**Overarching Assumptions:**

- The improved Broadway Boulevard will be a walkable complete street; per the project Vision—maintain and improve the provision of affordable, efficient, and sustainable transportation choices serving local and regional transportation needs for walking, bicycling, transit, and vehicles.
- For all new design options, assumption is a 30 to 35 mph design speed and posted speed with the street designed to encourage vehicles to travel at the design speed in support of the project Vision.

<table>
<thead>
<tr>
<th>Performance Measure Methodology</th>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Pedestrian Access and Mobility</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a. Functionality of Streetside for Pedestrian Activity: Degree to which there is enough width to support desired pedestrian activity, landscaping, street furnishings and other improvements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sidewalk width and the width of the buffer area between the sidewalk and the roadway are key factors for the comfort and functionality of a street for pedestrians.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The ITE Walkable Urban Thoroughfares Manual provides guidance for design of major urban streets like Broadway. The transportation characteristics of Broadway (i.e.; speed and number of lanes) make it a Boulevard Street type as defined by the manual (25-35 mph with 4-6 lanes, for various context types, see document for definitions). The current and potential character of the context along Broadway are defined as C-4 General Urban areas and C-3 Suburban areas in the manual. The combination of street type and context type lead to the guidance for sidewalk width:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o C-4 with predominantly commercial ground floor – 1.5 ft. edge, 7 ft. furnishings (including landscape), 8 ft. throughway, 2.5 ft. frontage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o C-4 with predominantly residential ground floor – 1.5 ft. edge, 8 ft. furnishings (including landscape), 8 ft. throughway, 0 to 1.5 ft. frontage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o C-3 with predominantly commercial ground floor – 1.5 ft. edge, 7 ft. furnishings (including landscape), 6 ft. throughway, 1.5 ft. frontage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o C-3 with predominantly residential ground floor – 1.5 ft. edge, 8 ft. furnishings (including landscape), 6 ft. throughway, 0 to 1.5 ft. frontage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Result of guidance in relation to Broadway is for a 9.5 ft.-wide landscape area and 8 ft. sidewalk. Assume that additional sidewalk width if needed would be part of private development; the assessment compares the range of possible pedestrian improvements to this guidance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b. Separation from Vehicular Traffic: Width and design character of area between outside edge of vehicle lane and sidewalk.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Guidance/factors include ITE Manual guidance for buffer width; Multi-modal level of service considerations for presence and frequency of street trees and other landscaping within buffer which varies depending on design of street elements; and speed and volume of traffic (assumed to be relatively constant). The potential to include buffered bicycle lanes could also increase the buffer distance perceptibly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1c. Pedestrian-oriented Facilities or Improvements: Extent of shade, lighting, seating, drinking fountains and other features to serve pedestrian needs and provide for visual interest.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Factors include percentage of shade, lighting levels and consistency, number and frequency of other pedestrian supportive design features (i.e.; seating, drinking fountains).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1d. Walkable Network/Neighborhood Connections: Ability for pedestrians to access neighborhoods and pedestrian network.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Factors include number, length between, and quality of connections from Broadway to surrounding pedestrian network.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• This measure cannot currently be assessed, because connections from Broadway and the pedestrian network are not included in the current level of design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Performance Measure Methodology

#### 1e. Pedestrian Crossings

- **Ease of crossing Broadway and side streets intersecting with Broadway on foot.**
  - Assume that the number of crossings is equal (except that existing conditions would have fewer than any future option). Therefore the current assessment is about the quality and distance of the crossing.
  - As design is developed further and intersection designs are developed the ease of crossing side streets can be assessed.

<table>
<thead>
<tr>
<th>Lane Configuration Type</th>
<th>Street Cross Section Elements</th>
<th>Street Cross Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle and transit lane number and width</td>
<td>Presence, frequency, and width of median</td>
<td>Range based on width from outside curb to outside curb and median presence, frequency, and width</td>
</tr>
</tbody>
</table>

#### 1f. Vehicle/Pedestrian Conflicts at Driveways

- **Degree to which conflicts between pedestrians and vehicles exist at driveways for site access; strongly related to Performance Measure 2b.**
  - Factors include level pedestrian crossing of driveway; vehicle speed; frequency of driveways; and visibility of the pedestrian on the sidewalk (measured by distance from right travel lane to sidewalk).

<table>
<thead>
<tr>
<th>Element or Combination of Elements</th>
<th>Range for Bike Lane / Cycle Track width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer width</td>
<td>---</td>
</tr>
<tr>
<td>Bicycle lane width</td>
<td>---</td>
</tr>
<tr>
<td>Sidewalk width</td>
<td>---</td>
</tr>
<tr>
<td>Sidewalk and Landscape</td>
<td>---</td>
</tr>
</tbody>
</table>

#### 1g. Universal Design

- **Provision of access and mobility for people of all ages and abilities using design elements that go beyond base requirements of disabled access per the Americans with Disabilities Act (ADA) federal design requirements.**

<table>
<thead>
<tr>
<th>Element or Combination of Elements</th>
<th>Range for Bike Lane / Cycle Track width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection and signal design</td>
<td>---</td>
</tr>
<tr>
<td>Type and design of pedestrian facilities</td>
<td>---</td>
</tr>
<tr>
<td>Design of transit facilities</td>
<td>---</td>
</tr>
<tr>
<td>Wayfinding signs</td>
<td>---</td>
</tr>
<tr>
<td>At current level of design, sidewalk width more than ADA minimum is an indicator of potential for universal design.</td>
<td>---</td>
</tr>
</tbody>
</table>

#### 1h. Walkable Destinations

- **Presence and access to jobs, homes, shopping, etc.; and presence of sufficient density of other uses and access from other uses to support market for employment, shopping, etc.**

<table>
<thead>
<tr>
<th>Element or Combination of Elements</th>
<th>Range for Bike Lane / Cycle Track width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection and signal design</td>
<td>---</td>
</tr>
<tr>
<td>Type and design of pedestrian facilities</td>
<td>---</td>
</tr>
<tr>
<td>Design of transit facilities</td>
<td>---</td>
</tr>
<tr>
<td>Wayfinding signs</td>
<td>---</td>
</tr>
</tbody>
</table>

| None, not measurable at current level of design | ---                                    |

#### 1i. Ease of Transition to Walking

- **Measure of the ability of users of other transportation modes to become pedestrians along Broadway.**

<table>
<thead>
<tr>
<th>Element or Combination of Elements</th>
<th>Range for Bike Lane / Cycle Track width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity and number of parking lots</td>
<td>---</td>
</tr>
<tr>
<td>Proximity and number of bicycle parking/lockers</td>
<td>---</td>
</tr>
<tr>
<td>Number of bus stops/transit stations</td>
<td>---</td>
</tr>
<tr>
<td>Number and type of comfort and safety features (lighting, seats, shade)</td>
<td>---</td>
</tr>
<tr>
<td>Number of attractions/commercial uses</td>
<td>---</td>
</tr>
</tbody>
</table>

| None, not measurable at current level of design | ---                                    |

### 2. Bicycle Access and Mobility

#### 2a. Separation of Bikes and Arterial Traffic

- **Degree to which the street design elements allow separation of cyclists from vehicular traffic.**
  - Greater separation is a factor related to bicyclist safety and comfort, and therefore likely bicycle use of Broadway.
  - The main factor in this performance measure is the width of the bicycle lane.
  - The following guidance is based on traffic speeds of 35 mph or less:
    - 5 ft. width negative [-]
    - 6 ft. width neutral (ITE Manual recommendation)
    - 7 to 9 ft. width buffered bike lane positive (+ to ++)
    - 7 to 8 ft. width beveled curb cycle track positive (++)
    - 9 ft. width full curb cycle track positive (+++)

<table>
<thead>
<tr>
<th>Element or Combination of Elements</th>
<th>Range for Bike Lane / Cycle Track width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle lane width / details of facility design</td>
<td>---</td>
</tr>
</tbody>
</table>
### Performance Measure Methodology

<table>
<thead>
<tr>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2b. Crossing Conflicts Between Bicycles and Vehicles (was Bike Conflicts with Crossing Vehicles): The frequency of points where vehicles cross the bike lane and the ability of the street design to mitigate those potential conflicts. Potential conflicts and level of comfort for bicyclists making turns at intersections with crossing streets.</td>
<td>Dedicated transit lane location</td>
</tr>
</tbody>
</table>
  * Assume all future options have
    1. a base assessment that ranges from one negative to one positive (- to +) for vehicles crossing bike lane to get to curb cuts, because there is uncertainty regarding how quickly an access management policy can reduce the number of site access curb cuts/driveways along Broadway.
    2. Have the potential for dedicated right turn lanes, green pavement treatments and other markings to be provided at intersections to enhance safety.
  * Options that require buses to cross over to bus pull outs are neutral.
  * Options with dedicated transit lanes in the middle get a single + for that, still would have local buses pulling into bus pull outs.
  * The assessment of potential conflicts and comfort for bicyclists making turns at intersections cannot be assessed at this level of design, because intersections are not yet designed; this will be done in the next phase of alternatives design and assessment.
| 2c. Pavement Condition: The smoothness of the street’s pavement initially and over time. | None, not measurable at current level of design |
  * Smooth pavement is a priority for bicyclist comfort.
  * Factors in addition to pavement type include:
    1. gutter design
    2. type of plants that are in the landscape.
  * Pavement type is not dependent on cross section design and therefore cannot be measured at the current level of design.
| 2d. Bike Facility Improvements: Extent of bike racks, shade, drinking fountains, green pavement (bike boxes, etc.) and other features to serve bicyclists’ needs. | Sidewalk width |
  * Factors include percentage of shade; use of bike boxes and other features; number and frequency of bike racks; drinking fountains; and other bicycle-supportive design features.
  * All design concepts will utilize bike boxes and green and other special paving markings as allowed by code.
  * At current level of design ranking is most affected by presence of trees or shade structures and the width of the sidewalk and buffer area to accommodate bicycle supportive facilities.
| 2e. Bike Network Connections: Convenience and safety of access to surrounding bike network. | None, not measurable at current level of design |
  * Factors include: Number, length between, and quality of connections from Broadway to surrounding bicycle network.
  * Quality of movement along Broadway to connections is assessed in 2a. Separation of Bikes and Arterial Traffic, 2b. Bike Conflicts with Crossing Traffic.
  * Need to know relationship of bicycle crossings to adjacent bicycle network, see Bike Crossings (this cannot be assessed at current level of design).
| 2f. Bicycle Corridor Travel Time: The time it takes for average and advanced bicyclists to travel the length of Broadway. | None, not measurable at current level of design |
  * Need further design details, including – signal and intersection design, alignment, access management design, transit stop locations, etc. in order to assess using VISSIM transportation simulation model.
| 2g. Bike Crossing: Convenience and quality of bicycle crossings of Broadway and side streets intersecting with Broadway. | Vehicle and transit lane number and width |
  * Assume some basic improvements at crossings and more crossings for all concept options, so this gives:
    1. Four lane options 1 plus;
    2. Six lane options 2 plus (regardless of median width as street crossings will likely be at least 18 ft. wide given turn lane and 7 ft. refuge island width); and
    3. Eight lane options a neutral, except for 6+T B given its large width.
  * As design is developed further and intersection designs are developed the ease of crossing side streets can be assessed.

- Center vs. Side Running
- Dedicated Transit

- Sidewalk width
- Buffer width
- Trees or shade structures

- Sidewalk and Landscape

- Range based on width from outside curb to outside curb
### 3. Transit Access and Mobility

<table>
<thead>
<tr>
<th>Performance Measure Methodology</th>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3a. Distance to Transit:</strong> Number and location of transit stops and the number of households, jobs, and services within walking distance has an relationship to transit ridership</td>
<td>None, not measurable at current level of design</td>
<td>Street Cross Section Elements</td>
</tr>
<tr>
<td>- Factors include: Number of households, jobs, and square feet of commercial use within walking distance of transit stops; and 1d. Walkable Network/Neighborhood Connections, 1h. Walkable Destinations, and several non-transportation performance measures.</td>
<td></td>
<td>Street Cross Section</td>
</tr>
<tr>
<td>- Cannot be assessed at current level of design as transportation factors require alignment and crossing design, and non-transportation factors are related to future land use</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **3b. Transit Stop Facilities:** Design qualities of transit stops for comfort and safety of riders and to support improved aesthetics and community character. | Sidewalk width | Presence and location of dedicated transit lanes (range for Sidewalk and Landscape width for side running dedicated transit and no dedicated transit) |
| - Factors include: Percentage of shade; lighting levels and consistency; and number and frequency of other design features (e.g.: drinking fountains, off-bus ticket machines, next bus information signs, wayfinding information, etc.). | Buffer width | Range for Sidewalk and Landscape width for side running dedicated transit and no dedicated transit |
| - Existing facilities are generally poor, although there are a few bus pull-outs. | Trees or shade structures | |
| - Four lanes get + when have pull outs (except those with wider pedestrian areas get +) because of lower construction cost may be more budget to improve transit stops; SATA also gets a + because of transit platforms for streetcar. | Dedicated transit lanes | |
| - Six lanes get neutral with pull outs as this is now the regional standard. | | |
| - BRT in middle of roadway gets ++ because it is assumed that this investment in roadway infrastructure for BRT would mean commitment to high-level of improvements on the platforms. | | |

| **3c. Transit Corridor Travel Time:** The time it takes to travel the length of the Broadway project by transit. | Dedicated transit lanes presence and location (i.e.; side or center running) | Presence and location of dedicated transit lanes and number of traffic lanes |
| - Existing corridor travel time is lower than existing vehicular traffic travel time, so two negatives rather than the one negative for 4a. Movement of Through Traffic | Bus pullouts | |
| - Four and six lanes with pull outs, signal prioritization, etc. are assumed to be slower than vehicular movement, because all buses must pull into bus pull outs and this slows the bus travel time. | Vehicular lane number | |
| - Dedicated transit lanes with accompanying signal prioritization, etc. are assumed to have roughly the same corridor travel time as vehicles, except for where the dedicated lane is outside lane (Options:4+TA and 6+TA), because it would have issues with right turning vehicles and the BRT may need to use the bus pullouts. Also, SATA is one minus sign less than the vehicular through movement performance measure because as least a portion of the service is in a dedicated lane. | | |
| - The assessment of 4 + T is shown as a range and 6 + T without a range because 6 + T creates more certainty that there will be enough capacity for both vehicles and buses to flow smoothly; 4 + T will not have ample capacity for vehicles unless there is a significant mode shift to transit away from vehicle use and there is a level of uncertainty as to the extent of potential mode shift. | VISSIM results accounting for signal timing, transit priority treatments, traffic delay, merges, and boarding time at transit stops | |
| - Initial assessment based on traffic assessment of current PAG projections and 30% reduced traffic growth option, with qualitative comparisons based on professional experience and judgment of relationship between transit and vehicular travel time | | |
| - Transit priority treatment at intersections, level boarding, off-vehicle ticketing, etc. are considered to be more likely with dedicated transit lanes | | |

| **3d. Schedule Adherence:** The extent that transit is able to stay on schedule. | Dedicated transit lanes presence and location (i.e.; side or center running) | Presence and location of dedicated transit lanes and number of traffic lanes |
| - Dependability of travel time along the corridor can be measured to a degree with VISSIM. | Bus pullouts | |
| - This measure is a rough combining of 3b and 3c with a slightly more weight to 3c. | Vehicular lane number | |
| - Dependent on factors that are not controllable as part of this project, including Sun Trans scheduling and transit driver behavior. | | |

| **3e. Frequency and Hours of Service:** The frequency at which transit service stops along Broadway and for what period of week and weekend days. | Dedicated transit lanes | Presence and location of dedicated transit lanes and number of traffic lanes |
| - Potential that service efficiencies related to other transit performance measures could allow for increase of service for minimal additional cost. | Median width (wide enough to allow future flexibility) | |
| - This is mainly an independent decision that Sun Trans would make that cannot be influenced to much a degree by this project. | Vehicular lane number (ability to convert to dedicated transit in the future) | |

| **3f. Accommodation of Future High Capacity Transit:** The ability of the roadway and roadside design to accommodate future high capacity transit. This can ultimately improve performance of design concepts in relation to other transit performance measures. | Dedicated transit lanes | Presence and location of dedicated transit lanes and number of traffic lanes |
| - Existing and 4 lanes get – because they would end up having one lane in each direction for vehicular traffic if dedicated transit lanes were provided. | Median width (wide enough to allow future flexibility) | |
| - Six lane options get a neutral o because even though these could be converted to 4+T with dedication of lanes, there would likely be resistance to reducing traffic lanes once they are in place and construction would need to occur to make the conversation. | Vehicular lane number (ability to convert to dedicated transit in the future) | |
Performance Measure Methodology

<table>
<thead>
<tr>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Configuration Type</td>
</tr>
</tbody>
</table>

3g. Riders per Vehicle: Average number of daily riders per transit vehicle or per peak hour transit vehicle.
- None, not measurable at current level of design

4. Vehicular Access and Mobility

4a. Movement of Through Traffic During Peak Traffic Periods: Effectiveness of moving through vehicular traffic, which affects a variety of other transportation, environment, and economic factors.
- Existing section with current volumes - impacts of buses stopping in through lanes and high number of ped HAWK signals (that are not synchronized with other signals), through traffic flow is less than desirable; increased traffic demand for either growth scenario without adding intersection capacity will result in long travel times and excessive delay.
- 4 lane options w/o exclusive transit lanes – do not provide sufficient through capacity at the signalized intersections for either growth scenario. These options assume that additional turning lanes are provided at the key intersections (Euclid, Campbell, Country Club) and bus pullouts and coordinated pedestrian HAWK signals are provided.
- 4 lane options with exclusive transit lanes – through traffic operations will be improved assuming that a sufficient modal shift from car to transit (BRT) occurs to reduce vehicular demand.
- 6 lane options w/o exclusive transit lanes – fair to good through traffic operations depending upon growth scenario; assumed bus pullouts and coordinated pedestrian HAWK signals.
- 6 lane options with exclusive transit lanes – good to very good through traffic operations depending upon growth scenario and assuming that a sufficient modal shift from car to transit (BRT) occurs to reduce vehicular demand.
- The SATA concept is rated lower than the 4 lane mixed flow options because the streetcar shared lanes are estimated to reduce performance for those lanes.
- Design details that will be developed later in the project (i.e.; intersection and signal design, access management, etc.) will allow assessment using VISSIM which will allow for quantitative measurement of:
  - Average corridor travel time
  - Average speed
  - Average 95 percentile queue length
  - Average delay Average corridor travel time
  - Volume to Capacity Ratio (V/C)
  - Travel time reliability
- Initial assessment based on assessment of current PAG projections and 30% reduced traffic growth option, with qualitative comparisons based on professional experience and judgment

4b. Intersection Delay – Overall Intersection Performance: Overall delay for vehicular traffic on Broadway and cross streets at intersections.
- Not measurable at current level of design
  - Vehicular lane number

4c. Intersection Delay – Worst Movement: Worst delay for a single vehicular movement on Broadway or cross streets at intersections.
- Not measurable at current level of design
  - Vehicular lane number

- Side running dedicated transit lane options have a right turning vehicle issues so rates a ++
- Center running dedicated transit lane options get ++, because they provide for high-quality high capacity transit with implementation of the concept
- SATA is rated neutral because only one direction is in a dedicated lane while the service levels are reduced by the other direction running in a shared lane.
- All current alternatives could accommodate the potential future integration of streetcar as a transit mode either in mixed-flow lanes with vehicles or in some cases within dedicated transit lanes.

3g. Riders per Vehicle: Average number of daily riders per transit vehicle or per peak hour transit vehicle.
- None, not measurable at current level of design

- VISSIM modeling and transit service assumptions
- Other transit performance measures effect transit ridership and efficiency of service
- Affected by Sun Trans service planning which is not controlled by this project

3. Movement of Buses: Effectiveness of moving buses, which affects a variety of other transportation, environment, and economic factors.

- Side running dedicated transit lane options have a right turning vehicle issues so rates a ++
- Center running dedicated transit lane options get ++, because they provide for high-quality high capacity transit with implementation of the concept
- SATA is rated neutral because only one direction is in a dedicated lane while the service levels are reduced by the other direction running in a shared lane.
- All current alternatives could accommodate the potential future integration of streetcar as a transit mode either in mixed-flow lanes with vehicles or in some cases within dedicated transit lanes.

3g. Riders per Vehicle: Average number of daily riders per transit vehicle or per peak hour transit vehicle.
- None, not measurable at current level of design

- VISSIM modeling and transit service assumptions
- Other transit performance measures effect transit ridership and efficiency of service
- Affected by Sun Trans service planning which is not controlled by this project

4. Vehicular Access and Mobility

4a. Movement of Through Traffic During Peak Traffic Periods: Effectiveness of moving through vehicular traffic, which affects a variety of other transportation, environment, and economic factors.
- Existing section with current volumes - impacts of buses stopping in through lanes and high number of ped HAWK signals (that are not synchronized with other signals), through traffic flow is less than desirable; increased traffic demand for either growth scenario without adding intersection capacity will result in long travel times and excessive delay.
- 4 lane options w/o exclusive transit lanes – do not provide sufficient through capacity at the signalized intersections for either growth scenario. These options assume that additional turning lanes are provided at the key intersections (Euclid, Campbell, Country Club) and bus pullouts and coordinated pedestrian HAWK signals are provided.
- 4 lane options with exclusive transit lanes – through traffic operations will be improved assuming that a sufficient modal shift from car to transit (BRT) occurs to reduce vehicular demand.
- 6 lane options w/o exclusive transit lanes – fair to good through traffic operations depending upon growth scenario; assumed bus pullouts and coordinated pedestrian HAWK signals.
- 6 lane options with exclusive transit lanes – good to very good through traffic operations depending upon growth scenario and assuming that a sufficient modal shift from car to transit (BRT) occurs to reduce vehicular demand.
- The SATA concept is rated lower than the 4 lane mixed flow options because the streetcar shared lanes are estimated to reduce performance for those lanes.
- Design details that will be developed later in the project (i.e.; intersection and signal design, access management, etc.) will allow assessment using VISSIM which will allow for quantitative measurement of:
  - Average corridor travel time
  - Average speed
  - Average 95 percentile queue length
  - Average delay Average corridor travel time
  - Volume to Capacity Ratio (V/C)
  - Travel time reliability
- Initial assessment based on assessment of current PAG projections and 30% reduced traffic growth option, with qualitative comparisons based on professional experience and judgment

4b. Intersection Delay – Overall Intersection Performance: Overall delay for vehicular traffic on Broadway and cross streets at intersections.
- Not measurable at current level of design
  - Vehicular lane number

4c. Intersection Delay – Worst Movement: Worst delay for a single vehicular movement on Broadway or cross streets at intersections.
- Not measurable at current level of design
  - Vehicular lane number
### Performance Measure Methodology

<table>
<thead>
<tr>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Configuration Type</td>
<td>Street Cross Section Elements</td>
</tr>
</tbody>
</table>

#### 4d. Accident Potential:
- Degree to which street design could affect the potential for accidents.
  - Certain factors can contribute to higher accident rates and severity of accidents. These can include the following factors, which are not determined at current level of design:
    - Number of access points to adjacent properties
    - Number of side street access points
    - Lane continuity (4e)
    - Amount of bike lane cross over length
  - None, not measurable at current level of design

#### 4e. Lane Continuity:
- The degree to which the number of lanes in the roadway is consistent. The number of lanes can be increased and decreased along the length of a street to reflect different traffic needs at different locations, but merging reduces capacity more than just the lane reduction and can increase the potential for crashes where the merge occurs.
  - Requires more detailed design in order to perform VISSIM analysis
  - Comparisons can be made to similar lane reductions in Tucson to evaluate potential for crashes.
  - None, not measurable at current level of design

#### 4f. Access Management for Adjacent Properties:
- The reduction of number and size of driveway and street access from Broadway.
  - Access management can improve traffic flow and traffic safety, reduce conflicts with pedestrians and bicyclists, and generally reduce potential for accidents.
  - Requires more detailed design.
  - None, not measurable at current level of design

#### 5. Person Access and Mobility

##### 5a. Person Trips for multiple measures:
- Multi-modal measures allowing evaluations on a per person basis.
  - A range of transportation measures can be estimated by person-trips.
  - Performance for different modes is measures using VISSIM analysis and converted to person trips for measures, including:
    - Corridor travel time
    - Average delay
    - Travel time reliability
    - Other measures as appropriate
  - None, not measurable at current level of design

#### 6. Sense of Place

##### 6a. Historic Resources:
- Number of historic structures lost due to direct impact and loss of usefulness resulting from parking, setback, site access and other conditions.
  - Based on review of relationship to future ROW to existing ROW and distance between building facades.
  - Based on review of relationship to future ROW to existing ROW and distance between building facades.
  - Total future right of way width
  - Range based on range of total right of way width

##### 6b. Significant Resources:
- Number of significant structures lost due to direct impact and loss of usefulness resulting from parking, setback, site access and other conditions.
  - Based on review of relationship to future ROW to existing ROW and distance between building facades.
  - Total future right of way width
  - Range based on range of total right of way width

##### 6c. Visual Quality:
- Ability of the street design to enhance the visual quality along it, including its relationship and impacts to the existing and future visual character of adjacent uses.
  - Factors related to street design character:
    - Design of median and streetside landscaping
    - Number and location of placemaking features (including public art, wayfinding, lighting, furniture, etc.)
    - Width of roadside areas for streetscape elements and landscaping
  - Factors related to character of adjacent uses:
    - Relationship to adjacent uses is difficult to predict at this point as don't know the future condition of context at current level of design
  - Buffer width
  - Landscape within buffer
  - Assessment requires full cross section to allow for understanding of the relationship of landscape, pavement area, and total width of the street

##### 6d. Broadway as a Destination:
- Provision of civic space, visual quality, visibility of uses, and multi-modal access that supports Broadway and the uses along it as a destination within the community.
  - Factors and/or related measures include:
    - 6c. Visual Quality
    - A balance of all access and mobility measures
    - 7a. Change in Economic Potential
    - 7i. Business Impacts
  - Buffer width
  - Landscape within buffer
  - Relationship to adjacent uses is difficult to predict at this point as don't know the future condition of context at current level of design
  - Not measurable at current level of design
### 6e. Gateway to Downtown

**Visual quality, ease of mobility, and similar features can make connection to downtown stronger and more inviting.** How does Broadway function as a place, in terms of visual quality, and as a transportation connection to downtown?

- Combination of 2. Bicycle, 3. Transit, and 4. Vehicular Access and Mobility
- 6a./6b. Minimize impacts to historic and significant buildings and thereby character of the area as an early extension of commercial activity out of downtown
- 6c. Visual Quality (at current level of design this is a measure of the visual quality of the street)
- 6g. Walkable Community (**which cannot be assessed at current level of design**)
- Relationship to adjacent uses is difficult to predict at this point as don’t know the future condition of context at current level of design
- Given the importance of future adjacent use to the assessment of this performance measure and the inability to adequately understand the potential for future use, this performance measure cannot be assessed at this time.

**Cross Section Elements that Affect Performance Assessment**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Trees or shade structures
- Dedicated transit lanes presence and location (i.e.; side or center running)
- Bus pullouts
- Vehicular lane number
- Median width (wide enough to allow future flexibility)
- Vehicular lane number (ability to convert to dedicated transit in the future)

**Street Cross Section Elements**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Relationship to adjacent uses is difficult to predict at this point as don’t know the future condition of context at current level of design
- Not measurable at current level of design

### 6f. Conduciveness to Business

Attractiveness of buildings along Broadway and the general community character as it relates to businesses.

**Factors and/or related measures include:**
- 6c. Visual Quality is related
- 6g. Walkable Community
- 7a. Change in Economic Potential
- Site access and parking
- Site revitalization and reuse
- Other factors to be determined

**Cross Section Elements that Affect Performance Assessment**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Trees or shade structures
- Bicycle lane width
- Vehicle and transit lane number and width
- Width of bicycle lanes
- Median presence and width

**Street Cross Section Elements**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Trees or shade structures
- Bicycle lane width
- Vehicle and transit lane number and width
- Width of bicycle lanes
- Median presence and width

### 6g. Walkable Community

The degree to which street improvements put a mix of land uses within walking distance of a maximum number of residences and workers.

**Factors and related measures include:**
- 1. Pedestrian Access and Mobility
- 7f. Land Use Mix
- 8a. Change in Economic Potential
- Given the importance of future adjacent use to the assessment of this performance measure and the inability to adequately understand the potential for future use, this performance measure cannot be assessed at this time.

**Cross Section Elements that Affect Performance Assessment**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Trees or shade structures
- Bicycle lane width
- Vehicle and transit lane number and width
- Width of bicycle lanes
- Median presence and width

**Street Cross Section Elements**
- Sidewalk width
- Buffer width
- Landscape within buffer
- Trees or shade structures
- Bicycle lane width
- Vehicle and transit lane number and width
- Median width (wide enough to allow future flexibility)
- Vehicular lane number (ability to convert to dedicated transit in the future)
- Ability to convert travel lanes to dedicated transit in the future

### 7. Environment and Public Health

**Greenhouse Gases:** Use of design features that can reduce emissions of CO₂, a greenhouse gas that contributes to global warming.

- Reduction of vehicle trips and vehicle miles travelled
- 1. Pedestrian Access and Mobility
- 2. Bicycle Access and Mobility
- 3. Transit Access and Mobility
- 6g. Walkable Community

**Level of congestion.**
- Average vehicular speed
- Average vehicular delay
- 4b. Intersection Delay – Overall Intersection Performance

**Quality of vehicle fleet, fuel, etc. (cannot be directly influenced by the Broadway project)**
- Many of these related performance measures cannot be assessed at the current level of design.
### Performance Measure Methodology

#### 7b. Other Tailpipe Emissions: Use of design features that can reduce particulates and other tailpipe emissions, which can affect public health in areas adjacent to Broadway.
- Reduction of vehicle trips and vehicle miles travelled.
  - 1. Pedestrian Access and Mobility
  - 2. Bicycle Access and Mobility
  - 3. Transit Access and Mobility
  - 6g. Walkable Community
- Level of congestion.
  - Average vehicular speed
  - Average vehicular delay
- 4b. Intersection Delay – Overall Intersection Performance
- Quality of vehicle fleet, fuel, etc. (cannot be directly influenced by the Broadway project)
- Many of these related performance measures cannot be assessed at the current level of design.

#### 7c. Heat Island:
- The solar heat gains to pavement can increase the temperature of the street and surrounding area which can have detrimental environmental and public health effects.
- Factors include:
  - Change in amount of pavement
  - Amount of shaded pavement and other areas that can hold heat
  - Proportion of shaded pavement
  - For this assessment it is assumed that there will be an effort to select construction materials for street and sidewalk pavement, as well as gravel/crushed stone for landscaped areas that are "cooler" and would reduce the heat island effect compared to existing materials used along Broadway
  - For initial assessment the following approach has been taken: Assume existing condition is the base "neutral" condition. Slight penalty for more R.O.W. paving with assumption that much of existing area outside of R.O.W. is hardscaped and that new paving could be high albedo (albedo is defined as the ability of a surface to reflect solar energy, high albedo does not necessarily correspond to high reflectance of visible light); increased positive assessment for trees and shade structures, and any proportional differences in shade.

#### 7d. Water Harvesting and Green Streets Stormwater Management:
- The degree to which the roadway is graded to drain stormwater into landscaped areas where its flow rate can be reduced, its water quality improved, and it can provide irrigation for the plants in the landscaped areas.
- TxDOT has recently adopted an Active Practice Guidelines for Green Streets which sets guidance for the design of water harvesting and green stormwater management of streets in Tucson.
- For initial assessment the following approach has been taken: Ratio of landscaped to pavement width.

#### 7e. Health Benefits of Changes in Walking and Biking (renamed and defined Walkability/Bikeability):
- The degree to which design elements of the Broadway improvements can support increases in the number and length of walking and biking trips, and walking and biking have a positive impact on public health.
- For initial assessment the following approach has been taken: Combined consideration of 1. Pedestrian and 2. Bicycle Access and Mobility performance measures given that this infrastructure is necessary to support the choice of walking and biking regardless of future land use conditions. In future assessments of more developed designs, this performance measure will be combined with 6g. Walkable Community.
<table>
<thead>
<tr>
<th>Performance Measure Methodology</th>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
</table>
| **7f. Land Use Mix** | - Sidewalk width  
- Buffer width  
- Bicycle lane width  
- Vehicle and transit lane number and width  
- Median presence and width  
- Not measurable at current level of design | **Lane Configuration Type**  
- Sidewalk width  
- Buffer width  
- Bicycle lane width  
- Vehicle and transit lane number and width  
- Median presence and width  
- Not measurable at current level of design |
| **7g. Affordability** | - Sidewalk width  
- Bus pullouts  
- Median presence and width (wide enough to allow future flexibility)  
- Not measurable at current level of design | **Street Cross Section Elements**  
- Sidewalk width  
- Bus pullouts  
- Median presence and width (wide enough to allow future flexibility)  
- Not measurable at current level of design |
| **8. Economic Vitality** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **8a. Change in Economic Potential** | - Sidewalk width  
- Buffer width  
- Bicycle lane width  
- Vehicle and transit lane number and width  
- Median presence and width  
- Not measurable at current level of design | **Street Cross Section**  
- Based on right-of-way range of types |
| **8b. Business Impacts** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **8c. Real estate and business market potential** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **8d. Infrastructure Development** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **8e. Business Impacts** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **8f. Job Impacts** | | **Street Cross Section**  
- Based on right-of-way range of types |
| **6g. Walkable Community Design + Architecture** | | **Street Cross Section**  
- Based on right-of-way range of types |
Performance Measure Methodology

- Assessment Methodology at current level of design for Long Term Economic Vitality Potential (6 or more years after construction of Broadway Improvements): The Project Team roughly estimated a percentage of street-fronting property that would be of sufficient depth to be re-developed. These “developable” parcels have long-term economic development potential. This estimate is based on the following assumptions:
  - A parcel with 65-foot depth can be reused for development (a 75-foot depth has also been evaluated to illustrate the variation in impact that could result from a deeper lot). The majority of lots that would result in 65-foot deep remnant parcels have alley access. A 65-foot depth allows for development of building types with “tuck-under” parking accessed from the alley with a 40-foot deep building fronting onto Broadway. In addition, surface parking lots with buffering along the Broadway sidewalk could be developed in between freestanding buildings. Design studies have shown that 1 to 2 story buildings, with some 3 story portions if desired, can be developed in this configuration for commercial, residential, or mixed use developments. This type of development would need to occur through a PUD entitlement.
  - 130’ R.O.W. – West and east of Campbell Avenue more than 95% (92%) of street fronting parcels could likely maintain their current use or be redeveloped (-- to ++)
  - 150’ R.O.W. – West of Campbell about 90% (75%) and to the east about 92% (92%) of street fronting parcels could likely maintain their current use or be redeveloped (to ++)
  - 160’ R.O.W. – West of Campbell about 75% (70%) and to the east about 92% (85%) of street fronting parcels could likely maintain their current use or be redeveloped (--- to ++)
  - 170’ R.O.W. – West of Campbell about 70% (62%) and to the east about 85% (85%) of street fronting parcels could likely maintain their current use or be redeveloped (--- to +)
### Performance Measure Methodology

#### 8e. Business Impacts:
The number and size (based on annual revenue) of existing businesses with impacts from the Broadway improvements that would cause the business to relocate; compared with the number and size (based on annual revenue estimate) of future businesses that could occupy new development on remnant parcels.

- Not able to assess at current level of design because potential impacts are not known at enough detail to assess which properties might be impacted.

#### 8f. Job Impacts:
Estimated change in number and income of jobs before and after implementation of the Broadway Project.

- Not able to assess at current level of planning, because job generation rates are not known, and potential impacts are not known at enough detail to assess which properties might be impacted.

### 9. Project Cost

#### 9a. Construction Cost:
Total construction cost of planned improvements.

- Main design factors are:
  - Cross section width (including intersection design)
  - Use of local access lanes (increased drainage system and lighting costs)
  - Amount of landscaping
  - Number and complexity of signals
  - Extent and type of lighting, landscape, pedestrian, bicycle, and transit facilities

#### 9b. Acquisition Cost:
Total cost of purchasing property, relocation costs, and other costs associated with acquisition of property.

- Main design factors are:
  - Cross section width
  - Intersection land area
  - Street alignment

#### 9c. Operations and Maintenance Cost:
Total cost of operating and maintaining the improvements.

- Pavement and other roadway and sidewalk maintenance.
- Signal systems operations and maintenance.
- Drainage systems (including water harvesting and green streets) maintenance.
- Landscape maintenance and replacement.
- Maintenance and replacement of other pedestrian, bicycle, and vehicular improvements.
- Transit operations and maintenance are not included

#### 9d. Income for Reuse of Excess City-owned Property:
Estimate of value of income from property that is acquired by the City to provide right of way for the Broadway improvements. In some cases this property will have buildings and/or land that can be sold or leased for other use. This performance measure estimates that value of that income.

- Factors that have an effect on the estimate of value for lease or land sale of remnant property, include:
  - Amount of remnant land
  - The market potential for and value of the uses that the property can accommodate
  - Not able to assess impacts from right of way as alignment and intersection design are not determined.
  - Not able to assess potential for reuse of remnant parcels or revitalization of existing parcels as alignment and intersection design are not determined.
## Performance Measure Methodology

### 10a. Ability to Provide for Changing Transportation Needs:

Performance Measure 3f. Accommodation of Future High Capacity Transit measures the ability of Broadway implementation concepts to provide space for potential future changes in the transit service provided along Broadway. Similarly, bicycle, pedestrian, and vehicular demands and needs could change over time. This performance measure allows for assessment of the ability of the Broadway design concepts to adapt to changing transportation demands over time with the goal of minimizing the need for additional right of way and other capital investment.

- **Factors that affect the ability to meet changing transportation needs include:**
  - Presence of transit lanes (or width to accommodate future lanes either within medians or through the conversion of a vehicular lane)
  - Width within the buffer and sidewalk areas to accommodate additional pedestrian, bicycle, and transit features.

### 10b. Risk of Relying on Future Development for Economic Vitality:

Assessment of risk of relying on future revitalization and new development to create positive change in Economic Vitality.

- **Factors that affect the risk of future development that can be influenced by the future roadway design, include:**
  - The amount of land area for future development
  - The size and configuration of future development sites
  - Access from Broadway to the future development sites

### 10c. Ability of City to Operate and Maintain Improvements:

Assessment of relative cost and benefit and ability of city budget to support Operations and Maintenance Costs.

- **Factors that affect the ability of the city to support the operations and maintenance of the future roadway are:**
  - Operations and maintenance costs
  - Ability of the city to fund the costs
  - The current assessment is expressed as a range given the uncertainty of the city to maintain a consistent level of funding and the relative cost of operations and maintenance for the various lane configurations types and the street cross sections

<table>
<thead>
<tr>
<th>Performance Measure Methodology</th>
<th>Cross Section Elements that Affect Performance Assessment</th>
<th>What Element or Combination of Elements is Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>10a. Ability to Provide for Changing Transportation Needs</td>
<td>Lane Configuration Type</td>
<td>Street Cross Section Elements</td>
</tr>
<tr>
<td></td>
<td>Sidewalk width</td>
<td>Buffer width</td>
</tr>
<tr>
<td>10b. Risk of Relying on Future Development for Economic Vitality</td>
<td>Sidewalk width</td>
<td>Buffer width</td>
</tr>
<tr>
<td>10c. Ability of City to Operate and Maintain Improvements</td>
<td>Sidewalk width</td>
<td>Buffer width</td>
</tr>
</tbody>
</table>