10. sbX ROADWAY DESIGN ELEMENTS

sbX roadway elements, such as running ways and queue jump lanes, are major factors that allow sbX vehicles to maintain high operating speeds and service reliability, and help make the sbX service more competitive with the automobile than typical local bus service. Combined with Transit Signal Priority (TSP) as described in Section 11, these elements can achieve significant increases in the reliability and the level of service provided.

10.1 sbX Design Speeds

Maximum operating speed in the sbX exclusive lanes shall be no more than 10 mph greater than the posted speed limit of parallel traffic. Design speed of parallel traffic and for sbX in mixed flow shall be the posted speed limit.

10.2 sbX Running Ways

sbX vehicles operate in running ways, which serve as the major determining factor in the speed, reliability, and total cost of a BRT system. Greater separation between the running way and mixed traffic produces faster operating speeds, and greater reliability, but increases capital costs.

sbX service can operate on three types of running ways:

- **Mixed-Flow Traffic Lanes** – Travel lanes used by sbX vehicles, local buses and regular traffic.
- **Converted Bus-Only Lanes** – Lanes, either at the curb or the median, that have been converted from mixed-flow or parking lanes to bus only lanes. These lanes may be used exclusively for buses during peak periods or throughout the day. The lanes are not physically separated from adjacent mixed-flow lanes and are usually delineated by pavement striping or signage. sbX vehicles and local buses would be allowed to enter curb running converted bus only lanes, however local buses would not be able to use center running lanes with a single platform, due to door configuration of local bus vehicles.
- **Dedicated Bus-Only Lanes** – Similar to a converted bus-only lane, either at the curb or the median that are purpose-built for transit and are physically separated from mixed traffic by barriers, bollards, or raised medians/curbs. As such, physical implementation and capital costs are somewhat higher for dedicated bus-only lanes compared to converted ones. The sbX Green Line E Street corridor operates in portions of center running dedicated bus-only lanes. sbX vehicles and local buses would be allowed to enter curb running dedicated bus only lanes, however local buses would not be able to use center running lanes with a single platform, due to door configuration of local bus vehicles.

In all three types of running way, the local bus stops would be located at separate stop locations from the sbX service. The following sections describe various BRT running way operating environments. Each defines the running way, identifies key operating advantages and disadvantages, and describes the applicability of each running way option available to Omnitrans and San Bernardino County.

10.2.1 Mixed-Flow Traffic Lanes

Mixed-flow lanes are general purpose traffic lanes used by buses and regular traffic, including trucks, private automobiles, and motorcycles. Preferred local bus stop locations would be located on the farside of the intersection ahead of the sbX stations, with a preferred distance of 40’ (a minimum of 25’) between the sbX stations and local bus stop to allow for sbX vehicles to reenter the mixed flow lanes (as shown in Figure 9-6.)

- **Advantages** – Mixed-flow traffic lanes have minimal capital costs since major physical modifications or expansions to the roadway are not necessary. Intersection delays can be reduced when Transit Signal Priority (TSP)
and queue jump lanes are implemented along a corridor. Buses benefit from a range of street and traffic improvements, which reduce overall traffic delay. Utility work in portions of the roadway generally does not impact bus operations with mixed flow traffic lanes. Local bus stops would be located adjacent to sbX stations, allowing for a short walking distance for transfers.

- **Disadvantages** – Bus operations are impacted by traffic conditions and congestion resulting in reduced speeds and reliability, and increased chances for collisions. Delay to buses may also result from turning, queuing, or double-parked vehicles and merging, turning, and/or loading/unloading buses may delay mixed-flow traffic. The absence of fixed infrastructure or guideway makes the system seem less “permanent,” which may reduce development potential along the corridor. Local bus stops may require bus turnouts where adequate space for the sbX service to pass local buses is not available.

- Omnitrans’ policy is that BRT shall operate in mixed-flow travel lanes when traffic conflicts do not impact operating speeds, reliability, daily boardings, and route performance; and/or average boardings per day are within standard range. BRT shall also operate in mixed-flow travel lanes when bus-only lanes are impractical.

### 10.2.2 Converted Bus-Only Lane

Curbside parking or mixed-flow lanes converted for transit vehicle use only during peak periods or throughout the day are considered converted bus-only lanes. These lanes can revert back to mixed-flow traffic after operating hours depending on traffic conditions and route demand throughout the day. Converted bus-only lanes generally do not require physical alterations, such as median conversion or street widening, to the street ROW. The lanes are demarcated by appropriate signage, pavement markings (e.g. diamond symbol), wide striping, and pavement coloring.

The lanes may be partially reserved (i.e., taxis, high-occupancy vehicles, emergency vehicles, or turning vehicles may be allowed to use the lane) or fully reserved (for buses only). Intersection crossings are made at-grade. Mixed traffic is typically allowed to enter or cross bus-only lanes to turn or park at designated parking spots along the curb. If a parking lane exists adjacent to converted bus-only lane, then peak period parking bans may need to be adopted. For converted bus-only lanes, the curb lane would be the preferred condition to allow for both local bus and sbX service to access the bus-only lane. Local buses would not be able to use a median lane due to the local bus door configuration. Local buses stops would interact with the sbX stations in the same way as mixed flow traffic lanes.

- **Advantages** – Increased competitive advantages can be gained versus automobiles and buses traveling in mixed-flow lanes. Buses operating in their own lane can operate faster, more reliably, and more safely than buses operating in mixed-flow traffic lanes. Higher peak period loads can be accommodated and shorter headways maintained since mixed-flow traffic does not conflict with bus movements. When combined with TSP and queue jump lanes, travel delays can be further minimized at intersections. Mixed-flow traffic does not conflict with merging, turning, and/or unloading and loading buses. There is a potential for development intensification and diversification along the corridor. Utility work in portions of the roadway generally does not impact bus operations with converted bus-only traffic lanes, as the bus can easily enter and exit the designated lane. Local bus stops would be located on the curb adjacent to sbX stations, allowing for a short walking distance for transfers.

- **Disadvantages** – Buses still cross intersections at-grade. Lanes are not physically separated from mixed-flow lanes, which may result in conflicts with turning or parked vehicles. To prevent conflicts with parked vehicles, peak period parking bans may be required.
Travel time advantages compared to the automobile are only achieved during hours when buses travel in bus-only lane. Conversion of lanes to bus-only lanes may require the displacement of parking, traffic, businesses, and pedestrians. Capital costs are higher than for BRT operating in mixed-flow traffic lanes. Active enforcement is necessary to keep lanes clear of non-designated vehicles. Local bus stops would not require bus turnouts for the sbX service to pass local buses however, the sbX service would be required to merge into mixed flow traffic lanes to pass local buses.

Omnitrans’ policy is that Converted Bus-only Lanes are applicable when: (i) delay from mixed traffic impacts route performance; (ii) sufficiently wide (11’–13’) parking or mixed-flow traffic lanes are available; (iii) sufficient financing exists for roadway improvements and lane demarcation; and (iv) daily boardings justify improved service.

10.2.3 Designated Curbside Bus-Only Lane

Designated curbside bus-only lanes are physically separated, purpose-built curbside lanes for transit vehicles only.

This requires physical alterations to the street ROW, where sufficient ROW is not available. Physical separation is accomplished with concrete barriers, raised medians or pavement, or bollards. Designated curbside bus-only lanes do not revert to mixed-flow traffic use like converted bus-only lanes.

Bus-only lanes may be partially reserved to allow shared usage by taxis, high occupancy vehicles (HOVs), emergency vehicles, or turning vehicles or can be fully reserved for buses only. The lane is physically separated throughout the entire length of the lane, except at intersections where crossings are made at-grade and at lane entrance and exit. Mixed traffic is typically allowed to enter or cross bus-only lanes to turn or park at designated parking spots along the curb. Local buses would have access to the bus-only lane, and local bus stop interface would be similar to the mixed-flow traffic lane condition, with the exception that local bus stops would require bus turnouts to prevent buses at local buses stops from blocking the use of the bus-only lane.

Lanes are demarcated by pavement markings, vertical signage and pavement coloring (especially at intersections and merge points).

- **Advantages** – Improved sbX travel times can be attained in designated curbside bus-only lanes, making sbX vehicles in these lanes more competitive with the automobile. Buses operating in their own lane can operate faster, more reliably, and more safely than buses in mixed flow lanes. Such systems can accommodate higher peak period loads and operate at lower headways. Mixed-flow traffic does not conflict with merging, turning, and/or unloading or loading buses. There is potential for development intensification and diversification along the corridor and near stations. Curbside bus-only lanes are generally more cost efficient than median bus-only lanes. Utility work in portions of the roadway generally does not impact bus operations with designated curbside bus-only lanes, as the bus can easily enter and exit the designated lanes, depending on lane delineation devices. Local bus stops would be located on the curb adjacent to sbX stations, allowing for a short walking distance for transfers.

- **Disadvantages** – Buses still cross intersections at-grade, including driveway curb cuts for adjacent, private land uses, and conflict with high volumes of right-turns. Implementation of new curbside bus lanes and street widening may displace parking, pedestrian and bicycle paths, and nearby residents and businesses. Higher capital costs compared to converted bus-only lanes. Active enforcement would be necessary to keep
non-transit vehicles out of the bus-only lanes. When compared to median bus-only lanes, station costs are generally higher as two separate platforms are needed. Local bus stops would require bus turnouts to prevent local buses from blocking the exclusive lane.

Omnitrans’ policy is that designated curbside bus-only lanes are applicable when: (i) delay from mixed traffic impacts route performance; (ii) existing traffic and street conditions prevent the conversion of a parking or mixed-flow traffic lane to a bus-only lane; (iii) the street section is wide enough to add an 11’ to 13’ curbside lane; (iv) permits to modify the ROW have been or can be obtained; (v) sufficient financing exists for proposed capital improvements; and (vi) daily boardings justify improved service.

10.2.4 Designated Median Bus-Only Lane

Designated median bus-only lanes are physically separated median lanes for transit vehicles only. Designated median bus-only lanes require physical alterations to the street ROW, in terms of median conversion and/or the takeover of adjacent mixed-flow lanes for bus-only operations. Physical separation is accomplished with concrete barriers, raised medians or pavement, or bollards. Designated bus-only lanes do not revert to mixed-flow traffic use like converted bus-only lanes. Lanes are demarcated by pavement markings, vertical signage and pavement coloring, especially at intersections and merge points.

Designated median bus-only lanes may be partially reserved to allow shared usage by taxis, high-occupancy vehicles (HOVs), emergency vehicles or turning vehicles to use the lane or fully reserved for buses only. Local bus service would not be able to utilize the median bus-only lanes due to the vehicle door configuration. The lane is physically separated throughout, except at intersections where crossings are made at-grade and at lane entrance and exit.

- **Advantages** — Improved sbX travel times can be attained compared to automobiles and buses traveling in mixed-flow traffic lanes, making dedicated bus-only lanes more competitive with the automobile. sbX vehicles operating in their own lane can operate faster, more reliably, and more safely than buses and vehicles traveling in mixed-flow traffic lanes. Such systems can accommodate higher peak period loads and operate at lower headways. Mixed flow traffic does not conflict with merging, turning, and/or unloading or loading buses. There is potential for development intensification and diversification along the corridor and near stations.
**Disadvantages** – Buses still cross intersections at-grade. Implementation of new median lanes may displace landscaping, median recreation areas, and adjacent traffic lanes. Considerably higher capital costs compared to converted bus-only lanes. Relatively higher capital costs compared to dedicated curbside bus-only lanes. Active enforcement would be necessary to keep non-transit vehicles out of the bus-only lanes. Left turning vehicles are banned from the busway, but are accommodated adjacent to the median dedicated BRT lanes. Center bus-only lanes require wider ROW than curbside bus-only lanes for provision of barriers and stations. Utility work in portions of the roadway may impact bus operations with designated median bus-only lanes, depending on lane delineation devices. Local bus stops would be located on the curb, and transit users would need to cross the street to access the median stations. Local bus stops would require bus turnouts in some locations to prevent local buses from blocking mixed-flow travel lanes.

Omnitrans’ policy is that designated median bus-only lanes are applicable when: (i) delay from mixed traffic impacts route performance; (ii) existing traffic and street conditions prevent the conversion of a parking or mixed-flow traffic lane to a bus-only lane; (iii) the existing street profile is not wide enough to accommodate adding 11’–13’ curbside lanes; (iv) sufficiently wide enough center medians exist (in addition to adjacent lanes) for a busway; (v) permits to modify ROW have been or can be obtained; (vi) sufficient financing exists for proposed capital improvements; and (vii) daily boardings justify improved service.

**10.3 Roadway Cross Sections**

Depending on the characteristics of each street along which the sbX system will be developed, accommodation of sbX lanes will require shared or exclusive use of some existing travel lanes, possible reduction in some existing lane widths, widening of roadways, and development of modified cross sections with space for sbX lanes, general travel lanes, parking, parkway, sidewalks, bikeways and shoulders as appropriate, in order to meet all pedestrian and vehicular space requirements.

Cross section requirements begin with each street’s functional classification and requirements for moving traffic at acceptable levels of service. Following development of new cross sections, assessments will be made of the adequacy of existing rights-of-way (ROW), the need for widening, availability of additional ROW, the need to purchase new ROW and any resulting impacts.

![Figure 10-2: Example of Dedicated Median Lane](image)
Throughout the design process, the designers will work closely with Omnitrans and the respective local jurisdictions to develop effective designs, identify and resolve design issues, and secure design approval from each city’s Public Works and Engineering departments as applicable.

Table 10-1 presents desirable and minimum standards for BRT lanes and other roadway elements. These standards should be used in developing proposed cross sections. An example of a proposed cross section for sbX Service in the sbX 4th Street/Holt Boulevard Corridor is shown in Figure 10-3.

<table>
<thead>
<tr>
<th>Table 10-1: Proposed Roadway Cross Section Element Design Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Widths for sbX</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>BRT lane width for center running</td>
</tr>
<tr>
<td>BRT lane width dedicated BRT lane for side running</td>
</tr>
<tr>
<td>Width of center running station (as designed)</td>
</tr>
<tr>
<td>Width for side running station</td>
</tr>
</tbody>
</table>

*Does not exist on the sbX Green Line. LACMTA Wilshire BRT has 12’ lane at curb.

10.4 Intersection Geometry
The geometry of the design of intersections shall be approved by the local jurisdictions and Caltrans as applicable.

10.5 Queue Jumpers
Delay at intersections from queuing vehicles detrimentally impacts bus performance. The cumulative impact of intersection delay can significantly hinder bus on-time performance and operating speed. Queue Jumpers are an effective solution that provides a special lane allowing transit vehicles to bypass queues at congested points, such as intersections. The lanes are distinctively identified by special pavement delineation.

Queue jumpers consist of a nearside right turn lane and farside bus stop and/or acceleration lane. Buses are allowed to use the right turn lane to bypass traffic congestion and proceed through the intersection. Additional enhancements to queue jumpers could include an exclusive bus only lane upstream from the traffic signal, an extension of the right turn lane to bypass traffic queued at the intersection, or an advanced green signal indication allowing the bus to pass through the intersection before general traffic does.

The ability to provide queue jump lanes could mean the difference between Omnitrans ability to provide local bus service or sbX service. Advantages include travel time saving, increased transit competitiveness, improved image of transit, and increased corridor carrying capacity. Furthermore, time saving can be achieved if the lane is integrated with a bus-only lane and/or TSP. Capital costs are relatively low compared to large-scale physical measures, such as grade separation, to reduce intersection delay.

Installation may result in: (i) a small increase in traffic delay; (ii) a decrease in roadway width for mixed traffic lanes; (iii) displacement of parking, pedestrians, and/or traffic; and (iv) increased danger for motorists and pedestrians, until they become accustomed to early entry of the bus into the intersection. Insufficient roadway width may prevent the installation of queue jump lanes at key congested intersections. Without other improvements (e.g., TSP) queue jumpers may be ineffective in reducing bus delay. Lanes require constant enforcement. If right turns are allowed out of the queue jump lane, this may interfere with bus flow.

Adequate distance would be provided on the far side of the intersection to enable easy reentry of the bus into mixed-flow traffic.
Figure 10-3: Example of a street cross section for dedicated median lane BRT

Produced for the City of Ontario by KTU+A, Holt Boulevard Corridor Streetscape and Strategic Plan, February 2012 (draft).
As shown in Figures 10-4 to 10-6, there are multiple strategies for queue jump lanes including:

**Queue Jumper with Acceleration Lane**
This option includes a nearside right turn lane (bus exempt), a nearside bus stop, and an acceleration lane for buses with a taper back to the general purpose lanes. The length of the acceleration lane is based on speed and should be designed by an experienced engineer.

**Queue Jumper with Farside Bus Stop**
This option may be used when there is a heavy directional transfer to an intersecting transit route. Buses can bypass queues either using a right turn lane (bus exempt) or an exclusive bus queue-jump lane. Since the bus stop is located farside, a standard transition can be used for buses to re-enter the traffic lane.

**Queue Jumper with Continuous Bus Lane**
This option includes a nearside right turn lane or an exclusive bus queue-jump lane, a farside bus stop and a continuous bus lane extending to the next block or further, depending on bus circulation patterns. Right turns are allowable by general traffic from the bus lane. Queue jumpers at arterial street intersections should be considered when:

- High-frequency bus routes have an average headway of 15 minutes or less;
- Forecasted traffic volumes exceed 500 vehicles per hour in the curb lane during the peak hour and right turn volumes exceed 250 vehicles per hour during the peak hour;
- Intersection operates at an unacceptable level of service (defined by local jurisdiction); and
- Cost and land acquisition are feasible.

An exclusive nearside bus-only lane in addition to the nearside right turn lane should be considered when the right turn volumes exceed 400 vehicles per hour during the peak hour. Further analysis should be conducted to determine specific warrants for the implementation of queue jumpers. The analysis should consider travel time benefits for bus passengers given varying levels of traffic congestion. The analysis should also consider the potential effect of causing delays to general traffic at the intersection blocking the transit vehicles travel between intersections.

Queue jumpers shall be implemented on a limited, as needed basis, at primary intersections, where delay significantly impacts bus performance, where adequate right-of-way exists to place a queue jump lane, and where benefits to transit are potentially the highest. A public awareness education process may be needed when queue jumpers are being implemented. Queue jump lanes provide the greatest benefits to buses when combined with TSP and/or bus-only lanes.

**10.6 Curbs, Gutters and Medians**
New curb and gutter will adhere to applicable city standards. Where the existing roadway is to be widened, curb and gutter shall be replaced to match existing. Curb and gutter will be 6” or 8” high, with a 1.5’ to 2’ gutter width according to individual city standards. At sbX station platforms, the curb height will be approximately 12” to 15” for level boarding.

All existing curb ramps will be maintained or relocated to new curb return location. If the existing curb return at a proposed station location does not have a curb ramp, one will be provided.

**10.7 Clearances**
Minimum horizontal clearance from the street to fixed objects on sidewalks that are to be reconstructed or on sbX station platforms shall be 2’ measured from the edge of the traveled way or face of curb. At stations the minimum clearance between overhead canopy and curb face will also be 2’.

Existing minimum vertical clearances will not be reduced along the sbX runningway. This may require the runningway pavement to be no higher than the existing pavement at critical locations.
Figure 10-4: Queue Jump Lane as Part of Right Turn Lane

NOTES:
1. ONLY TRANSIT VEHICLES PERMITTED TO MAKE STRAIGHT-AHEAD MOVEMENT OUT OF THE RIGHT-TURN LANE.
2. EFFECTIVENESS WILL BE IMPROVED IF THE QUEUE JUMP LANE IS INTEGRATED WITH TRANSIT SIGNAL PRIORITY.
NOTES:
1. THE LENGTH OF THE QUEUE JUMP APPROACH SHALL EXCEED THE MAXIMUM OBSERVED QUEUE LENGTH IN THE ADJACENT MIXED TRAFFIC LANES.
2. ONLY BUSES ARE ALLOWED TO THE QUEUE JUMP LANE.
3. EFFECTIVENESS WILL BE IMPROVED IF THE QUEUE JUMP LANE IS INTEGRATED WITH TRANSIT SIGNAL PRIORITY.

Figure 10-5: Queue Jump Lane Adjacent to Right Turn Lane
Figure 10-6: Queue Jump Lane with “Pork Chop” Islands

NOTES:
1. RIGHT-TURNING VEHICLES ARE ALLOWED INTO THE BUS-ONLY LANE IN THIS SCENARIO, BUT ONLY TRANSIT VEHICLES MAY MAKE STRAIGHT-AHEAD MOVEMENTS.
2. RIGHT-TURNING VEHICLES ALLOWED INTO THE BUS-ONLY LANE PRIOR TO THE END OF THE MAXIMUM OBSERVED QUEUE.
3. BUS ONLY LANE IS CONTINUOUS THROUGH THE INTERSECTION IN THIS SCENARIO.
4. EFFECTIVENESS WILL BE IMPROVED IF THE QUEUE JUMP LANE IS INTEGRATED WITH TRANSIT SIGNAL PRIORITY.
The general geometric design principals contained in the AASHTO publication “A Policy on Geometric Design of Highway and Streets,” and the standards for the local jurisdictions will be followed.

10.8 Turn Lane Storage Length
Turn lane storage length will be based on standard traffic engineering assessment of acceptable levels of service and the availability of ROW, costs, impacts and related factors.

10.9 Minimum Curb Radii
The minimum curb radii at intersections shall be determined using the standard local bus turning template, which is the maximum of Omnitrans fleet or city standards, whichever is greater. The standard bus turning radii is shown in Figure 10-7.

Curb returns will be reconstructed only where impacted. Non-standard curb radii will conform to standard unless doing so would impact an existing building or structure.

10.10 Additional Measures Supporting Transit Priority
The physical improvements described above are only as effective as traffic management, regulation and enforcement measures in place to ensure that these facilities and infrastructure function well and give transit a competitive advantage over the automobile. Traffic management, regulation and enforcement measures are described below:

10.10.1 Traffic Control and Management
Traffic controls relate to curb use, turning movements, and street directions at individual locations, on selected segments, or on an entire route where existing roadway traffic, parking, or turning movements reduce operating efficiency.

Three types of traffic control are generally adopted:

- Curb Parking Restrictions and Loading Controls. Imposed during peak periods or working hours to increase the lane width available to buses, reduce conflicts with vehicles entering or leaving a parking space, and increase transit operating speeds. These lanes may also be used as bus-only lanes if parking is banned throughout a corridor.

- Turn Controls (Banning of Left/Right Turns). Reduces the time lost behind queuing automobiles and reduces the chance of conflict with turning vehicles.

Initial opposition to these regulatory measures may appear if public “buy-in” is not obtained, especially for the prohibition of on-street parking, which can affect retail and commercial areas.

10.10.2 Enforcement
Bus-only lanes must be enforced to be effective. Without the active enforcement interference and improper use by automobiles, taxis, and trucks, can significantly reduce bus performance and safety.

Enforcement is necessary along bus-only lanes where potential exists for vehicular turning, or parking conflicts.

Enforcement must include the agencies and entities that will be involved in enforcement activities, such as local jurisdictions, Caltrans, SANBAG, local and state police, state and local judicial systems, and federal entities, as well as the type of strategy employed. The following are the types of enforcement methods available:

- Routine Enforcement – Random enforcement along a corridor throughout the day.

- Special Enforcement – Team patrols for a specific purpose.
• **Selective Enforcement** – A combination of routine and special enforcement, often focusing on problematic sections or locations.

• **Public Enforcement** – The public can call in violators.

• **Automated Enforcement** – Closed-circuit television (CCTV) may be used to identify violators and direct enforcement personnel accordingly. Also, cameras mounted on buses or at the wayside along the corridor, may be used to record violators and then subsequently issue summons or fines after accessing state or DMV databases. Violators shall be fined, have their cars towed, or be given penalty points against their driving record. These penalties are often publicized through public awareness programs.

Widespread disregard for bus-only lanes can significantly reduce operating performance of buses in these lanes. The higher the level of enforcement desired, the higher the costs. Automated or video enforcement requires regulatory changes to existing legislation, which may delay or sideline deployment.

Enforcement shall be conducted consistently around existing sbX stations and queue jump lanes. If a bus-only lane is implemented, routine enforcement, combined with CCTV and automated cameras, can most effectively regulate the corridor, although, as noted, regulatory changes must be made to existing legislation. It shall also be a priority to reduce operating expenses, so the introduction of automated cameras is very appropriate.

### 10.10.3 Signing and Pavement Markings

Special signs and signal displays are most applicable in areas where the potential for conflict with mixed traffic is the highest or conflicts have proven problematic in the past.

As shown in Figure 10-7, signs and displays may include the following:

• **Traffic Signs** – Diamond symbol and “Bus Only” pavement markings in bus-only lanes, pavement striping, and vertical signage, such as warning and regulatory signs about staying out of the bus-only lanes and turning prohibitions.

• **Signal Displays** – Transit-specific signal displays, which are most applicable on median bus-only lanes and queue jump lanes. These signals are used to differentiate the transit signal from signals meant for normal traffic.

The use of “BUS ONLY” pavement legends shall indicate the exclusive use of the lanes by buses. In addition, the logo “sbX” shall be installed on each block in the center of the sbX lanes in each direction to indicate that the lanes are for the exclusive use of sbX and to prevent any other vehicles, including non-sbX buses, to enter the exclusive lanes. Where transitways and/or bus lanes are built on arterials, signs shall be provided in each direction at each intersection. Figure 10-8 shows the sbX pavement legend for exclusive lanes.

Implementing alternate pavement color through colored asphalt or concrete can reinforce the notion that a particular lane is reserved for another use, thereby reducing conflicts with other vehicles and should be implemented along sbX lanes where feasible.

The following Figures 10-9 and Figure 10-10 are typical signage and pavement markings implemented by the sbX. All signs should be high intensity with graffiti resistant film.
Figure 10–7: Bus only traffic signs and signal displays.
Differentiation in the appearance of the runningway can be accommodated through a number of techniques including pavement markings, lane delineators, alternate pavement texture, and alternate pavement color. Implementing alternate pavement color through colored asphalt or concrete is particularly effective in reinforcing the message that a particular lane is reserved for another use, thereby reducing conflicts with other vehicles. As shown in Figure 10-11, Omnitrans has developed standard lane delineators and pavement symbols for the sbX Green Line; however lane delineators for future corridors will be developed in coordination with the respective jurisdictions.

Signing and pavement markings will be designed per applicable California MUTCD and municipal standards, with variances requested if necessary for any sbX distinguishing signing or markings. Special treatments or markings to differentiate the sbX service can effectively convey where the sbX service operates.
Figure 10-11: sbX Lane Delineation Detail

Diagram illustrating LEFT TURN PROHIBITION BARRIER TREATMENT and sbX BUS ONLY LANE with detailed measurements and materials.