Bus Rapid Transit
Route Planning Project

Executive Summary

JUNE 2010
Disclaimer

This is a project for the Western Riverside Council of Governments (WRCOG), Bus Rapid Transit Route Planning Project, with funding provided by the Southern California Association of Governments’ (SCAG) Compass Blueprint Program. Compass Blueprint assists Southern California cities and other organizations in evaluating planning options and stimulating development consistent with the region’s goals. Compass Blueprint tools support visioning efforts, infill analyses, economic and policy analyses, and marketing and communication programs.

The preparation of this report has been financed in part through grant(s) from the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) through the U.S. Department of Transportation (DOT) in accordance with the provision under the Metropolitan Planning Program as set forth in Section 104(f) of Title 23 of the U.S. Code.

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1. Introduction and Purpose of Study

The BRT Route Planning Project was conducted under a SCAG Compass Blueprint grant to identify corridors in the WRCOG area of jurisdiction that would be suitable for bus rapid transit (BRT) service and determine the priority for BRT projects to be developed following implementation of the previously studied Magnolia Corridor BRT project. Based off of the 2035 growth projections, this report reflects a long range opportunity for BRT implementation.

This study is non-binding. Jurisdictions, and local transportation commissions and agencies, are not required to adopt this plan. In addition, no funding is available at this time to pursue BRT or any other element discussed in this report. However, as SB 375 and AB 32 move forward for implementation, local governments will be required to develop plans that reduce vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. BRT is one avenue that can be pursued towards the goal of GHG reductions and this study lays out possible routes and opportunities to pursue BRT in western Riverside County in the future.

In the event that there is a desire among the region’s policy makers to explore BRT in the future, this study could be used and/or referenced as a potential starting point. Nothing in this report suggests or recommends that any future study be funded, or that any policy be changed to move in that direction. To advance the recommended corridors to implementation, each will require a feasibility study and financial plan. Service implementation will be subject to funding availability and the economic constraints at the time. The timing of their implementation will be determined through the planning and programming processes of WRCOG, the Riverside Transit Agency (RTA), and the Riverside County Transportation Commission (RCTC).

2. Study Process

The study was conducted under the direction of an interagency project team with representatives of WRCOG, SCAG, RTA, and RCTC. Discussions with individual cities and Riverside County staff contributed to the information used in the study. The analysis was conceptual in nature and future in-depth studies would be required to determine if BRT service can be cost-effectively provided in the potential corridors. The evaluation considered the conceptual operational characteristics of the potential BRT services, but did not attempt to provide a detailed financial analysis.

The study was conducted through the completion of several individual tasks. Initial efforts focused on data gathering, research on the key characteristics of BRT that would attract riders, and case studies of existing BRT services. These activities enabled the development of an initial set of freeway and arterial corridors that were subjected to an initial screening. The highest rated corridors received additional analysis. The results of the additional analysis led to a set of recommended corridors, followed by a discussion of funding and the prospects for implementation. As the corridor analyses were taking place, an analysis of station development opportunities was conducted for six types of BRT stations. Separate technical memos, available under separate cover, were prepared to document each of the tasks.
3. Rider Profile

The Rider Profile task documented travel demands in the study area, and the key attributes that make BRT attractive to riders. The major travel demands are shown in Figure 1, followed by the BRT attractiveness attributes.

**Figure 1  Major Regional Travel Patterns**

The key elements of BRT found to attract riders include:

- Travel Time Savings
- Travel Time Reliability
- Service Frequency
- Unique Vehicles
- Enhanced Stations
- Branding
- Consistent Service Operation
- Service Design
  - Service to at least one activity center, more if possible
  - A simple, easy to understand route system
  - Service spans longer than most of the transit system
  - Limited number of stops
  - Connections to other services
  - Provision of local service in same corridor if warranted
  - Fare levels that are generally less than commuter rail service
  - Provisions for taking bikes on vehicles
4. Case Studies

BRT services in the five metropolitan areas listed below were researched to provide guidance for the type of BRT services that can be considered in the study area.

- LA Metro Rapid, Los Angeles, CA
- Swift Bus Route 99, Everett, WA
- York Region Transit VIVA York, Toronto, Canada
- Valley Metro RAPID, Phoenix, AZ
- Houston Park-and-Ride Express Service, Houston, TX

The review of these systems revealed several elements that could be part of the BRT system in Western Riverside County.

- Several of the systems have special treatments for their stops, stations, and vehicles as part of the branding of the system. These aspects identify the service as unique, enabling existing and prospective riders to easily identify them as the higher quality services.

- Almost all of the systems use newer vehicles with specialized design features and amenities. The use of these vehicles provides a higher level of comfort that supports the image that the BRT services are unique and high quality.

- Stops and stations have extra amenities, such as real time arrival information, to enhance the customer experience.

- Several of the systems have major park-and-ride facilities, in some cases with direct access to freeways. These facilities enable service provision to a large catchment area, especially for long distance commutes. They also provide parking for carpools and vanpools, enabling a leveraging of benefits for alternative transportation efforts.

- HOV lanes shared with buses enable BRT services to operate at a higher speed and provide faster travel times. Like the park-and-ride lots, the lanes enable several alternative transportation modes to take advantage of the capital investment.

- The arterial BRT systems use transit signal priority extensively to provide faster operating speeds and shorter travel times. While relatively low in cost, the use of TSP provides attractive benefits for commuters and other riders in congested corridors. Their use requires close coordination with local traffic engineers in both design and operation to minimize impacts to cross streets.
5. Initial Corridors

Based on discussions with the Project Team, review of previous reports, input from the region’s planning directors, and field inspections, 13 corridors were identified for the initial screening as reported in Table 1 and Figure 2.

Table 1 Initial Screening Corridors

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Limits</th>
<th>Length (miles)</th>
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<tbody>
<tr>
<td><strong>Freeway/Highway Corridors</strong></td>
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<tr>
<td>I-15</td>
<td>Corona Metrolink Station - Pechanga Resort</td>
<td>41.7</td>
</tr>
<tr>
<td>I-215</td>
<td>Perris Metrolink Station - Pechanga Resort</td>
<td>25.6</td>
</tr>
<tr>
<td>I-10</td>
<td>Calimesa - Beaumont</td>
<td>7.5</td>
</tr>
<tr>
<td>SR-60 West</td>
<td>Downtown Riverside - Moreno Valley (Redlands Blvd)</td>
<td>24.9</td>
</tr>
<tr>
<td>SR-60/I-10 East</td>
<td>Moreno Valley (Redlands Blvd) to Morongo/Cabazon</td>
<td>19.9</td>
</tr>
<tr>
<td>SR-74</td>
<td>Perris Metrolink Station - Hemet</td>
<td>17.0</td>
</tr>
<tr>
<td>SR-79</td>
<td>Hemet - Pechanga Resort</td>
<td>17.2</td>
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<tr>
<td><strong>Freeway/Highway Corridors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alessandro Boulevard</td>
<td>Magnolia - Riverside Co. Medical Center</td>
<td>13.5</td>
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<tr>
<td>Van Buren Boulevard</td>
<td>Magnolia/Galleria - I-215/March AFB</td>
<td>12.7</td>
</tr>
<tr>
<td>Mid-Valley Parkway West</td>
<td>I-215 - Lake Perris</td>
<td>4.9</td>
</tr>
<tr>
<td>Mid-Valley Parkway East</td>
<td>Lake Perris - Hemet</td>
<td>15.8</td>
</tr>
<tr>
<td>Margarita/Ynez</td>
<td>Pechanga Resort - Loma Linda University Medical Center Murrieta</td>
<td>17.2</td>
</tr>
<tr>
<td>Jefferson Avenue</td>
<td>Pechanga Resort - Lake Elsinore Outlet Stores</td>
<td>24.7</td>
</tr>
</tbody>
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Figure 2 Initial Screening Corridors
Each one was evaluated using these criteria:

- Population Density
- Employment Density
- Activity Centers
- Smart Growth Opportunities
- Local and Regional Transit Connectivity
- Existing Local and Express Bus Service
- Potential for Transit Priority Treatments

Based on the results of the initial screening, five corridors were selected for additional evaluation. While the other corridors were not selected for further consideration of BRT service at this time, they remain candidates for other types of transit service improvements, including enhanced express services, increased frequency, and upgraded vehicles. Specific improvements will be determined as part of the annual short range transportation plan update conducted by RTA.

The Perris Boulevard corridor was added to the detailed evaluation after initial screening as a result of a review of ridership on existing routes in the RTA system. The Perris Boulevard corridor, is among RTA’s most patronized routes. Its linear nature and service to key activity centers make it a suitable corridor for consideration of BRT service. Also, during the course of the detailed evaluation, opportunities in Temecula led to combining the Margarita-Ynez corridor with the I-215 corridor. The corridors considered in the detailed evaluation are listed in Table 2.

**Table 2  Detailed Evaluation Corridors**

<table>
<thead>
<tr>
<th>Corridor</th>
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<tr>
<td>SR-60 West</td>
<td>Downtown Riverside - Moreno Valley (Redlands Blvd)</td>
<td>24.9</td>
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<tr>
<td><strong>Arterial Corridors</strong></td>
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<td></td>
</tr>
<tr>
<td>Alessandro Boulevard</td>
<td>Magnolia - Riverside Co. Medical Center</td>
<td>13.5</td>
</tr>
<tr>
<td>Perris Boulevard</td>
<td>Moreno Valley Mall - Perris Transit Center</td>
<td>16.7</td>
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</table>
6. Additional Screening of Shortlisted Corridors

The three freeway and two arterial corridors with the highest rankings are described below.

Freeway/Highway Corridors

I-15 – The I-15 corridor extends from the Corona Metrolink Station to the Pechanga Resort near Temecula. HOV lanes are planned in the median north of I-215, providing an excellent opportunity for BRT travel time savings. Key stations in the corridor include Pechanga Resort, Temecula Transit Center, Railroad Canyon Road/Lake Elsinore, Dos Lagos, and the Corona Metrolink Station. Selected park and ride lots in the corridor would also be served.

I-215 – This corridor stretches from the Perris Transit Center and future Metrolink station to the Pechanga Resort. Service would be provided to the Metrolink Station at SR-74, the park-and-ride lot at Newport Road, the new Loma Linda Medical Center at Murrieta, the future Temecula Transit Center, and Jefferson Avenue. Selected park and ride lots in the corridor would also be served.

SR-60 West Segment – This corridor extends from the Downtown Riverside Transit Center/Metrolink Station to the eastern end of Moreno Valley at Redlands Boulevard. Key stations include the Moreno Valley Mall and UCR.

Arterial Corridors

Alessandro Boulevard – This corridor extends from Magnolia Avenue to the Riverside County Medical Center in Moreno Valley. It would serve established areas near the Magnolia Corridor, along with developing areas west of I-215 and in Moreno Valley. Key stations include Magnolia Avenue, Mission Grove, the future Moreno Valley March Field Metrolink Station, and the Riverside County Medical Center.

Perris Boulevard – This corridor extends from the Perris Transit Center and future Metrolink station in downtown Perris to the Moreno Valley Mall. It would serve the Riverside Community College and future development at March Air Force Base, and would intersect with the Alessandro BRT corridor. The existing service in the corridor, Route 19, is one of the highest ridership routes in the RTA system.
Developed in collaboration with the Project Team, the following criteria were used to evaluate the shortlisted corridors.

- Population Density
- Employment Density
- Transit Dependency
- Service to Employment Centers & Redevelopment Areas
- Activity Centers
- High Speed Operation/Travel Time Savings
- Local and Regional Transit Connectivity
- Support of Regional & Local Transportation Plans
- Support of Regional & Local Land Use Plans
- Support of Smart Growth
- Effect on Traffic Operations
- Right of Way Availability
- Capital Improvements
- Operating Cost
- Phasing of Corridor into Ultimate System

Each criterion was scored using a scale of -2 to +2 using the following general scoring concept.

+2 Substantially Positive
+1 Somewhat Positive
0 Average
-1 Somewhat Negative
-2 Substantially Negative

Using the criteria and measurement methods described in Section 3, the corridors were scored for each of the criteria and totaled for an overall score, as summarized in Table 3 and shown in Figure 4.

### Table 3 Corridor Scoring Summary

<table>
<thead>
<tr>
<th>Corridor</th>
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<tbody>
<tr>
<td>Alessandro Boulevard</td>
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<tr>
<td>Perris Boulevard</td>
<td>11</td>
</tr>
<tr>
<td>I-15</td>
<td>11</td>
</tr>
<tr>
<td>I-215</td>
<td>9</td>
</tr>
<tr>
<td>SR-60 West</td>
<td>9</td>
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</table>
Figure 3  Corridor Rankings

Source: IBI Group
7. Use of Study Results

To maximize its effectiveness and the use of capital investment, BRT service needs to provide frequent service and carry large numbers of passengers. Arterial routes usually serve a wide range of trips throughout the day, many of them short in length, that facilitates high ridership. Freeway routes often serve primarily commuters, leading to the need for frequent service on weekdays during peak periods, but less service during off peak times and weekends. As a result, true BRT service lends itself well to deployment in arterial corridors, while finely tuned, high quality express service can often serve transit demand in freeway corridors.

Implementation of BRT or enhanced express services will most likely be phased in nature. Improved commuter service can be the precursor to BRT particularly along the highway corridors. A similar approach of phased improvement can also be used for the arterial corridors. An excellent example is the Route 1 service in the Magnolia corridor. With relatively high frequency service today, Route 1 is a strong candidate for upgrading to BRT service. The demonstrated high levels of demand in the corridor today indicate that BRT will be beneficial as the next step for service between Corona to Moreno Valley in the Magnolia corridor.

Freeway express service can likewise be upgraded in phases with increased frequency during peak hours, enhanced vehicles, and improved amenities at stops. The I-15 corridor, which already has strong commuter demand, could be the beneficiary of these improvements, especially with the future HOV lanes available to increase operating speeds and decrease travel time. Should demand throughout the day build to sufficient levels, service in this corridor could be upgraded to all day BRT type service with higher frequency.

It is also important to note that the level of development density in these corridors will need to increase dramatically to justify and sustain BRT service levels and infrastructure improvements. Research has found that an urban area should have a density of at least 5,000 persons per square mile to support bus rapid transit (TCRP Report 90, Bus Rapid Transit Volume 2: Implementation Guidelines, Table 2-1, page 2-5, 2003). By 2035, the Alessandro and Perris corridors are expected to have population densities near the 5,000 level. The other corridors are projected to have substantially less. In addition, any type of federal grant will require a demonstrated need for service at levels that can support 10 to 15 minute headways for a BRT project to be eligible for funding.

Corridor Improvements

With the key attributes of BRT and express bus service in mind, the following recommendations are provided regarding the study corridors.

BRT Corridors

Alessandro Corridor – As an arterial corridor with strong existing and future travel demand, this highest ranked corridor lends itself well to phased implementation. It can be upgraded gradually, with priority treatments and branded shelters being added early, followed by traffic signal priority, queue jumps, higher frequency, and BRT vehicles. The first step involves incorporating this corridor into the region’s programming documents, to secure funding and ensure it is the next BRT corridor to be developed after the both phases of the Magnolia project are completed.
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Perris Boulevard – Tied with I-15 as the second highest corridor, BRT service in this arterial corridor can be implemented in a way that matches improvements with increases in demand over time. The start up of Metrolink service in late 2012, in addition to the routes currently serving the Perris Transit Center, will provide an important opportunity to begin the phased upgrade to BRT in this corridor. As March Air Force Base is developed, ridership in this corridor can be expected to grow and BRT service will help serve that demand.

Express Bus Corridors

I-15 – As one of the second highest ranked corridors, I-15 has outstanding potential for upgraded transit service. Due to the long distances and commute nature of much of the corridor’s travel, it is recommended that upgraded express service be provided. This upgraded service could be implemented in phases, by first operating on the planned HOV lanes when they are completed to increase operating speed and reduce travel time. Stations in the early phases could be provided on the shoulders, or on interchange on ramps. A stop at the Dos Lagos development could be implemented early, providing service to this high density, mixed use development. Over time, online stations with pedestrian overpasses could be provided to serve park and ride lots and minimize off line travel. Vehicles can be upgraded to highway coaches, similar to the services operated on I-15 in San Diego. Finely tuned scheduling to match work start and stop times would enable the service to be effective and help ensure it is provided at a reasonable cost.

I-215 – Like I-15, this corridor would be more suitable for upgraded express bus service rather than high frequency, all day BRT service. Since HOV lanes are not planned for in this corridor, there will be limited opportunities to improve mainline travel time. Queue jumps and TSP could be provide on the arterial portion of the route. Lower cost stations could be provided on the shoulders, with pedestrian bridges to link both sides of the freeway to the stops. Tying into the Perris Transit Center and the future Metrolink service, will provide a strong terminal connection, while service to the Temecula Transit Center will enhance travel opportunities in the southern part of the study area and assist in the redevelopment along Jefferson Avenue.

SR-60 West – This corridor also lends itself to upgraded express bus service to take advantage of the existing and future HOV lanes. The improved service would provide travel time savings through the congested SR-6/I-215 interchange, and service to UCR and Downtown Riverside would be enhanced. While it is located near the Alessandro Corridor, its service can be tailed to avoid duplication by focusing on commuter travel, with lower frequency in the off peak periods.
Funding Issues

Reduced tax revenues resulting from the economic slowdown and the changing nature of communities due to difficulties in the housing market, have resulted in a reduced amount of funding for the region’s transportation infrastructure projects. Currently federal, state and local revenue streams that are available to fund transit operations have been significantly reduced. While this trend is expected to continue in the near-term, longer term funding solutions and sources may become apparent in the future as alternative transportation methods - such as BRT - may be more fully examined for the potential to reduce vehicle miles traveled and greenhouse gas emissions.

At this time it is not possible to define a timeline for the implementation of these services, as implementation of transit improvements in any of these corridors will depend on the availability of new or increased funding. Identifying specific existing and new funding sources would be an important part of the next phase of service development. The region’s transportation partners, WRCOG, RCTC, and RTA, may incorporate these corridors into the region’s transportation programs and seek to secure funding for their construction and operation in the future. Gradual upgrades in the highest ranking corridors will be required.

8. Station Area Planning

Focusing urban development around transit facilities is recognized as a significant way to improve the effectiveness of public transportation systems. Furthermore, the placement and design of transit stations can achieve other community planning and development objectives. The future transit stations associated with the BRT corridors in Western Riverside County have multiple roles to play. First, there is the transportation role, including providing safe and efficient interface between riders and buses. Next, and equally important, are the placemaking and land development roles that maximize the placement, size, and design of the station to add character, create place, and help foster surrounding development over time. With this perspective in mind, several BRT station concepts, including their relationship to existing or future potential development, were examined.

Six prototypical BRT station types were identified for the Western Riverside BRT corridors:

- Multimodal Station - Corona, Riverside, Perris
- Major Bus Transfer Station - Temecula Transit Center
- In-Line Station - Menifee
- End-of-Line Station - Riverside County Medical Center
- Village Center Park-n-Ride Station - Dos Lagos
- Walk-up Station - Abbott Labs

Each of these station types was examined, along with principles and design ideas for associated development, to illustrate the typical station requirements, layout, and integration with surrounding development. These are intended to be used as a guide for future station planning along each of the western Riverside BRT routes. Opportunities for future TOD will of course vary from station area to station area, but the basic principles and best practices for ensuring development that is “transit oriented” versus “transit adjacent” remain the same.
City of Menifee In-Line Station Conceptual Site Plan - Located along shoulder

- southbound BRT route
- conceptual 27,000 sq.ft. performing arts center
- 100 spaces reserved for BRT parking
- conceptual location of 51,000 sq.ft. Mt San Jacinto College expansion buildings
- southbound BRT station ticketing & waiting pavilions (60’ long)
- 100 spaces reserved for BRT parking

City of Menifee In-Line Station Conceptual Site Plan - Located within median

- proposed pedestrian bridge accessible by safe pedestrian crossings
- southbound BRT route within proposed HOV lanes
- northbound BRT station ticketing & waiting pavilions (60’ long)
- southbound BRT station ticketing & waiting pavilions (60’ long)
- northbound BRT route within proposed HOV lanes

- proposed BRT route
Riverside County Medical Center End-of-Line Station Conceptual Site Plan

- Future high-intensity development: possible senior housing, assisted living, or medical office, etc.
- 4–6 additional bus bays to accommodate layover time for end-of-line station
- 2–3 story flats or office above commercial ground-floor commercial
- Safe pedestrian crosswalks identified with distinctive paving
- Motorcourt product orientated to street
- Triplex units within the site provides variety and diversity
- Potential mixed-use office/commercial concept
- Blue Ribbon Lane
- BRT station ticketing & waiting pavilions (60’ long)
- Approximately 75 spaces reserved for BRT parking
- Proposed BRT route
- Pedestrian access from BRT station to Medical Center
- Existing local and regional bus drop-off area
Village Center Park & Ride Station Conceptual Site Plan
City of Temecula Walk-Up Station Conceptual Site Plan

- sidewalk to adjacent commercial
- northbound BRT station waiting area
- northbound BRT station ticketing pavilion
- extra bus bay to accommodate possible layovers
- pedestrian bridge
- pedestrian access to new Abbott office building
- safe pedestrian crosswalks identified with distinctive paving
- northbound BRT route
- Abbott office building housing 4,000 employees
- pedestrian access to Abbott Laboratories building
- southbound BRT route
- extra bus bay to accommodate possible layovers
- southbound BRT station ticketing pavilion
- southbound BRT station waiting area
- proposed BRT route