Los Angeles County
Metropolitan Transportation Authority

visioning BRT

BUS RAPID TRANSIT VISION & PRINCIPLES STUDY

Metro®

Final Report
November 2020

Table of Contents

List of Tables

List of Figures

Executive Summary

In November 2016, LA County voters passed Measure M, a half-cent sales tax measure that provides funding for mobility projects, including a total of four specific Bus Rapid Transit (BRT) projects, as well as a countywide BRT program to deliver additional BRT projects with funding available in each of the next five decades.

With Metro and municipal transit agencies poised to make major BRT investments, the BRT Vision & Principles Study was undertaken to establish a cohesive set of guidelines and standards to direct Metro investment in on-street BRT projects. The majority of Metro's existing BRT guidance pertains only to projects constructed on exclusive right-of-ways, such as the L line (Orange Line). As such, this study establishes a local definition of BRT, supportive design guidelines and identifies the corridors where BRT can best meet Metro mobility goals as defined in the Vision 2028 Strategic Plan. The adoption of these BRT guidelines and standards will ensure a high-quality customer experience for our transit patrons, while increasing transparency with our local agency partners and our community stakeholders by clarifying the types of street improvements required to deliver a BRT project. In addition, the study further identifies and prioritizes strong BRT candidate corridors based on indicators of service demand, equity and capacity for BRT supportive elements.

Overall, the BRT Vision & Principles Study generated the following guiding deliverables:

> Metro BRT standards

> Metro Design Guidelines Manual

> Final Report with a recommended list of potential BRT corridors

The BRT Vision & Principles Study was conducted through close coordination with the following separate but parallel Metro efforts to enhance bus service and improve mobility in the region: the Long Range Transportation Plan (LRTP), the NextGen Bus Plan and the Bus Speed Improvement Working Group. The coordinated effort ensured that future plans for BRT systems and bus lane improvements were in close alignment.

Study Purpose, Vision, Guiding Principles, Goals & Objectives

The purpose of this study is to provide a foundational definition of BRT that sets high performance standards, while establishing clear eligibility criteria for Measure M Countywide BRT program funds. This study helps improve LA County's public transit network and ensures that BRT will fulfill a distinct role as a mode of transportation that enhances and integrates with existing LA County mobility services and future mobility hubs, as part of the world-class transportation system envisioned for all Metro customers. This purpose is supported by the study's vision statement, "BRT-the Convenient Choice for Connecting Customers and Communities" and the guiding principles on the following page.

TABLE 1: BRT VISION & PRINCIPLES STUDY - GUIDING PRINCIPLES

Guiding Principles	Description
World-class	Offer exceptional service, operations and amenities that enhance the customer experience.
Equitable	Focus on on understanding and meeting the mobility needs of underserved communities.
Customer-centric	Prioritize the needs of our customers over public agency challenges and constraints.
Reliable	Run on time, eliminates bus bunching and provides accurate, real-time information.
Safe and Secure	Operate safely and has secure stations and vehicles with proper lighting and visible security measures.
Integrated and Connected	Seamlessly connect people and places with existing and planned transportation services across the region.
Community-focused	Promote and support vibrant communities around transit through community investment, including walking and biking infrastructure.

The following goals were developed to guide implementation of the LA County BRT Network:

> Provide an attractive, convenient and reliable mode choice that is a safe, secure, inviting and comfortable experience for all users for the entire trip.

> Fulfill a distinct role that enhances and integrates with existing mobility services.

> Connect people to where they need and want to go.

> Operate at high-performance levels allowing users to bypass congestion.

> Provide excellent infrastructure, vehicles, amenities and customer service.

> Consider community needs and enhance quality of life.

> Align design standards and service needs to maximize benefits.

In order to realize these goals, specific objectives were developed to detail the activities necessary to achieve them. These objectives informed several key areas of the study, including BRT standards, performance indicators, design guidelines and corridor selection. (Refer to **TABLE 5:** BRT GOALS & OBJECTIVES)

BRT Standards

Standards provide the foundational definition of BRT. The standards define which types of bus improvements and performance standards, and at what thresholds constitute a BRT project. The purpose of the standards is to provide guidance for Metro BRT projects and establish eligibility criteria for Measure M BRT program funds.

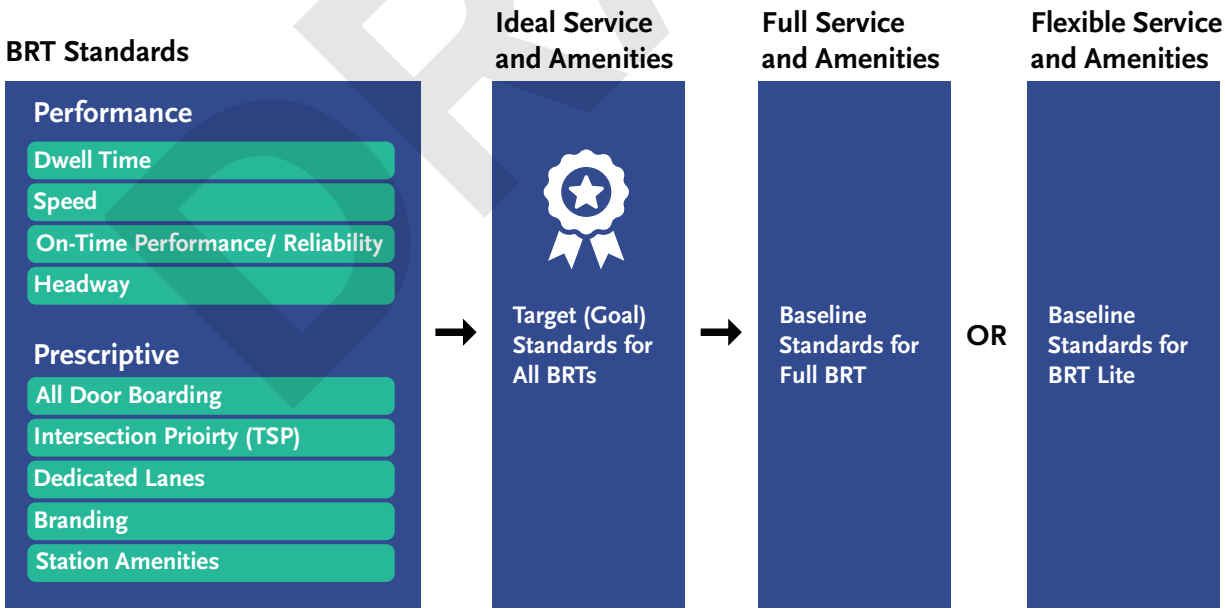
These standards are further organized and defined in two distinct tiers, Full BRT and BRT Lite, that set an "ideal" and mimum level of service which are also separated into performance and prescriptive based standards. These are further delineated by tiers of performance (speed, dwell time, headway and on-time) and prescriptive-based standards (all-door boarding, intersection priority, dedicated lanes, branding and station amennities). (Refer to **FIGURE 1:** BRT VISION & PRINCIPLES STUDY - GUIDING PRINCIPLES)

The differentiation in standards is not only to provide for context sensitive solutions in a county as large as Los Angeles, but also in recognition that service performance should drive infrastructure investment. In this way, performance-based standards necessitate the use of prescriptive standards to achieve the requisite performance levels identified in the BRT standards.

TABLE 2: ORGANIZATION OF BRT STANDARDS

Standard	Description
Headway	Average interval of time between vehicles.
Speed	Average corridor speed inclusive of dwell time with provisions for percent improvement over existing speeds.
On-time Performance/ Reliability	Percentage of on-time arrival at stations.
Dwell Time	Average time per person per boarding or average per station.
Dedicated Lanes	Percentage of corridor with dedicated bus lanes.
Intersection Priority	Percentage of signals in a corridor with active signal priority.
Station Amenities	Expressed as percentage of stations that provide specific amenities at each stop.
All-door Boarding	Provided on vehicles and available at all stations.
Branding	Design and logo distinguishing BRT from local service.

FIGURE 1: BRT VISION & PRINCIPLES STUDY - GUIDING PRINCIPLES



All standards, both performance and prescriptive, result in better transit performance independently. However, various combinations can produce synergist improvements. Therefore, comparing Full BRT versus BRT Lite might result in similar overall benefits with Full BRT having the highest overall benefit.

The following are categorical benefits expected from both Full BRT and BRT Lite:

> Improved Travel Times

> Quick Boarding and Alighting

> Brand Recognition

> Station Amenities

And the following tools will enable improved travel times for both Full BRt and BRT Lite:

> Improved or Dedicated Running Ways

> Intelligent Transportation Systems (ITS)

> Intersection Priority (TSP)

BRT Design Guidelines

The following BRT design guidelines align with the BRT vision, goals and objectives, and draw on best practices from BRT systems across North America and around the world. The BRT Design Guidelines Manual, a separate companion document to this final report, provides recommendations on six interconnected aspects of BRT:

> Stations and Platforms

> Running Ways

> ITS

> Operations

> Branding

> Transit-oriented Communities (TOCs)

These design guidelines are flexible enough to address potential site-specific constraints and/or applicable local ordinances. They will be used by Metro in updating its existing BRT Design Criteria Manual, and by municipal transit agencies wishing to run new BRT lines under Measure M's BRT Program, facilitating the implementation of the county's next iteration of BRT services.

BRT Corridors

The screening and selection process was designed to identify the corridors where BRT is best deployed as a mobility solution. These have characteristics that include an optimal intersection of need and opportunity, meaning that there is not only a demand for service, but the corridor contains the requisite characteristics to support BRT infrastructure.

The main features Metro considers of primary importance in this selection include: service demand, regional connectivity, along with an opportunity to improve bus speeds, supportive infrastructure and equity. Three primary sources were used to identify potential corridors:

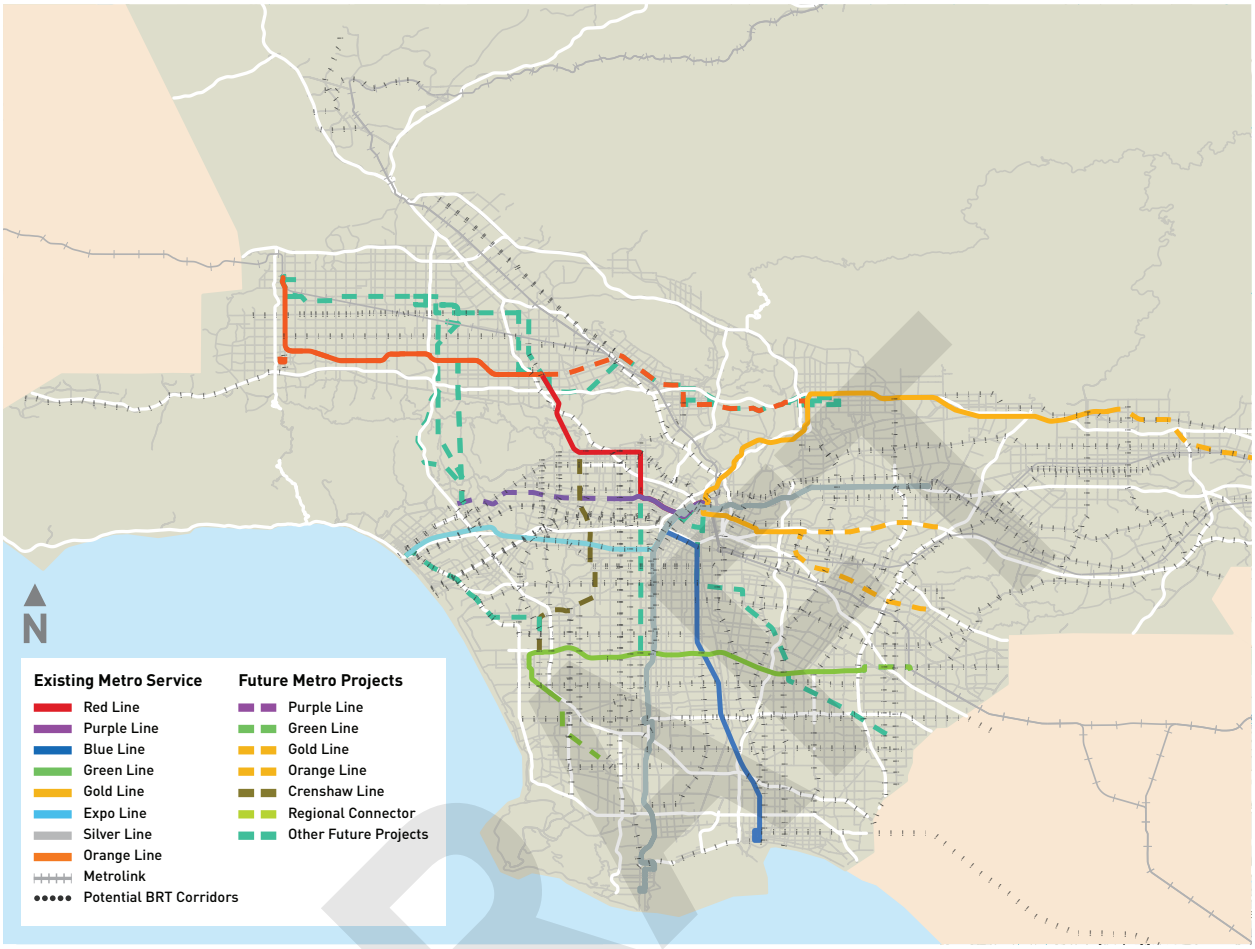
> BRT candidate corridors identified in recent planning studies and efforts by Metro

> Direct input from the project's targeted stakeholders

> Use of a parametric design tool to identify promising corridors not identified through the efforts mentioned above

The map on the following page depicts the universe of potential BRT corridors.

FIGURE 2: UNIVERSE OF POTENTIAL BRT CORRIDORS IN LOS ANGELES COUNTY



Corridor Screening Process

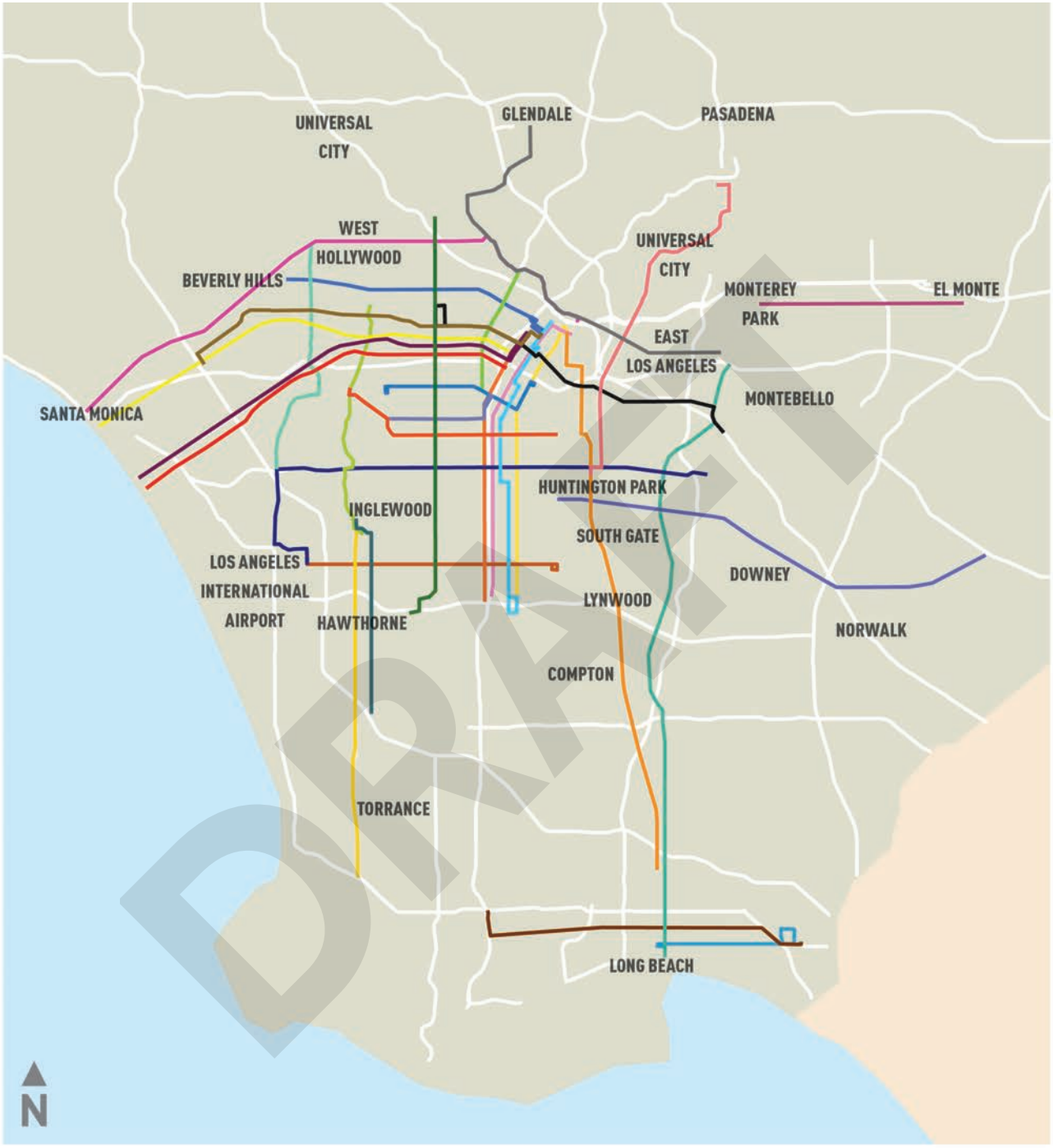
Given the large number of corridors a three-level screening process was used, wherein each successive screening level introduces additional data to arrive at a prioritized set of corridors.

Level 1 Screening

To begin the evaluation process, all potential corridors were reviewed for "fatal" flaws and either eliminated from consideration or their routing was adjusted. After this initial screening/refinement, the remaining corridors were loaded into the parametric model that analyzed network connectivity, land use, points of interest, demographics and Metro's Equity Focus Community (EFC)[1] metric. The model compared the area within ¼ mile of each corridor relative to the area along every other corridor and generated a score for each option. A total of 30 corridors, shown on the following map, were selected for Level 2 analysis.

1 As part of the LRTP, Metro has defined "Equity Focus Communities" (EFCs) as communities representing geographic areas that have the following socioeconomic characteristics; more than 40% of households are low-income and either 80% of households are non-white or 10% have no access to a vehicle.

FIGURE 3: TOP 30 BRT VISION & PRINCIPLES STUDY CORRIDORS MAP



BRT Highest Ranked 30 Corridors

- 3rd Street
- 7th Street
- Alvarado/Hoover
- Anaheim
- Atlantic
- Avalon Blvd
- Broadway
- Century
- Figueroa
- Florence - Whittier
- Garvey
- Hawthorne
- Jefferson
- Jefferson/Slauson
- La Brea
- La Cienega Culver City
- Long Beach Blvd
- MLK
- Main
- Olympic
- Pico
- Prairie
- Santa Monica
- Soto
- Sunset
- Venice Blvd
- Vernon
- Washington Mid City
- West Olympic
- Western to Green Line

Level 2 Screening

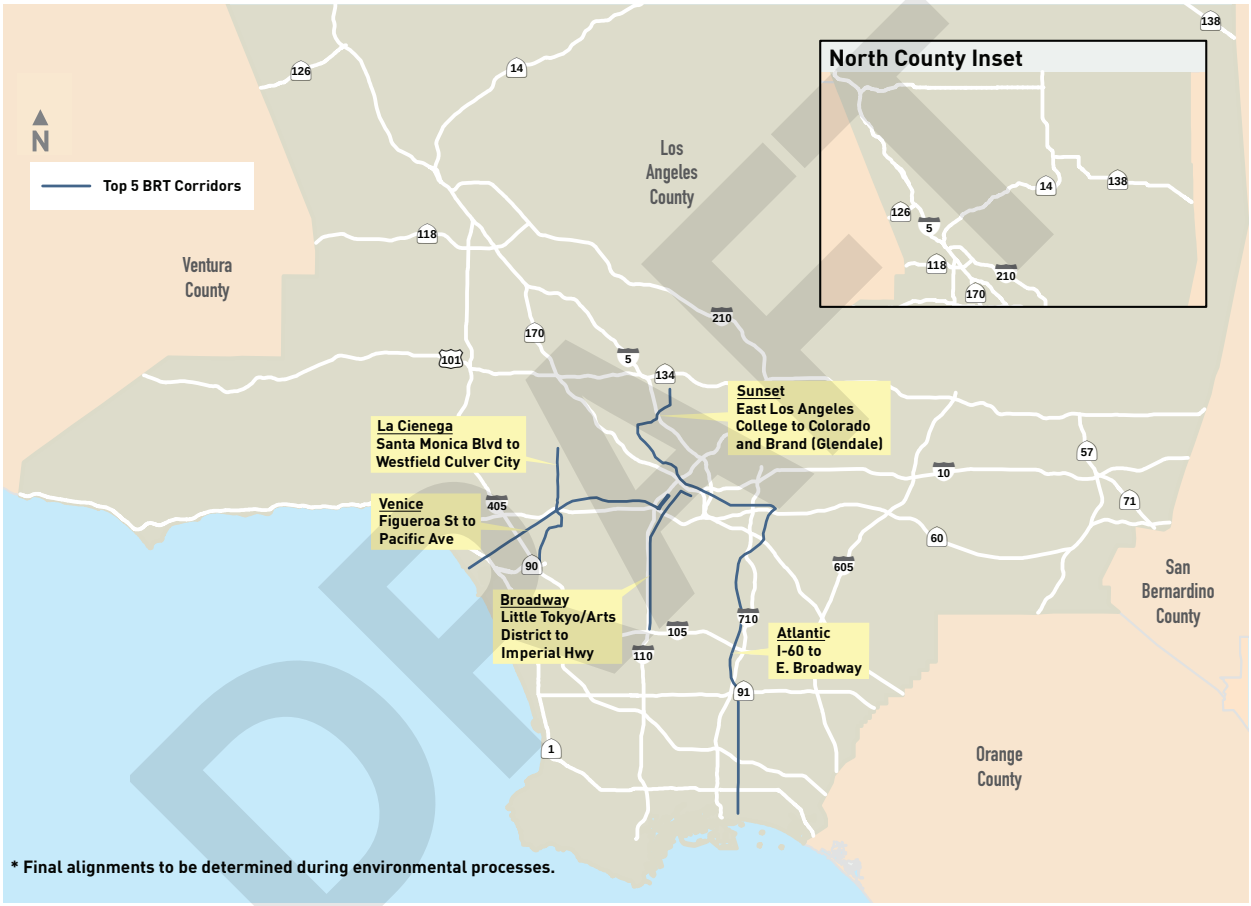
The 30 most promising corridors identified in the Level 1 screening were put through a second level of parametric analysis with additional criteria added, including: supporting TOCs, trip length, travel delay, network connectivity, equity, corridor constructability and transit propensity (as developed through NextGen). This second screening was coupled with another visual inspection process, which allowed the team to identify any other attributes of or difficulties with the corridor that would assist in the identification of the most promising and best performing 15 corridors.

FIGURE 4: TOP 15 BRT VISION & PRINCIPLES STUDY CORRIDORS MAP

Level 3 Screening

The third and final screening process further reviewed the top 15 performing corridors with additional quantitative and qualitative analysis. Network connectivity, transit propensity and equity were carried forward from previous screening with new criteria including: qualitative evaluations of TOC and transit-friendly plans and policies in the corridors, a qualitative assessment of travel time savings potential, surveys of ground conditions, assessment of alignment with local government's specific modal vision for any identified corridor and input from key stakeholders. This final assessment identified the top five performing corridors to support future BRT service.

FIGURE 5: TOP FIVE BRT VISION & PRINCIPLES STUDY CORRIDORS MAP



Top Five BRT Corridors

Metro has identified the following as the top five candidates eligible for Measure M Countywide BRT program funds, including: Atlantic Blvd (East Los Angeles Gold Line terminus to Downtown Long Beach), Broadway (Little Tokyo Gold Line Station to Imperial Highway), Cesar Chavez/Sunset (Atlantic Blvd via Vermont/Los Feliz/Central to Broadway), La Cienega (Santa Monica Blvd via Obama/ Jefferson to Slauson), and Venice Blvd (Pacific Avenue via Flower Street to 7th Street). Each of these present excellent opportunities for BRT investment. Of these top five BRT corridors, Metro staff will present a recommendation to the Metro Board of Directors for the initial advancement of one these corridors into project development, subject to available funding. The balance of the remaining corridors would be eligible for Measure M Countywide BRT program funds in subsequent years as funding becomes available.

Atlantic

The Atlantic corridor provides high-capacity network coverage in Southeast LA County, from the San Gabriel Valley to the City of Long Beach, connecting cities and communities. When compared to the other top five corridors, this corridor has a moderate level of network connectivity and opportunity to build BRT-supportive infrastructure and realize travel time savings, although sidewalks are wide relative to other corridors, allowing more opportunity to build stations with Full BRT passenger amenities. Although this corridor has a comparatively low ridership score, it provides access to industrial jobs for lower-income workers, addressing Metro's equity goals.

Broadway

Broadway is a vibrant transit corridor with very high network connectivity and is also a NextGen Tier One corridor. When compared to the other top five corridors, this corridor had a very high score in the Equity Focus Community index and is a high-priority corridor per Los Angeles Department of Transportation's (LADOT) assessment. Broadway runs through two City of LA Community Plan areas which feature TOC and transit-supportive policies. This corridor has moderate level ridership and a moderate opportunity to build BRT-friendly infrastructure and realize travel time savings. A future alternatives analysis could consider both Broadway and Figueroa, which closely parallel each other and perform comparably.

La Cienega

The La Cienega corridor provides high-capacity north-south network coverage on the Westside, linking cities and communities, including West Hollywood, Beverly Grove, eastern Beverly Hills, Pico-Robertson and Culver City. It runs through three City of LA Community Plan areas, which feature or are being updated to feature TOC and transit-supportive policies. Culver City has recently completed a TOD Visioning Study, and West Hollywood has TOC-supportive policies in place that could support the implementation of a BRT on the La Cienega corridor. In comparison to the other top five corridors, La Cienega has a moderate-level opportunity to build BRT-friendly infrastructure and realize travel time savings. This corridor has a low network connectivity score, low ridership score, it is not a NextGen Tier One corridor and it has a low score in the Equity Focus Community Index.

Sunset

The Sunset corridor has a very high network connectivity score and connects downtown Los Angeles with the San Fernando Valley. Sunset is a NextGen Tier One corridor that runs through six City of LA Community Plan areas, which feature or are being updated to feature TOC and transit-supportive policies. When compared to the other top five corridors, this corridor has a moderate-level of ridership and a moderate-level opportunity to build BRT-friendly infrastructure and realize travel time savings.

Venice

Venice has a very high network connectivity score and a very high ridership score. Venice is a NextGen Tier One corridor with a high-level opportunity to build BRT-friendly infrastructure and realize travel time savings. This corridor has pedestrian-friendly features along much of its distance with a strong mix of land uses oriented to the street. The Venice corridor runs through seven City of LA Community Plan areas, which feature TOC and transit-supportive policies. Culver City has recently completed a Transit Oriented Development (TOD) Visioning Study, which includes Venice. Venice has communities with strong transit-supportive policies along corridor and it is an LADOT high-priority corridor.

Strategic BRT Network

The Strategic BRT Network is a complementary effort that builds on the top five BRT corridors. It is a strategic unfunded list of potential BRT projects that Metro or other local agency could pursue should additional funding become available. The Strategic BRT Network derives from the strong

candidate corridors that were identified in the multi-step screening process used to develop the top five corridors and applies a gap analysis to connect potential BRT corridors to Metro's existing and planned BRT and rail system. This network provides a roadmap for future BRT expansion in LA County that Metro or other local agencies could pursue should additional funding become available. Staff examined local city plans, Council of Governments studies, and other regional transportation plans to identify locally preferred transit corridors to assure alignment between our proposed corridors and those our local partners may have already identified. Input was also solicited on the network from local agency partners – including the study Technical Advisory Committee (TAC), as well as through individual meetings with local agencies and key stakeholders.

Conclusion and Next Steps

Metro is making unprecedented investments in our LA County mobility system, including specific investments in BRT. The work completed through the BRT Vision & Principles study establishes the necessary foundation to guide those BRT investments into the foreseeable future.

With three early potential BRT projects currently in some level of study, and more to follow, the completion of this work is timely and necessary. Upon Board approval, staff will proceed with the continued application of BRT standards and design guidelines to our BRT mobility corridor studies. In addition, staff will take the necessary steps to incorporate the design guidelines into select administrative and technical documents where necessary to ensure adherence to the adopted guidance. Staff will also present this top five list to the Metro Board for consideration, recommending that one of these corridors be taken into project development in the near-term, subject to available funding. With Board concurrence on a specific corridor, staff will return to the Board with recommended programming actions of Measure M Countywide BRT Program funds to advance one of the top five BRT corridors into project development, subject to available funding.

Background

BRT is generally defined as a high-quality bus service that provides fast, reliable and convenient service through the use of several key attributes, including, dedicated bus lanes, branded vehicles and stations, frequent service, intelligent transportation systems, and all-door boarding or off-board fare collection. These improvements allow BRT systems to minimize or avoid many of the delays typically experienced by local bus service and therefore have the potential to improve regional mobility, reduce transportation costs, and ease commutes. Local examples of BRT service in LA County include the Metro G Line (Orange), serving the San Fernando Valley and the Metro J Line (Silver) serving El Monte, downtown LA and San Pedro.

While Metro has detailed design criteria to guide the development of BRT systems constructed in exclusive rights-of-way (such as the G Line), guidance for on-street BRT operations is limited. With Metro and municipal transit agencies poised to make major investment in BRT systems in the future, the BRT Vision & Principles Study was undertaken as a comprehensive effort to guide the development of future on-street BRT systems. This study expands on previous Metro BRT studies such as the 2013 LA County Bus Rapid Transit and Street Design Improvement Study (CBRT) to develop standards and design guidelines for on-street BRT systems and also refreshes prior corridor analyses with new data sets.

Metro's Current Transit Service[1]

Metro service includes a variety of transit modes that fulfill various connectivity and passenger needs, including five types of bus service and two types of rail service .

> **Bus** – The five types of bus service currently provided by Metro include:

- **Shuttle** – operates on local streets with closely spaced stops (0.25 mile) and predominantly serves riders traveling between neighborhoods
- **Local Service** – operates on major arterials with stops at least 0.25 miles apart and serves riders traveling inter-community
- **Rapid** – operates on the highest ridership corridors where demand warrants additional capacity beyond that offered by Local service
- **Express** – operates on major arterials and freeways with stops at least 1.25 miles apart and serves riders traveling between communities and regionally
- **BRT Service** – operates on either a dedicated right-of-way, a major arterial or in High-Occupancy Vehicle/High-Occupancy Toll lanes, and stops about 1.25 miles apart and serves riders traveling inter-community

> **Rail** –Both of Metro's rail options operate along dedicated right-of-way and are powered by electricity. There are a total of 93 stations in the system, each offering connections to Metro bus service. The two types of rail service currently provided by Metro include:

- **Heavy Rail** – a subway system that includes two lines, served by the D Line (Red) and the B Line (Purple)
- **Light Rail** – consists of four lines, A Line (Blue), C Line (Green), E Line (Expo) and the L Line (Gold)

The work completed through this BRT Vision & Principles study pertains exclusively to the BRT service category noted above.

1 This list does not include micro mobility and microtransit services, which are emerging Metro transit programs

Key Advantages of BRT

BRT is an assemblage of bus speed improvement strategies, operational enhancements and infrastructure that when combined, create a distinct mobility solution. The primary attributes that make BRT an attractive and distinct transit option for select corridors in LA County are:

> **Context Sensitivity -** Provides flexibility in the standards and design guidelines to accommodate the diverse needs of the various cities and transit operators in the region, while not diluting the overall operational and physical characteristics that distinguish BRT from regular or Rapid bus service.

> **Leverages Existing Infrastructure** - Presents the ability to use the streets and highways that are already accessible as right-of-way. If conditions change over time along a BRT route, it is possible to adjust alignments more readily than for LRT.

> **Cost-Effective -** Offers a cost-effective way to provide mass transit. Even at the highest levels of infrastructure investment, BRT is a fraction of the cost of both light and heavy rail options. Based on BRT projects currently in development by Metro, as well as a review of recently constructed BRT lines around North America, the cost per mile for BRT implementation falls roughly within the following ranges shown in **TABLE 3**.

TABLE 3: ESTIMATED RANGE OF COSTS PER MILE FOR A BRT IMPLEMENTATION

LOW RANGE ESTIMATE	MEDIUM RANGE ESTIMATE	HIGH RANGE ESTIMATE
$10-15 million/mile	$25-30 million/mile	$100+ million/mile
BRT Lite; about 20% of route has a dedicated running way, no or minimal right-of-way acquisition, no grade-separation	Full BRT; at least 50% of route has a dedicated running way; no or minimal right-of-way acquisition, no grade-separation	Full BRT; at least 80% of route has a dedicated running way; extensive right-of-way acquisition and/or grade-separation

Study Purpose

The BRT Vision & Principles Study develops a comprehensive vision for BRT project development, selection and operation in LACounty. BRT standards provide a foundational definition of BRT that not only sets high performance standards but establishes clear eligibility criteria for Measure M Countywide BRT program funds. Design guidelines assist Metro and other municipal transit operators in the planning, design and operation of an efficient and effective BRT system.

Performance indicators developed through the study provide the necessary tools to monitor system performance and customer satisfaction. A BRT corridor selection process has been developed that screens projects based not only on indicators of service demand and equity but on assessments of constructability. Finally, using the aforementioned tools, the study identifies and prioritizes corridors that are best suited for future BRT project development.

Project Vision & Guiding Principles

Given that there is some variability in national and international definitions of BRT and even within those definitions some latitude for variability in implementation, an initial vision and guiding principles was developed to orient all subsequent work. This initial step not only allowed for a pragmatic assessment of desired BRT outcomes but also allowed for the assessment of alignment with supportive Metro policies, such as Vision 2028 and the Equity Platform.

The five overarching goals of the Vision 2028 plan provided a customer-centric framework that was critical to crafting the vision for the BRT Vision & Principles Study. Similarly, the Metro Board's adopted Equity Framework provided guidance on considerations pertaining to vulnerable populations. The study team also considered parallel studies and guiding documents, such as the NextGen Bus Plan and the Long-Range Transportation Plan to ensure cohesion with their respective goals and objectives.

The vision statement chosen for the study is "BRT-the Convenient Choice for Connecting Customers and Communities." In addition to the vision statement, seven guiding principles were identified that influenced the development of goals for this project, shown in **TABLE 4** below.

Vision Statement: BRT-the Convenient Choice for Connecting Customers and Communities

Guiding principles were developed to assist the project stakeholders in expressing a common set of values. This study continued with a process that recognized the important attributes of BRT for LA County, based on these principles and through the creation of a set of goals and objectives which, in turn, supported the development of key performance indicators, standards and design guidelines for BRT.

TABLE 4: BRT GUIDING PRINCIPLES

Guiding Principles	Description
World-class	Offer exceptional service, operations and amenities that enhance the customer experience.
Equitable	Focus on on understanding and meeting the mobility needs of underserved communities.
Customer-centric	Prioritize the needs of our customers over public agency challenges and constraints.
Reliable	Run on time, eliminates bus bunching and provides accurate, real-time information.
Safe and Secure	Operate safely and has secure stations and vehicles with proper lighting and visible security measures.
Integrated and Connected	Seamlessly connect people and places with existing and planned transportation services across the region.
Community-focused	Promote and support vibrant communities around transit through community investment, including walking and biking infrastructure.

Project Goals & Objectives

Goals Tailored for the Region

Goals developed for this study express specific and desired outcomes for LA County BRT services and infrastructure. The purpose of the goals is to answer what we intend to accomplish or achieve with the BRT network, while ensuring alignment with the values expressed in the guiding principles. In this study, the goals directly influenced the development of objectives, performance measures and key performance indicators (KPIs). KPIs provide a mechanism of accountability for Metro and other municipalities and transit service providers as BRT projects work toward achieving the goals.

The following goals were developed to guide implementation of the LA County BRT Network:

> Our BRT will provide an attractive, convenient and reliable mode choice that is a safe, secure, inviting and comfortable experience for all users for the entire trip.

> Our BRT will fulfill a distinct role that enhances and integrates with existing mobility services.

> Our BRT will connect people to where they need and want to go.

> Our BRT will consistently operate at high-performance levels allowing users to bypass congestion.

> Our BRT will provide excellent infrastructure, vehicles, amenities and customer service.

> Our BRT will consider community needs and enhance quality of life.

> Our BRT will align design standards and service needs to maximize benefits.

Development of Objectives to Realize BRT Goals

In order to realize BRT goals, specific objectives were developed to detail the activities necessary to achieve the corresponding goal. The process allows for a more precise and fully measurable outcome that can be tracked over time where necessary. These objectives informed several key areas of the study, including BRT standards, performance indicators, design guidelines and corridor selection. **TABLE 5** includes the complete list of detailed objectives and related goals.

TABLE 5: BRT GOALS & OBJECTIVES

RELATED GOAL	OBJECTIVE
Our BRT will provide an attractive, convenient and reliable mode choice that is a safe, secure, inviting and comfortable experience for all users for the entire trip	Achieve a minimum 90% on-time arrival rate. Achieve excess wait time in the peak-period of no more than one minute. Limit travel time variation for Full BRT to no less than 25% MPH average speed improvement over regular bus service from end-to-end (or point-to-point where there is no comparable service). Offer a pleasing, rail-like passenger experience to BRT riders specifically with regard to travel times, dwell times, speeds and amenities. Achieve incident rates 15% below the Metro average per operational mile. Achieve on-board passenger security incident rates 15% below Metro average.
Our BRT will fulfill a distinct role that enhances and integrates with existing mobility services	Maximize the percentage of passenger transfers between BRT and other high-frequency transit or mobility services which can be made within 10 minutes (combined walk time and average waiting time). 100% of stations will offer amenities and access to first/last mile supporting services, including dedicated transportation network company (TNC) drop off/pick up, shared scooter/bike, bike lockers, etc. Provide personalized relevant information to customers on mobility options at their destination and measure based on customer opinion survey. Develop unique vehicle branding approaches that distinguish BRT as different from standard bus service and flexible enough to accommodate vehicles on multiple BRT routes.
Our BRT will connect people to where they need and want to go	Connect to one or more major BRT or light rail transit (LRT) stations or other major intermodal points to support larger transportation network connectivity. Equity Focus Community indicators will be considered at least as strongly as population and employment density in route selection and design.
Our BRT will consistently operate at high-performance levels allowing users to bypass congestion	Achieve an average peak-period end-to-end running time inclusive of stops within 1.8x (for Full BRT) and 2.4x (for BRT Lite) of the baseline free-flow travel time (inclusive of stops). Improve reporting rate on BRT locations to at least every 10 seconds. Achieve a 90% non-cash payment by 2028. Limit need to kneel bus to 10% of stations. Measure and estimate signal-based intersection delay and reduce by 20%. Reduce the number of signalized stops for the bus by 25%. Achieve average station dwell times of 12 seconds or 1.7 seconds per person.
Our BRT will provide excellent infrastructure, vehicles, amenities and customer service	Achieve an 80% positive approval through a periodic customer survey quality rating for vehicle and station condition and cleanliness. All public-facing BRT infrastructure achieve same mean time between failure (MTBF) as Metro rail system counterparts. BRT will be the proving ground for emerging technologies and strategies.

RELATED GOAL	OBJECTIVE
Our BRT will consider community needs and enhance quality of life	Ensure customized wayfinding and mode transfer options for first/last mile at each station. Identify and improve major barriers to walking or rolling to each station; develop and collaborate with partners to achieve improvements. Involve the community through walk-audits, site-surveys, design charrettes and other inclusive community engagement strategies for every BRT project. Achieve an 80% positive approval rating in a post-implementation community survey for enhanced quality of life perceptions. Ensure that BRT network corridor selection processes include equity criteria to serve vulnerable communities and strive to continuously refine said criteria to best serve these communities. Undertake authentic engagement that centers on the voices of vulnerable communities. Implement an ongoing consultation process with all stakeholders in the public sector (e.g., police), the private sector (e.g., merchants, real estate interests) and the general public as part of planning and implementation to support place-making and place-keeping. Provide cities and residents along the BRT corridor alignment with toolkits and data to promote TOC outcomes, while providing protections for affordable housing stock.
Our BRT will align design standards and service needs to maximize benefits	Select corridors based on technical analysis and expressed community needs and ability to meet BRT design standards. Secure memo of understanding or policy agreements from local jurisdictions to provide BRT priority through infrastructure, operating strategies or policies.

Combined with best practices, these objectives provided the best and most complete information required to move forward with the development of the following subset of BRT study products.

> **Standards:** Tracking back to the vision, goals and objectives ensured that the proposed BRT standards include thresholds that reflect consideration of baseline conditions and capabilities of Metro and local agencies that will need to implement them during the deployment of BRT.

> **Performance Indicators:** The planning elements were instrumental in the development of key performance indicators (KPIs) such as those that help the BRT planning and operations leadership create and adjust new BRTs as needed to meet envisioned service and infrastructure. As the stewards of Measure M, Metro will also use the KPIs to monitor the performance of BRT lines implemented using Measure M funds by both Metro and municipal transit agencies.

> **Design Guidelines:** Every section of the design guidelines developed as part of this study resulted in BRT design guidance that clearly reflects the vision and supports a design that can meet the expectations of Metro and the jurisdictions responsible for planning and development of a BRT.

> **BRT Corridors:** The corridor selection criteria were mapped to the planning elements to ensure that quantitative and qualitative analyses of potential study corridors were measured against the principles and values.

BRT Standards

While there are numerous reputable BRT standards and guidance that have been published both at the national and international level, strict adoption of any one of those standards to an area as large and diverse as LA County proved impractical. Therefore, this study drew upon existing national and international guidance to develop a local BRT standard, adapted to the specific context-sensitive needs of LA County.

The standards developed through this study provide the foundational definition of LA County BRT, including improvements, components and thresholds constituting BRT. This foundational definition of BRT is important not only to establish consistency in BRT project development but also to establish eligibility criteria for Metro Countywide BRT program funds.

As shown in **FIGURE 6**, the standards draw from a familiar mix of service parameters, enhancements and infrastructure that, when combined, provide a baseline definition for high-quality BRT service.

FIGURE 6: CATEGORIES OF BRT STANDARDS

The operational and brand consistency derived from the standards conveys multiple benefits, including but not limited to:

> Provide the transit rider with a consistently high-quality, seamless and reliable user experience across the entire LA County BRT network, whether operated by Metro or a municipal transit agency.

> Increase transparency with community members and public agency partners by setting clear expectations of what a BRT project entails.

> Ensure that the investment of public resources in infrastructure is commensurate with service.

> Provide consistency in approach to BRT investments.

Experience with BRT has shown that the best systems are not simply a sum of their parts. High-performance BRT systems are usually the result of ensuring that the individual components (e.g. running ways, stations, ITS elements, operating plans) work well with and reinforce each other. The standards proposed here, and the subsequent design guidelines, are aimed at ensuring this level of tight integration among BRT's components.

Organization of Standards for BRT

Standards developed in this study are organized in two distinct BRT tiers for performance and infrastructure. The tiers of standards support BRT's distinctive and premium levels of service and amenities, while providing flexibility to accommodate a variety of regional conditions under which BRT will be implemented. This approach allowed for a context-specific application of national and international standards in LA County, consistent with the goals established for the project.

This includes identifying where flexibility for those standards exists, and where standards are best

represented by a single set of criteria or by multiple levels of criteria for different levels of BRT service.

Tiered BRT Standards

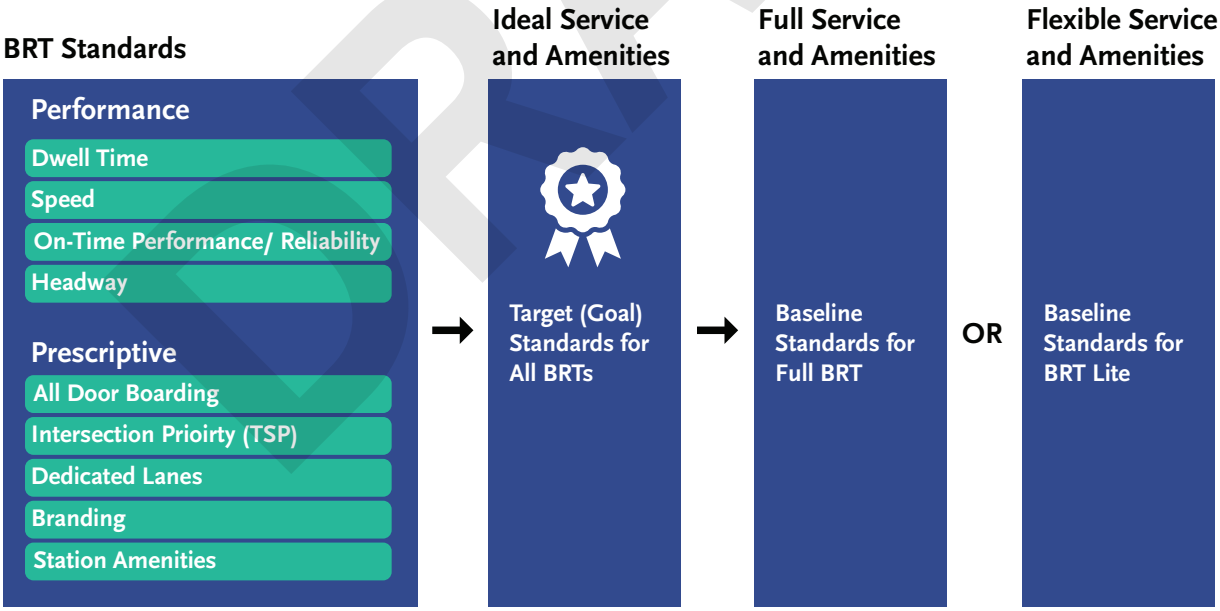
The two-tiered BRT standard sets a minimum standard for service to be considered BRT, as well as an ideal BRT standard of service. These are labeled as Full BRT and BRT Lite, respectively. This tiering of standards allows local jurisdictions and Metro to deploy BRT systems in areas where it may not be possible to achieve Full BRT standards but enhancements to service are warranted. This will ensure that BRT services can be directed to areas that need it most, while distinguishing the level of BRT service from other Metro or municipal transit services. The two levels of BRT service are defined as follows:

> **Full BRT:** A high-capacity, high-mobility, and high-amenity level of BRT service that is comparable to light rail transit (LRT). Full BRT has rail-like stations, a high percentage of dedicated running ways, and highly reliable, yet flexible service.

> **BRT Lite:** The minimum level of BRT, positioned between current Metro Rapid bus service and Full BRT. It still offers high levels of amenities and flexibility, but with a somewhat lower level of dedicated running ways and speed and reliability enhancing features.

In addition to BRT tiers, a target goal set of standards is included that represents an ideal BRT project implementation. Target standards are illustrative of opportunities to further enhance BRT performance beyond baseline requirements. The delineation of standards by tiers, performance and prescriptive-based standards is shown in **TABLE 7**.

FIGURE 7: ORGANIZATION OF BRT STANDARDS



Performance and Prescriptive Standards

Standards are further designated as prescriptive or performance-based. The use of both prescriptive and performance-based standards is intended to create an interdependency that drives the need for infrastructure. The additional benefit is the inherent flexibility of the application of the standards:

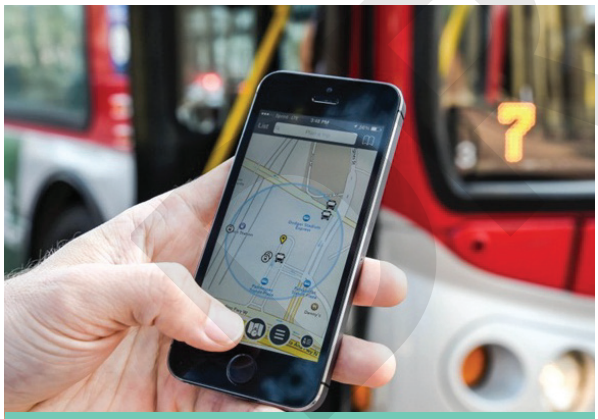
a range of prescriptive-based improvements can be deployed to achieve performance outcomes.

Performance Standards: Performance standards are outcome-based, focused on operational performance of the BRT service. Flexibility allows for meeting at least three of the four standards for the following areas:

FIGURE 8: BRT PERFORMANCE STANDARDS

Dwell Time

Speed



On-time Performance/Reliability

Headway

Prescriptive Standards: Prescriptive standards require that specific criteria are met, irrespective of outcomes. These are directed towards the physical and as-built characteristics of the BRT corridor defined within five standards:.

FIGURE 9: BRT PRESCRIPTIVE STANDARDS

All-door Boarding

Intersection Priority (TSP)

Dedicated Lanes

Branding

Station Amenities

The use of peak period lanes and station amenities based on headways are examples of flexibility in applying standards. In addition to minimum standards, standardized targets were also identified to achieve if possible, for Full BRT and BRT Lite. These minimum and target standards represent the foundation by which BRT will be measured in LA County. Collectively achieving these standards along each BRT corridor will help to ensure a high-quality, attractive BRT service that distinguishes itself from other services in the region.

Considerations for BRT Implementation

As we consider the characteristics and benefits of BRT implementation, it is important to remember that the individual standards are interdependent, each element or treatment, building on the benefits of the others. That is not to say that certain standards do not have greater impact on performance outcomes, but that the whole of the standards is greater than the sum of each individually.

Full BRT provides the most complete implementation in terms of service and facilities and is designed and constructed to approximate LRT. This level of BRT adheres to the highest level of standards as defined though this study for the BRT network in LA County. Within this high standard, there is built-in flexibility to accommodate the diverse conditions within the communities along the corridor without sacrificing reliability; however, the corridors selected through this study include characteristics that provide the best opportunity for a Full BRT implementation.

The characteristics and benefits of a Full BRT implementation are:

> Full BRT implementation provides the greatest opportunity for realization of improved travel times along a corridor, giving priority to the efficient movement of people over vehicles. The goal of Full BRT is to provide fast (average speed, including dwell time, 18 MPH), frequent (10 minute headways) and reliable service (80% on-time).

> Full BRT quick boarding and alighting (two second/person or 15-second/stop dwell time average) contributes to the overall speed and efficiency of the BRT operation. BRT riders benefit from reduced travel times along the corridor when stops and dwell times are expedited.

> Full BRT is branded and recognized by the traveling public as a distinctive and premium transit service through a BRT designator on stations and vehicles that includes a distinctive design, logo and colors.

> Full BRT implementation relies on a significant percentage (50%) of dedicated running ways, offering a more rail-like experience for the rider, less interference from other transportation modes, and less traffic congestion-related delays.

> Full BRT running way alignment is laid out to minimize conflict with other modes, including common points of conflict, such as vehicle turning movements, on-street parking, ingress and egress from adjacent commercial and retail establishments, delivery vehicles, and taxis or transportation network company (TNC) vehicles. Proper alignment adds the benefit of improved safety and fewer delays along the route.

> Full BRT implementation includes a full complement of station amenities to continue to enhance the rail-like experience and attract additional ridership from transit-dependent and choice riders. While the target is for all stations to have Full BRT amenities, the standard indicates that 90% of stations will include the following amenities:

- Weather protection
- Lighting
- Real-time information
- Trash receptacles
- Seating/lean bars
- Branding
- Metro art

> In space-constrained environments, where the Metro station kit of parts design cannot be adapted, no more than 10% of Full BRT stations may include the following amenities:

  - Lighting
  - Trash receptacles
  - Seating/lean bars
  - Branding

> All-door boarding reduces station dwell times by improving boarding and alighting – moving passengers quickly between the BRT vehicle and the station platform. All-door boarding is a characteristic of BRT that is shared by both Full and Lite versions of a BRT implementation.

> Intelligent Transportation Systems (ITS) elements, provide the analytical tools to monitor day-to-day and historical operations, provide faster and more reliable communications, and enhance safety and security for operators and passengers. Many ITS elements such as closed-circuit television cameras, on-board Wi-Fi, vehicle location monitoring and other supporting technology enhancements are ready for implementation now.

> Intersection Priority (TSP) for Full BRT active signal priority at 90% of the signals on the corridor. The primary benefit of more signal priority is the opportunity for the bus to progress along the corridor with less impedance and delay at intersections.

Characteristics and Benefits of BRT Lite Implementation

BRT Lite is another tool in Metro's toolkit that can be applied on corridors with special considerations or constraints. BRT Lite provides the highest levels of flexibility to accommodate corridors where Full BRT deployment may not be necessary or viable. It offers high levels of amenities but with more tractable performance standards that can improve upon existing local bus service.

The characteristics and benefits of a BRT Lite implementation are:

> BRT Lite implementation provides an opportunity for realization of improved travel times along a corridor, giving priority to the efficient movement of people over vehicles. The goal of BRT Lite is to provide fast (average speed, including dwell time, 15 MPH), frequent (12-minute headways) and reliable service (75% on time).

> BRT Lite includes quick boarding and alighting (2.5-second/person or 18-second/stop dwell time average) contributes to the overall speed and efficiency of the BRT operation. BRT riders benefit from reduced travel times along the corridor when stops and dwell times are expedited.

> BRT Lite branding is important in differentiating BRT service such that it is recognized by the traveling public as a distinctive and premium transit service. For BRT Lite, stations and vehicles include a designator at minimum that identifies the service as BRT.

> BRT Lite implementations rely on a dedicated running way (20% of the corridor during peak and 10% at all times) for the BRT vehicles to assist in mitigating interference from other modes and helping to reduce traffic congestion-related delays.

> BRT Lite running way alignment is designed to mitigate conflict with other modes as much as possible and avoid common points of conflict, such as vehicle turning movements, on-street parking, ingress and egress from adjacent commercial and retail establishments, delivery vehicles, and taxis or TNC vehicles. Proper alignment adds the benefit of improved safety and fewer delays along the route.

> BRT Lite's baseline station amenities are consistent with BRT's premium service experience and attract additional ridership from transit dependent and choice riders. Seventy-five percent of BRT Lite stations will include:

- Weather protection
- Lighting
- Real-time information
- Trash receptacles
- Seating/leaning bars
- Branding
- Metro art

> BRT Lite's all-door boarding reduces station dwell times by improving boarding and alighting – moving more passengers more quickly between the BRT vehicle and the station platform. All-door boarding is a characteristic of BRT that is shared by both Full and Lite versions of a BRT implementation.

> BRT Lite's ITS elements provide the analytical tools to monitor day-to-day and historical operations, provide faster and more reliable communications, and enhance safety and security for operators and passengers. Many ITS elements, such as closed-circuit television cameras, on-board Wi-Fi, vehicle location monitoring, and other supporting technology enhancements are mature and ready for implementation now.

> BRT Lite's TSP encompasses 75% of signals with active signal priority on the BRT route and all of guideway signals on the corridor. The primary benefit of more signal priority is the opportunity for the bus to progress along the corridor with less impedance and delay at intersections.

On the following page, **TABLE 6** applies the defined thresholds for Full BRT and BRT Lite conditions, providing an easy accessible summary.

TABLE 6: BRT STANDARDS DEFINITIONS

Minimum BRT Standards					Standards Flexibility Options		
Standard	Performance or Perscriptive	Full BRT	BRT Lite	Target (Goal)	Alternate	Must Meet	Special Conditions
1. Headway	Performance	10 Minutes (Peak Periods)	12 Minutes (Peak Periods)	Five Minutes (Peak Periods)	Yes	Meet three of four performance standards	Off-peak headways cannot exceed 30 min except on weekends and holidays.
2. Speed	Performance	18 MPH average speed (inclusive of dwell)	15 MPH average speed (inclusive of dwell)	20 MPH average speed (inclusive of dwell)	Yes		Shared street/station environments at terminals can be exempted from standrd if bus circulation is not mixed with autos. MPH data is inclusive of dwells and should include data within 90%. Abnormal major service disruptions and detours can be excluded from standards
Alternative: 2a. Alternative Speed		25% MPH average speed improvement over existing bus service in corridor (inclusive of dwell)	15% MPH average speed improvement over existing bus service in corridor (inclusive of dwell)	30% MPH average speed improvement over existing bus service in corridor (inclusive of dwell)	Yes		
3. On-time Performance/ Reliability	Performance	80% on time (e.g. one minute early/five minutes late)	75% on time (e.g. one minute early/five minutes late)	90% on-time (e.g. one minute early/five minutes late)	No		
4. Dwell Time	Performance	2 seconds per person (per boarding) or average 15 seconds	2.5 seconds per person (per boarding) or average 15 seconds	1.7 seconds per person (per boarding) or average 15 seconds	No		Higher average dwell times can be exempted if per person threshold is met. Abnormal events above 95% of maximum dwell can be exempted. Stations with level boarding and prepaid fares are exempt from this standard.
5. Dedicated Lanes	Prescriptive	50% of corridor	20% of the corridor during peak & 10% at all times	100% of the corridor; remove conflicting left turns and consolidate conflicting driveways	Yes	Must meet or the alternative	
Alternative: 5a. Peak Lanes		N/A	40% during peak	N/A			
6. Intersection Priority (TSP)	Prescriptive	90% of signals with active signal priority (100% of signals on guideways)	75% of signals with active signal priority (90% of signals on guideways)	100% of signals with aggressive active signal priority	No	Must meet	
7. Station Amenities	Prescriptive	90% of Full stations & 10% of Lite stations	75% of Full stations & 25% of Lite stations	100% Full stations	Yes	Must meet or alternative	Shared street/station environments and terminals may have features and information systems that match the greater environment, as long as BRT stops/bays are clearly marked with matching brand elements. If headways are five minutes or less then seating may be replaced by leaning rails in very constrained areas or areas that provide seperate supplementary seating.
Alternative: 7a. High Frequency Station Amenities		If headways 5 min or less - 80% Full stations 20% Lite stations	If headways 5 min or less - 60% Full stations 40% Lite stations				
8. All-door Boarding	Prescriptive	All stations allow all-door boarding	All stations allow all-door boarding	All stations allow all-door boarding	No	Must meet	Up to 10% of Full BRT and 20% of BRT Lite stations can be exempted from all-door boarding if off-board fare payment is used.
9. Branding	Prescriptive	Distinctive design and logo. coordinated colors	BRT designator	Distinctive branding, including design and logo on all stations and vehicles	No	Must meet	

Notes: * Full stations = Weather protection (shelter), lighting, real-time information, trash receptacles, seating/leaning, Other passenger amenities, station IDs, security cameras, art
**Lite stations = Seating, trash recepticles, ID, brand

BRT Design Guidelines

The BRT design guidelines, developed as part of this study along with performance measures, will assist and guide Metro and other municipal transit operators in the planning, design, operation and monitoring of an efficient and effective BRT system. The design guidelines align with the BRT vision, goals and objectives, build upon lessons learned from Metro's existing BRT and rail systems, and draw on best practices from BRT systems across North America and around the world.

The BRT Design Guidelines Manual, a separate companion document to this final report, provides recommendations on six critical and interconnected aspects of Bus Rapid Transit: General Operating Characteristics, the design of BRT Running Ways, Stations, ITS, Branding and integration with Transit-oriented Communities (TOC). The design guidelines also identify creative, adaptable and innovative BRT improvements and solutions, promote BRT as an investment in communities, facilitate safe pedestrian and bicycle connections to the BRT network and encourage holistic planning efforts that support and promote TOC.

The passenger experience, safety, operational and capital requirements and cost-effectiveness were considered when developing these guidelines. The design guidelines are flexible enough to address potential site-specific constraints and/or applicable local ordinances. They will be used by Metro in updating its existing BRT Design Criteria Manual, and by municipal transit agencies wishing to implement new BRT lines under Measure M's BRT Program, ushering in the county's next iteration of BRT services.

FIGURE 11: CRITICAL & INTERCONNECTED BRT ASPECTS

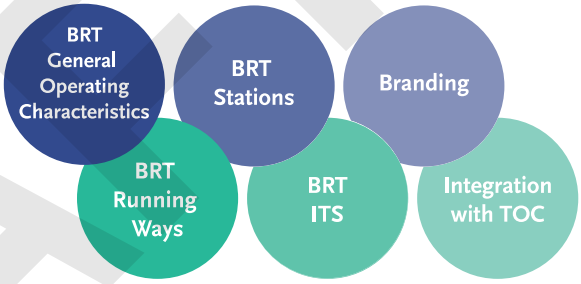
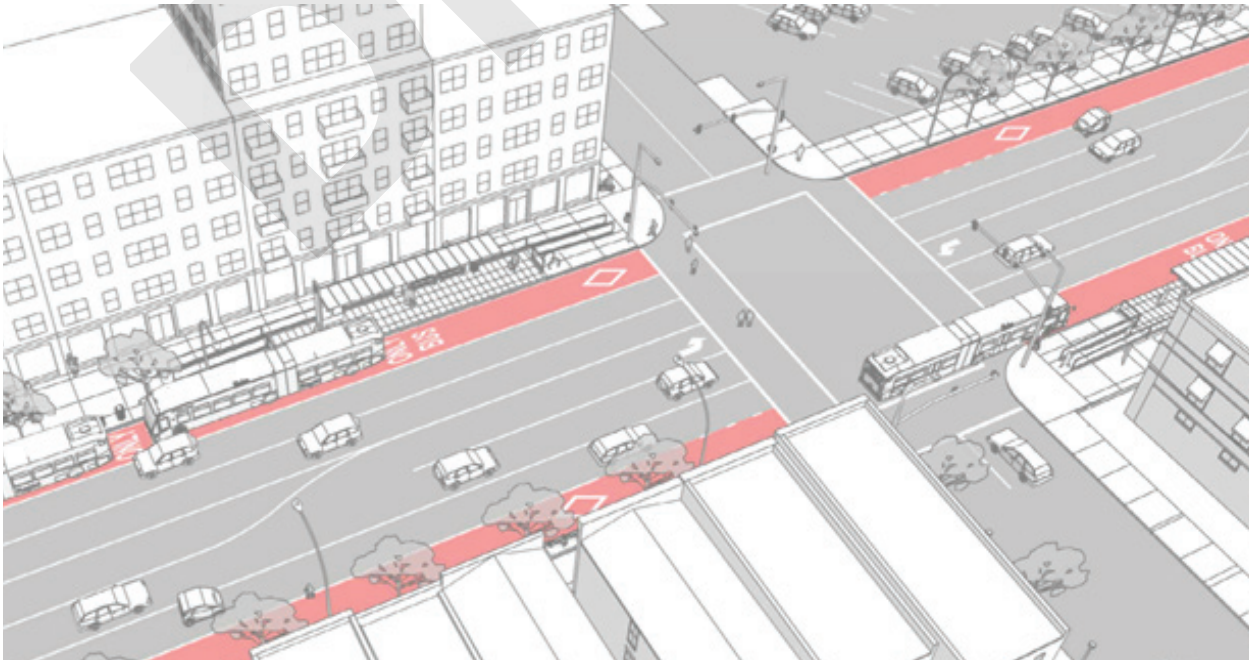


FIGURE 10: CURB RUNNING BRT OPERATION



BRT Corridors

The corridor screening and selection process was designed to identify the corridors where BRT is best deployed as a mobility solution. It is important to note that BRT investment is not appropriate for every high-ridership corridor, nor is BRT the only tool available to improve bus speeds and service reliability. Other speed improvement tools include: queue jumps, bus only lanes, signal priority and more can be selectively deployed to alleviate choke points on any given bus route.

Corridors identified and selected as the best candidates for BRT, through this study, have characteristics that include an optimal intersection of need and opportunity, meaning that there is not only a demand for service, but the corridor contains the requisite characteristics to support BRT infrastructure.

Thematically, the main features that Metro considered of primary importance in the selection of BRT corridors included: service demand, regional connectivity, along with an opportunity to improve bus speeds, supportive infrastructure and Metro's Equity Focus Communities (EFCs).

Corridor Identification

Metro's technical team used three primary sources to gather a broad list of potential corridors for BRT implementation:

> BRT candidate corridors identified in recent planning studies and efforts by Metro

> Direct input from the project's targeted stakeholders

> Use of a parametric design tool to identify promising corridors not identified through the efforts mentioned above

Recent Planning Studies and Efforts by Metro

Recent planning studies and efforts by Metro provided the basis from which to begin the identification and evaluation of potential BRT corridors. A literature review and research initially yielded a list of 34 corridors primarily informed by Metro's Bus Rapid Transit and Street Design Improvement Study (2013) and the Sub-regional Mobility Matrix effort undertaken in support of Measure M. The team also coordinated with other related initiatives, including the NextGen Bus Plan, LRTP, Bus Speed Improvement Working Group and the Metro Vision 2028 Strategic Plan.

Three corridors from the 2013 study and the Mobility Matrix effort are currently in the planning and implementation stages, now known as the North Hollywood to Pasadena, North San Fernando Valley and Vermont corridor projects. In order to avoid any duplication of efforts, none of the aforementioned projects nor any mobility corridor in the Measure M expenditure plan was analyzed through this process.

Technical Advisory Committee Input

To help guide the study process, a Technical Advisory Committee (TAC) was established, comprised of staff from Metro departments, cities and municipal transit operators. The TAC provided insight on the identification and validation of BRT corridors and direction on the identification of the Strategic BRT network. Through the assistance of the TAC, an additional 39 corridors were identified for consideration. This was in addition to the previously identified corridors noted above.

Parametric Design Tool

In order to find promising corridors not yet identified by the two aforementioned methods – corridors from previous studies or stakeholder input – a computational (or "parametric") analysis was utilized. Parametric modeling is a customizable algorithmic process enabling the efficient and effective processing of complex information, associating multiple parameters (or datasets) as design drivers for evidence-based decision making. The algorithms built for the BRT Vision provided parametric analysis for the project in two phases. The first used three criteria (equity, population density, employment density) to ensure the potential BRT routes provided county coverage and specifically served areas with the highest need. The subsequent phase added additional layers of criteria to rank the lines based on performance potential, choosing the best lines to consider.

This type of modeling is an innovative way of leveraging the available analytical technologies to incorporate many disparate datasets into a cohesive and understandable whole, thereby giving each corridor the same level of quantitative analysis.

In this final step to identify candidate corridors, the automated parametric algorithm was used to review every arterial segment in LA County and create a "heat map" of segments that score well in the areas of population density, employment density, intermodal connections, as well as Metro's EFC metric. Use of the parametric tool ensured that no viable BRT candidate corridors were neglected or overlooked due to bias or human error.

The high-performing segments identified through this process were manually combined into corridors. This analysis resulted in 11 new corridors in East Los Angeles, South Los Angeles and the San Fernando Valley, complementing and filling gaps in the corridors identified above.

The Universe of Corridors

Based on previous studies, plans and input from the BRT TAC described in the previous sections, a comprehensive set of corridors was assembled and is depicted in the map in ***Figure 12***, shown on the following page. This set of corridors became the basis for all subsequent analysis and screening activities. This was an important step in providing a foundational set of corridors where all desired BRT routes were considered. After this step, the various criteria for a successful BRT were progressively applied in three screening levels to narrow the field to those routes likely to perform the best and serve the needs of each respective community.

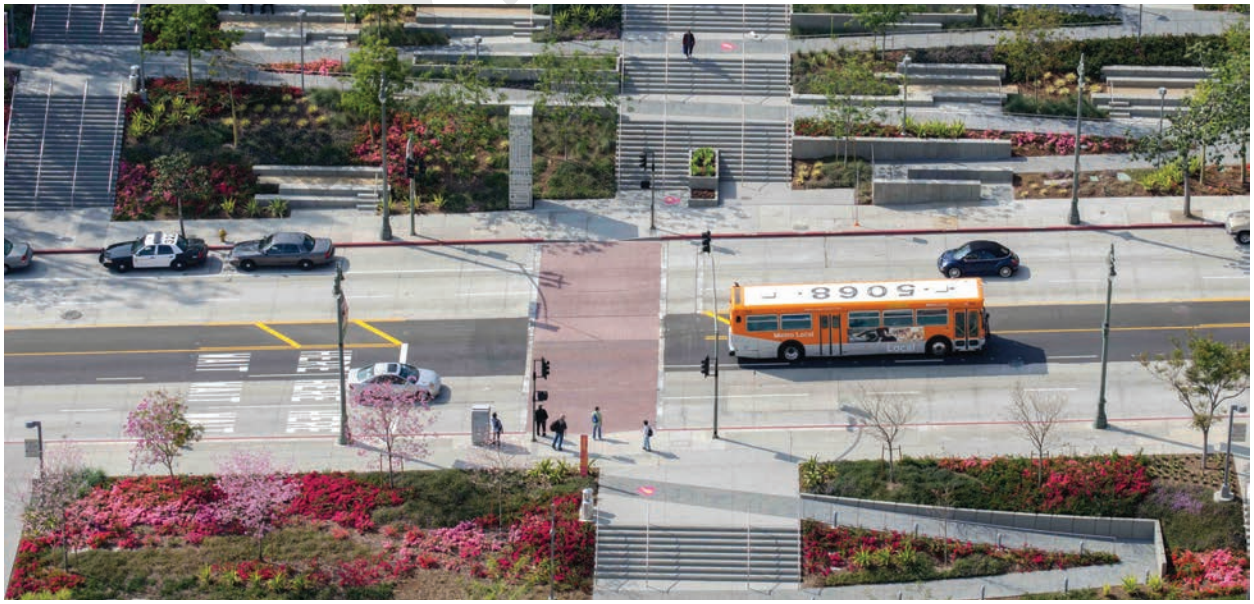
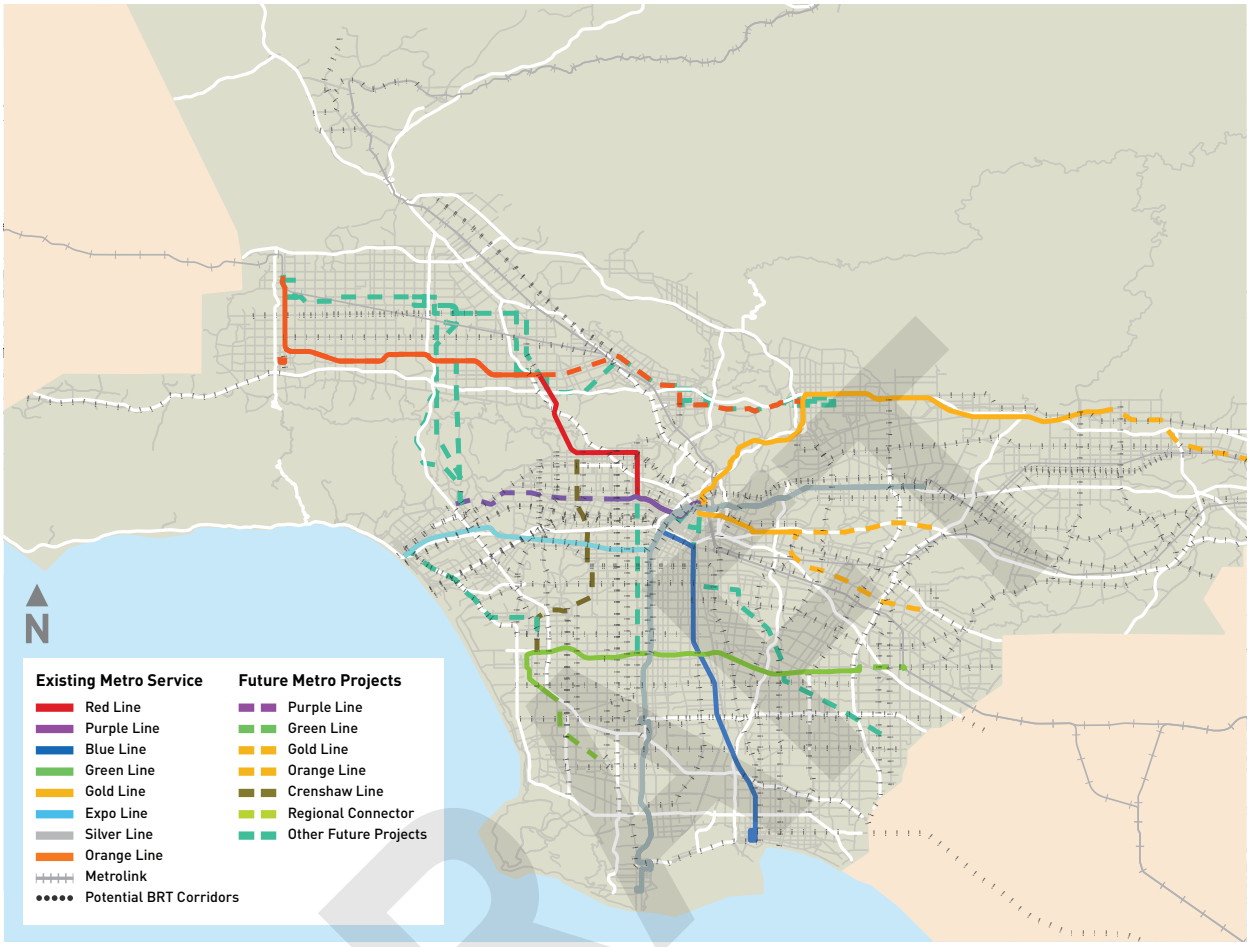


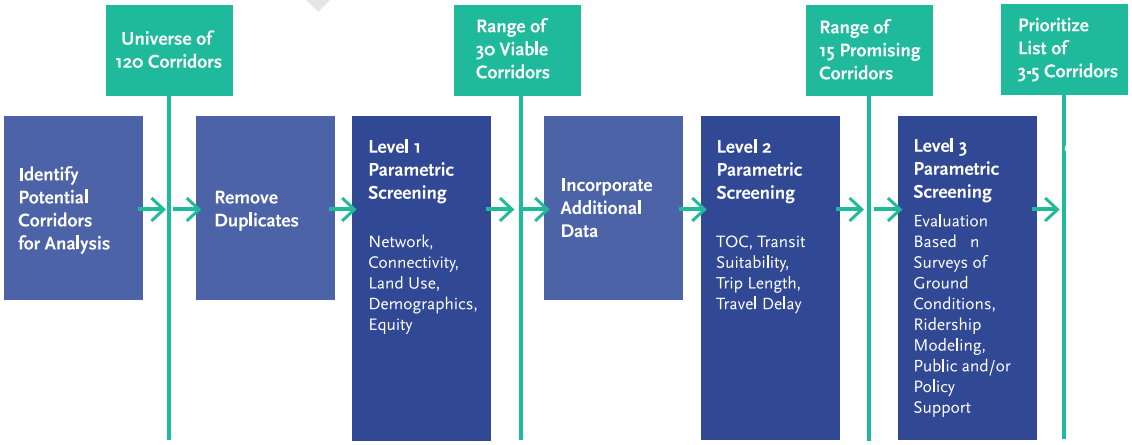
FIGURE 12: UNIVERSE OF POTENTIAL BRT CORRIDORS IN LOS ANGELES COUNTY



Corridor Screening Process

The process chart in ***Figure 13*** depicts the progression and levels of screening used to analyze potential corridors and select the most promising corridors for BRT implementation in LA County. Given the large number of corridors, and in keeping with common transit planning practice, a three-level screening process was used, wherein each successive screening level introduces additional data to arrive at a prioritized set of corridors. The following section provides detail for each level of the process.

FIGURE 13: BRT CORRIDOR THREE-LEVEL SCREENING PROCESS



Level 1 Screening

After compiling the list of potential BRT corridors, the technical team reviewed the results for high-level feasibility. Potential corridors were eliminated from consideration, or their routing was adjusted, for the following reasons:

> The corridor does not begin, end, or connect to existing or planned high-capacity transit services or key activity centers.

> The corridor does not begin or end at key activity centers.

> The corridor is duplicative of existing or planned high-capacity transit.

> The corridor was determined to be infeasible in a prior study.

> The corridor did not meet minimum length requirements (six miles) or was a small extension to an existing or planned transit corridor.

Once the initial screening/refinement was performed, the remaining corridors were loaded into the parametric model for level 1 screening. The screening analyzed network connectivity, land use, points of interest, demographics and Metro's EFC metric. The criteria are listed in ***Table 7***. The model compared the area within ¼ mile of each corridor relative to the area along every other corridor and generated a score for each option. Corridors that best met the criteria — such as those that have higher levels of job or residential density or include a higher proportion of the corridor in an EFC area — received higher scores.

The Level 1 screening resulted in a list of 30 corridors to be taken into the next level screening, as shown in **FIGURE 14**.

TABLE 7: LEVEL 1 PARAMETRIC CRITERIA

CRITERIA	DEFINITION
Network Connectivity	Measures how well connected the corridor would be to other lines of transit service.
Demographics: Population Density	Measures how many people live adjacent to the corridor.
Demographics: Employment Density	Measures how many jobs are adjacent to the corridor.
Equity	Measures how much of the corridor falls within Metro's Equity Focus Communities metric.
Land Use: Educational Facilities	Measures the corridor's connectivity to schools.
Land Use: Transit-supportive Zoning	Measures how much of the corridor is zoned for more transit-supportive land uses (such as multi-family residential).
Land Use: Points of Interest	Measures the corridor's connectivity to points of interest, such as libraries and parks.

FIGURE 14: TOP 30 BRT VISION & PRINCIPLES STUDY CORRIDORS MAP (COLOR)

Level 2 Screening

In this second screening, the team introduced additional parameters into the model. The 30 most promising corridors were put through a second level of parametric analysis, which considered a rating of each corridor's suitability for supporting transit-oriented communities, trip length, travel delay, network connectivity and equity. This second screening was coupled with another visual inspection process, which allowed the team to identify any other attributes of or difficulties with the corridor that would assist in the identification of the most promising and best performing 15 corridors. The criteria used in the Level 2 screening are shown in **TABLE 8**.

TABLE 8: LEVEL 2 PARAMETRIC CRITERIA

CRITERIA	DEFINITION
Transit Propensity	Measures likelihood of residents living along a corridor to take transit.
Trip Length	Average trip length in a corridor based on location-based services data.
Trip Delay	Travel Time Index output from iPEMS, Metro's Arterial Performance database.
Corridor Constructability	Qualitative evaluation of the physical compatibility of a corridor for new BRT service.
Transit Oriented Communities (TOCs)	Qualitative evaluation of TOC potential along a corridor.
Network Connectivity	Measures how well connected the corridor would be to other lines of transit service.
Equity	Measures how much of the corridor falls within Metro's Equity Focus Communities metric.

FIGURE 15: TOP 15 BRT VISION & PRINCIPLES STUDY CORRIDORS MAP (COLOR)

Level 3 Screening

The final Level 3 screening process was more qualitative in nature. In this screening, the 15 top performing corridors were reviewed with additional detail incorporated into the analysis. Network connectivity, transit propensity and equity were carried forward from previous screening with new criteria incorporated: qualitative evaluations of TOC and transit-friendly plans and policies, a qualitative assessment of travel time savings potential, surveys of ground conditions, public and political support and input from key stakeholders. This final assessment shortened the list further, identifying the five priority corridors recommended for BRT implementation, as documented in the following section. The criteria used in the Level 3 screening are shown in **TABLE 9**.

TABLE 9: LEVEL 3 CORRIDOR SCREENING CRITERIA

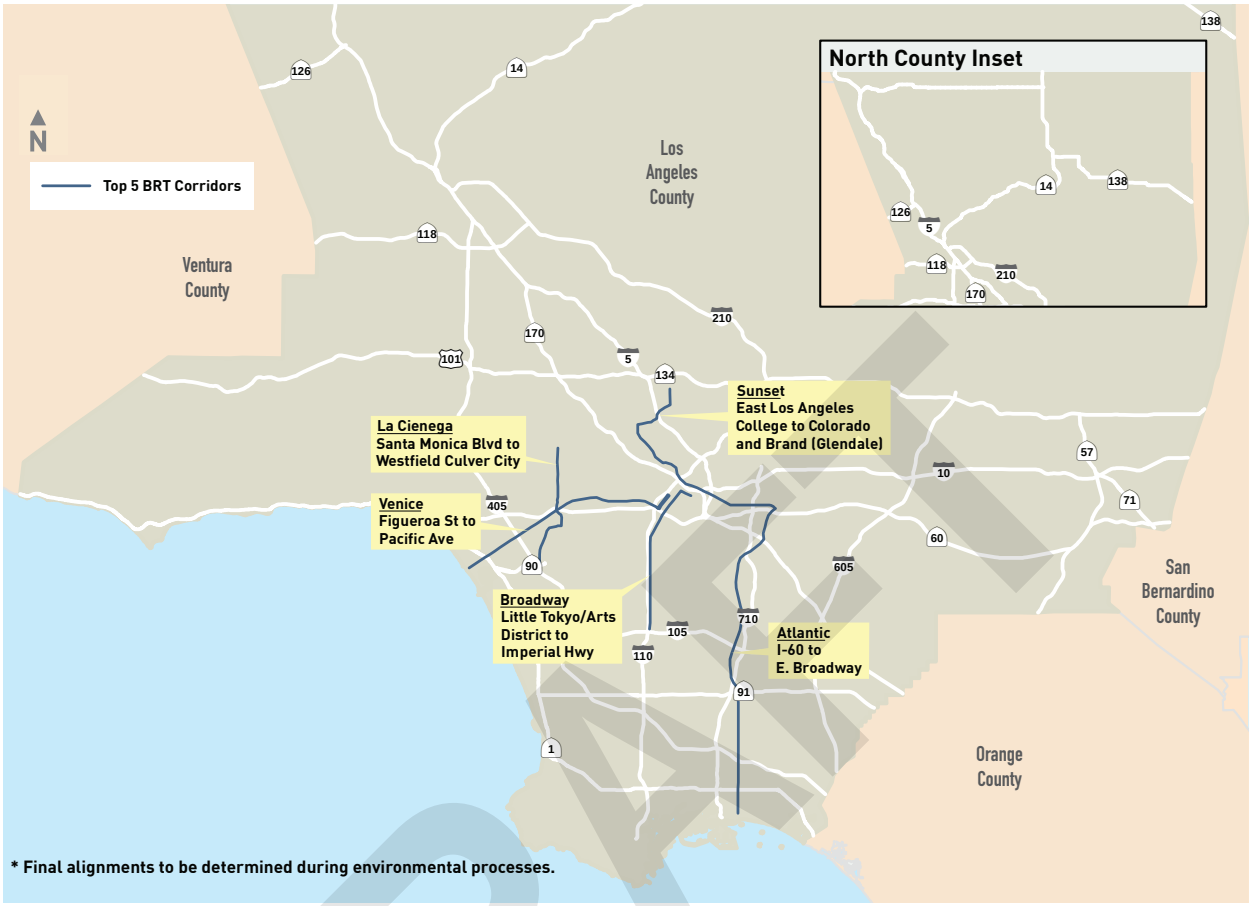
CRITERIA	DEFINITION
Transit Propensity	Measures likelihood of residents living along a corridor to take transit.
Transit-friendly Policies	Qualitative evaluation of transit supportive traffic management plans, policies and infrastructure along the corridor.
Travel Time Savings Potential	A qualitative assessment considering corridor congestion hot-spots from the iPEMS data coupled with the likely constructability of transit-priority measures in the hot-spots.
Existing Right-of-Way and Corridor Constraints	Qualitative evaluation of the physical compatibility of a corridor for new BRT service.
Transit Supportive Land Uses and Plans	Qualitative evaluation of transit supportive plans and policies along the corridor.
Network Connectivity	Measures how well connected the corridor would be to other lines of transit service.
Equity	Measures how much of the corridor falls within Metro's Equity Focus Communities metric.
Public and/or Policy Support	Qualitative assessment of documented support for BRT in the corridor.

Top Five BRT Corridors

Based on the criteria and rigorous screening process conducted throughout this study, Metro has identified the following five corridors as the top candidates eligible for Measure M Countywide BRT program funds. Each of the top five corridors present excellent opportunities for BRT investment. Of these top five BRT corridors, Metro staff will present a recommendation to the Metro Board of Directors that one of these corridors be initially advanced into project development, subject to available funding. The balance of the remaining corridors would be eligible for Measure M Countywide BRT program funds in subsequent years as funding becomes available. The corridors are listed in alphabetical order. The selected corridors are depicted in the map in ***Figure 16***.

FIGURE 16: TOP FIVE BRT VISION & PRINCIPLES STUDY CORRIDORS

FIGURE 17: TOP FIVE BRT VISION & PRINCIPLES STUDY CORRIDORS MAP (COLOR)



Atlantic

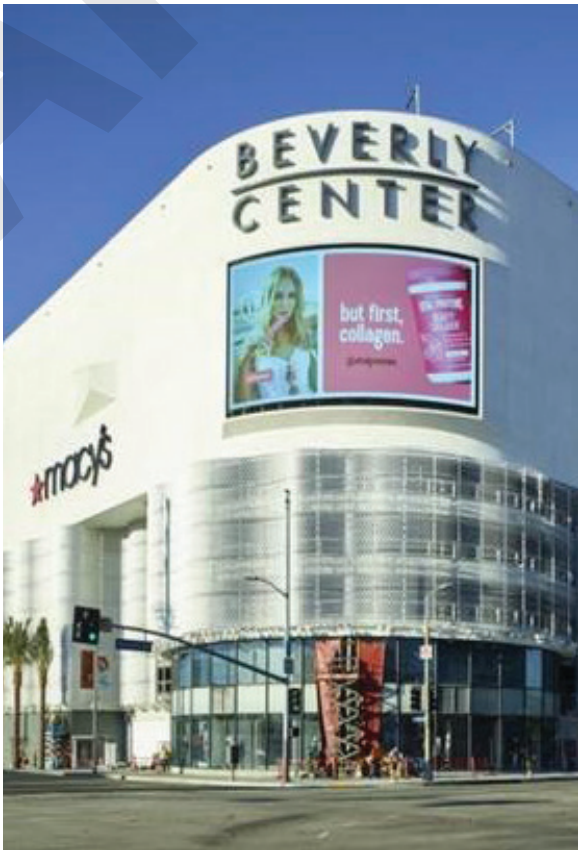
The Atlantic corridor provides high-capacity network coverage in Southeast LA County, from the San Gabriel Valley to the City of Long Beach, connecting cities and communities. When compared to the other top five corridors, this corridor has a moderate level of network connectivity. Atlantic also has a moderate opportunity to build BRT-friendly infrastructure and realize travel time savings, although sidewalks are wide relative to other corridors, allowing more opportunity to build stations with Full BRT passenger amenities. Although this corridor has a comparatively low ridership score, it provides access to industrial jobs for lower-income workers, addressing Metro's equity goals.

Broadway

Broadway is a vibrant transit corridor with very high network connectivity and is also a NextGen Tier One corridor[1]. When compared to the other top five corridors, this corridor had a very high score in the Equity Focus Community index and is a high-priority corridor per Los Angeles Department of Transportation's (LADOT's) assessment. Broadway runs through two City of LA Community Plan areas which feature TOC and transit-supportive policies. This corridor has moderate level ridership and a moderate opportunity to build BRT-friendly infrastructure and realize travel time savings. A future alternatives analysis could consider both Broadway and Figueroa, which closely parallel each other and perform comparably.

La Cienega

The La Cienega corridor provides high-capacity north-south network coverage on the Westside, linking cities and communities, including West Hollywood, Beverly Grove, eastern Beverly Hills, Pico-Robertson and Culver City. It runs through three City of LA Community Plan areas, which feature or are being updated to feature TOC and transit-supportive policies. Culver City has recently completed a TOD Visioning Study, and West Hollywood has TOC-supportive policies in place that could support the implementation of a BRT on the La Cienega corridor. In comparison to the other top five corridors, La Cienega has a moderate-level opportunity to build BRT-friendly infrastructure and realize travel time savings. This corridor has a low network connectivity score, low ridership score, it is not a NextGen Tier One corridor and it has a low score in the Equity Focus Community index.



1 Corridors analyzed during the development of the NextGen Bus Plan were also considered throughout this study. Additional information about the NextGen Bus Plan can be found at: https://www.metro.net/projects/nextgen/.

Sunset

The Sunset corridor has a very high network connectivity score and connects downtown Los Angeles with the San Fernando Valley. Sunset is a NextGen Tier One corridor that runs through six City of LA Community Plan areas, which feature or are being updated to feature TOC and transit-supportive policies. When compared to the other top five corridors, this corridor has a moderate-level of ridership and a moderate-level opportunity to build BRT-friendly infrastructure and realize travel time savings.

Venice

Venice has a very high network connectivity score and a very high ridership score. Venice is a NextGen Tier One corridor with a high-level opportunity to build BRT-friendly infrastructure and realize travel time savings. This corridor has pedestrian-friendly features along much of its distance with a strong mix of land uses oriented to the street. The Venice corridor runs through seven City of LA Community Plan areas, which feature TOC and transit-supportive policies. Culver City has recently completed a TOD Visioning Study, which includes Venice. Venice has communities with strong transit-supportive policies along corridor and it is an LADOT high-priority corridor.

Strategic BRT Network

The Strategic BRT Network builds upon the top five corridors and utilizes a three-step process to layout a roadmap for future BRT expansion in LA County. If the top five recommended BRT corridors are where investment begins, the Strategic BRT Network is where expansion should continue should future funding become available. The first step in the development of the network was to pull from our initial BRT corridor screening assessment – the 120 corridors evaluated as part of the top five recommended corridors – and utilize the Top 30 corridors identified to develop a "core" network. The top 30 corridors – through virtue of their selection process – are previously identified, high-performing transit corridors that jump ahead of other analyzed corridors for their specific strengths in network connectivity, transit supportive land uses, transit propensity, trip length, trip delay and equity.

The second step was to build off of our core network and build out a countywide network for BRT. Staff conducted a gap analysis with four main objectives: 1) consider the existing and planned rail/BRT network, 2) identify gaps in service coverage area, 3) connect future BRT corridors to one another and the Metro rail network, and 4) leverage corridors identified and screened through the project study. Staff examined local city plans,

Council of Governments studies, and other regional transportation plans to identify locally preferred transit corridors to assure alignment between our proposed corridors and those our local partners may have already identified. The second step of the process also involved removing duplicate service – identifying parallel BRT corridors near one another – with priority given to the corridor with the higher opportunity to construct.

Finally, our third step was to solicit input on the network from our local agency partners – including our study TAC, as well as through individual meetings with local agencies and key stakeholders. The third step allowed staff to receive direct feedback from our local partners and make changes where necessary to align Metro's vision for the future of BRT in LA County with that of our local partners.

FIGURE 18: BRT NETWORK

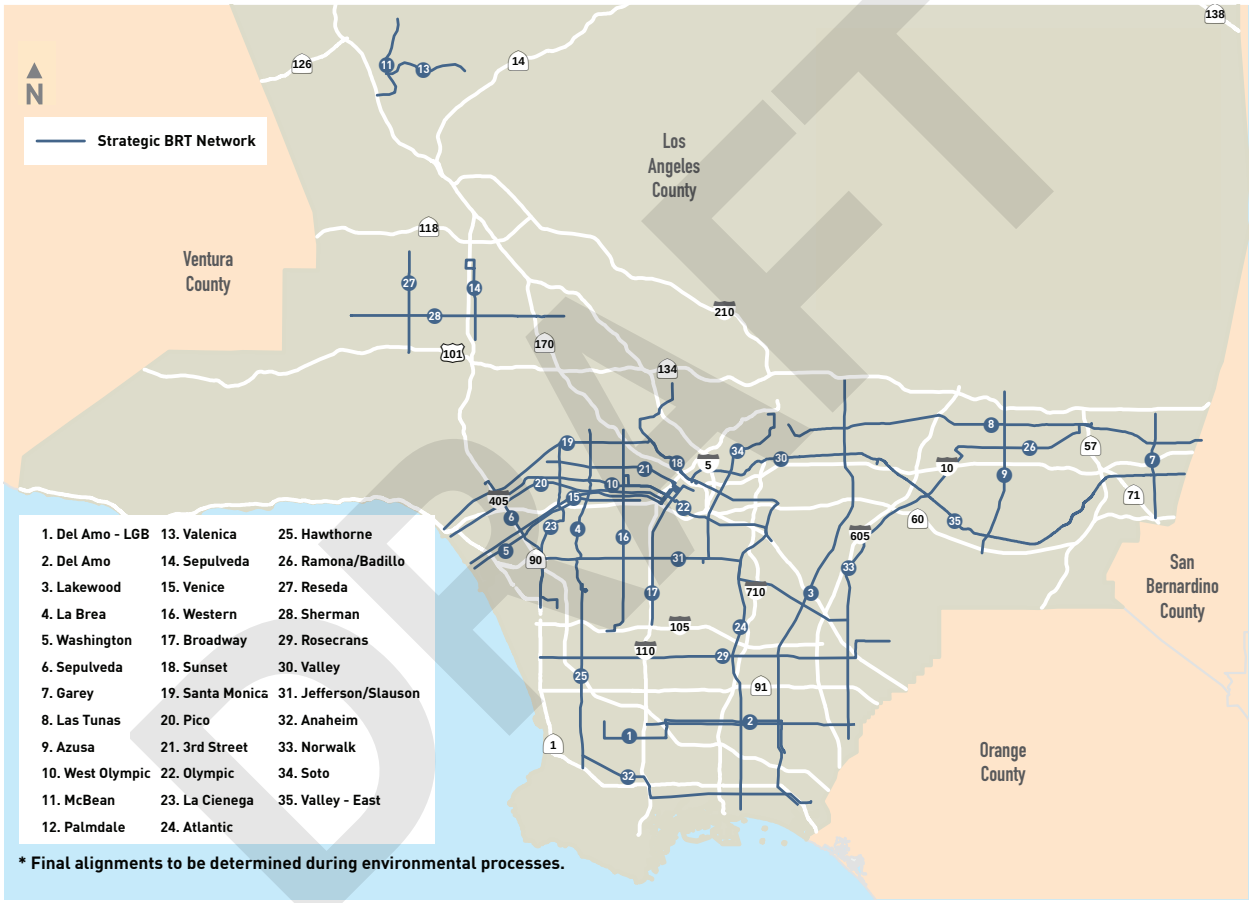
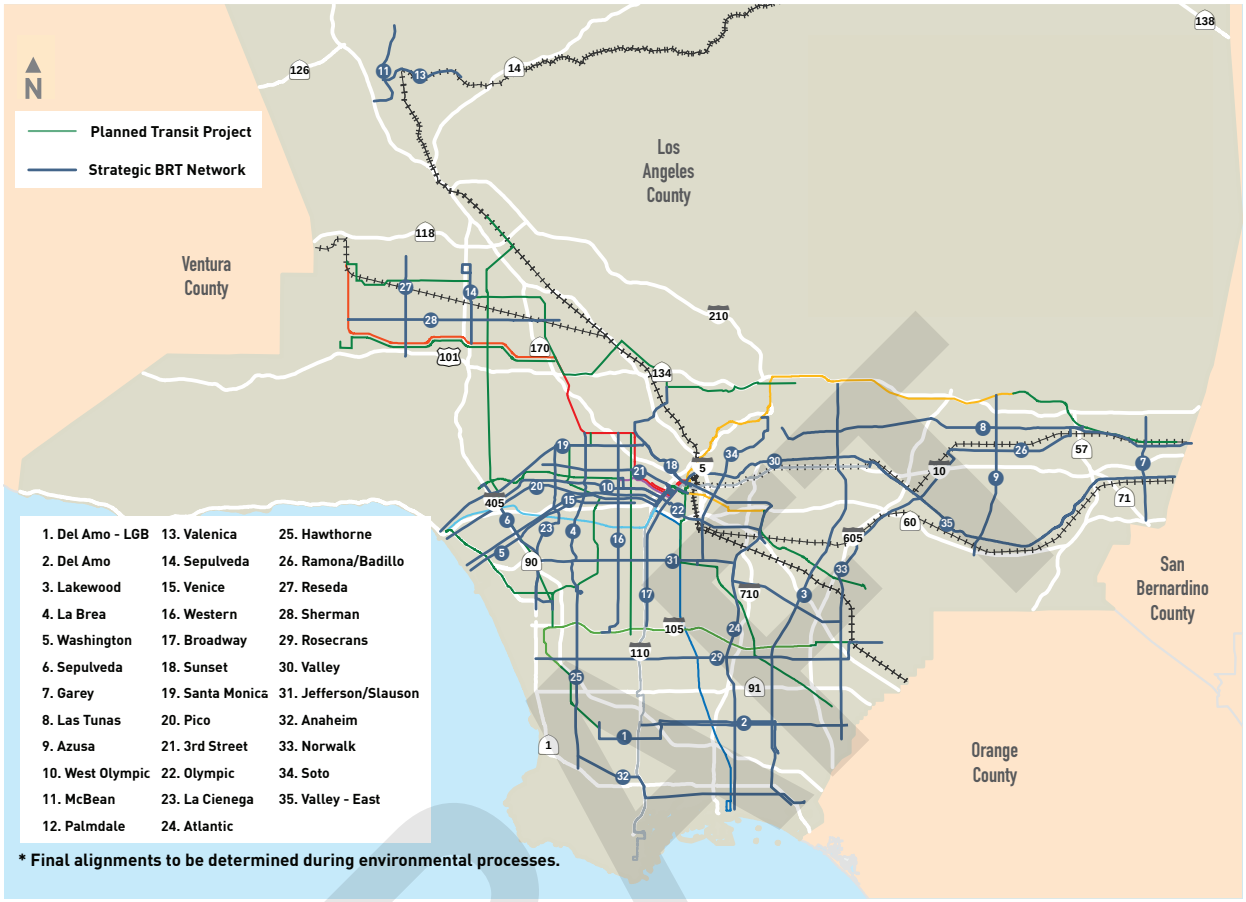


FIGURE 19: BRT NETWORK & THE EXISTING/PLANNED TRANSIT



Conclusion

Metro is making unprecedented investments in our LA County mobility system, including specific investments in BRT. The work completed through the BRT Vision & Principles study establishes the necessary foundation to guide those BRT investments into the foreseeable future. The completion of this work is timely and necessary, particularly as Metro is embarked on three early potential BRT projects, all in some level of study, and with more to follow.

Coordination with the Metro BRT mobility corridor teams has been a continuous feature of this study. Accordingly, BRT projects that are currently in some level of study, as of this writing, are expected to meet the BRT standards established in this document. Future BRT projects will similarly be held to those BRT standards as will any public agency seeking to use Measure M Countywide BRT program funds to develop a BRT project.

The design guideline manual, referenced briefly in this report and available as an accompaniment to this report, will provide the necessary interim guidance for BRT planning work. Next steps for the design guideline manual will be to adapt that work to specific design criteria. This will ensure that as BRT projects move through design and construction phases that the design guidelines are incorporated into the project.

The study identified a top five BRT corridors recommended for future project implementation. These BRT corridors offer the requisite characteristics for successful BRT service. Metro staff will present this top five list to the Metro Board for consideration, recommending that one of these corridors be taken into project development in the near-term. With Board concurrence on a specific corridor, staff will return to the Board at a later date with recommended programming actions and next steps. This will necessarily involve more detailed corridor level analysis, conceptual design work and public engagement with corridor communities and stakeholders.

Finally, periodic updates to the standards, design guidelines and design criteria will be undertaken as necessary to stay current with emerging technologies and best practices.

Appendix

Key Transit Terms

TERM	DEFINITION
iPEMS	Metro's online roadway (freeways and arterials) performance monitoring tool to support local agency and sub-regional operations and planning efforts. iPeMs uses HERE real-time crowd-source data and provides real-time continuous speed data every minute.
ITS	Technical innovations that apply communications and information processing to improve the efficiency and safety of ground transportation systems.
Headway	The time that passes between the departure of one bus and the arrival of another.
LRTP	Metro's plan to assess future population increases projected for the county and what such increases will mean for future mobility needs. The plan recommends what can be done within anticipated revenues, as well as what could be done if additional revenues became available. The 2009 LRTP is an update to the 2001 Long Range Transportation Plan for future transportation investments in LA County through 2040.
MTBF	Mean time between failure, or inherent failures of a mechanical or electronic system during normal system operation.
POP	Proof of payment for transit services, such as TAP, reduced fare, low-income fare, or annual fare cards.
Right-of-way	Right-of-way is a type of easement granted or reserved for use by an operator of a transportation project, such as for a BRT running way or station. Ownership of the right-of-way stays with the original owner.
Running way	A transportation corridor dedicated for exclusive or preferential use by public transit vehicles, including rail vehicles, buses, carpools and vanpools.
TAP	Transit pass, a plastic card with an embedded smart card chip, is designed to apply fare payments at fareboxes, ticket vending machines and other participating agencies.
TOC	TOCs include land use planning and community development policies that maximize access to transit as a key organizing principle and acknowledge mobility as an integral part of the urban fabric.
TNC	Transportation Network Companies provide prearranged transportation services for compensation using an online-enabled application or platform (such as smart phone apps) to connect drivers using their personal vehicles with passengers.
TSP	Transit signal priority refers to the functioning relationship between active signals along a corridor. A common cycle length is established for all intersections in the coordinated system. By maintaining a constant relationship between the signals at all times, there is a greater likelihood that mobility will be improved. This does not mean that the signals will provide a green light at the same time for the entire length of a corridor; rather, that each signal will quite literally be synchronized with the entire system, allowing for more efficient mobility.