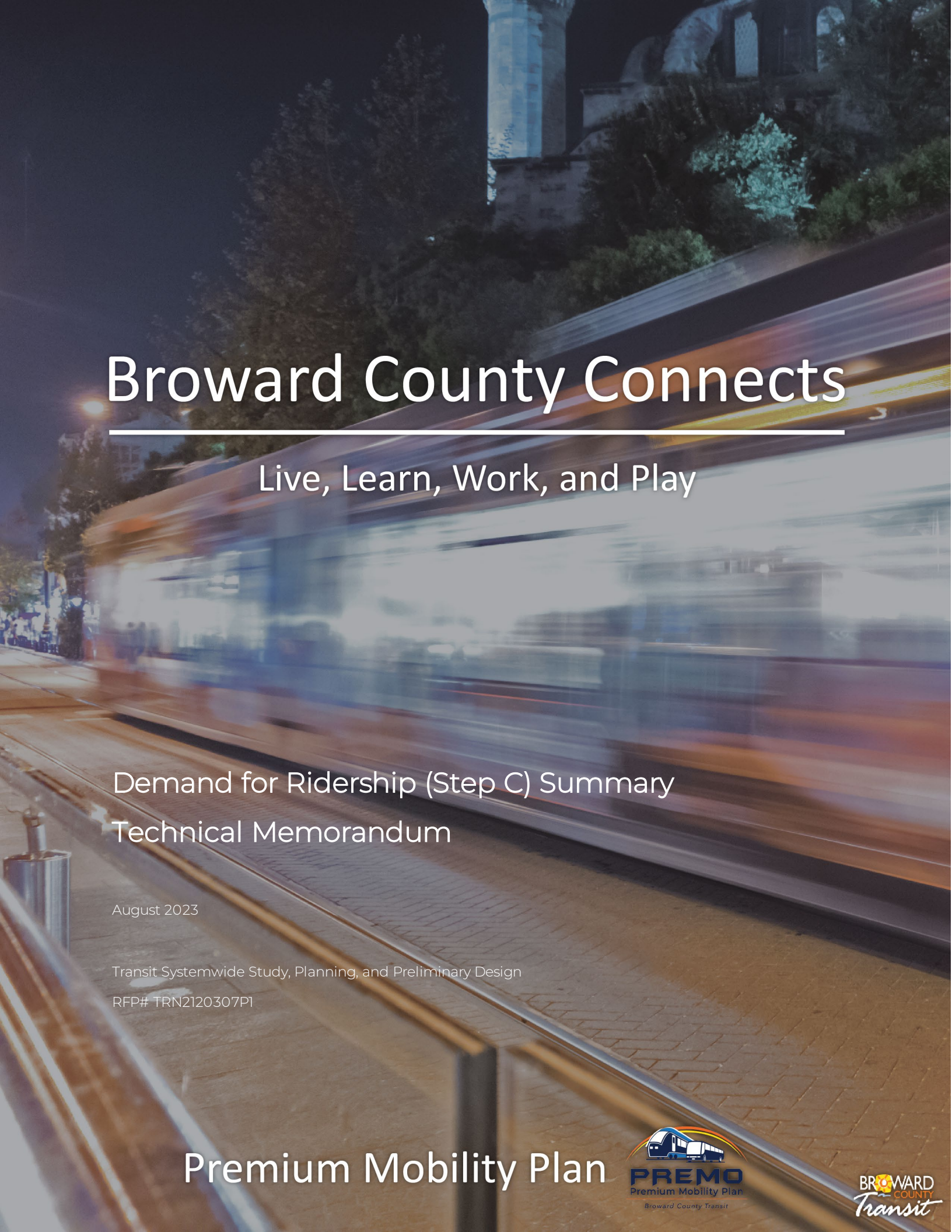

Broward County Connects

Live, Learn, Work, and Play

Demand for Ridership (Step C) Summary Technical Memorandum

August 2023

Transit Systemwide Study, Planning, and Preliminary Design

RFP# TRN2120307P1

Premium Mobility Plan

PREMO Premium Mobility Plan Broward County Transit

BROWARD COUNTY Transit

Name:	Broward County Transit Systemwide Study, Planning, and Preliminary Design
RFP Contract Number:	TRN2120307P1
Project Limits:	Broward County (Entire County)
Proposed Activity:	Provide a transit systemwide study including planning and preliminary designs resulting in the Premium Mobility Plan (PREMO)
Document Purpose:	Description and documentation of BCT Premium Mobility Plan's Step C approach, methodology, coordination, and results.

Prepared for
Broward County

Prepared by
WSP

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Acronyms and Abbreviations

BCT	Broward County Transit
CIG	Capital Investment Grant
CTPP	Census Transportation Planning Package
FDCA	Florida Department of Community Affairs
FDOR	Florida Department of Revenue
FDOT	Florida Department of Transportation
FG	Fixed Guideway
FLL	Ft. Lauderdale-Hollywood International Airport
FLU	Future Land Use
FTA	Federal Transit Administration
GIS	Geographic Information System
JTW	Journey to Work
KNR	Kiss-n-Ride
LEHD	Longitudinal Employer-Household Dynamics
LPA	Locally Preferred Alternative
MAP Broward	Mobility Advancement Program
OD	Origin-Destination
PAG	Project Advisory Group
PNR	Park-n-Ride
PREMO	Broward County Transit Premium Mobility Plan
SMART	Strategic Miami Area Rapid Transit
STOPS	Simplified Trips on Project Software
TAZ	Traffic Analysis Zone
TDP	Transit Development Plan
TOD	Transit Oriented Development
TSP	Transit Signal Priority
VMT	Vehicle Miles Traveled

1. Introduction

PREMO incorporates the goals of the Penny for Transportation Surtax Program. This program, referred to as the Broward Mobility Advancement Program (MAP Broward), provides funding support for improving transit service, enhancing multimodal options, and ensuring economic development and benefits. The Transportation Surtax took effect on January 1, 2019.

This document outlines Step C of PREMO to identify Ridership Demand.

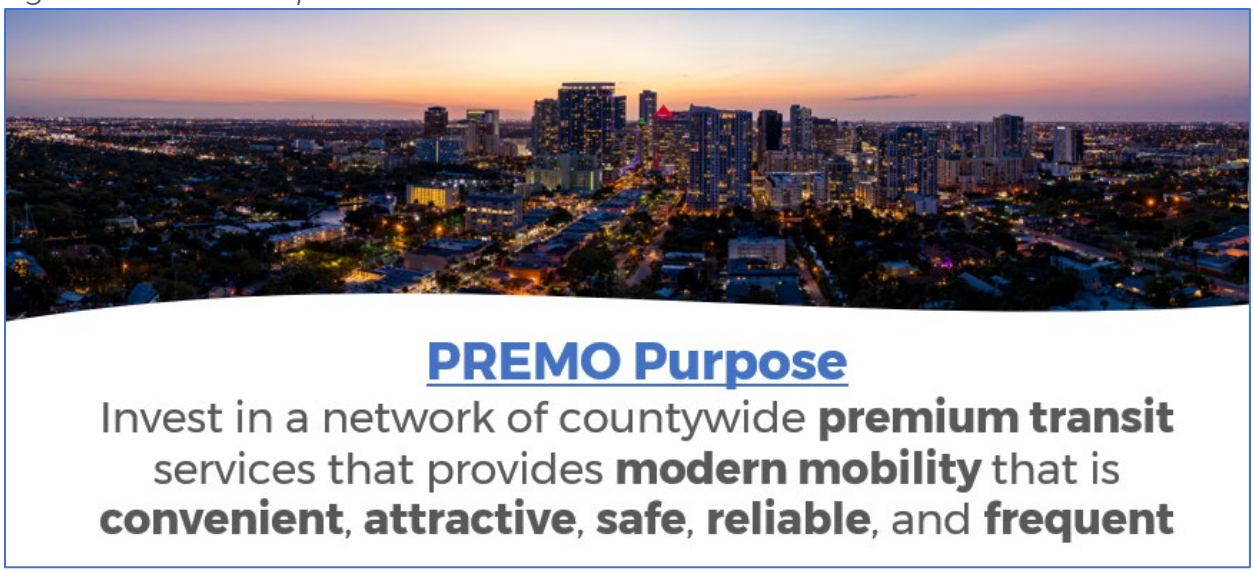
1.1 PREMO Purpose

PREMO will define a vision for a world-class premium transit network in Broward County (Figure 1). To achieve this vision, PREMO strategically identifies a program of projects that sequences the implementation of premium transit services —connecting local BCT routes to regional services.

Premium transit is an expression that describes high-capacity transit projects that are modern, convenient, attractive, safe, and reliable. Premium transit can also include investments that give preferential treatment to transit in the form of exclusive or shared transit lanes and the use of technologies that give transit a priority at signalized intersections.

PREMO will closely follow Federal Transit Administration (FTA) Capital Investment Grant (CIG) guidelines, while coordinating closely with the Florida Department of Transportation (FDOT), the Broward County Public Works Department, municipal partners, and other stakeholders.

Figure 1: PREMO Purpose



1.2 PREMO Goals

PREMO will evaluate and recommend the location and mode of various premium transit service investments in Broward County. The goals of PREMO include:

- Improve Mobility for All: ensure mobility improvements for all who live, work, and travel in Broward County through implementing a reliable, premium transit service
- Implement Equitable Transit Solutions: ensure that transit improvements provide access to jobs, services, and destinations from all communities throughout Broward County, with a focus on equitable connections for transit dependent populations and underrepresented communities
- Improve Safety and Security, and Ensure Environmental Stewardship: provide safe mobility options that minimize impacts to the environment and ensure that customers and communities are safe and secure
- Enhance Economic Development and Ensure Financial Sustainability: implement cost-effective transit solutions to encourage transit-supportive development while providing improved access and connectivity to employment areas and population centers
- Integrate and Serve Communities: implement transit investments with connections to multimodal hubs, employment centers, and activity centers to connect with existing and future development that is oriented for transit

1.3 PREMO Process

PREMO follows a tiered technical evaluation process, with each tier addressing a single key question. The answer to each question facilitates the development of the PREMO Plan, serves County needs, and meets established goals. Figure 2 illustrates the PREMO process starting with the identification of a premium transit network (Step A) and resulting in a sequenced program of projects (Step F) for implementation.

Figure 2: PREMO Evaluation Process

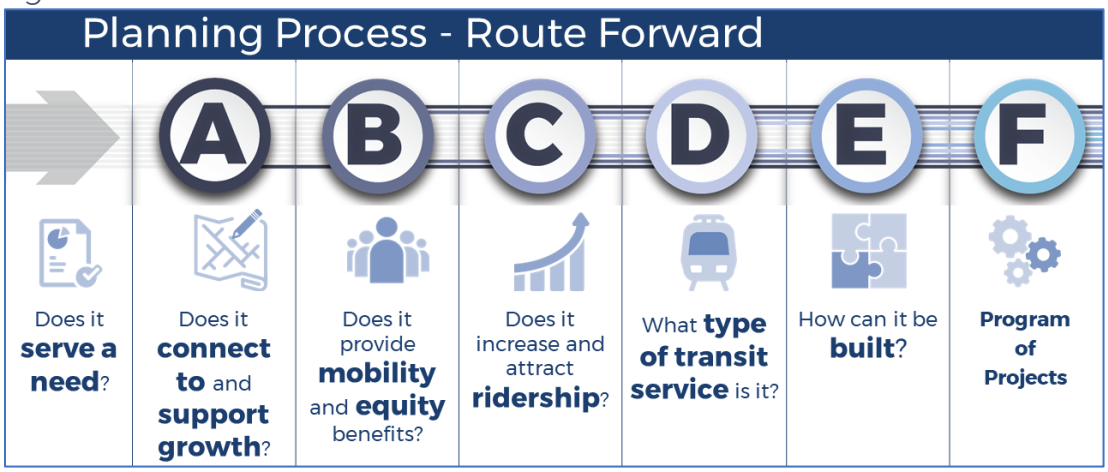


Table 1 provides a detailed summary of the PREMO process. PREMO will be directed by the outcomes of technical analyses, stakeholder direction, and public opinion.

Table 1: PREMO Process Steps

Step	Key Question to be Addressed	Anticipated Outcome
Initial	Does the proposed PREMO corridor address a County mobility need?	**Initial Network:** List of initial candidate corridors to be considered for premium transit
A	Does the proposed PREMO corridor connect to and support County growth?	**Initial Corridors:** Approximately 20 top performing corridors to be considered for a premium transit investment
B	Does the proposed PREMO corridor provide mobility and equity benefits?	**Shortlisted Corridors**: Approximately 10 top performing corridors to be considered for a premium transit investment
C	Does the proposed PREMO corridor increase and attract transit ridership?	**Demand for Ridership**: Evaluate ridership demand and match appropriate transit types for each Shortlisted Corridor
D	What type of transit service best serves the proposed PREMO corridors?	**Define the Preferred Transit Type**: Validated and defined the recommend transit type for each Shortlisted Corridor
E & F	How can the proposed PREMO projects best be built?	**Implementation Strategy:** A sequenced program of projects and each project's proposed implementation strategy

1.4 Getting to Step C

The Initial Network is comprised of major north-south and east-west roads within Broward County with potential to serve both existing and future mobility needs. This Initial Network was presented to the PAG in January 2022 and is discussed in the Transit Systems Definition Report.

1.4.1 Step A: Identifying the Initial Corridors

The purpose of Step A was to identify corridors that connect to and support Broward County's expected growth and resulted in the Initial Corridors to move forward into Step B. For more information about the process to identify the Initial Corridors, refer to the Initial Corridors (Step A) Summary Technical Memorandum. The Initial Corridors are listed below and the PREMO Initial Network is shown in Figure 3:

- Atlantic Boulevard
- Broward Boulevard
- Commercial Boulevard
- Cypress Creek Road
- Dixie Highway
- Douglas Road/Pine Island Road
- Hollywood Boulevard
- Lyons Road/31st Avenue
- Miramar Pkwy/Hallandale Beach Blvd
- Nob Hill Road/Palm Avenue
- Oakland Park Boulevard
- Pembroke Road
- Powerline Road
- Sample Road
- Sheridan Street
- SR A1A/Ocean Boulevard
- SR7/US441
- Sunrise Boulevard
- University Drive
- US-1/Federal Highway

Figure 3: PREMO Initial Network

1.4.2 Step B: Identifying the Shortlisted Corridors

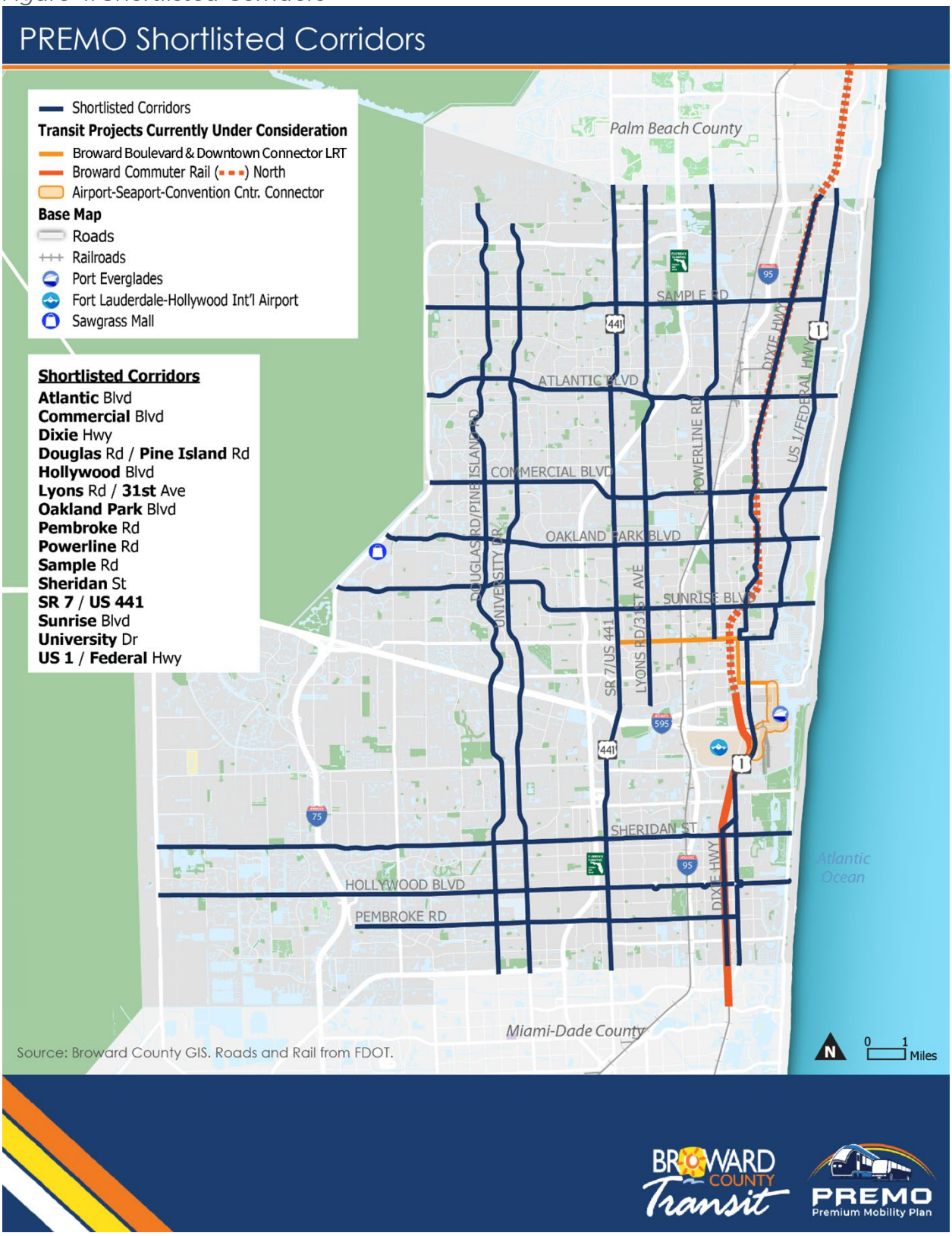
The purpose of Step B was to identify corridors that provide mobility and equity benefits to residents and visitors in Broward County. The Step B technical evaluation resulted in the identification of the Shortlisted Corridors to move forward into Step C. For more information about the process to identify the Shortlisted Corridors, refer to the Shortlisted Corridors (Step B) Summary Technical Memorandum. The Shortlisted Corridors are listed below and shown in Figure 4:

- Atlantic Boulevard
- Commercial Boulevard
- Dixie Highway
- Douglas Road/Pine Island Road
- Hollywood Boulevard
- Lyons Road/31st Avenue
- Oakland Park Boulevard
- Pembroke Road
- Powerline Road
- Sample Road
- Sheridan Street
- SR 7/US 441
- Sunrise Boulevard
- University Drive
- US-1/Federal Highway

1.5 Broward County Transit Projects Currently Under Consideration

PREMO recognizes the importance of projects currently being considered by Broward County. While these efforts are being discussed or studied under separate but parallel efforts, they are part of the broader Broward County premium network and included within PREMO. These projects include Broward Commuter Rail South, the Airport-Seaport-Convention Center Connector, Downtown Connector, and Broward Boulevard. These projects are shown in relation to the Shortlisted Corridors on Figure 4.

Figure 4: Shortlisted Corridors



1.5.3 Broward Commuter Rail – South

Broward Commuter Rail South (Figure 5) is a proposed 11.5-mile commuter service operating together with Brightline on the FEC line and connecting to the south with Aventura and Miami. Three new Broward County stations are proposed:

- SW 15th St/SW 17th St. (near Broward Health Medical Center) – Ft. Lauderdale
- Ft. Lauderdale/Hollywood International Airport
- Tyler Street/Taylor Street – Hollywood

The project goals are to enhance regional mobility, provide congestion relief on roadways, and foster economic growth. The Broward County Board of County Commissioners selected an LPA in August 2022, and the FTA subsequently approved project development in December 2022. With total project capital expenses estimated at $297 million, 50% of needed funding is anticipated from the FTA's Small Starts grant program. The northern portion to Palm Beach County is under further study.

Figure 5: Broward Commuter Rail Project Map

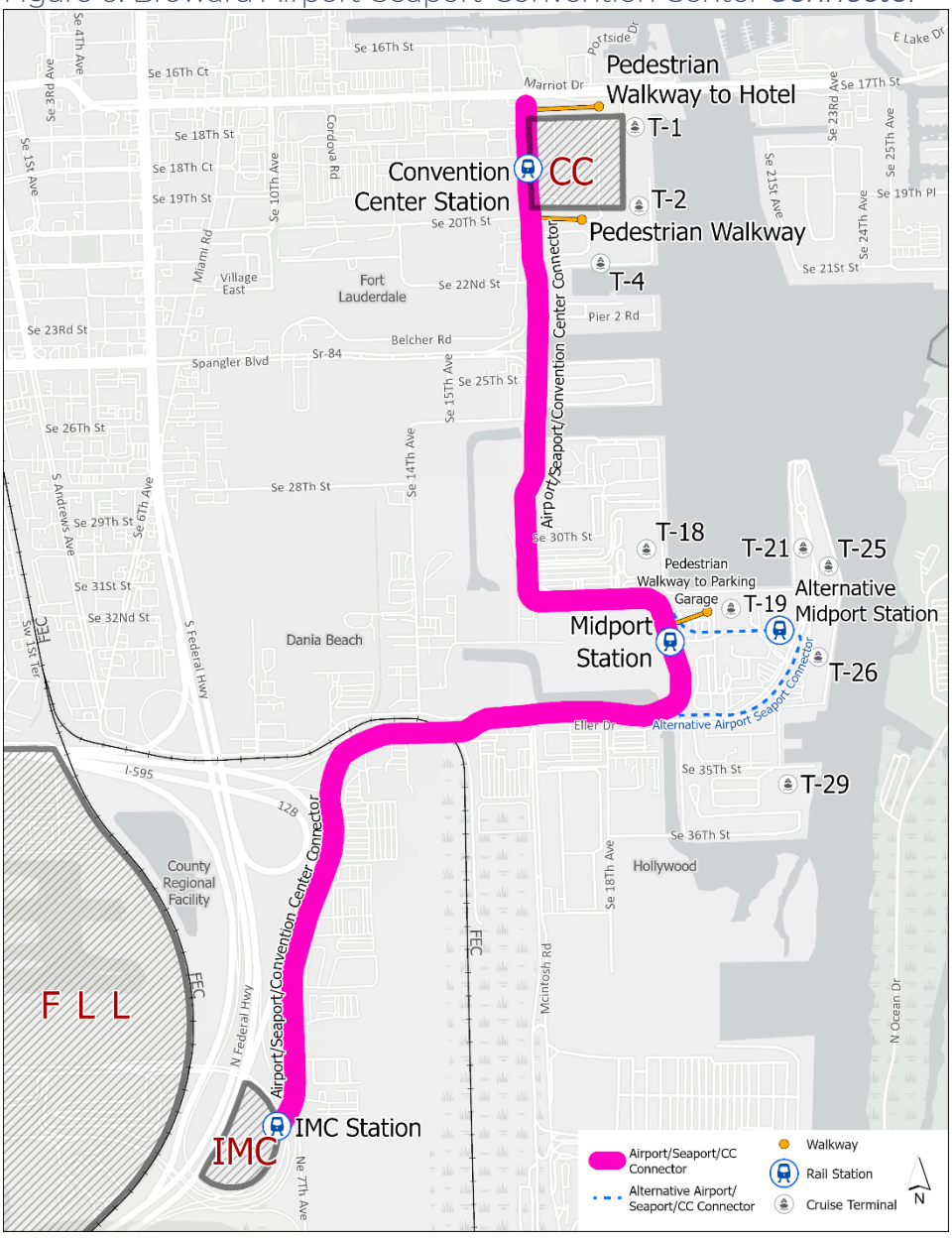
1.5.4 Airport-Seaport-Convention Center Connector LRT

Broward County will study light rail transit (LRT) connecting Ft. Lauderdale-Hollywood International Airport (FLL), Port Everglades, and the Broward County Convention Center (*Figure 6*). BCT advanced the project by including capital planning budget funding of $81.7 million in FY25 for planning, design, and project management and $202.5 in FY27 for construction, anticipating FTA New Starts support for 50% of the total program cost.

The Airport-Seaport-Convention Center Connector is planned to be 3.5 miles with 3 stations:

- Intermodal Center (at FLL)
- Midport (Port Everglades)
- Convention Center

Figure 6: Broward Airport-Seaport-Convention Center *Connector*

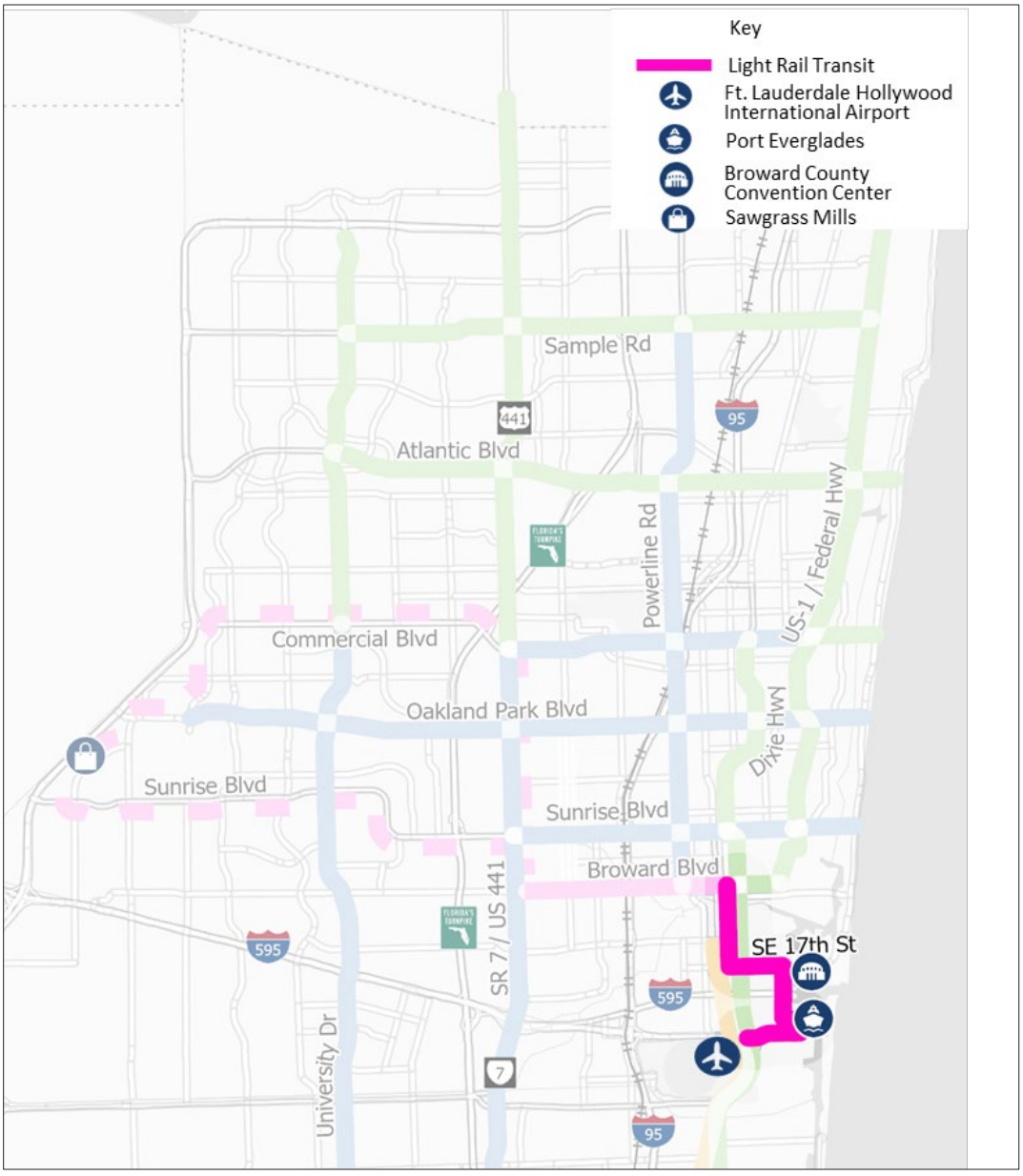


1.5.5 Downtown Connector LRT

The Downtown Connection LRT is a logical extension from the Convention Center to Downtown Fort Lauderdale (Figure 7). The project will add 4 miles of light rail west along SE 17th Street and north to downtown, passing near the Broward Health Medical Center and the Broward County Courthouse complex and connecting these locations with the seaport and airport.

Alignment and station locations are to be finalized; projected opening is 2035

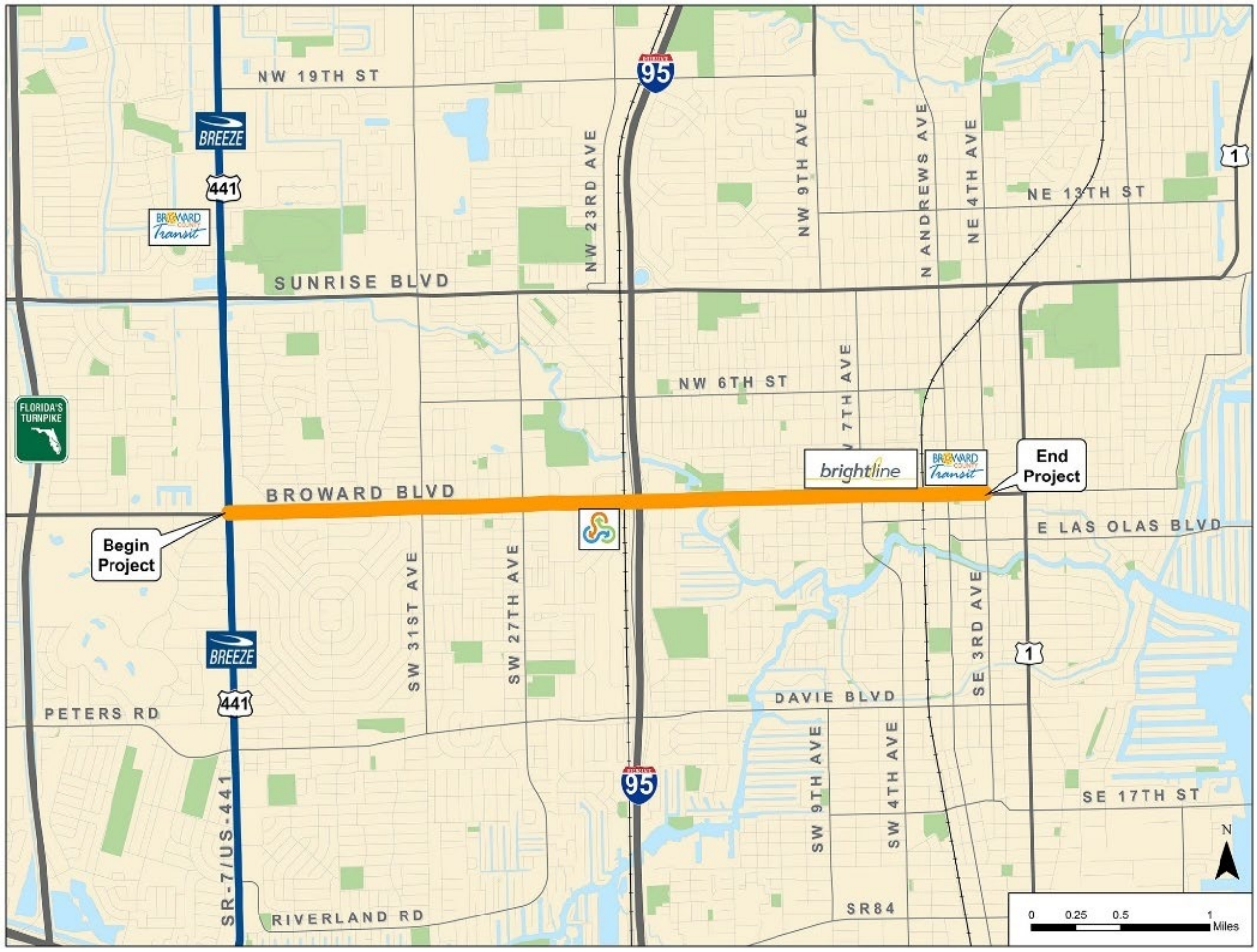
Figure 7: Downtown Connector LRT



1.5.6 Broward Boulevard LRT

Broward County and FDOT D4 have initiated the Broward Boulevard Premium Transit (BBPT) Study (Figure 8), which includes a technical evaluation of a premium east-west transit service along the segment of Broward Boulevard from approximately SR 7/US 441 in the City of Lauderhill to approximately East 3rd Avenue in Downtown Fort Lauderdale. The purpose of this project is to provide mobility options and make important transit connections within the study area, including SR 7/US 441 Breeze and local service, the 95 Express Bus and Tri-Rail station at Broward Boulevard and I-95, and with the Brightline Station and Broward County Transit (BCT) Central Terminal in Downtown Fort Lauderdale.

Figure 8: Broward Boulevard Study Map



2. Transit Suitability

Transit types were assessed for each corridor to determine which mode best meets PREMO goals and best serves the anticipated demand for transit in each corridor, before analyzing ridership demand for each of the shortlisted corridors. Five modes were analyzed:

- Bus Rapid Transit (BRT)
- Commuter Rail
- Heavy Rail
- Light Rail Transit (LRT)
- High Frequency Bus

2.1 Transit Modes Considered

The following descriptions for each mode were defined by the Federal Transit Administration (FTA) National Transit Database Glossary.

Bus Rapid Transit (BRT)

High-quality bus-based transit system that delivers fast and efficient service. A lower cost alternative to light rail. BRT is generally characterized by:

- Dedicated lanes and busways
- Traffic signal priority
- Off-board fare collection
- Elevated platforms
- Enhanced stations/stops


Taiwan

Commuter Rail

An electric or diesel propelled railway for urban passenger train service which operates between a central city and outlying areas. Service operates on a regular basis by a transit operator to transport passengers within urbanized areas (UZAs), or between UZAs and outlying areas. Commuter rail is generally characterized by:

- Multi-trip tickets
- Specific station-to-station fares
- Railroad employment practices
- Relatively long distance between stops
- 1-2 stations in the central business district

South Florida

Heavy Rail

A transit mode that is an electric railway with the capacity for a heavy volume of traffic. It is characterized by:

- High speed and rapid acceleration passenger rail cars operating singly or in multi-car trains on fixed rail
- Sophisticated signaling
- High platform loading
- Separate rights-of-way (ROW) from which all other vehicular and foot traffic are excluded


Miami, Florida

Light Rail Transit (LRT)

A rail transit mode that typically is electric with a light volume traffic capacity compared to heavy rail. It is characterized by:

- Passenger rail cars operating singly (or in short, usually two car trains) on fixed rails in shared or exclusive right-of-way (ROW)
- Low or high platform loading
- Vehicle power drawn from an overhead electric line via a trolley or a pantograph

High Frequency Bus

Bus service provided on a repetitive, fixed schedule basis along a specific route, characterized by:

- Vehicles stopping to pick up and deliver passengers to specific locations
- Each fixed route trip serves the same origins and destinations
- High frequency average headway of 15 minutes or less for a significant portion of the day (15 hours or more)

2.2 Alignment of Transit Modes to PREMO Goals

PREMO envisions premium transit characterized by advanced technology, environmental advantages and sustainable capability that can most efficiently meet Broward County's transit needs and the objectives set forth by MAP Broward. The PREMO Goals are:

- **Mobility**: Improve mobility for all
- **Equity**: Implement equitable transit solutions
- **Connectivity and Land Use**: Integrate with and serve communities
- **Economic Development and Financial Sustainability**: Enhance business development and ensure monetary sustainability
- **Environmental Benefits and Safety**: Improve safety and security, ensure environmental stewardship

Objectives of the PREMO Goals as discussed in the PREMO Purpose, Goals, and Objectives Technical Memorandum are illustrated in Table 2.

Table 2: PREMO Goal Objectives

PREMO Goal Objectives	
Goal	**Objectives**
Improve Mobility for All	• Provide frequent and reliable transit service • Implement corridor improvements that decrease transit travel times • Implement premium transit investments that attract choice riders • Promote customer excellence
Equitable Transit Solution	• Provide transit improvement options that benefit transit-dependent populations • Provide access to employment for traditionally underrepresented communities • Assure geographic equity on the distribution of transit investments • Engage all communities and population types throughout Broward County
Integrate with and Serve Communities	• Integrate transit connections at existing and future County mobility hubs and major activity centers (e.g., trip generators and attractors) • Implement transit capital investments in communities with supportive land use policies to attract and promote transit-oriented development and redevelopment • Identify opportunities to integrate transit into future development opportunities
Enhance Economic Development, Ensure Financial Sustainability	• Stimulate growth in jobs and population in areas supported by premium transit • Advance cost-effective capital investments that attract federal and state grant funding
Improve Safety, Security, Environmental Stewardship	• Promote premium transit investments that reduce crashes • Implement capital improvements that minimize potential impacts to natural, physical, social, historic, and cultural resources • Implement premium transit improvements that are adaptative to climate change as supported by the Broward County Climate Change Action Plan

Tables 3, 4, 5, 6, and 7 summarize the findings of analysis comparing each mode with PREMO goals.

The ability of each mode to meet the specific PREMO goal was rated as follows:

 = Mode meets PREMO Goal

 = Mode partially meets PREMO goal

 = Mode does not meet PREMO goal

Table 3: PREMO Goals and Bus Rapid Transit

Bus Rapid Transit (BRT) and PREMO Goals		
Goal	Synopsis	Meets Goal?
Improve Mobility for All	Efficient, reliable, and frequent public service with affordable fares and modern amenities providing increased capability to serve larger populations at limited capital and operational expense compared to other forms of transit, such as rail. Meets PREMO goal as premium transit.	●
Equitable Transit Solution	Because of its capital and operating cost advantages, BRT provides greater mobility to more people at less cost, thus providing increased transit equity through service to transit dependent populations and underrepresented communities.	●
Integrate with and Serve Communities	Flexible mobility solution with high ability to integrate with and serve multiple communities, through ability to run in mixed traffic as needed, or dedicated lanes to reduce travel times, or a hybrid of the two. Promotes transit-oriented development.	●
Enhance Economic Development, Ensure Financial Sustainability	BRT economically serves densely populated urban areas to provide higher levels of passenger capacity than standard bus services, along with faster and more reliable journey times. Increased access to jobs, housing and activity centers enhances economic development to the region.	●
Improve Safety, Security, Environmental Stewardship	By increasing capacity in transit corridors and providing faster and more attractive transportation options, BRT can reduce the number of cars on the road and idling in traffic. Combined with more efficient operations, BRT can improve air quality in cities and help reach CO2 emissions reduction goals.	●

Table 4: PREMO Goals and Commuter Rail

Commuter Rail and PREMO Goals		
Goal	Synopsis	Meets Goal?
Improve Mobility for All	Commuter rail is the oldest of all railway passenger transit modes, qualifies as premium transit that decreases transit travel times and attracts choice riders.	
Equitable Transit Solution	Priority on providing transport to commuters who reside farther out from urban centers, with service primarily during weekday rush hours. There are fewer stops and potentially limited weekday service options that decrease the ability to serve communities and those who are transit dependent.	
Integrate with and Serve Communities	Commuter rail normally accommodates longest-distance trips made within metropolitan regions during weekday peak travel periods at high overall average operating speeds of typically between 30 and 50 miles per hour, with relatively few stations stops. Limited ability to integrate with multiple communities.	
Enhance Economic Development, Ensure Financial Sustainability	Stimulates job growth by increasing access to workers at increased distances for urban job corridor.	
Improve Safety, Security, Environmental Stewardship	Common practice in the United States and Canada is to use commuter train coaches drawn by diesel-electric locomotives, as opposed to electrified multiple-unit equipment. There is less environmental advantage compared to electric bus or light rail transit.	

Table 5: PREMO Goals and Heavy Rail

Heavy Rail and PREMO Goals		
Goal	Synopsis	Meets Goal?
Improve Mobility for All	Like light rail, heavy rail systems are intended to accommodate all types and lengths of passenger trips within the most densely developed portions of metropolitan areas.	
Equitable Transit Solution	Focus is on weekday peak travel periods, as well as during midday and evening off-peak travel periods and on weekends; less priority to transit dependent populations and underrepresented communities.	
Integrate with and Serve Communities	Heavy rail systems require an exclusive, completely grade-separated alignment, extensive subways and elevated structures are needed, which cannot interact with other traffic, thus limiting TOD capability.	
Enhance Economic Development, Ensure Financial Sustainability	Completely grade-separated alignment is costly and disruptive to construct. Limited stops in business districts can lessen ability to enhance economic development	
Improve Safety, Security, Environmental Stewardship	Heavy rail utilizes electrically propelled train cars operating over fully grade-separated rights-of-way. Because cars carry heavier loads, ability to stop in an emergency takes longer compared to other transit, including light rail, a safety detriment.	

Table 6: PREMO Goals and Light Rail Transit

Light Rail Transit (LRT) and PREMO Goals		
Goal	Synopsis	Meets Goal?
Improve Mobility for All	Light rail vehicles are designed to run faster and carry more passengers over greater distances in a metropolitan area, maximizing mobility advantages for more people. Meets PREMO goal as premium transit.	●
Equitable Transit Solution	LRT flexibly carries large volumes of commuters to and from the city center with relatively higher speeds than local buses and at a lower cost than heavy rail, providing equitable transit capabilities. LRT attracts more riders from other modes by providing passengers a better riding experience that is comfortable, fast, quiet, and safe.	●
Integrate with and Serve Communities	LRT can operate in shared traffic corridors, increased capability to integrate with communities, plus greater ability to serve underrepresented populations with more frequent stops compared to commuter or heavy rail.	●
Enhance Economic Development, Ensure Financial Sustainability	LRT can cover long distances at higher speeds, with the flexibility to make more frequent stops in business districts, increasing economic development opportunities. LRT promotes economic and land development along corridors and stations through improved access and mobility.	●
Improve Safety, Security, Environmental Stewardship	Electric-powered light rail vehicles reduce emissions and produce less noise than other transit modes, especially for an equivalent volume of automobile traffic. Ability to stop quicker (compared to heavy rail) provides a safety advantage in heavily populated areas.	●

Table 7: PREMO Goals and High Frequency Bus Service

High Frequency Bus Service and PREMO Goals		
Goal	Synopsis	Meets Goal?
Improve Mobility for All	Conventional bus service in mixed traffic but with reduced headways averaging 15 minutes or less. While not considered "premium transit," provides ability to complement BRT and LRT network increasing mobility.	
Equitable Transit Solution	Highly equitable transit solution, low-cost capability to reach more people with more routes, meets the goal of providing equitable connections for transit dependent populations and underrepresented communities.	
Integrate with and Serve Communities	High frequency bus service meets this goal, flexible routes with ability to integrate with and serve multiple communities.	
Enhance Economic Development, Ensure Financial Sustainability	Provides increased mobility to BRT and LRT network from neighborhoods not directly served by premium transit stops, thus enhancing the premium network's ability to stimulate growth.	
Improve Safety, Security, Environmental Stewardship	Green energy electric fleet can minimize environmental hazards of traditional diesel-powered vehicles.	

2.3 Preferred PREMO Transit Modes

Results of the Transit Suitability Analysis determined that three transit modes provided the greatest opportunity to achieve PREMO's goals: BRT, LRT, and High Frequency Bus.

Preferred PREMO Modes:

- BRT: Meets all 5 PREMO goals as affordable premium transit best suited to meet multiple community needs, including ability to serve transit dependent populations and underrepresented communities while promoting economic development. High frequency service that emulates LRT service, providing fast and reliable service.
- LRT: Meets all 5 PREMO goals as premium transit with high-volume capability to transport commuters and decrease traffic congestion. Integrates into the streetscape and promotes TOD, attracting more riders with a superior riding experience that is comfortable, fast, quiet, and safe.
- High Frequency Bus: Urban transit that seamlessly integrates into the streetscape, high ability to increase mobility to underrepresented communities and transit dependent population and complement a BRT/LRT network.

PREMO Complimentary Mode:

- Commuter Rail: Qualifies as premium transit and typically operates along a long corridor with one to two stops per city/town/suburb. It can provide important service for Broward County.

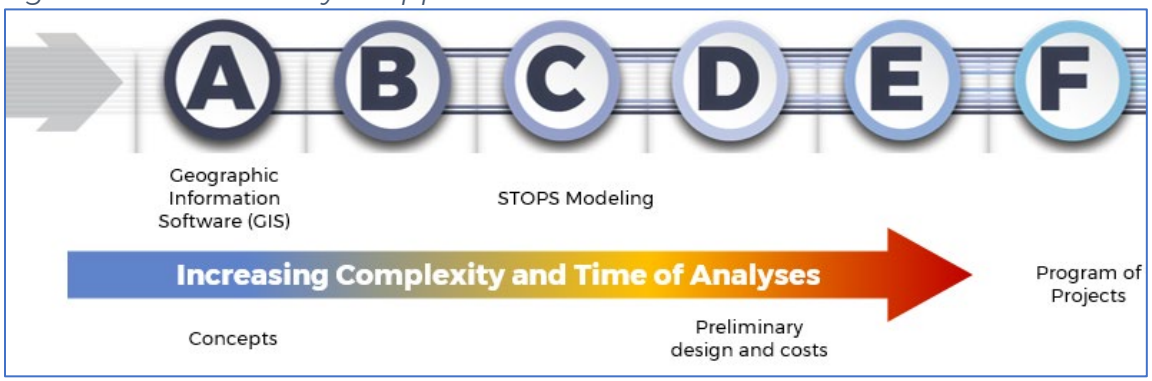
Non-preferred PREMO Mode:

- Heavy Rail: Qualifies as premium transit, but requires exclusive, completely grade-separated alignment, including subways and elevated structures in some areas. Less ability to integrate into streetscape compared to LRT, BRT, and High Frequency Bus.

3. Step C Approach

The PREMO process evaluates candidate premium transit recommendations using quantitative and qualitative analyses to determine how well each recommendation satisfies the identified goals. In doing so, performance measures are aligned with PREMO goals and objectives. Each step in PREMO's development increases the level of analytical complexity, as illustrated in Figure 9.

Figure 9: PREMO Analysis Approach



3.1 Description of the Criteria and PREMO Goals

The purpose of Step C is to further examine the Shortlist Corridors and match the most suitable transit mode to the preliminary ridership demand as guided by the FTA CIG cost effectiveness project rating criteria. These Shortlist Corridors, in alphabetical order, are:

- Atlantic Boulevard
- Commercial Boulevard
- Dixie Highway
- Hollywood Boulevard
- Lyons Road / 31st Avenue
- Pembroke Road
- Douglas Road/Pine Island Road
- Powerline Road
- Sample Road
- Sheridan Street
- SR7 / U.S. 441
- Sunrise Boulevard
- University Drive
- US-1 / Federal Highway

PREMO's purpose is to invest in a network of countywide premium transit services that provide modern mobility that is convenient, attractive, safe, reliable, and frequent. To reach this outcome, measurable goals and objectives were defined. Collectively, these set the ground rules for how projects are evaluated against each other and prioritized as part of the development of the PREMO plan recommendations. Step C furthers PREMO's Improve Mobility for All goal.

The Improve Mobility for All goal seeks mobility benefits for all transportation users, with a focus on mobility alternatives to the automobile that lessen the impact of congestion and improves travel times. To evaluate corridors for this goal, Step C evaluates four criteria:

- Opening Day Total Daily Transit Trips
- Opening Day Total Daily Transit Dependent Trips
- Opening Day Total New Daily Transit Trips
- Preliminary FTA Cost-Effectiveness Assessment

Performance measures for these criteria are detailed in Table 8.

Table 8: Step C Performance Measures

Key: Does it increase and attract ridership? Goals: Improve Mobility for All Objective: Identify Top 5 Performing Corridors					
PREMO Goal	Evaluation Criteria	Measure of Effectiveness	Data Sources	Measure Thresholds	Scoring Methodology
Improve Mobility for All	Opening Day Total Daily Transit Trips	Forecasted ridership *(weighted linked trips)	MODE NUETRAL Ridership Forecasts, FTA STOPS Model	Range of data results demonstrated by top 10 corridors divided into quintiles	High Medium High Medium Medium Low Low
	Opening Day Total Daily Transit Dependent Trips	Forecasted ridership **(transit dependent)			
	Opening Day Total New Daily Transit Trips	Forecasted ridership ***(new riders)			
	Preliminary FTA Cost-effectiveness assessment				

* Linked trips using the proposed project include all trips made on the project whether or not the rider boards or alights on the project or elsewhere in the transit system.

** FTA assigns a weight of two trips by transit dependent persons, or households with zero vehicles

*** FTA evaluates congestion relief based on the number of new weekday linked transit trips resulting from implementation of the proposed project

3.2 Analysis Methodology

3.2.1 Simplified Trips on Project Software

The Simplified Trips on Project Software (STOPS) is a standalone computer program that applies a set of travel models to predict detailed transit travel patterns for user-specified scenarios. It is a simplified method, developed by FTA, that project sponsors of FTA's CIG (New Starts, Small Starts) projects can use, at their discretion, to predict the trips on the project and the change in automobile vehicles miles traveled (VMT) required for the environmental measure. STOPS was initially released in 2013, with several updates provided since that release.

This STOPS model version 2.51, which is customized for the southeast Florida region, was originally developed to support ongoing planning, development, and funding applications for Miami-Dade County's Strategic Miami Area Rapid Transit (SMART) plan. For PREMO, the model was adjusted and refined for transit ridership estimation in Broward County.

District System

STOPS uses districts to define a logical grouping of Traffic Analysis Zones (TAZs), or special areas delineated by transportation officials for tabulating traffic-related data, both within transportation corridors and throughout the region. Such districts are used by STOPS to scale the Census Transportation Planning Package (CTPP) Journey to Work (JTW) trips to the MPO population and employment forecasts and for reporting STOPS outputs within a logical and concise framework.

The modeling team defined districts both within the existing transit corridors and throughout the region. Smaller districts were specified in areas with high transit ridership such as downtown areas. A total of 31 districts were used for Broward County. Figure 10 shows the districts used for analysis.

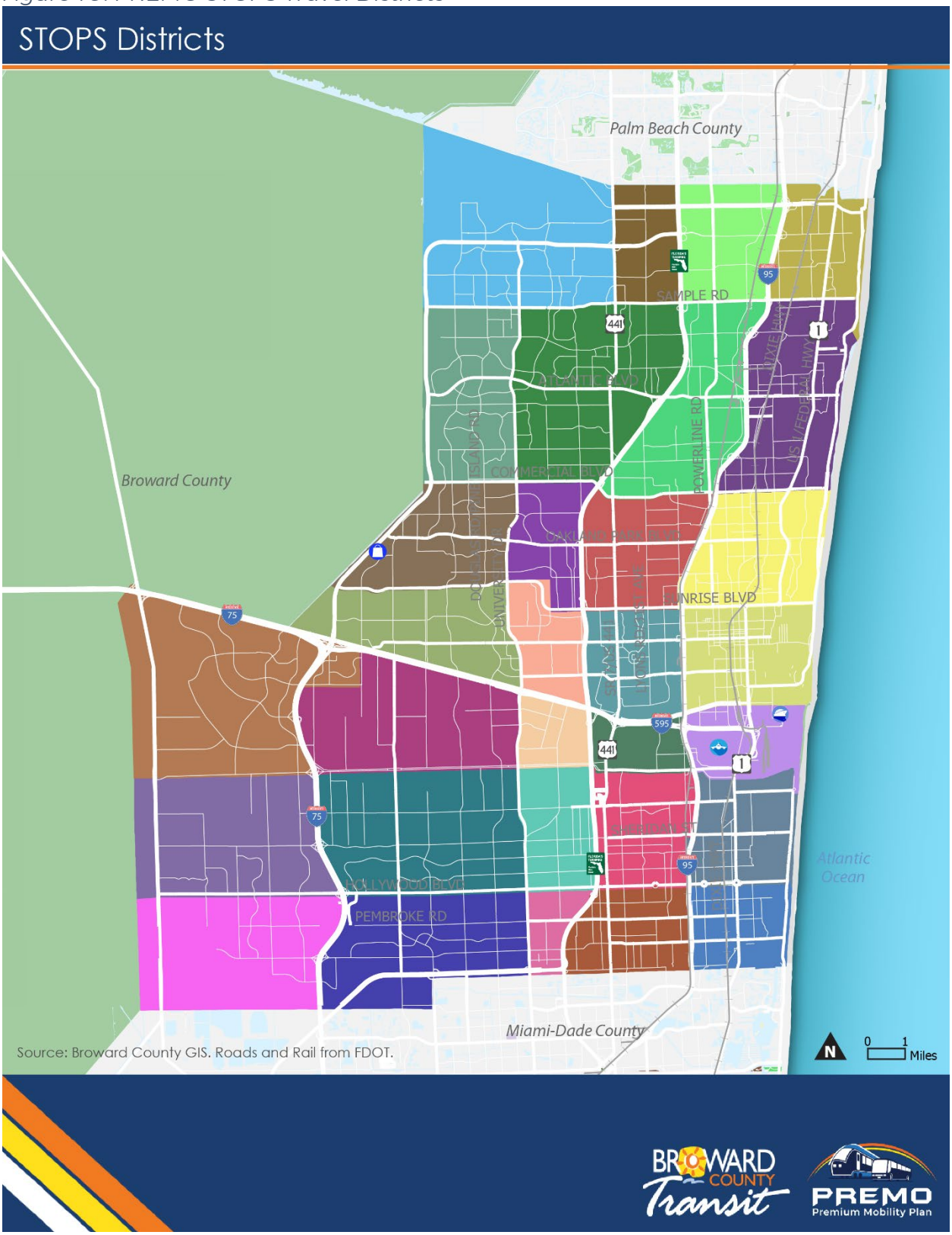
Approaches

STOPS has three approaches to develop an application: "Synthetic," "Synthetic with Special Markets," and "Incremental."

The "Synthetic" approach relies on the CTPP data and demographic data from the regional travel model to estimate transit trips. In this approach, the model self-calibrates to local conditions using user-provided aggregated data, transit network information, and roadway network information. The "Synthetic" approach is used primarily when a good transit on-board survey is not available.

The "Synthetic with Special Markets" approach uses the "Synthetic" approach with additional distinct travel patterns not captured by the CTPP data. Examples of special markets include large airports, universities, or tourist areas. The data requirements for this STOPS approach are the same as the synthetic approach, but also include special market trip flows.

Figure 10: PREMO STOPS Travel Districts



The "Incremental" approach relies on data from a 'good' transit survey as the basis for developing person trips and calibrating STOPS instead of relying on the CTPP data and aggregate transit trip information. It provides the ability to incorporate transit on-board survey information to better reflect existing transit travel patterns in the region. This approach is preferred when a 'good' transit survey is available or forthcoming.

The model used is the "Synthetic" STOPS approach. Due to the lack of a good, recent, on-board origin-destination (O-D) survey on BCT system, an “incremental” STOPS approach is not feasible for this study at this point.

Calibration

STOPS provides the option of reading station/stop or route level count data and using this information to refine the model calibration. The standard practice is to calibrate the STOPS model initially without using any of these group calibration approach options. If needed, the appropriate option is turned on depending on the data available to fine-tune some of the station or route level boardings.

Recent on-board ridership surveys were unavailable for all the agencies, and existing transit travel patterns were hard to reflect in the model. However, this model includes route level observed data, so the group calibration approach is set to “11-OD Adjustment Route". This option adjusts the person origin-destination (OD) trip table based on a comparison of modeled and observed route-level ridership. This option will result in an almost identical match between modeled and observed route-level ridership. For the current year, the observed region-wide linked transit trips target is 434,150, and the model estimates of 429,885 trips are replicated within a 1 percent margin of error. The BCT weekday system ridership target of 87,919 and the model estimated weekday ridership of 87,758 are nearly identical. Table 9 shows a comparison of the total observed and estimated boardings by agency.

Table 9: STOPS Model Calibration (Boardings by Transit Agency)

Route Type	Observed 2019 Weekday Ridership	Modeled 2019 Weekday Ridership	% Difference
Metrorail	63,028	61,933	-1.7%
Metromover	30,454	29,413	-3.4%
Tri-Rail	14,769	14,594	-1.2%
Metrobus	164,856	164,073	-0.5%
Municipal Shuttle	38,653	38,799	0.4%
BCT Bus	87,919	87,758	-0.2%
Palm Tran	31,195	30,804	-1.3%
Tri-Rail Bus	3,276	2,511	-23.4%
Total	**434,150**	**429,885**	**-1.0%**

Table 10 compares the total observed and estimated weekday boardings by route for BCT.

Table 10: STOPS Model Calibration (Observed and Modeled Ridership)

Route Name	Observed Ridership	Modeled Ridership	% Difference
01-US 1 Local	4,256	4,262	0.1%
02-University Dr Local	4,435	4,431	-0.1%
04-South SR A1A Local	557	556	-0.2%
05-Pembroke Rd Local	930	933	0.3%
06-Broward Terminal / County	1,350	1,350	0.0%
07-Hollywood Blvd / Pines Blvd Local	2,619	2,618	0.0%
09-Broward Terminal - Young	1,191	1,191	0.0%
10-Federal Hwy Local	2,788	2,787	0.0%
101-US1 Breeze	1,712	1,714	0.1%
102-University Breeze	762	760	-0.3%
106-95 Express Miramar	494	492	-0.4%
108-95 Express Pembroke Pine	466	257	-44.8%
109-95 Express Pembroke Pine	610	617	1.1%
11-US 441/Prospect R - Brow	1,996	1,996	0.0%
110-595 Express BB&T Center	436	434	-0.5%
114-595 Express BB&T Center	463	458	-1.1%
12-Westfield Mall - A1A	1,032	1,031	-0.1%
122-Broward Breeze	133	133	0.0%
14 – Powerline Rd	3,100	3,099	0.0%
15-Tri-Rail - County Line Rd	83	136	63.9%
16-Stirling Rd Local	748	749	0.1%
18 – S State Rd 7 Local	4,102	4,101	0.0%
19-N State Rd 7 Local	5,385	5,381	-0.1%
20 – Central Terminal to Broward Health Local	685	686	0.1%
22-Broward Blvd Local	3,154	3,162	0.3%
23-Pembroke Lakes Mall	255	257	0.8%
28 – Miramar Pkwy/Hallandale Beach Blvd Local	2,814	2,814	0.0%

Route Name	Observed Ridership	Modeled Ridership	% Difference
30-Davie Blvd Local	1,701	1,701	0.0%
31-Broward Terminal	2,415	2,414	0.0%
34-Sample Rd Local	2,910	2,903	-0.2%
36 – Sunrise Blvd Local	4,357	4,358	0.0%
40 – Sistrunk Blvd./17th St Causeway/A1A Local	2,540	2,540	0.0%
42-Atlantic Blvd Local	1,485	1,484	-0.1%
441-Breeze	3,891	3,890	0.0%
48-Hillsboro Blvd Local	399	399	0.0%
50 – Dixie Highway Local	3,520	3,519	0.0%
55-Commercial Blvd Local	2,032	2,032	0.0%
56-Welleby Plz-109 A-Sunrise Local	327	327	0.0%
60 – Andrews Ave and Coconut Creek Pkwy Local	3,311	3,311	0.0%
62-McNab Rd Local	1,691	1,690	-0.1%
72-Oakland Park Blvd Local	6,466	6,467	0.0%
81-Broward Terminal - West Terminal Local	2,745	2,746	0.0%
83-Copans Rd/Royal Palm Blvd Local	933	932	-0.1%
88-Pine Island Rd Local	640	640	0.0%
Total	**87,919**	**87,758**	**-0.2%**

Step C STOPS Analysis

Once the STOPS model was calibrated for Broward County, it was used in analyzing the potential transit corridors identified at the conclusion of Step B. The model outputs were used as a data source for the Step C evaluation criteria outlined in the PREMO Goals, Objectives, Process, and Performance Report. The intent of this step was to evaluate the total transit demand within a given corridor. As a result, the alternatives were fully optimized to create a "best case" scenario. For example, parking restrictions at PREMO stops were removed. Even though it was recognized that a vast majority of stops would have little to no parking, not capping parking helped to identify any latent Park-and-Ride (PNR) or Kiss-and-Ride (KNR) needs and moreover was useful in the evaluation of the total ridership demand across all trip types (walk access, transfer, PNR, and KNR). For the Step C model application, the following is a set of general assumptions that were used as a basis for corridor travel demand forecasting:

- An average premium transit speed of 25mph (mode neutral)
- Fixed guideway (FG) setting of 1.0
- An average station spacing of one half-mile
- Maximize PNR Type 1 access at all stations
- Transit signal priority (TSP) at major intersections, reducing the amount of time the transit vehicle queued at intersections resulting in 12% reduction in total travel time
- Existing background transit network
- Service frequency with 15-minute headways

3.2.2 Isochrone Analysis

An isochrone analysis calculates how far a rider can travel in a set amount of time using transit. The PREMO Team used this analysis to measure the Initial Corridors for their ability to reach destinations throughout the county in 30 minutes, given a potential investment in premium transit. This 30-minute travel time was calculated using the PREMO network and the existing BCT transit network. The corridors were divided into approximately three-mile segments representing five-minute premium transit travel time. The analysis then used a specialized GIS software that integrates GIS data, such as network distances and travel times based on the actual shape of the road network, with demand modeling and logistics functionality to calculate the volume of employment, activity centers, and affordable housing accessible within a 30-minute transit travel distance.

In Step C, the isochrone analysis results were compared to the station boarding activity to determine level of benefit and activity of ridership within each 3-mile segment.

3.2.3 Matching Transit Types to Corridor Demand

Step C evaluates a transit type's (BRT and LRT) ability to effectively serve the ridership demand along each corridor. This was accomplished by using the forecasted ridership demand and the FTA cost effective project rating criteria to:

- Determine an appropriate order-of-magnitude capital investment for each corridor that meets the expected demand and is competitive for federal funding
- Match the transit type that can be constructed to serve the ridership demand and align with demand driven order-of-magnitude capital investment

The FTA provides discretionary transit funding opportunities through the Capital Investment Grants (CIG) program. Using the FTA Capital Investment Grant Cost Effectiveness Project Rating Guidelines and the results of Step C ridership forecasts, PREMO assessed the most effective transit type for serving the potential ridership demand for each corridor. FTA was

effectiveness rating which is ten dollars per trip for FTA New Starts applications and five dollars per trip for FTA Small Starts applications, or better.

Step C, using FTA cost effectiveness guidance for federal funding support, evaluated each transit type's ability to serve demand by using the following calculation:

LRT

1. Multiply a **$10 annual cost per trip** by **annual ridership** to calculate the **annual project capital *"budget"*** which is competitive for federal CIG **New Starts** funding
2. Multiply the **annual capital *"budget"*** by a 30 Year project life span to calculate the **total project capital "budget"** that is competitive for federal **New Starts** CIG funding
3. Subtract **30 years of estimated operating** expenses from the **total project capital "budget"** and divide by the total length of the project (miles) to calculate the **PREMO capital budget per mile**

BRT

1. Multiply a **$5 annual cost per trip** by **annual ridership** to calculate the **annual project capital *"budget"*** which is competitive for federal CIG **Small Starts** funding
2. Multiply the **annual capital *"budget"*** by a 30 Year project life span to calculate the **total project capital "budget"** that is competitive for federal **Small Starts** CIG funding
3. Subtract **30 years of estimated operating** expenses from the **total project capital "budget"** and divide by the total length of the project (miles) to calculate the PREMO capital budget per mile

4. Step C Results

4.1 Step C Shortlist Corridor Results

Using the methodology described, PREMO used the forecasted ridership demand to determine the appropriate level of capital investment for each Recommended Corridor. Once this appropriate level of capital investment was defined, the transit type that best serves the demand and the appropriate level of investment was identified. The information presented within the following sections describes the boarding activity per station and 3-mile corridor segments and their corresponding isochrone analysis results. Table 11 includes the breakpoints for the Step C analysis.

Table 11: Step C Analysis Data Breakpoints

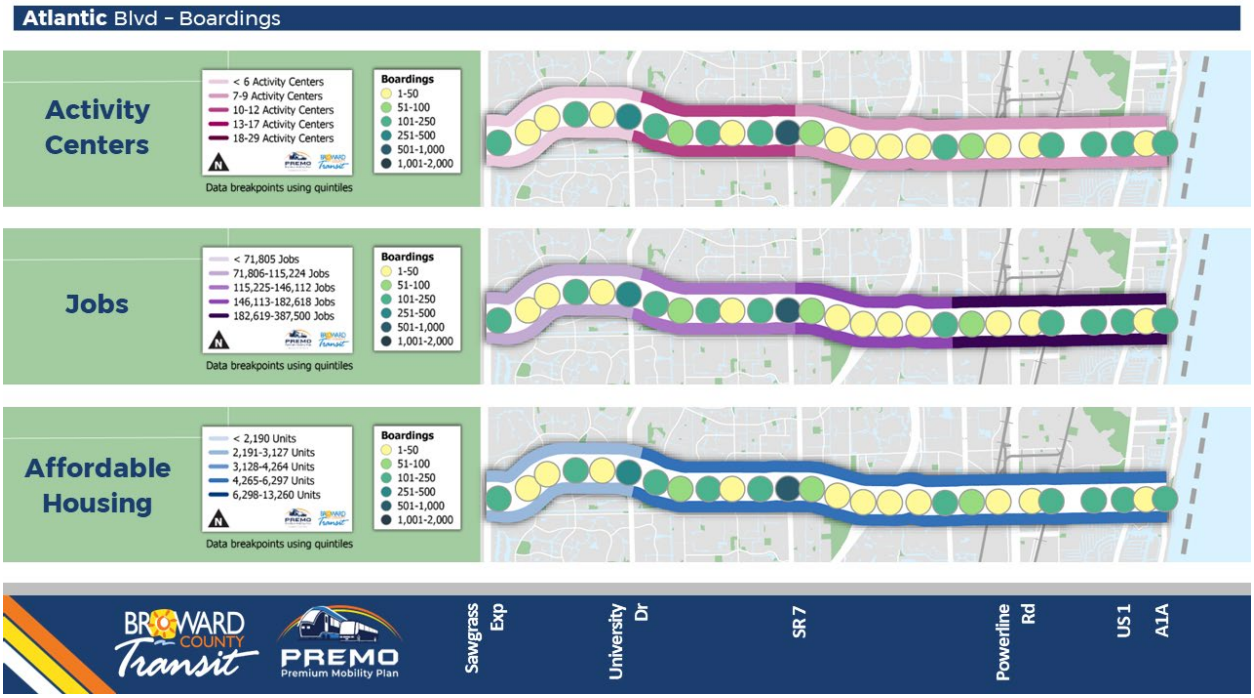
Station Boarding Activity (STOPS)	Isochrone – Regional Activity Centers Served Within Each 3-mile Segment	Isochrone – Jobs Served Within Each 3-mile Segment	Isochrone – Affordable Housing Served Within Each 3-mile Segment
1-50	0-6	0-71,805	0-2,190
51-100	7-9	71,806-115,224	2,191-3,127
101-250	10-12	115,225-146,112	3,128-4,264
251-500	13-17	146,113-182,618	4,265-6,297
501-1,000	18-29	182,619-387,500	6,298-13,260
1,001-2,000	>29	>387,500	>13,260

The following sections describe boardings per stop and rider access activity centers, jobs, and affordable housing (isochrone analysis results) for each of the shortlisted corridors. Once the initial analysis was completed, coordination with BCT helped to shape the recommendations for Step D analysis. Table 12 summarizes the results of the Step C assessment of transit type, input from BCT staff, and recommendations for Step D analyses.

4.1.1 Atlantic Boulevard

As Figure 11 shows, the highest boardings are from University Drive to SR 7 and west of Powerline Road to A1A. However, there are also higher boardings on the western end of the corridor near SR 869. Activity center access is highest from University Drive to SR 7, while jobs and affordable housing access is highest from University Drive to A1A. The technical results show the entire length, from SR 869 to A1A, could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

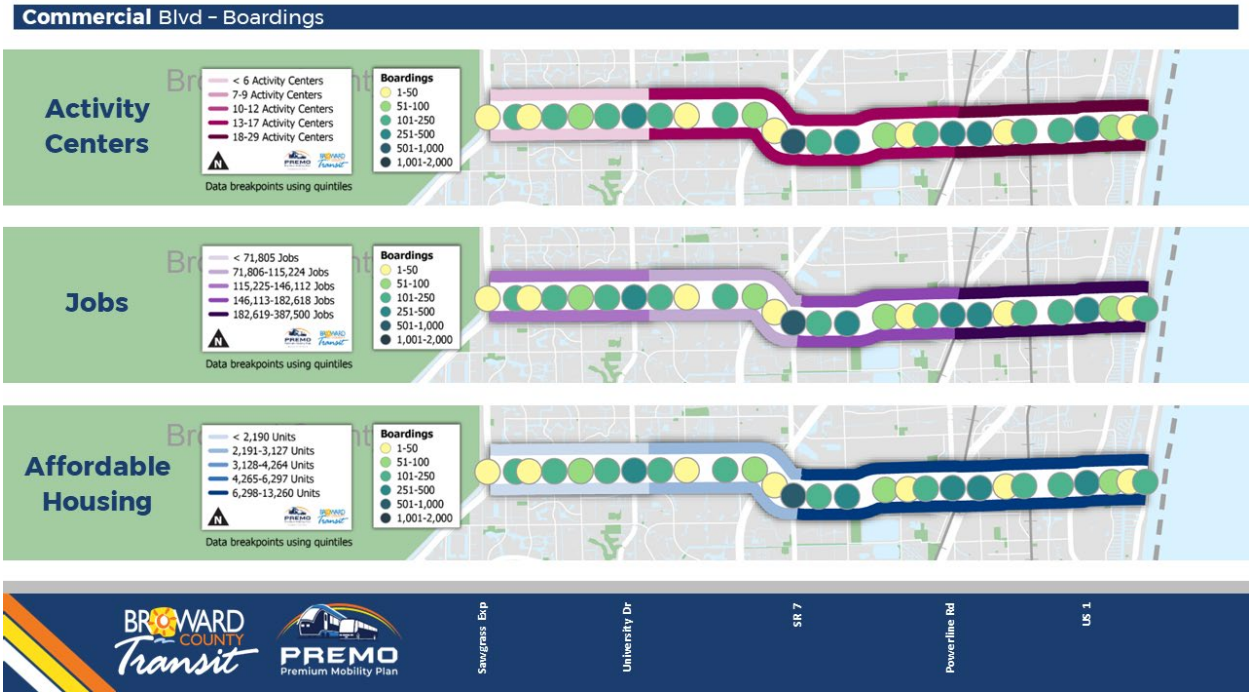
Figure 11: Atlantic Boulevard Isochrone Analysis Results



4.1.2 Commercial Boulevard

As Figure 12 shows, the highest boardings are from University Drive to A1A. However, there are also higher boardings on the western end of the corridor near the Sawgrass Expressway. For jobs and affordable housing, access is highest between SR 7 and A1A, with activity center access highest between University Drive and A1A. The technical results show the entire length, from SR 869 to A1A could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 12: Commercial Boulevard Isochrone Analysis Results



4.1.3 Dixie Highway

As Figure 13 shows, the highest boardings are from Hollywood Boulevard to Sample Road. This coincides with access to activity centers, jobs, and affordable housing. The technical results therefore show Hollywood Boulevard to Sample Road could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor and LRT in the central portion of the corridor.

Figure 13: Dixie Highway Isochrone Analysis Results

4.1.4 Douglas Road/Pine Island Road

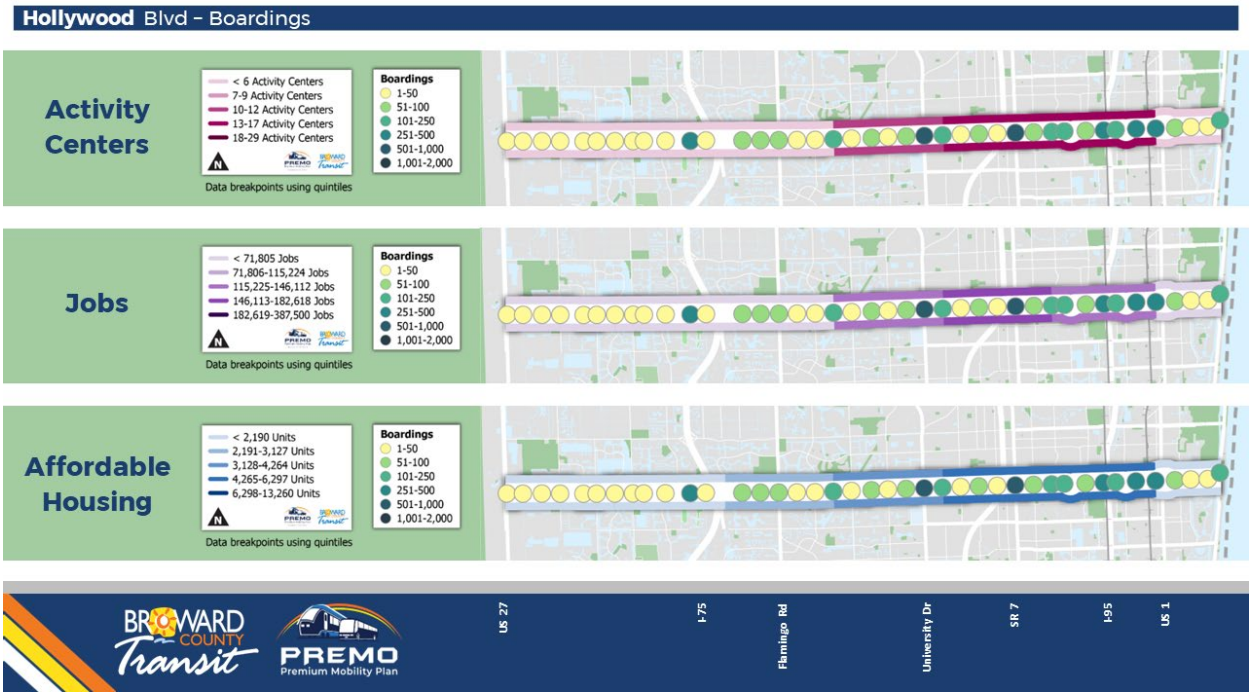
As Figure 14 shows, the boardings are moderate along a majority of the corridor from Miramar Parkway to Sample Road, with fewer boardings between Hollywood Boulevard and Griffin Road. Activity center access is highest between I-595 and Commercial Boulevard. Affordable housing access is highest between Broward Boulevard and Commercial Boulevard and south of Griffin Road, while jobs have the highest access between I-595 and Oakland Park Boulevard. The technical results show the portions from Miramar Parkway to Hollywood Boulevard and Griffin Road to Sample Road could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 14: Douglas Road/Pine Island Road Isochrone Analysis Results

4.1.5 Hollywood Boulevard

As Figure 15 shows, the highest boardings are from University Drive to US 1, with moderate boardings between I-75 and University Drive. Access to activity centers and jobs is highest between Palm Avenue and US 1, while affordable housing access is highest from just east of I-75 to US 1. The technical results show I-75 to US 1 could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 15: Hollywood Boulevard Isochrone Analysis Results



4.1.6 Lyons Road/31st Avenue

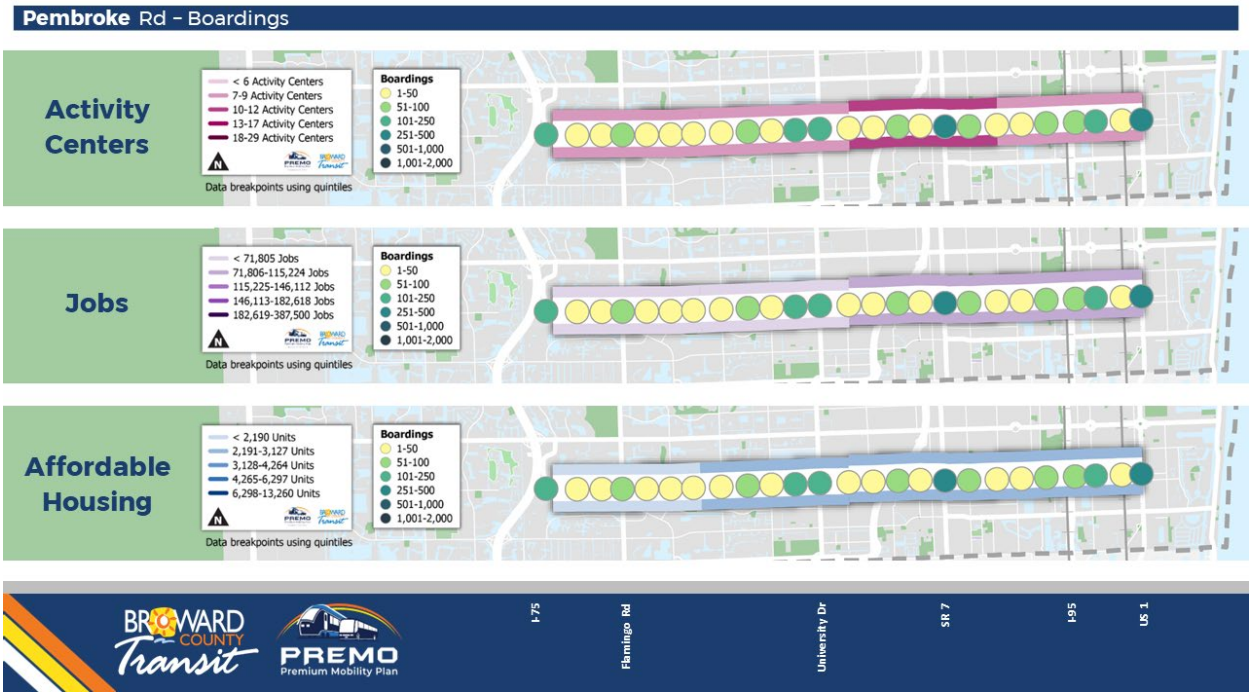
As Figure 16 shows, the highest boardings are from Davie Boulevard to SR 869. Access to jobs and affordable housing is highest from Sunrise Boulevard to SR 869, while access to activity centers is highest between Davie Boulevard and Sample Road. The technical results show Davie Boulevard to SR 869 could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 16: Lyons Road/31st Avenue Isochrone Analysis Results

4.1.7 Pembroke Road

As Figure 17 shows, the highest boardings are from University Drive to US 1, with light to moderate boardings between I-75 and University Drive. Access to activity centers is high along the entire corridor, but highest from east of University Drive to east of SR 7. Access to jobs and affordable housing is moderate on the east end of the corridor. The technical results show University Drive to US 1 could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 17: Pembroke Road Isochrone Analysis Results



4.1.8 Powerline Road

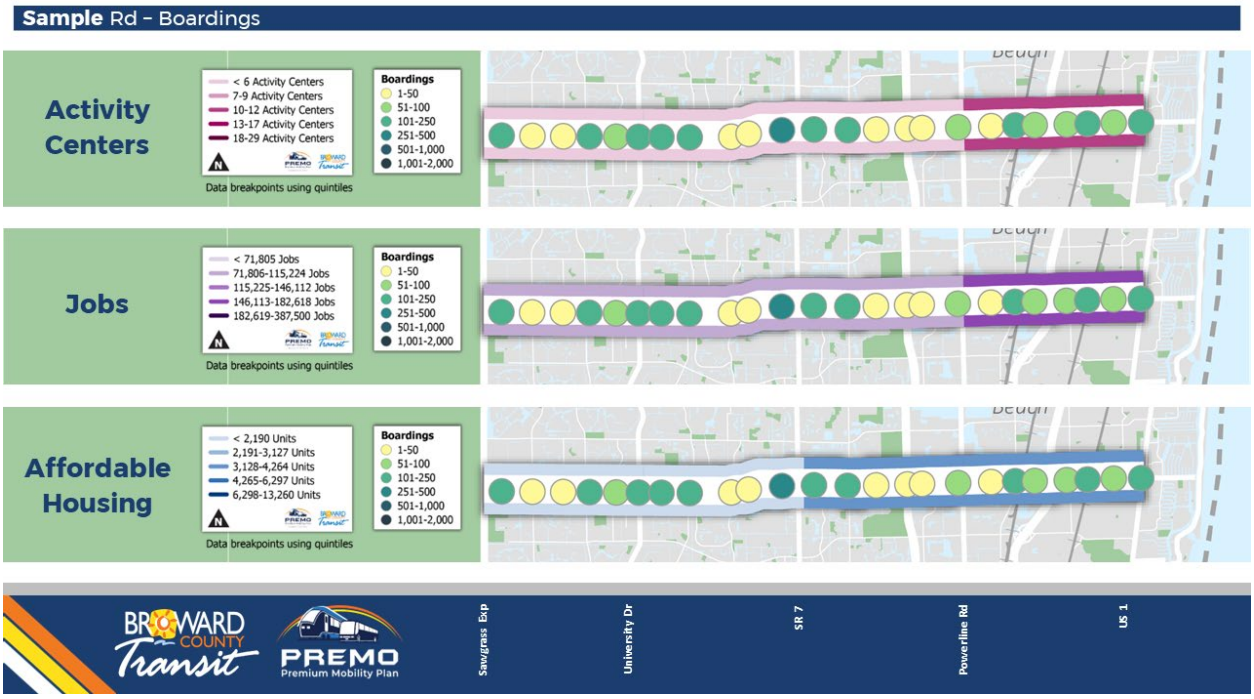
As Figure 18 shows, the highest boardings are from Broward Boulevard to Sample Road. This coincides with the access to activity centers, jobs, and affordable housing, which are all highest along this portion of the corridor. The technical results show Broward Boulevard to Sample Road could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 18: Powerline Road Isochrone Analysis Results

4.1.9 Sample Road

As Figure 19 shows, the highest boardings are from University Drive to US 1, with moderate boardings between SR 869 and University Drive. Access to activity centers is highest between Pembroke Road and US 1. Access to jobs is high along the entire corridor, but highest from Pembroke Road to US 1. Access to affordable housing is highest from SR 7 to US 1, and moderate on the west end of the corridor. The technical results show between University Drive and US 1 could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

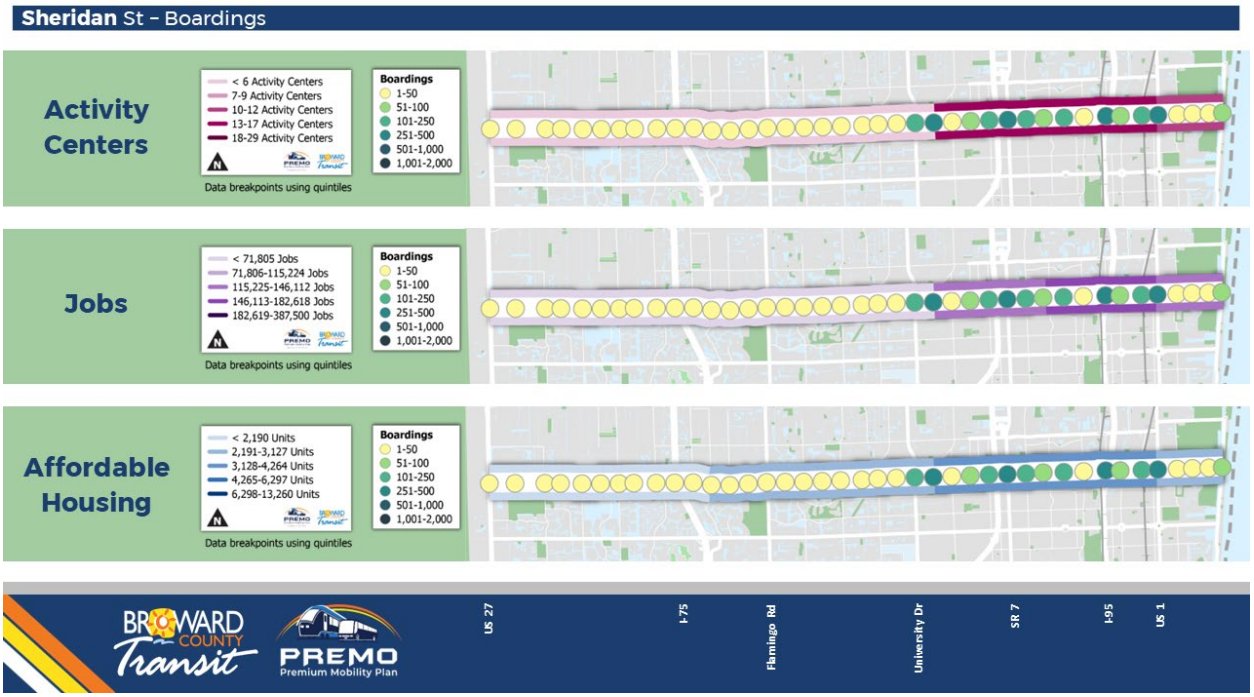
Figure 19: Sample Road Isochrone Analysis Results



4.1.10 Sheridan Street

As Figure 20 shows, the highest boardings are from University Drive to US 1, with moderate boardings between US 1 and A1A. Access to activity centers, jobs, and affordable housing is high along the east of University Drive, with moderate access to affordable housing between I-75 and University Drive. The technical results show between University Drive and US 1 could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

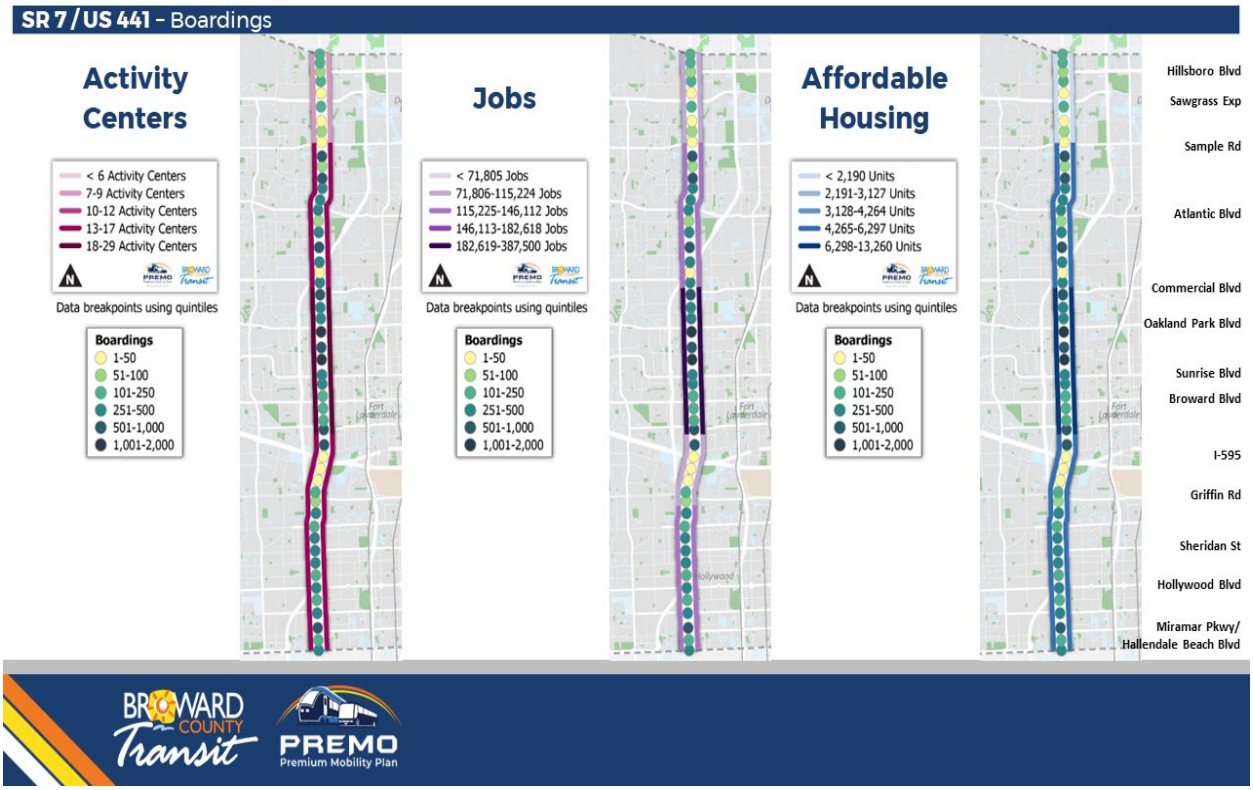
Figure 20: Sheridan Street Isochrone Analysis Results



4.1.11 SR 7/US 441

As Figure 21 shows, the highest boardings are from the Broward/Miami-Dade County Line to Sample Road. This coincides with the access to activity centers. Access to jobs and affordable housing is highest between I-595 and Commercial Boulevard, with moderate access south of I-595 and north of Commercial Boulevard. The technical results show SW 41st Street (near the county line) to Sample Road could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor and LRT in the central portion of the corridor.

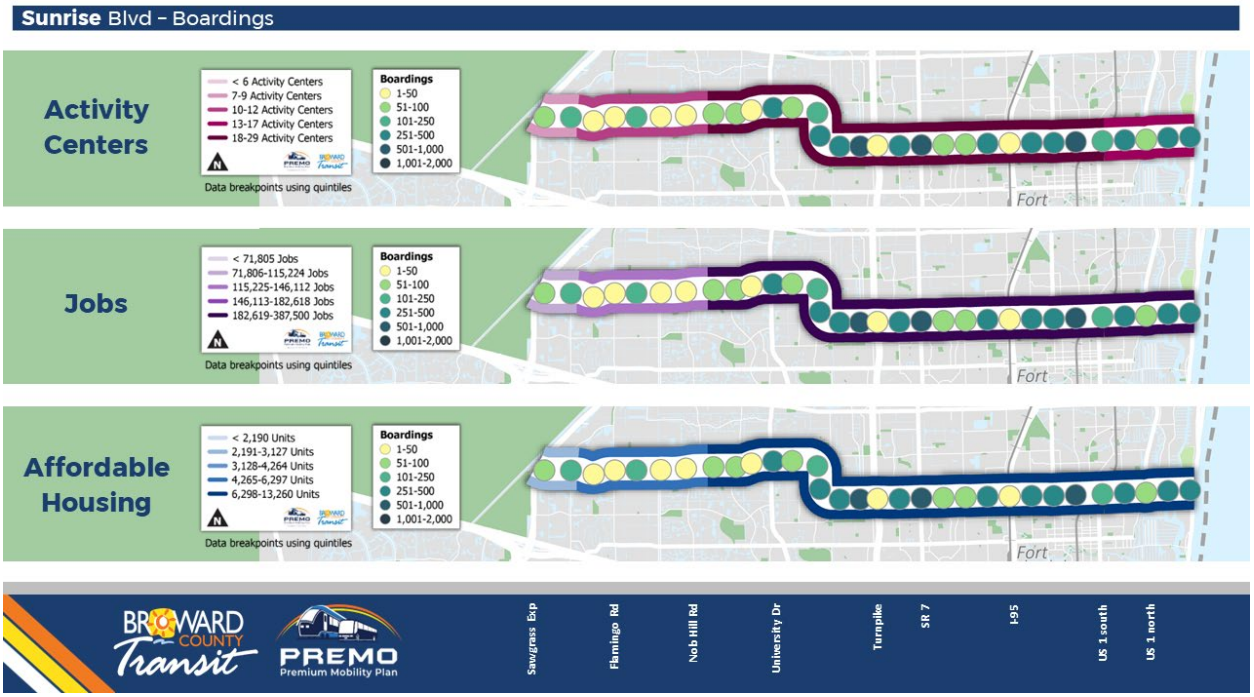
Figure 21: SR 7 / US 441 Isochrone Analysis Results



4.1.12 Sunrise Boulevard

As Figure 22 shows, the highest boardings are from University Drive to A1A, with moderate boardings near SR 869. Access to activity centers, jobs, and affordable housing is highest east of Nob Hill Road, and moderate to the west. The technical results show the entire corridor from SR 869 to A1A could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 22: Sunrise Boulevard Isochrone Analysis Results



4.1.13 University Drive

As Figure 23 shows, the highest boardings are from the Broward/Miami-Dade County Line to Sample Road. Access to activity centers is highest between I-595 and Sample Road and the county line to Sheridan Street, and moderate between Hollywood Boulevard and I-595 and Sunrise Boulevard to Atlantic Boulevard. Access to jobs is moderate along the entire corridor. Access to affordable housing is highest from the county line to Commercial Boulevard. The technical results show Miramar Parkway to Sample Road could be appropriate for premium service. The forecasted ridership demand is expected to support BRT in this corridor.

Figure 23: University Drive Isochrone Analysis Results

4.1.14 US 1/Federal Highway

As Figure 24 shows, the highest boardings are from the Broward/Miami-Dade County Line to Sample Road. Access to activity centers is high along the entire corridor. Access to affordable housing and jobs is highest from the county line to Sample Road, with moderate access north of Sample Road. The technical results show Hallandale Beach Road to Copans Road south of Atlantic Boulevard could be appropriate for premium service. The forecasted ridership demand is expected to support BRT and LRT in this corridor.

Figure 24: US 1/Federal Highway Isochrone Analysis Results

Table 12: Step C Recommended Corridors and Suitable Transit Type

Corridor Name	Limits	Miles	Annual Ridership Demand *(Linked Trips)	Transit Type	Appropriate Level of Capital Investment Based on Demand	Does this Transit Type Serve the Demand and the Appropriate Level of Capital Investment?
Atlantic Blvd	SR 869 to A1A	13	980,000	BRT	$4 Million per Mile	Consider High Frequency Bus
				LRT	$10 Million per Mile	No
Commercial Blvd	SR 869 to A1A	13	1,260,000	BRT	$7 Million per Mile	Yes
				LRT	$17 Million per Mile	Evaluate high performing segments
Dixie Hwy	Hollywood Blvd to Sample Rd	25	4,530,000	BRT	$19 Million per Mile	Yes
				LRT	$41 Million per Mile	Study Further
Douglas Rd/Pine Island Rd	Miramar Pkwy to Hollywood Blvd Griffin Rd to Sample Rd	2 15	1,700,000	BRT	$2 Million per Mile	Consider High Frequency Bus or removing from further study
Hollywood Blvd	I-75 to US 1	20	1310,000	BRT	$2 Million per Mile	Consider High Frequency Bus
				LRT	$6 Million per Mile	No
Lyons Rd/ 31st Ave	Davie Blvd to SR 859	16	2,190,000	BRT	$12 Million per Mile	Yes
				LRT	$28 Million per Mile	No
Pembroke Rd	University Dr to US 1	12	650,000	BRT	Less than $1 Million per Mile	Consider removing from further study
				LRT	$4 Million per Mile	

Table 12: Step C Recommended Corridors and Suitable Transit Type

Corridor Name	Limits	Miles	Annual Ridership Demand *(Linked Trips)	Transit Type	Appropriate Level of Capital Investment Based on Demand	Does this Transit Type Serve the Demand and the Appropriate Level of Capital Investment?
Powerline Rd	Broward Blvd to Sample Rd	14	1,470,000	BRT	$ 8 Million per Mile	Yes
				LRT	$ 18 Million per Mile	No
Sample Rd	Pine Island Rd to US 1	12	760,000	BRT	$ 2 Million per Mile	Consider High Frequency Bus
				LRT	$ 7 Million per Mile	No
Sheridan St	University Dr to A1A	20	840,000	BRT	Less than $1 Million per Mile	Consider High Frequency Bus
				LRT	Less than $1 Million per Mile	No
SR 7/US 441	SW 41st St to Sample Rd	25	4,940,000	BRT	$ 22 Million per Mile	Yes
				LRT	$ 46 Million per Mile	Evaluate high performing segments
Sunrise Blvd	SR 869 to A1A	15	6,765	BRT	$ 9 Million per Mile	Yes
				LRT	$ 23 Million per Mile	Evaluate high performing segments
University Dr	Miramar Pkwy to Sample Rd	21	8,440	BRT	$ 8 Million per Mile	Yes
				LRT	$ 19 Million per Mile	Evaluate high performing segments
US-1/Federal Hwy	Hallandale Beach Blvd to Copans Rd	22	12,221	BRT	$ 16 Million per Mile	Yes
				LRT	$ 35 Million per Mile	Evaluate high performing segments