationalrtap.org/Web-Apps/GTFS-Builder/Support

13.2 Optional - Complete Fares Two Tabs - Guidebook page 32

13. Optional – Complete transfers, fare_attributes, and fare_rules Tabs

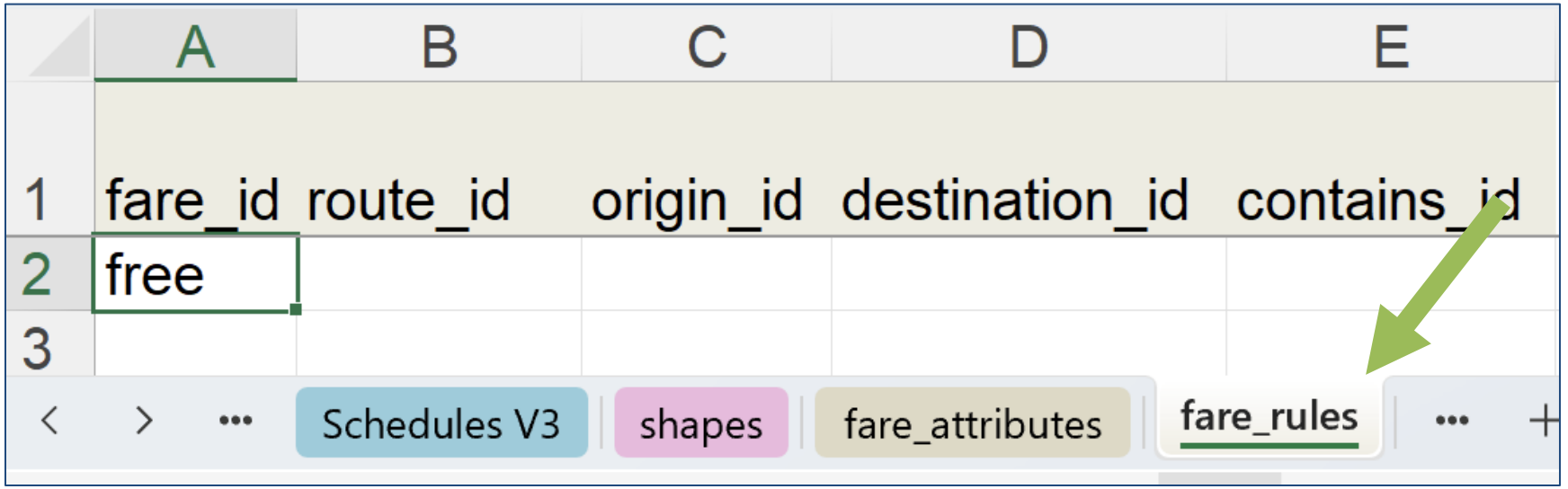
To display information related to one-way adult fares and refine how transfers between routes display, data must be entered into these similarly named tabs. Data entry in these three tabs is not required. However, if data is to be entered, data in the columns listed shown in the tables below as "**Required**" must be entered. Additional support and a demonstration of the explanations provided in this section are available in this **video**.

Fares: Attributes and Rules (Import/Export file)



	A	B	C	D	E	F	G
1	fare_id	price	currency_type	payment_method	transfers	agency_id	transfer_duration
2	free	0.00	USD	0		jta	
3							

routes | stops | trips | stop_times | feed_info | Schedules V3 | shapes | fare_attributes



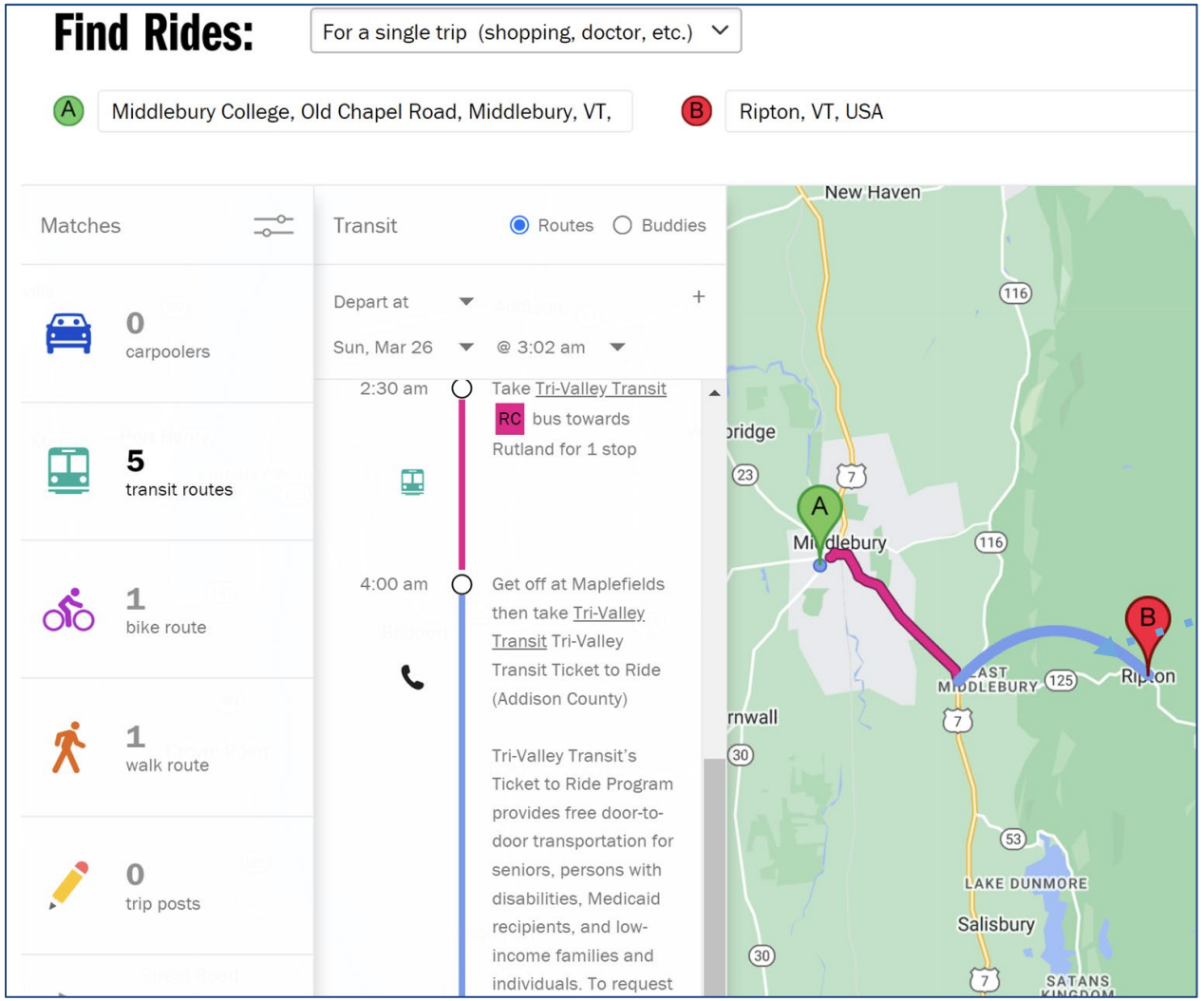
	A	B	C	D	E
1	fare_id	route_id	origin_id	destination_id	contains_id
2	free				
3					

Schedules V3 | shapes | fare_attributes | fare_rules

On-Demand Services

GTFS-Flex and Workaround

Regional or State Trip Planners May Publish GTFS-Flex



Vermont State-funded trip planner

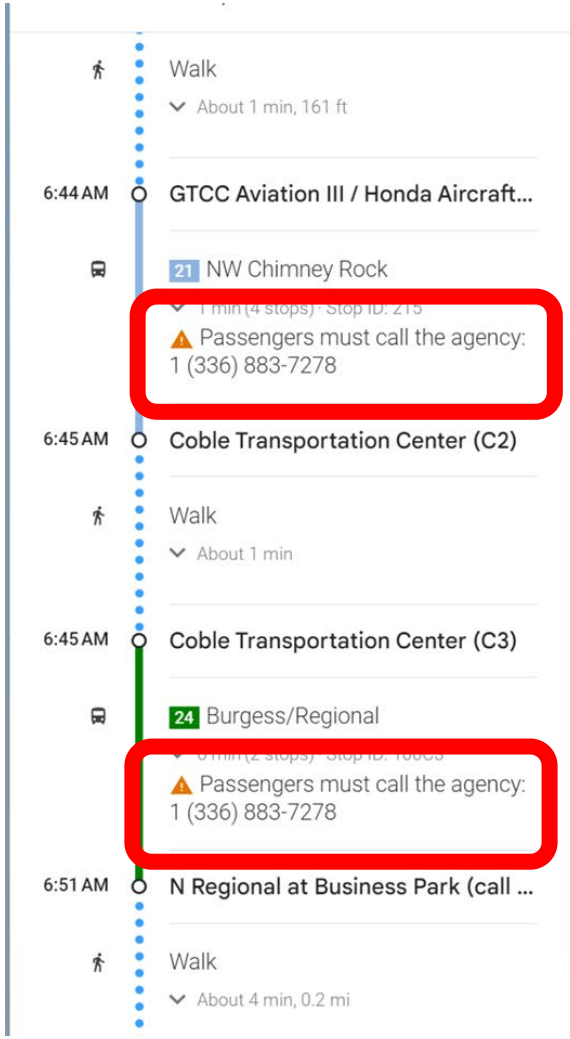
https://www.connectingcommuters.org/travel-apps/trip-planner/

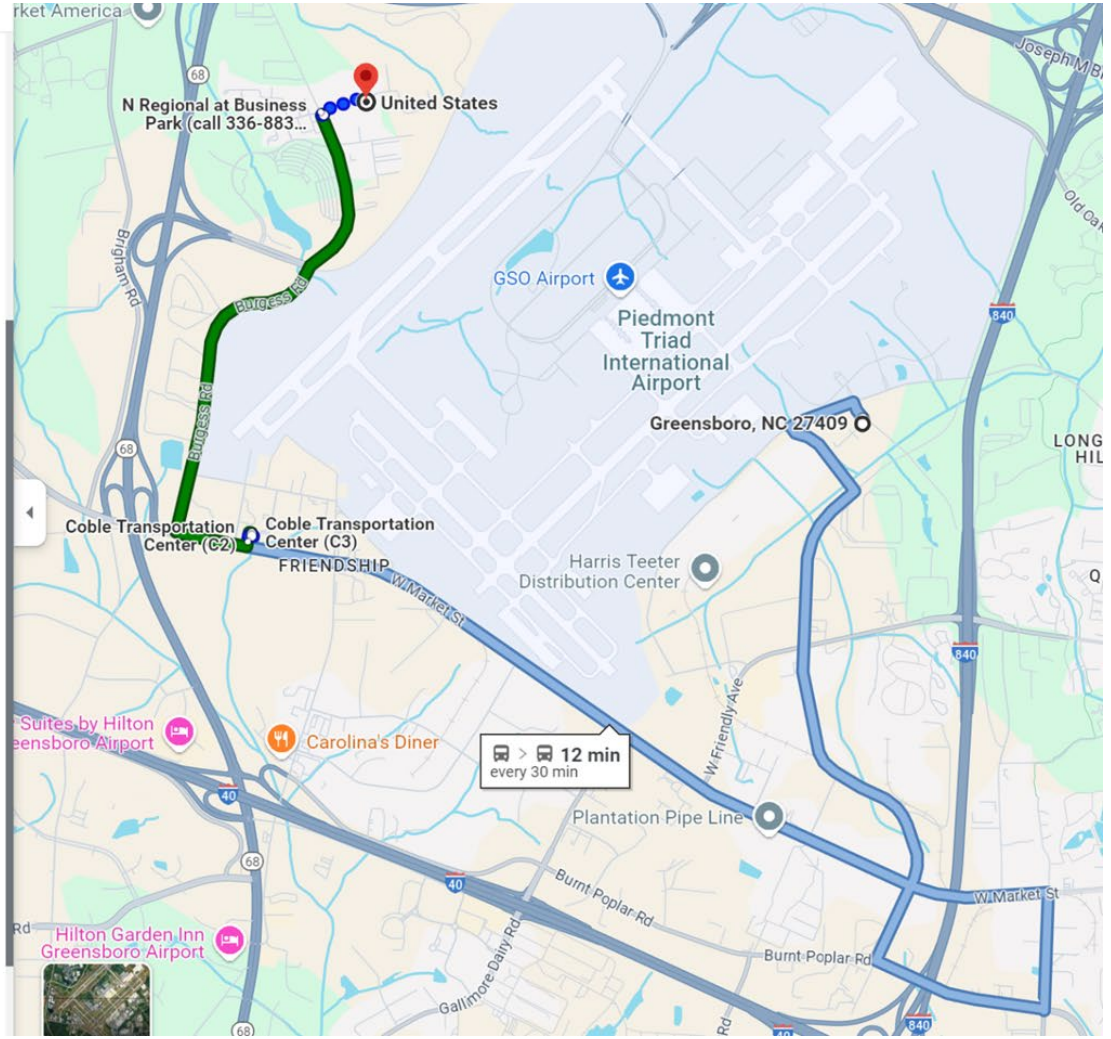
"Call for" Tri-Valley Transit Ticket to Ride (flex) connector 48 hours ahead if you are senior, Medicaid, low-income, etc

Greensboro NC (Call # at least 30 min. ahead)

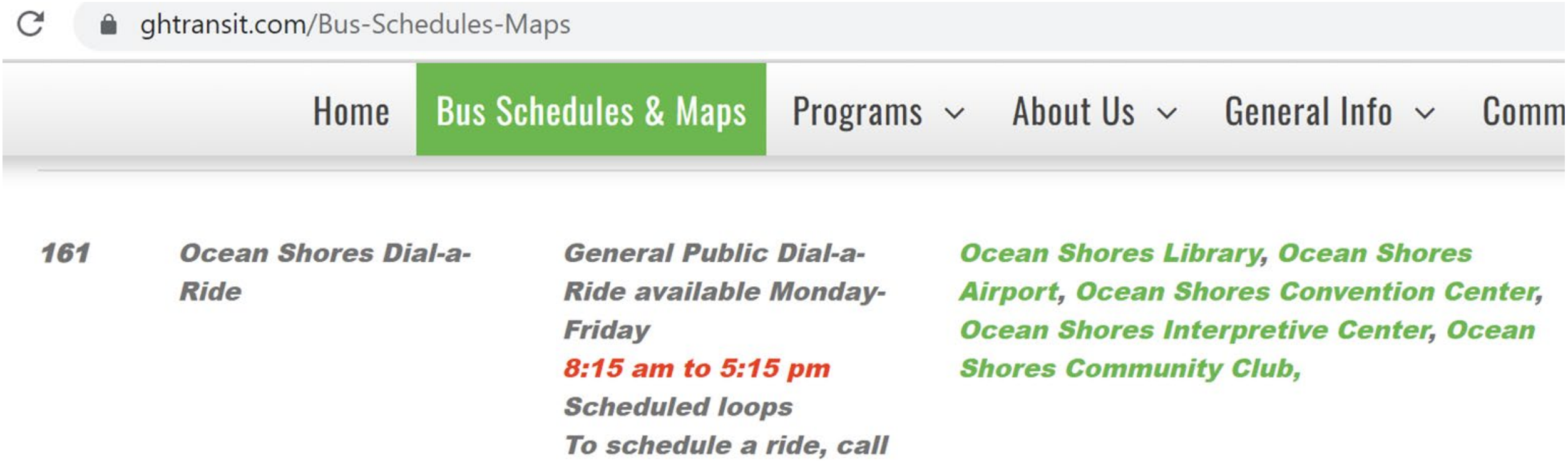
Each stop_name:

Airpark North (Burgess Rd) (call 336-883-7278 for pickup at least 30 minutes in advance)





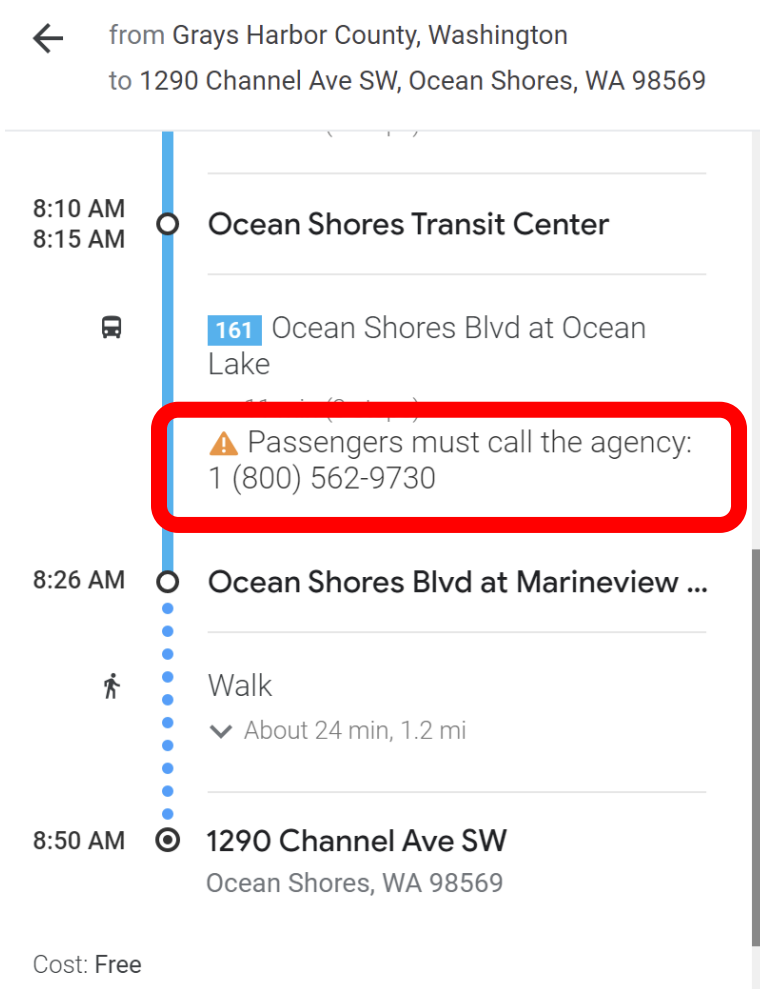
Ocean Shores, Washington - Dial-A-Ride “161”

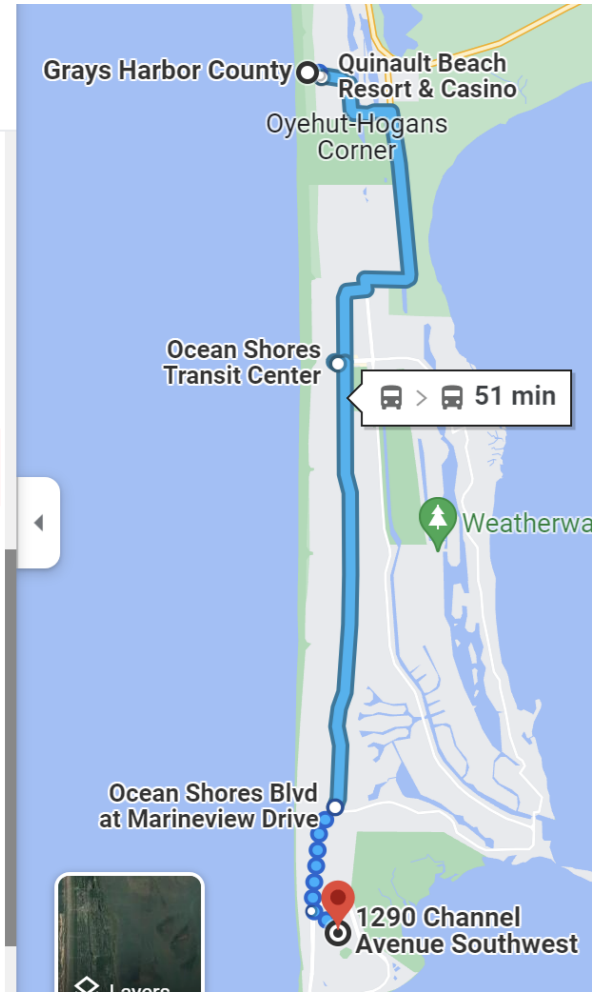


Ocean Shores, Washington

Route 161 - General Purpose Dial-a ride

⚠ Passengers must call the agency





National RTAP's GTFS Builder Support/Guidebook

https://www.nationalrtap.org/Web-Apps/GTFS-Builder/Support

15. GTFS Flex Workaround - Guidebook page 39

15. GTFS Flex Workaround

Until Google and other trip planners allow flexible on-demand services to be published with the forthcoming GTFS-Flex specifications, GTFS Builders offers an easy workaround to ensure these services are seen on trip planners. The following details how to build a "flex workaround" solution within the current constraints of "fixed and timed" schedules required by Google and other trip planners. Additional support and a demonstration of the explanations provided in this section are available in the *Demand Response Services* **video.**

1. Create a simple "workaround route" on the agency website. The route can consist of a few stops (4 to 8 stops) and include as few as one trip per day or even one trip per week. The "workaround route" must be shown on the agency website and it must indicate on the website that riders are not required to call-in to travel using the "workaround route." As described above in *Section 8.3 Generate a Schedule for Agency Website*, a simple schedule can be created using the **Schedule Generator** file and copied onto the agency website.

Flex On-Demand Workaround: When Publishing with Google

1. Create “stand-in” route
    a. Anyone can ride (not for only veterans, or only seniors)
    b. Choose popular places
    c. Add non-timepoints
2. Publish this route’s “Timetable” on your website
3. Launch
4. Once Launched add “Rider Must Call for Pick-up” or “2” in pick_up/drop-off_type & bus stop_name

Questions?

Published? Success! Problems?

Please Share with National RTAP

Upcoming and Recent National RTAP Events

Mobility Wallets 101

November 5, 2024, 2:00-3:00 PM ET

Succession Planning LinkedIn Learnalong

January 7, 2025, 2:00-3:00 PM ET

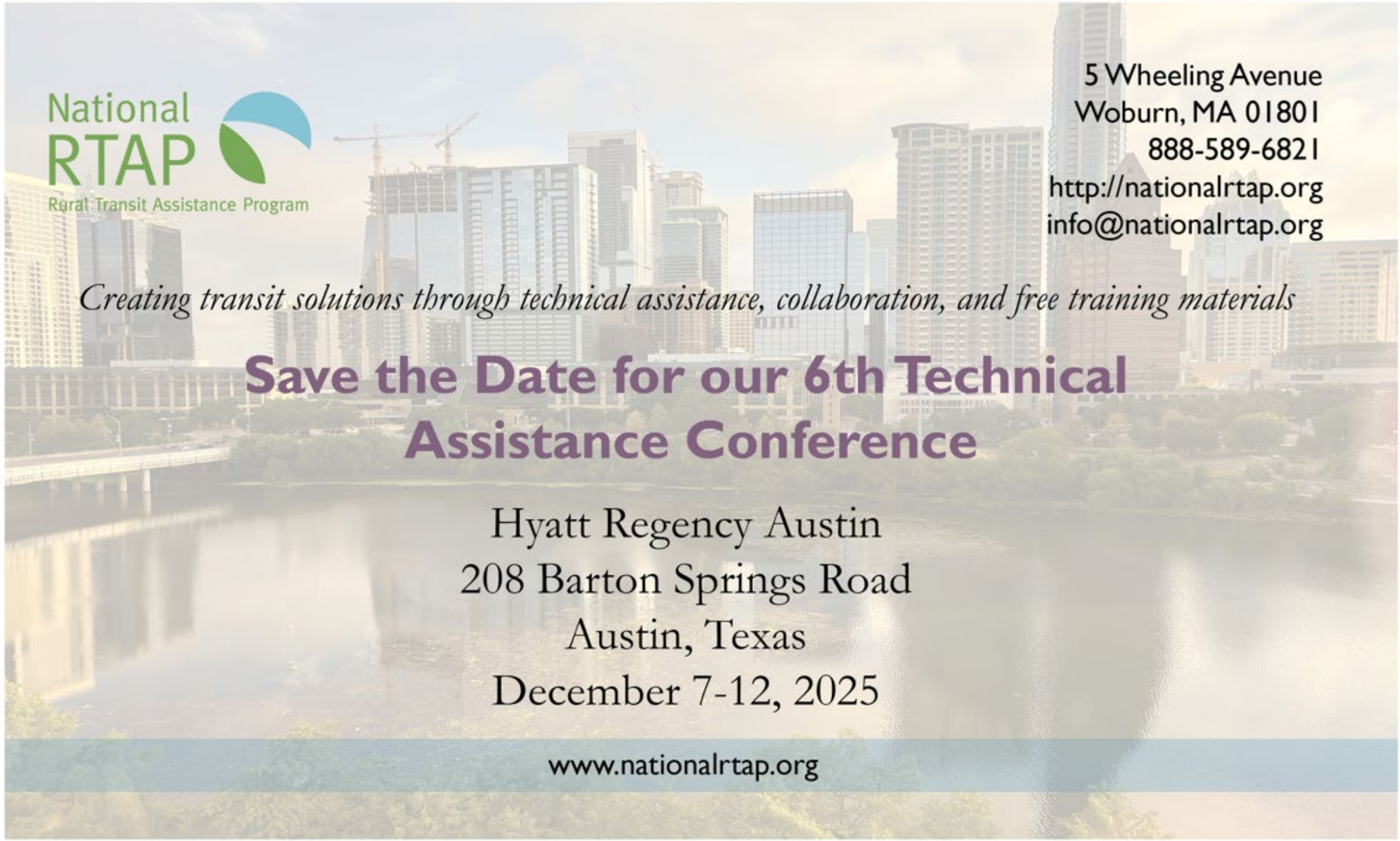
Updated Marketing Toolkit Introduction

November 12, 2024, 2:00-3:00 PM ET

Books in Transit Discussion Group – The Lost Ticket

February 20, 2025, 2:00-3:00 PM ET

To register go to: nationalrtap.org/Webinars


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Rural Transit Assistance Program
5 Wheeling Avenue
Woburn, MA 01801
888-589-6821
http://nationalrtap.org
info@nationalrtap.org
Creating transit solutions through technical assistance, collaboration, and free training materials
Save the Date for our 6th Technical Assistance Conference
Hyatt Regency Austin
208 Barton Springs Road
Austin, Texas
December 7-12, 2025
www.nationalrtap.org

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Federal Transit Administration