4. PROJECT DEFINITION: ENGINEERING AND URBAN DESIGN ISSUES

This section is structured to provide additional definition for several key aspects of the Alternatives being carried forward for the Stage II Evaluation. This includes their operations, the facilities required to support their operations, urban design at stations and along the alignment, and the relationship of the project to the Crenshaw Transit Corridor project.

For the Stage II evaluation, the four Build Alternatives have been broken into smaller segments to allow for a more detailed and thorough evaluation. These segments correspond to minimum operable segments (MOS) or unique physical conditions as shown in Table 4.1 and Figure 4.1.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Segment(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local North</td>
<td>Little Tokyo/Arts District – Slauson Ave</td>
</tr>
<tr>
<td></td>
<td>Blue Line – Crenshaw Blvd</td>
</tr>
<tr>
<td>Local South</td>
<td>Metro Green Line – Redondo Beach RTC</td>
</tr>
<tr>
<td></td>
<td>Redondo Beach RTC – Torrance RTC</td>
</tr>
<tr>
<td></td>
<td>Torrance RTC – Normandie Ave</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via Normandie / Gaffey</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via I-110</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via Sepulveda / Willow</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via PCH</td>
</tr>
<tr>
<td>Regional</td>
<td>LAUS – Century/Aviation</td>
</tr>
<tr>
<td></td>
<td>Century/Aviation – Vermont Ave</td>
</tr>
<tr>
<td></td>
<td>Vermont Ave – San Pedro via I-110</td>
</tr>
<tr>
<td>Express</td>
<td>LAUS – LAX</td>
</tr>
</tbody>
</table>
Figure 4.1. Build Alternative – Stage II Analysis Segments

Regional / Express Alternatives: Union Station to LAX (Century/Aviation or CTA)

Local North Alternative: Little Tokyo/Arts District to Slauson Ave

Local North Alternative: Metro Blue Line to Crenshaw Blvd

Local South Alternative: Marine/Redondo Beach to Redondo Beach RTC

Local South Alternative: Redondo Beach RTC to Torrance RTC

Local South Alternative: Torrance RTC to Normandie Ave

Local South Alternative: Normandie Ave to Metro Blue Line

Local South / Regional Alternatives: Normandie Ave to San Pedro

Regional Alternative: Century/Aviation to Normandie Ave

Source: AE LLC, STV Incorporated
4.1. OPERATING PLAN

The operation of each Build Alternative was modeled to determine key parameters using a set of assumptions (operating hours, headways, route length, runtimes, average speeds, annualization factors etc.) and the outputs from a train operations model. Operating statistics are used to estimate Operating and Maintenance (O&M) costs, significant infrastructure needs (additional tracks, improved junctions, etc) and ridership.

4.1.1. Operations on Existing / Planned Transit System

During the initial alternatives definition process and Stage I screening, one objective that was pursued was to maximize opportunities to use existing transit infrastructure in the Study Area. This section investigates the feasibility of using these existing and planned transit lines.

Existing and Planned Transit Lines in Study Area

- **Metro Blue Line** (Existing) – Light Rail Transit (LRT) line from Long Beach (Transit Mall) to downtown Los Angeles (7th / Flower). Potential Harbor Subdivision interactions with Blue Line in Long Beach south of Willow Street and in downtown Los Angeles between Slauson Avenue and Washington Boulevard.

- **Metro Green Line** (Existing) – LRT line from Norwalk (I-105/I-605) to Redondo Beach (Marine/Redondo Beach). Potential Harbor Subdivision interactions with Green Line along existing alignment in El Segundo between Imperial Highway and Marine Avenue, and as possible extension of Green Line into South Bay as part of the Local South Alternative.

- **Metro Gold Line** (Existing) – LRT line from East Los Angeles (Atlantic/Pomona) to Sierra Madre (Sierra Madre Villa). Potential Harbor Subdivision interactions with Gold Line in downtown Los Angeles between Little Tokyo/Arts District station (1st/Alameda) and Los Angeles Union Station (LAUS).

- **Metro Crenshaw Transit Corridor** (Planned) – LRT or Bus Rapid Transit (BRT) line from El Segundo (Imperial/Aviation) to under construction Exposition Line (Exposition/Crenshaw). Potential Harbor Subdivision interactions with Crenshaw Corridor between Crenshaw Boulevard and Imperial Highway, and potentially further south if Crenshaw Corridor service is extended into South Bay.

- **Metro Regional Connector Transit Corridor** (Planned) – LRT line in downtown Los Angeles between current terminus of Metro Blue / Exposition lines (7th / Flower) and Metro Gold Line (1st/Alameda). Potential Harbor Subdivision interactions with the Regional Connector in the 1st/Alameda vicinity.

- **California High-Speed Train Project** (CHSTP) (Planned) – High-Speed train line between Anaheim, Los Angeles, San Francisco, and other points statewide. Potential Harbor Subdivision interactions with CHSTP from Redondo Junction area to LAUS along the Los Angeles River corridor.
Operations Issues – LAUS Area

With the planned introduction of the Regional Connector, LRT service in downtown Los Angeles will be reconfigured to allow for through service as opposed to the current LRT operations. It is expected that the Blue, Gold, and Exposition lines will be reconfigured operationally into two services: San Gabriel Valley / Pasadena to Long Beach, and East Los Angeles to Culver City / Santa Monica. This will require the construction of a new connection from the Regional Connector to the Metro Gold Line at 1st/Alameda.

To incorporate the Harbor Subdivision service in the downtown Los Angeles area, a third line would be required at 1st/Alameda and additional service would need to be accommodated along the existing Gold Line tracks between 1st/Alameda and LAUS. This scenario requires the weaving of schedules between the proposed Harbor Subdivision line and the Blue, Gold, and Exposition Lines. This would require extremely close attention to daily operations, scheduling, and a high degree of operator training. At this time, it appears to be operationally infeasible to safely and reliably weave the proposed Harbor Subdivision line with other services given the limited capacity along this segment.

To be able to accommodate the Harbor Subdivision in this area, it is likely that some of the following improvements would be needed:

- A siding or additional platform at LAUS for a separate recovery / layover location so that the Harbor Subdivision Line does not interfere with through operations of the Gold Line.
- Grade-separated junctions at interface locations with the Regional Connector and Gold Lines.
- Additional tracks / new alignment into LAUS to allow for additional capacity

Given the significant community impacts that have already been incurred / will be incurred in the Little Tokyo community from the Metro Gold Line Eastside Extension project and Regional Connector project, the measures proposed above will likely have unacceptable community impacts and still present serious operational constraints. As a result, the Local North Alternative will not be investigated further north of 1st/Alameda. A subterranean stub-end station in the 1st/Alameda area will be investigated in the Stage II evaluation, and a transfer will be needed to reach LAUS from the Local North Alternative.

Operations Issues – Blue Line between Washington Boulevard and Slauson Avenue

The Local North Alternative is proposed to run in the existing Metro Blue Line corridor between Washington Boulevard and Slauson Avenue. Running on the existing tracks was investigated by the Project Team and Metro Operations, and found to be operationally infeasible because of interlining issues. The Metro Blue Line would need to coordinate schedules with the Local North Alternative south of Washington Boulevard, then with the Exposition Line (currently under construction) north of Washington Boulevard. This additional coordination would introduce an unacceptable level of uncertainty and delay into the schedule.
Given the operational issues in this area, the Local North Alternative will run on completely separate tracks adjacent to the Blue Line (in the footprint of the existing Union Pacific Freight tracks). The alignment will break off the Blue Line corridor to avoid impacting the planned Service and Inspection facility in the Washington/Long Beach area, and run along Alameda Street north to 1st/Alameda.

**Operations Issues – Los Angeles River Corridor with CHSTP**

The CHSTP is planned to run along the Los Angeles River corridor into LAUS, with two dedicated tracks carrying the trains in this area. The Regional and Express Alternatives for the Harbor Subdivision project are proposed to run in this corridor. Operational analyses by the CHSTP have indicated that there is no excess capacity on the CHSTP tracks through this corridor. The Regional and Express Alternatives will instead likely run on the relocated Amtrak / Metrolink tracks through this area, which would occupy the footprint of several existing freight tracks. Provisions have been made in the conceptual design and cost estimate for a third track in this area to allow for sufficient Harbor Subdivision, Amtrak, and Metrolink capacity.

**Operations Issues – Crenshaw Corridor**

The Crenshaw Corridor project follows the Harbor Subdivision between Crenshaw Boulevard and Imperial Highway. If LRT is chosen as the preferred alternative for the project, the Local North Alternative is proposed to interline with the Crenshaw service southwest of Crenshaw Boulevard. The plan currently is to have 10 minute headways on both the Crenshaw and Local North alignments, combining for five minute headways southwest of Crenshaw Boulevard. With the potential interlining of two Green Line alignments (Norwalk to Redondo Beach and Norwalk to Los Angeles International Airport (LAX)) in the LAX area as well, this will likely present significant operational constraints. These issues will be investigated further as the project progresses, and may require additional tracks or other infrastructure in the LAX area.

**Operations Issues – Green Line / Crenshaw Corridor Extension**

The Local South Alternative is intended to act as a Green Line extension south from the current terminus at Marine/Redondo Beach. If LRT is the preferred alternative for the Crenshaw Corridor, it will likely also be extended south. Such operations appear to be operationally feasible, although several issues will need to be addressed. One is that the Green Line currently operates on a completely grade-separated alignment, and any extension will need to accommodate this capability. The issue is currently being investigated as part of the Crenshaw Corridor project (which is not completely grade separated and will interline with the Green Line if LRT is selected as the preferred alternative), and it is expected that the Harbor Subdivision project will utilize a similar design strategy.
Operations Issues – Blue Line in Long Beach

In the preliminary definition of alternatives and Stage I analysis, the Local South Alternative was proposed to run on the existing Metro Blue Line tracks into Long Beach for the Sepulveda / Willow and Pacific Coast Highway (PCH) routing options. Similar to the Local North Alternative, running on the existing tracks was determined to be operationally infeasible because of interlining issues. Interlining with the Local South Alternative would require extensive schedule coordination with the Metro Green Line and Crenshaw Corridor, and the Regional Connector project will require coordination with the Gold Line and Exposition Line. This operational scheme would basically require the coordination of all LRT lines in the Metro system to stay on schedule, and is not possible with current train control technology (or in the foreseeable future). For this reason, the Local South Alternatives to Long Beach have been truncated to terminate at the existing Metro Blue Line Stations at Willow Street and Pacific Coast Highway. A transfer will be required to head to destinations further to the north or south on the Blue Line.

4.1.2. Travel Times and Speeds

Travel times for the Build Alternatives are significantly shorter than travel times for the Transportation System Management (TSM) Alternatives, confirming the strong operational advantages of fixed guideway transit service over street running express bus service. This is especially true of the Regional Alternative, which extends from the South Bay to Union Station and is the longest of the four alternatives. These travel time benefits are expected to increase over time, as congestion on Study Area arterials worsens and average bus speeds deteriorate. Travel times for the four alternatives are detailed below (within each alternative, there are only minor travel time variances between modes):
Table 4.2. Travel Times and Speeds – Build Alternatives

<table>
<thead>
<tr>
<th>Alt.</th>
<th>Segment</th>
<th>Length (mi)</th>
<th>Travel Time (min)</th>
<th>Average Speed (mph)</th>
<th>TSM Travel Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local North</td>
<td>Little Tokyo/Arts District – Slauson Ave</td>
<td>4.5</td>
<td>10.3</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blue Line – Crenshaw Blvd</td>
<td>5.3</td>
<td>10.4</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Local North – Total</strong></td>
<td><strong>9.8</strong></td>
<td><strong>20.7</strong></td>
<td><strong>28</strong></td>
<td><strong>44.4</strong></td>
</tr>
<tr>
<td>Local South</td>
<td>Metro Green Line – Redondo Beach RTC</td>
<td>2.2</td>
<td>3.8</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redondo Beach RTC – Torrance RTC</td>
<td>2.5</td>
<td>4.5</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Torrance RTC – Normandie Ave</td>
<td>3.3</td>
<td>6.4</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via Normandie / Gaffey</td>
<td>4.5</td>
<td>7.7</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via I-110</td>
<td>5.1</td>
<td>8.2</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via Sepulveda / Willow</td>
<td>6.5</td>
<td>12.7</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via PCH</td>
<td>7.0</td>
<td>13.8</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Local South – Total</strong></td>
<td><strong>12.5 – 15.0</strong></td>
<td><strong>22.4 – 28.5</strong></td>
<td><strong>32 – 34</strong></td>
<td><strong>59.6 – 68.0</strong></td>
</tr>
<tr>
<td>Regional</td>
<td>LAUS – Century/Aviation</td>
<td>14.8</td>
<td>22.2</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Century/Aviation – Vermont Ave</td>
<td>12.5</td>
<td>17.2</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vermont Ave – San Pedro via I-110</td>
<td>5.2</td>
<td>7.6</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Regional – Total</strong></td>
<td><strong>32.6</strong></td>
<td><strong>46.9</strong></td>
<td><strong>42</strong></td>
<td><strong>118.4</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Express – Total</strong></td>
<td><strong>16.2</strong></td>
<td><strong>20.4</strong></td>
<td><strong>48</strong></td>
<td><strong>33.6</strong></td>
</tr>
</tbody>
</table>

Charts showing the running times between stations for the Local North, Local South, and Regional Alternatives are shown in Figure 4.2 through Figure 4.4. There are no intermediate stations for the Express Alternative.

**Figure 4.2. Running Times – LRT Mode – Local North Alternative**

Source: STV Incorporated
4.2. Crenshaw Transit Corridor Issues

The proposed Metro Crenshaw Transit Corridor project is currently considering two transit service alternatives along Crenshaw Boulevard through Los Angeles and Inglewood: BRT and
LRT. Both alternatives use the Harbor Subdivision corridor for approximately five miles from Crenshaw Boulevard in the north to the existing Metro Green Line Aviation/LAX station in the south. The selection and implementation of a Crenshaw Corridor Locally Preferred Alternative (LPA) will guide the improvements recommended for the Harbor Subdivision project.

The benefit of the Crenshaw Corridor project to the Harbor Subdivision alternatives under study is that the Crenshaw project will reconstruct and improve approximately five miles of railroad infrastructure at no cost to the Harbor Subdivision project.

Table 4.3 provides a summary of the considerations for a Crenshaw BRT alternative on the Harbor Subdivision alternatives. If BRT is chosen as the LPA, a new busway will be constructed along the north and west side of the Harbor Subdivision right-of-way (ROW) between Crenshaw Boulevard and Century/Aviation. Given this new BRT guideway, the Regional or Express Alternatives using Self-Propelled Railcars (SPR), Electric Multiple Units (EMU), or Commuter Rail Transit (CRT) vehicles on the relocated freight track would be the more viable options for the Harbor Subdivision through this area.

Table 4.3. Key Harbor Subdivision Decisions – BRT Chosen as Crenshaw Corridor LPA

<table>
<thead>
<tr>
<th>Harbor Modal Option(s)</th>
<th>Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRT- or Freight-</td>
<td></td>
</tr>
<tr>
<td>Compatible SPR, EMU,</td>
<td>• Services would run on relocated freight track (may need temporal separation with&lt;br&gt;</td>
</tr>
<tr>
<td>CRT</td>
<td>• ROW takes may be needed to accommodate passing siding (siding likely not</td>
</tr>
<tr>
<td></td>
<td>needed for Harbor Subdivision headways greater than 15 minutes).</td>
</tr>
</tbody>
</table>

If LRT is chosen as the Crenshaw Corridor LPA, a new double-tracked rail line would be constructed along the north and west side of the Harbor Subdivision ROW, necessitating a shift of the existing freight track to the south side of the ROW. The LRT tracks in this section could be made available for a Harbor Subdivision Alternative connecting the Slauson Corridor to LAX at little or no cost to the Harbor Subdivision project. Also, through this section, the Harbor Subdivision ROW can host both Crenshaw LRT and a Regional or Express service operating on the relocated freight track. Table 4.4 provides a summary of the key decisions of the Crenshaw LRT alternative on the Harbor Subdivision alternatives.

Table 4.4. Key Harbor Subdivision Decisions – LRT Chosen as Crenshaw Corridor LPA

<table>
<thead>
<tr>
<th>Harbor Modal Option(s)</th>
<th>Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRT &amp; LRT-Compatible</td>
<td>• Approximately 5 miles of LRT tracks (plus connection to Metro Green Line and&lt;br&gt;</td>
</tr>
<tr>
<td>SPR</td>
<td>additional existing shared infrastructure to Marine) would be available for use at&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>no cost to Harbor Subdivision Project.</td>
</tr>
<tr>
<td></td>
<td>• Street crossings would need to be examined to determine if additional Harbor&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>Subdivision LRT or SPR vehicles could be accommodated without triggering need</td>
</tr>
<tr>
<td></td>
<td>for additional grade separations.</td>
</tr>
<tr>
<td>Freight-Compatible</td>
<td>• Services would run on relocated freight track.</td>
</tr>
<tr>
<td>SPR, EMU, CRT</td>
<td>• ROW takes would be needed to accommodate passing siding (siding not needed&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>for Harbor Subdivision headways greater than 15 minutes).</td>
</tr>
</tbody>
</table>
4.3. **Support Facilities**

The introduction of new fixed-guideway transit service along the Harbor Subdivision corridor requires new support facilities along with the vehicles and track. The most prominent facilities are for vehicle maintenance and traction power supply (for electrically-powered modes), as described in the following sections.

4.3.1. **Storage and Maintenance**

The operation of transit service along the Harbor Subdivision will require off-corridor facilities where transit vehicles can be serviced, maintained and stored overnight. There are several potential sites for maintenance and storage facilities located near the ROW that can support the needs of the Harbor Subdivision alternatives, both for the near term and future build out. The assessment of maintenance and storage requirements for the Harbor Subdivision alternatives considered opportunities to leverage both existing and planned maintenance facilities, particularly those options identified for the Crenshaw Transit Corridor.

Maintenance and storage sites were identified in downtown Los Angeles, Westchester, El Segundo, Redondo Beach, Torrance, Wilmington and San Pedro, several of which are expansions of existing or proposed maintenance facilities in the Study Area. The number of new vehicles required for each alternative is shown in Table 4.5. All Harbor Subdivision alternatives require approximately 10 – 20 new vehicles for initial operations.

**Table 4.5. Vehicle Requirements – Build Alternatives**

<table>
<thead>
<tr>
<th>Alt.</th>
<th>Segment</th>
<th>LRT</th>
<th>LRT-Compat. SPR</th>
<th>Freight-Compat. SPR</th>
<th>EMU</th>
<th>CRT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local North</strong></td>
<td>Little Tokyo/Arts District – Slauson Ave</td>
<td>8</td>
<td>8</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Blue Line – Crenshaw Blvd</td>
<td>8</td>
<td>8</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td><strong>Local North – Total</strong></td>
<td><strong>16</strong></td>
<td><strong>16</strong></td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Local South</strong></td>
<td>Green Line – Redondo Beach RTC</td>
<td>3</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Redondo Beach RTC – Torrance RTC</td>
<td>3</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Torrance RTC – Normandie Ave</td>
<td>4</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via Normandie / Gaffey</td>
<td>6</td>
<td>6</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – San Pedro via I-110</td>
<td>6</td>
<td>6</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via Sepulveda / Willow</td>
<td>10</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Normandie Ave – Blue Line via PCH</td>
<td>10</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td><strong>Local South – Total</strong></td>
<td><strong>16 – 20</strong></td>
<td><strong>16 – 20</strong></td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
### Vehicles Required (Initial)

<table>
<thead>
<tr>
<th>Alt.</th>
<th>Segment</th>
<th>LRT</th>
<th>LRT-Compat. SPR</th>
<th>Freight-Compat. SPR</th>
<th>EMU</th>
<th>CRT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAUS – Century/Aviation</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>2 engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 coaches</td>
</tr>
<tr>
<td></td>
<td>Century/Aviation – Vermont Ave</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>2 engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 coaches</td>
</tr>
<tr>
<td></td>
<td>Vermont Ave – San Pedro via I-110</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>1 engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 coaches</td>
</tr>
<tr>
<td></td>
<td>Regional – Total</td>
<td>15</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>5 engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20 coaches</td>
</tr>
<tr>
<td></td>
<td>Express – Total</td>
<td>9</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>3 engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 coaches</td>
</tr>
</tbody>
</table>

### 4.3.2. Traction Power

Although traction power requirements are typically a function of preliminary and final design and based upon the system selected, it is useful to consider the basic requirements for these systems during the initial planning stages. Traction power requirements have been examined in relation to location of power supply, and footprints of facilities required to house the traction power equipment. Two high voltage power transmission substations have been identified along the corridor as possible supply sources for larger substations as required by the LRT and EMU modes. One site is located in the northern corridor, just west of a potential storage / maintenance facility located in Westchester, and another potential site is located in Wilmington near the southern end of the corridor, as shown in Figure 4.5.
Figure 4.5. Potential Storage / Maintenance Facility & Substation Sites

Potential Maintenance / Storage Facility Site
Potential High-Voltage Transmission Substation Site

Source: STV Incorporated
4.4. **Station and Alignment Urban Design**

Urban design activities have served as a key aspect of the Alternatives Analysis (AA) process, showing how the proposed transit projects can be integrated into the surrounding community. The activities are summarized in this section, which also includes several representative designs for stations and alignments throughout the Study Area.

### 4.4.1. Urban Design Approach

The urban design concepts for the Harbor Subdivision Transit Corridor are based on the following urban design approach:

1. **Support the integration of transit and community.** To create truly livable communities and to comply with current state legislation on climate change (AB32 and SB375), the state's major planning organizations will be required to consider how to reduce vehicle miles traveled when developing future plans. It is understood that greenhouse gas emission reductions are most effectively achieved by reducing automobile trips or vehicle miles traveled. When transit and land use (and its associated densities) are well-coordinated, the most successful station areas with strong ridership can result. The design of the station and any adjacent development must be thoughtfully integrated into the community while providing services and desirable amenities that encourage people to travel less by car and use transit. As part of the site design process, pedestrian and bicycle safety will be considered within the station area and through planning safe linkages to the surrounding community.

2. **Provide a foundation for the alignment's identity.** The urban design elements described in this report are like a kit-of-parts for the transit system. When thoughtfully designed they create a basic foundation for what the alignment will look like and can make new transit service “more legible” across the urban landscape of Los Angeles.

3. **Aim for sustainable and cost-effective solutions.** The urban design approach should contribute to the sustainability of the local communities being served by transit. This goal will inform decisions such as where stations should be located (highest, densest mix of uses), architectural design and material choices. Cost-effective solutions will be mandated by the limited funding sources that may exist in the future.

4. **Promote economic development consistent with local planning goals.** Locally adopted plans authored by a planning department or redevelopment agency should inform the land uses and development potential at each station area. The transit-oriented development opportunities shown in this report are intended to complement what has been envisioned by each community as the highest and best use for the area surrounding each station.

### 4.4.2. Transit-Oriented Development

Transit-Oriented Development (TOD) is a strategy meant to support the creation of more sustainable communities. TOD aims to reduce vehicle miles traveled by encouraging
development in the immediate station area and providing housing and jobs, services and amenities close to transit. TODs can be a single-use (like a hospital or employment center) but are often realized as mixed-use to encourage walking, bicycling and using transit to access most of one’s daily needs.

As outlined by the Center for Transit-Oriented Development, key benefits of TOD include:

- Reduced transportation costs
- Accommodates growth while mitigating its negative impacts
- Pedestrian activity increases safety and creates a dynamic environment
- Environmental impact reduced

There are several necessary components needed for successful TOD, including:

- Quality transit to regional destinations
- Dense development with limited parking
- Multiple uses within easy walking distance
- District-based (not project-based) planning framework

Additional components of a successful TOD program for the Harbor Subdivision are described in the following sections.

**Metro Joint Development Program**

Metro has successfully completed ten TOD projects to date on the Metro Blue, Red, and Gold Lines and at LAUS through its Joint Development Program. The Joint Development Program seeks to encourage comprehensive planning and development around station sites and along transit corridors; and to reduce auto use and congestion through encouragement of transit-linked development. In addition, the program strives to deliver development that:

- Promotes and enhances transit ridership
- Enhances and protects the transportation corridor and its environs
- Enhances the land use and economic development goals of surrounding communities and conforms to local and regional development plans
- Generates value to Metro based on a fair market return on public investment.

The Metro Joint Development Program should be a key element of the design and development of stations appropriate for TOD along the Harbor Subdivision corridor.

**4.4.3. Urban Design Concepts**

Preliminary station locations were selected for the four Build Alternatives using a variety of criteria, including freeway, arterial, and transit connections, land use compatibility, and consultation with stakeholders and the public. Preliminary urban design concepts were
developed for approximately 20 stations along the corridor, along with alignment designs between stations in key sections. These preliminary concepts were presented at the Technical Advisory Committee (TAC) workshops in July and August 2009, with selected concepts shown at the October 2009 Public Meetings. Representative concepts from throughout the Study Area are included in this section.

**Station Types**

Three basic station types were applied to the 20 stations areas selected throughout the corridor. These station types reflect assumptions on how to best serve specific areas and the potential ridership along the Harbor Subdivision Transit Corridor. The three station types are:

- **Neighborhood Station.** This station is designed to fit into existing residential neighborhoods and serve residents without introducing large amounts of new activity.
- **Transfer Station.** Medium-sized station designed for transit riders to make efficient inter-modal connections between transit systems or routes.
- **Transit Center Station.** Large station designed for major activity centers, transferring between multiple mode choices and representing the greatest potential for transit-oriented development.

**7th/Alameda Station**

This neighborhood station is located in downtown Los Angeles and within the Los Angeles Community Redevelopment Agency’s (CRA-LA) Central Industrial project area. The station would serve the adjacent industrial businesses and provide access to the Metro Local and Rapid bus lines along with the Greyhound Bus Terminal east on 7th Street.

For conceptual design purposes, the station is assumed to be located on an aerial structure in the center of Alameda Street in order to maintain truck and automobile left-turn movements onto cross-streets and driveways serving industrial properties. It is assumed that the number of travel lanes would be maintained, but due to the station entry plaza in the median, the ROW would need to be widened with some land acquired along the west side of Alameda Street in the vicinity of the station. Because the existing industrial-zoned blocks are so long, a new signalized crosswalk could be provided on Alameda Street to facilitate access to a mid-block entry south of the station platform.

Alameda Street could be improved to function more like a transit boulevard with improvements that benefit pedestrians and bicyclist going to work in the nearby industries, or who live in the new urban lofts in the immediate area. This could be accomplished by enhancing the pedestrian zone with tree lined parkways and sidewalk improvements and considering bicycle lanes or amenities to encourage a safe way to ride in the surrounding station area. The preliminary urban design concept for the 7th/Alameda station is shown in Figure 4.6.
**Figure 4.6. 7th/Alameda Preliminary Station Concept**

**7th/Alameda Station**
This neighborhood aerial station would serve the adjacent industrial businesses and provide access to the Randi Bus, Metro Local Bus on 7th and Alameda and the Greyhound Bus Terminal exit along 7th Street. A new pedestrian crosswalk would facilitate access to a mid-block station entry. Tree lined parkways and sidewalk improvements would transform this utilitarian thoroughfare into a green street that encourages walking and bicycling.

![Existing Context](image1)

![Proposed Section](image2)

![Proposed Plan](image3)

*Source: Cityworks Design*
Slauson/Long Beach Station

This transfer station is located in Southeast Los Angeles near the unincorporated Florence neighborhood of Los Angeles County. This station would provide access to the Metro Blue Line and Metro local buses on Long Beach and Slauson Avenues. It is assumed that the number of traffic lanes would be retained on Slauson which serves as a major east-west truck route. A new signalized crosswalk near the existing Blue Line Station and new platform in Metro’s right-of-way would facilitate pedestrian linkages between stations and local bus service.

Slauson Avenue north of Metro’s right-of-way could be vastly improved with tree-lined parkways and sidewalk improvements, making the experience of walking to the station positive for nearby residents. A new transit plaza at the station entry points would transform this neighborhood’s edge and enhance access to Augustus Hawkins Park.

There is opportunity for TOD immediately north of the proposed station on what is now zoned as industrial land, but is actually a crude mix of small industrial uses and single-family homes. As part of a Community Plan Update, the Los Angeles City Planning Department is contemplating the area between the Metro Blue Line and Augustus Hawkins Park for potential land use changes that support jobs and better housing choices for the community. The outcome of any potential land use changes has not been finalized.

The preliminary urban design concept for the Slauson/Long Beach station is shown in Figure 4.7.
Figure 4.7. Slauson/Long Beach Preliminary Station Concept

Slauson / Long Beach Station
This transfer station would provide access to the Metro Blue Line and Metro Local Buses on Long Beach and Slauson Avenue. A new signalized crosswalk would facilitate pedestrian linkages to the Blue Line and local bus stops. Tree-lined pathways, sidewalk improvements and a new transit plaza would transform the neighborhood edge and support new mixed-use development and access to Augustus Hawkins Park.

Existing Context

Proposed Plan

Existing Section

Proposed Section

Source: Cityworks Design
Slauson Corridor – Conceptual Sketch

The existing Metro-owned ROW would accommodate two new tracks for local service. Where the ROW approaches 100,’ additional space could be enhanced with a linear park, or mixed use development. Both options would serve the adjacent neighborhood with a much needed open space amenity and help bolster economic development goals. Slauson Avenue would continue to function as a major regional truck route, but could become more hospitable with the addition of parkways and street trees and a consistent sidewalk along the north side as shown in Figure 4.8.

Figure 4.8. Slauson Corridor – Conceptual Before & After Sketches

One-Track Concept
Two-Track Concept

Source: Cityworks Design

Slauson/Western Station

This transfer station is located in South Los Angeles and would provide access to Rapid Bus and Metro local buses on Western and Slauson Avenues. This intersection is ideal for a station since it already functions as a major community crossroads, transit use is heavy and major retailers are anchored there. A center platform station would be sited where the ROW begins to move south towards Inglewood, leaving an existing triangular parcel at the southeast corner of Slauson and Western Avenues.

The station area would benefit from tree-lined parkways, sidewalk improvements, and either a new community-serving commercial amenity or mixed-use development. Any improvements should facilitate linkages to the broader community such as Amistad Plaza, surrounding retail, and industrial properties.

The triangular site north of the station platform represents a great opportunity to add a new community-serving amenity or mixed-use development. It could be developed with shared parking, or little to no parking to take advantage of its proximity to the station and to create an incentive for developers (lower costs would likely result from reduced parking requirements). Any future redevelopment of the corner should integrate a public plaza that provides breathing room because transfer activity will only increase over time.

The introduction of future uses other than convenience and auto-oriented services would further elevate the stature of this important crossroads. Any TOD opportunities should be explored in conjunction with the Community Plan Update being led by Los Angeles City Planning and the CRA/LA.

The preliminary urban design concept for the Slauson/Western station is shown in Figure 4.9.
Western Station

This transfer station would provide access to Rapid Bus and Metro Local Bus on Western and Slauson. New tree-lined pathways, sidewalk improvements, and either a new community-serving commercial amenity or mixed-use development would transform this important intersection and facilitate linkages to the broader community such as Aversa’s Plaza, surrounding retail, and industrial properties.

Source: Cityworks Design
Manhattan Beach/Inglewood Station

The Manhattan Beach/Inglewood Station is located adjacent to the communities of Lawndale and Redondo Beach. The proximity of this station to Manhattan Beach Boulevard and Inglewood Avenue allows for connections to bus routes on these major thoroughfares, as well as providing a convenient vehicular approach for local users. Patrons from the adjacent neighborhoods of Lawndale, Hawthorne, and Manhattan Beach would gain easy pedestrian and non-motorized access to the station through the network of sidewalks and crosswalks within the surrounding commercial areas and neighborhoods.

One of the primary challenges for this station is situating it within the block and at an angle to the two adjacent streets, while at the same time providing easy and efficient pedestrian and vehicular access into the site. Circulation routes would be provided for both buses and private vehicles, with areas allocated for bus stops, drop-off and kiss-n-ride functions. The one-way movement of traffic through the site would help to encourage the smooth flow of vehicles into and out of the station area. The site could be kept relatively open to maintain visual links from the areas surrounding the site to the station itself, which is important for orientation and station identity. Pedestrian and non-motorized access would be accommodated by way of wide sidewalks and direct routes to station entry points, with bike paths and bike parking included in the layout.

Some of the under-utilized properties adjacent to the station have strong development potential for commercial uses and TOD, particularly at the perimeter of the site. It is envisioned that some of these TOD opportunities may develop over time, and that uses might initially include public parking, with the addition of possible mixed uses in the future.

The preliminary urban design concept for the Manhattan Beach/Inglewood station is shown in Figure 4.10.
Manhattan Beach / Inglewood

The proximity of this local station to Manhattan Beach Boulevard and Inglewood Avenue allows for connections to the bus routes on these major thoroughfares, as well as providing a convenient commuter approach for local users. Patrons from the adjacent neighborhoods of Lawndale, Hawthorne, and Manhattan Beach would gain easy pedestrian and non-motorized access to the station. Some of the under-utilized properties adjacent to the station have strong development potential for commercial uses and transit-oriented development.

Figure 4.10. Manhattan Beach/Inglewood Preliminary Station Concept

Source: Anil Verma Associates
Cruise Terminal Station

The Cruise Terminal Station is the San Pedro terminus of the Harbor Subdivision Transit Corridor. The unique location on Harbor Boulevard between the Vincent Thomas Bridge and the Cruise Terminal and the need to provide easy and efficient connections to the adjacent uses required an innovative station design. The station’s location near the Cruise Ship Terminal and the San Pedro Waterfront Red Car Line, and the potential connection between the Cruise Terminal and LAX by way of the Harbor Subdivision, have the potential to generate high ridership at this station.

The station plaza would be the center of this scheme, which is in effect a continuation of the adjacent Fountain Plaza by way of an overhead pedestrian bridge connection; the existing Fountain Plaza continues on as a landscaped promenade to the Ports-o-Call area. It is envisioned that an enhanced connection such as an overhead bridge to the Cruise Terminal building itself be provided from the Fountain Plaza to allow direct access without having to walk across roads and parking lots. The Red Car platform would be located across the Harbor Subdivision Station plaza to facilitate easy transfer between the lines.

An existing park-n-ride lot across Harbor Boulevard would be convenient to the station and would provide parking for regional users. Some of the adjacent properties have potential for commercial development or TOD uses. Additional parking areas and possible TOD associated with the Cruise Terminal are future possibilities that could provide mutual benefit, enhancing the station area as a destination and providing Cruise Terminal patrons with easy access to other areas of Los Angeles.

The preliminary urban design concept for the Cruise Terminal station is shown in Figure 4.11.
Cruise Terminal Station

The Cruise Terminal Station is the terminus of the Harbor Subdivision Transit Corridor. Its location near the Cruise Ship Terminal and the San Pedro Waterfront Red Car Line has the potential to generate much passenger traffic. It is envisioned that the station will link to the existing pedestrian plaza and promenade along Harbor Boulevard, with an enhanced connection to the Cruise Terminal building itself. The adjacent Red Car platform located across the plaza from the Metro Station will facilitate easy transfer between the lines. An existing park-and-ride lot across Harbor Boulevard is convenient to the station and will provide parking for regional users. Some of the adjacent properties have potential for commercial development or TOD uses.

Source: Anil Verma Associates
Avalon Station

The Avalon Station is located in a mainly residential area near Avalon Boulevard, with some commercial uses to the north and south along Avalon Boulevard itself. Integrating the station into what is primarily a residential neighborhood presented design challenges, but also opportunities to improve the immediate station area.

At this point along the ROW, the corridor has a strip of land along the north side of the tracks that could be utilized as a linear park. Providing green space for the neighborhood, as well as possible biking and walking/jogging paths, would provide the community with secondary benefits from the project beyond that of the transit corridor itself. Small pockets of land along the ROW also might be utilized as mini-park areas with enhanced landscaping.

The preliminary urban design concept for the Avalon station is shown in Figure 4.12.
Avalon Station

Avalon Station is located in a mostly residential area that is on both sides of Avalon Boulevard, with some commercial uses to the north and south along Avalon Boulevard itself. At this point along the ROW, the corridor has a strip of land along the north side of the tracks that could be utilized as a linear park incorporating walking/jogging paths along with some enhanced landscaping. This would provide the community with secondary benefits from the project beyond that of the transit corridor itself.

Figure 4.12. Avalon Preliminary Station Concept

Existing Context

Proposed Plan

Proposed Section

Source: Anil Verma Associates
Willow/Santa Fe Station

This neighborhood station is located in the City of Long Beach and would serve the adjacent West Long Beach neighborhood, small businesses and provide access to local buses on Santa Fe Avenue. The existing median and trees in the center of the roadway would need to be sacrificed to accommodate a new street-running transit system. A travel lane/off-peak parking lane would need to be eliminated in both directions. Land acquisition along the south side of Willow Street would be necessary to accommodate a split platform station because of the limited right-of-way.

Willow Street's pedestrian environment would need to be improved with more consistent tree-lined parkways and sidewalk improvements. Enhanced bus linkages would need to be developed with Long Beach Transit to accommodate new ridership using this station.

There is a significant TOD opportunity at this important neighborhood center. Redevelopment and/or joint development could transform the area over time in a manner consistent with the Long Beach 2030 General Plan Update, and local neighborhood strategies being developed by city planning staff and the community. The existing small parcel sizes on Willow Street remain a challenge and any successful mixed-use project would need to explore the possibilities of combining parcels. The immediate Willow/Santa Fe station area should be considered for district parking or shared-use parking.
Willow/Santa Fe Station

This neighborhood station would serve the adjacent West Long Beach neighborhood, small businesses and provide access to the local issues on Santa Fe Avenue. Tree lined walkways, sidewalk improvements, and potential redevelopment at this neighborhood center could transform the area over time.

Figure 4.13. Willow/Santa Fe Preliminary Station Concept

Existing Context

Source: Cityworks Design
Willow Street – Conceptual Before & After Sketch

Willow Street’s narrow ROW brings serious challenges to adding fixed-rail transit service in the street. Station sites would require additional land takes to accommodate the platform. For the typical alignment between station sites, and assuming the number of traffic lanes would remain the same, the south sidewalk would be reduced from 10’ to 6,’ making it more difficult to create a walkable street. Major land takes along the south side of Willow Avenue would allow for wider sidewalks, while creating narrower commercial parcels (a pre-existing issue) unless additional parcels were integrated immediately behind these. Integrating additional parcels would have enormous impacts that would likely be unacceptable to the community (middle sketch of Figure 4.14). Another alternative (bottom sketch) would be to eliminate a travel lane in each direction to accommodate a parkway, street trees and reasonable sidewalk width without taking land beyond the station sites. Traffic impacts would need to be evaluated citywide to better understand the circulation patterns that might result if travel lanes were eliminated.

Figure 4.14. Willow Street – Conceptual Before & After Sketches

Three-Lane Concept
Two-Lane Concept with Widened Sidewalks and Parkways

Source: Cityworks Design