Corridor Evaluation, Recommendations, and Project Strategy

FINAL REPORT

South Halsted Bus Corridor Enhancement Project

November **2019**

Prepared for:

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List of Acronyms

AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
CAG	Corridor Advisory Group
CDOT	Chicago Department of Transportation
CE	Categorical Exclusion
CMAQ	Congestion Mitigation and Air Quality
CTA	Chicago Transit Authority
FTA	Federal Transit Administration
GIS	Geographic Information System
IDOT	Illinois Department of Transportation
NEPA	National Environmental Policy Act
ROW	Right of Way
STP	Surface Transportation Program
TSP	Transit Signal Priority

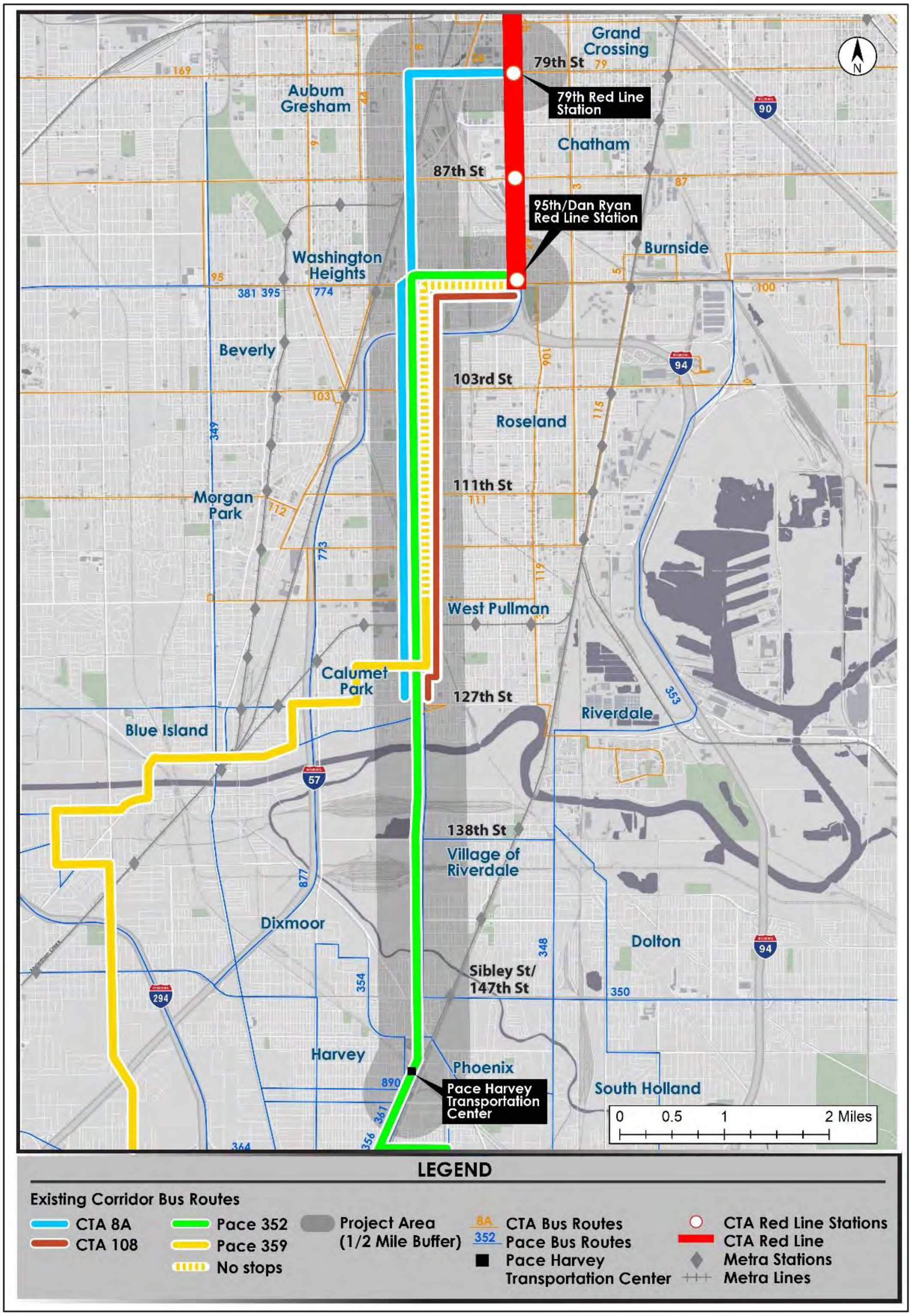
1. Project Overview

The Chicago Transit Authority (CTA) in partnership with Pace Suburban Bus propose the South Halsted Bus Corridor Enhancement Project to improve transit along approximately 11 miles of South Halsted Street, from the Pace Harvey Transportation Center to 79th Street. As shown in Figure 1.1, the corridor also includes segments of 79th and 95th Streets that provide connections to the CTA Red Line 79th and 95th Street Stations. As described in the project's *Purpose and Need Statement*, the need for this project stems from the extended travel times, gaps in service during off peak hours, and limited rapid transit options experienced by riders of the South Halsted Corridor. Potential enhancements to improve overall service consists of reducing travel times by utilizing different rapid transit strategies, increasing transit connectivity, and improving passenger waiting areas. The purpose of the project is to decrease transit travel time, develop service coordination to better meet service gaps, and improve quality of service throughout the South Halsted Corridor.

Following the completion of the *Existing Conditions and Needs & Deficiencies Report*, analysis for the project involved two screenings to define and narrow potential improvement alternatives. The project team began by developing bus enhancement concepts that could be used to make improvements to the corridor. These concepts were then screened based on several measures of effectiveness, which served as a defined set of criteria used to evaluate each improvement strategy. Measures of effectiveness for the first screening include: bus travel time, reliability, traffic impacts, parking impacts, widening/median impacts, relative cost, and grant opportunities. Screening results were then shared with the project Corridor Advisory Group (CAG), comprised of local stakeholders. The CAG provided feedback and direction that was used for further evaluation of each strategy, including recommended updates to the measures of effectiveness: adding person throughput and economic impact potential to the measures of effectiveness and removing grant opportunities.

A second screening evaluated three corridor improvement alternatives with varying levels of bus enhancements. These three alternatives were presented to the CAG, which provided its feedback for the three alternatives.

FIGURE 1.1: PROJECT AREA



2. Corridor Improvement Strategies

The *Existing Conditions and Needs & Deficiencies Report* examined opportunities for improvement for the South Halsted Bus Corridor Enhancement Project. As a result, several improvement strategies were identified. The improvement strategies include transit signal priority (TSP) and signal optimization, queue jumps, bus lanes, station improvements, and limited stop service. Each of these strategies are described below.

2.1. TSP AND SIGNAL OPTIMIZATION

TSP and signal optimization enable buses to more effectively move through signal-controlled intersections without significantly disrupting traffic. Signal optimization is the practice of rebalancing signal timings to ensure the efficient movement of vehicles. TSP typically involves buses that can send a priority request to a signal controller, which may provide an early or extended green signal for transit vehicles. The signal priority is determined based on the bus location, schedule, and the current traffic-signal phasing. This early or extended green can take place at either the beginning or end of the green signal phase, depending on how soon the bus will approach the signal. Typical practice is for TSP to only be utilized for buses that are running behind schedule.

FIGURE 2.1: TRANSIT SIGNAL PRIORITY CONCEPT

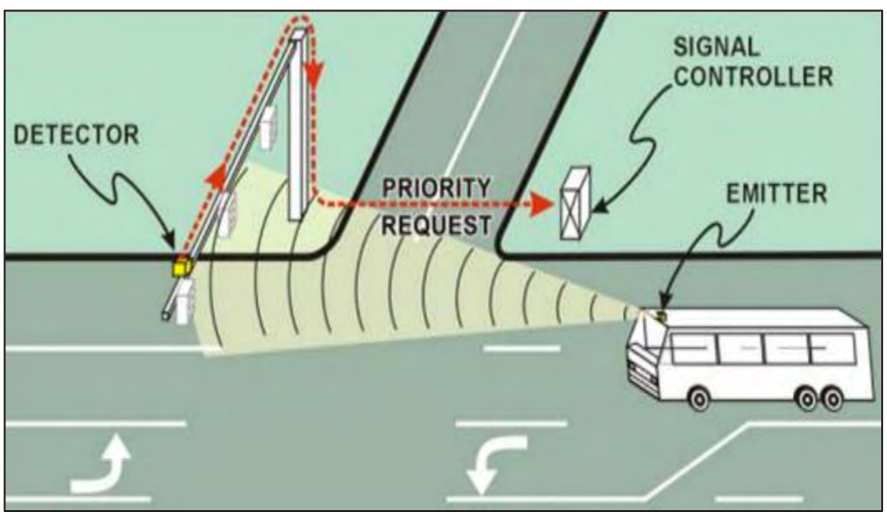


FIGURE 2.2: QUEUE JUMP SIGN (LEFT) AND EXAMPLE ON LOOP LINK CORRIDOR (RIGHT)

This is not signal preemption, which is used by emergency vehicles to guarantee green lights for the length of their journey. Nonetheless, TSP and signal optimization help buses recover lost time and maintain reliable schedules. Signal optimization and TSP are being undertaken throughout the Chicago metropolitan area, including the South Halsted Corridor, through the Regional Transportation Authority's (RTA) Regional Transit Signal Integration Program. Signal optimization has already been completed south of 127th Street with TSP to follow in 2019 or 2020. Optimization and TSP north of 127th Street are planned to follow, but the timeline for implementation has not yet been determined.

2.2. QUEUE JUMPS

Queue jumps are typically designated bus lanes located at intersections accompanied with dedicated signals that prioritize buses. They allow buses to bypass queued traffic at intersections with the intention of reducing bus delays. For buses stopped at a signal, this approach can also give buses a head start before the general traffic. Some queue jumps operate with cameras, that trigger the signal when a bus is present. Others operate like TSP, and a priority request is sent to a signal controller to provide an advanced green for an approaching bus using a separate transit signal. In queue jumps that are shared with right turning vehicles, this priority request can also provide an early green arrow to clear out right-turning vehicles.

2.3. BUS LANES (PEAK OR 24 HOUR)

Bus lanes are dedicated lanes exclusively for transit use. Bus lanes help buses bypass general traffic congestion. Bus lanes can be in operation 24 hours per day or only during peak periods. For the South Halsted Corridor, the proposed bus lanes would be located adjacent to the curb, repurposing space that is currently street parking or a travel lane, depending on the segment of the corridor. Like with queue jumps, right turning vehicles would be allowed to enter the bus lane to access adjacent side streets and driveways. In bus lanes that are shared with right turning vehicles, this priority request can also provide an early green arrow to clear out right-turning vehicles.

FIGURE 2.3: LOOP LINK BUS LANE (LEFT) AND JEFFERY JUMP BUS LANE (RIGHT)

This strategy would maximize the benefit to transit by minimizing instances where buses are slowed by general traffic. Bus lanes assist in reducing transit delays due to congested traffic operations.

Median or center running bus lanes were considered during the earliest phase of the project. This option was not carried forward due to the need for a new fleet of buses with both right- and left-side doors, its lack of consistency with the existing Pulse program, and the desire not to implement contra-flow lanes that would be needed if buses with right side doors were used for a center running operation.

2.4. STATION IMPROVEMENTS

Station improvements include near-level boarding to mitigate accessibility issues, heated shelters that offer seating, enhanced lighting to increase safety, and vertical markers that provide real-time and static information. Additional upgrades consist of installing trash receptacles, bicycle racks, and landscaping. Collaboration with local communities can help determine which updates would be preferred at each station. Station improvements would improve the comfort and experience of riders. These new stations would also help to give a sense of placemaking and permanence that presents an opportunity for economic investment and community development.

2.5. LIMITED STOP SERVICE

Limited-stop service provides more rapid service for a reduced number of stops. When considering transit operations, each required bus stop takes time for passengers to board and alight, as well as time for the bus to decelerate, accelerate, and merge with general traffic. Fewer bus stops thus speeds up overall running time and improves reliability. Limited-stop service stations would be placed in areas with high existing ridership and spaced between one-half to three quarters of a mile apart to allow for a convenient walking distance. The local bus service would remain in place and continue to serve the local bus stops.

3. Screen 1: Preliminary Corridor Improvement Concepts

With the bus enhancement strategies identified above in Section 2, the project team initiated Screen 1. During Screen 1, corridor improvement strategies were evaluated and prioritized. This was done by comparing measures of effectiveness for each preliminary concept including Concept 1: Queue Jumps and Concept 2: Bus Lanes. Screen 1 identified bus enhancement concepts which would be most effective in meeting the project's purpose and need as well as being accepted by the community. Station improvements for the portion of the corridor served by Pace are defined though Pace's existing Pulse Program. Pulse service could be implemented regardless of the selected concept. Limited-stop locations were identified through a combination of ridership and spacing requirements associated with walksheds. Station locations were further evaluated through fieldwork and consideration for local land use and infrastructure conditions. These qualitative analyses were conducted both during the existing conditions assessment and refined at later stages of the study. Throughout the process, it was assumed that station locations would remain constant regardless of the selected concept.

This section describes measures of effectiveness for Screen 1, preliminary concepts evaluated, the selected limited-stop locations, and stakeholder input.

3.1. MEASURES OF EFFECTIVENESS

Measures of effectiveness were developed to compare the preliminary bus enhancement concepts for queue jumps and bus lanes. The *Existing Conditions and Needs and Deficiencies Report* called attention to the insufficiencies and opportunities present within the South Halsted Corridor including bus travel time, on time performance, and station quality/amenities. Evaluation criteria were created from the key factors identified in the report. These measures of effectiveness include bus travel time, reliability, traffic impacts, parking impacts, widening/median impacts, grant opportunities, and relative cost. They provided a means to prioritize the application of queue jumps and bus lanes along the corridor. A description of each of the measures of effectiveness are as follows:

- <u>Bus Travel Time</u>: The effectiveness of each concept at increasing bus speed and reducing time at intersections to improve overall bus travel time through the corridor.
- <u>Reliability</u>: The effectiveness of each concept at maintaining consistent waiting and travel times. In addition to buses' ability to adhere to posted schedules, it also includes riders' perception of travel time consistency.

- Traffic Impacts: Some concepts may repurpose a travel lane or modify signal timing. Altering the existing conditions could impact general traffic.
- Parking Impacts: Some concepts may repurpose parking in sections of the corridor. Eliminating parking options in the area could impact current use by drivers and/or businesses.
- Widening/Median Impacts: Certain concepts may require additional space within the roadway to accommodate the proposed geometry of the new configuration. In some cases, the additional space could come from the parkway (i.e. grassy area between road and sidewalk) or narrowing the roadway median. In areas where there are planted medians, narrowing could influence the type of the vegetation appropriate for planting including street trees. In general, configurations that required narrowing a sidewalk significantly were not considered.
- Grant Opportunities: High quality transit features make the project eligible and/or more likely to be funded by certain federal, state, or local grants. The Federal Transit Administration's (FTA) Small Starts program provides competitive grants to transit projects that plan significant improvements to transit mobility, ridership, and service quality. Eligibility for such federal grants reduces the local cost of the project.
- Relative Cost: The cost of the project varies depending on the existing conditions of the roadway and the concepts selected.

3.2. PRELIMINARY CONCEPTS

The primary goal of Screen 1 was to evaluate and prioritize the application of improvement strategies along the corridor. This screening sought to compare queue jumps and bus lanes. Limited stop service and station improvements were considered separately and could be implemented alongside either option. The preliminary concepts were developed using the data collected in the *Existing Conditions and Needs and Deficiencies Report.* A general description of the preliminary concepts is included below.

3.2.1. Concept 1 - Queue Jumps

The first concept involves the application of queue jumps at individual intersections from 79th Street to 154th Street. As shown in Figure 3.1, which provides an aerial view of a sample intersection on South Halsted Street, the inclusion of a queue jump would be added to the right most lane on the approach to the intersection. General traffic would still be permitted to access the queue jump lane to make right turns. As described in Section 2.2, a special transit-specific signal would also be installed to allow the bus early entry into the intersection and to clear out any vehicles turning right.

FIGURE 3.1: QUEUE JUMP TYPICAL INTERSECTION

As noted in Table 3.1, the addition of queue jumps would save an average of 4 to 8 seconds per intersection, which would improve bus travel time and reliability at each of the signalized intersections along the South Halsted Corridor. Overall impacts to traffic are anticipated to be low, with some minor impacts to general traffic at intersections.

TABLE 3.1: CONCEPT 1 CHARACTERISTICS

Measure	Impact
Bus Travel Time	Average savings of approximately 4-8 seconds[1] per intersection, or approximately 5% for entire corridor; only available/necessary at 28 intersections
Reliability	Increase travel time reliability
Traffic Impacts	Low, some minor impacts at intersections
Parking Impacts	314 spaces at 28 intersections (approx. 11 spaces per intersection)
Median/Widening Impacts	Typically 1 to 4 feet at intersections
Grant Opportunities	Limited
Relative Cost	Medium Low

[1] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-3

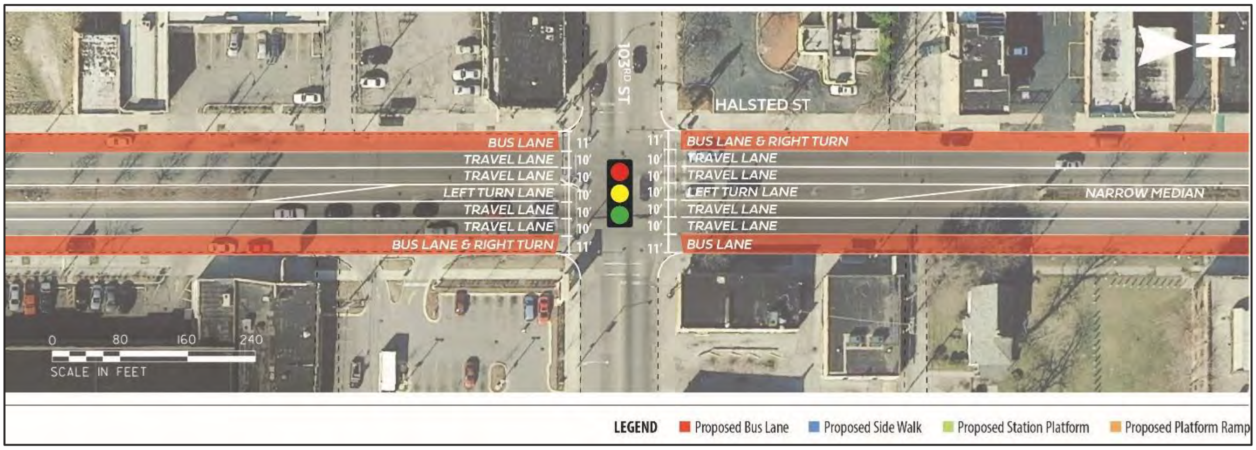
Appendix D: Traffic Analysis contains additional details regarding the traffic analysis, including a list of the signalized intersections along the corridor. Queue jumps typically require an additional width of about 1 to 4 feet within the roadway at intersections. In areas with on-street parking, several spaces on both sides of the intersection would be removed to accommodate the queue jump. South of 129th Place, the general travel lanes could shift, converting existing low volume left turn lane into a left and through lane to accommodate the queue jumps. An alternate option would be to widen the road, impacting the parkway and/or sidewalk, for a queue jump lane. This condition occurs at four intersections including 134th Street, 138th Street, 144th Street, and 147th Street/Sibley Avenue. The addition of queue jumps at each of the corridor's 28 signalized intersections would result in the removal of about 9 spaces per intersection, or 253 parking spaces along the South Halsted Corridor.

The relative cost of this concept is low to moderate. Though dedicated transit lanes are not required for a project to be eligible for FTA Small Starts funding, the lack of any dedicated lanes for this option may limit grant funding opportunities as the project may be viewed as less competitive for this grant.

3.2.2. Concept 2 - Bus Lanes

Concept 2 involves the application of bus lanes that provide a more comprehensive approach for prioritizing transit by creating or reserving a dedicated transit lane on the curbside along the corridor. As this phase of the study, the two reviewed bus-lane options were (1) only during peak hours, and (2) 24 hours a day. Further, the application of the bus lanes was considered from 79th Street to 103rd Street as well as from 79th Street to 154th Street at this stage in the process. Bus lanes from 79th Street to 103rd Street were considered during this screening because buses faced their slowest speeds in this section. Each option maintains existing bike lanes on the north end of the corridor. The extent of the bus lanes would be further screened later in the study. During the study, 79th Street was identified as a Bus Priority Zone corridor and improvements are being made within the project study area. Additional improvements to 79th Street and 95th Street could be considered as part of separate corridor studies. Figure 3.2 shows an aerial view of a sample intersection on South Halsted Street with the inclusion of a dedicated bus lane. In all cases, general traffic would be permitted to access bus lanes to facilitate right turns and driveway access. As with queue jumps, a special transit-specific signal would be added for the bus and right-turning vehicles.

FIGURE 3.2: BUS LANE TYPICAL INTERSECTION



Implementing bus lanes would save an average of up to one minute per mile and enable buses to gain speed throughout the corridor, which would improve bus travel time.[2] Buses traveling in dedicated bus only lanes are less susceptible to congestion; they remove competition with the general traffic. Therefore, bus lanes would similarly increase reliability since buses can maintain consistent speeds.

Dedicated lanes could be created by converting either on-street parking (if available) or a general travel lane into a bus lane. Repurposing on-street parking would create parking impacts, but no traffic impacts. Repurposing a general travel lane may have traffic impacts, but no parking impacts. No on-street parking is available from 129th Place to 154th Street; conversion of a general travel lane into a bus lane is the only bus lane option along this specific section. While feasible to take either parking or travel lanes in different sections of the corridor, ensuring some degree of lane continuity throughout the corridor is important as well. In some cases, bus lanes would require additional space to convert a parking lane that is approximately 7 to 8 feet wide into a bus lane that is 11 feet wide. This would require moving the curbline to widen the roadway or narrowing the median through a portion of the corridor from 100th Street to 129th Place. Though narrowing/widening is needed to provide space for the bus lane, the remaining median width is generally greater than 7 feet and therefore able to accommodate street trees. This would retain the character of these segments. Also, where there is sidewalk narrowing, remaining sidewalk width is 9 feet or greater. Additional details are described in Section 4.2.6: Median Narrowing/Roadway Widening and Appendix K: Median Narrowing and Roadway Widening. The relative cost of this concept is greater than queue jumps, but the inclusion of bus

[2] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-

lanes would result in greater overall transit improvements and make the project more competitive for federal Small Starts funding.

TABLE 3.2: CONCEPT 2 CHARACTERISTICS

Measure	Impact
Bus Travel Time	Average savings of approximately 1 minute per mile[3] in typical urban environment, or 6% savings to 103rd Street and 13% savings to 154th Street*
Reliability	Significantly improve travel time and reliability beyond queue jumps
Traffic Impacts	Low if dedicated lanes repurpose parking Moderate if existing travel lane is repurposed
Parking Impacts	Halsted (79th to 103rd): ~718 spaces (28 per block) Halsted (103rd to 127th): 874 spaces (32 per block) 79th: 132 spaces (9 per block) 95th: ~238 spaces (17 per block)
Median/Widening Impacts	Moderate, typically 2 to 6 feet median narrowing; some roadway widening may also be required
Grant Opportunities	High, FTA Small Start grant most competitive if significant dedicated lanes
Relative Cost	Greater than Concept 1

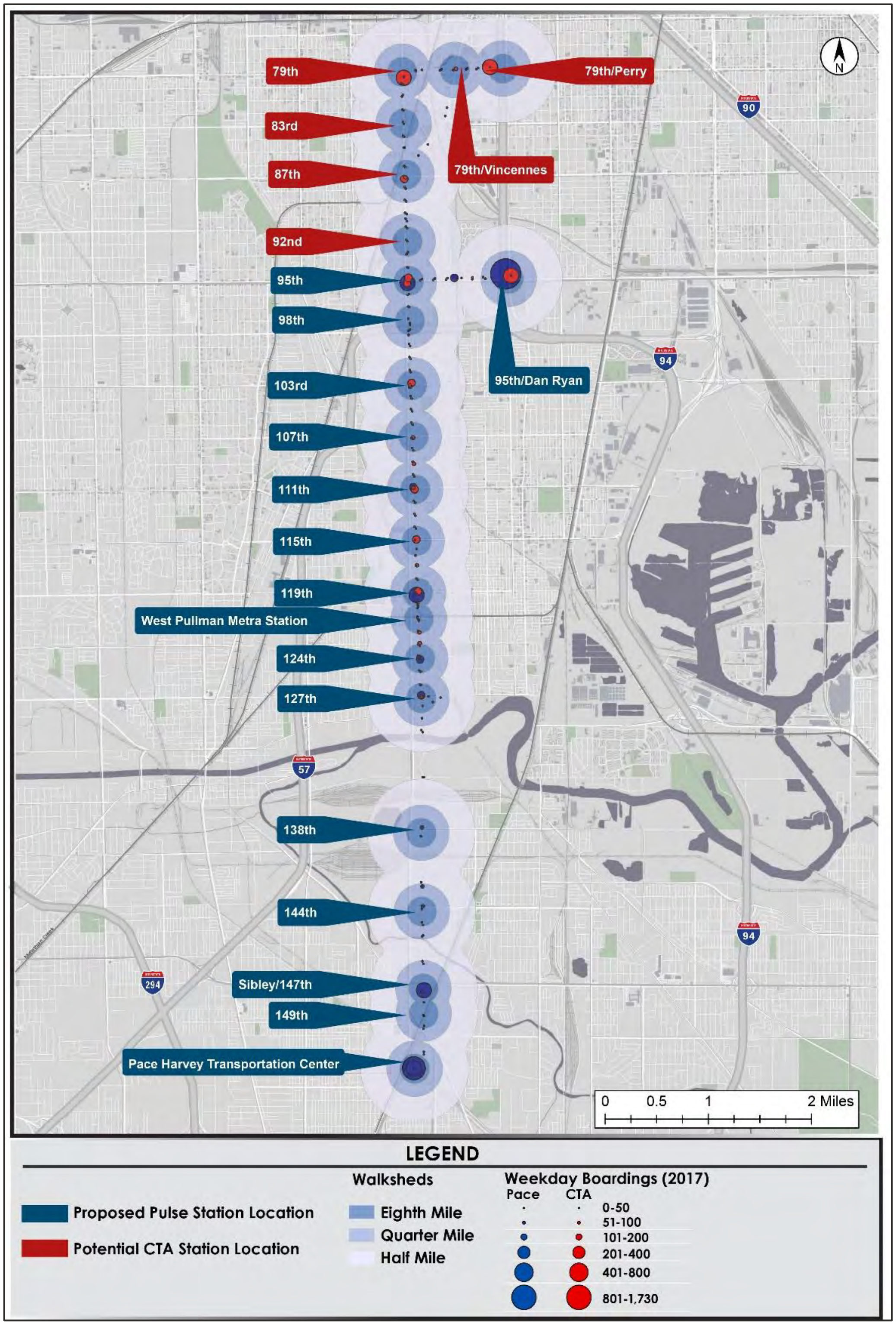
3.2.3. Limited Stop Service & Station Improvements

For both preliminary concepts summarized above, limited-stop service and station improvements are proposed. To improve transit running time and provide for a cost-effective investment, station locations would be optimized based on consideration for stations with the highest boardings and alightings, balanced with walking distance between stations. Figure 3.3 shows a graphic depicting ridership at each existing bus stop and walkshed distances at proposed limited stop stations. Proposed limited stop stations are indicated by a flag symbol. Limited-stop service stations are proposed to be spaced approximately a half mile apart along the South Halsted Corridor, which would ensure that 98% of the existing riders would be within quarter of a mile from where they currently board, rather than at every block. A quarter mile is typically a five-minute walk for most riders when Americans with Disabilities Act (ADA) compliant sidewalks are provided.[4]

[3] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-

[4] The need for accessible pedestrian infrastructure is discussed in the *Existing Conditions and Needs & Deficiencies Report*. If station locations require a change to walking routes, the agency responsible for sidewalk maintenance should provide input on ADA compliance and maintenance issues within the area.

FIGURE 3.3: CURRENT RIDERSHIP BY STOP AND PROPOSED LIMITED STOP PATTERN



In addition to limited-stop service, station improvements would occur at the proposed locations following the design guidelines established by Pace for their Milwaukee[5] and Dempster[6] Pulse Corridors. A rendering of a station on the Pulse Corridor is shown in Figure 3.4. These upgraded stations would include near-level boarding to mitigate accessibility issues, heated shelters that offer seating, enhanced lighting to increase safety, and vertical markers that provide real-time and static information. The near level station platforms also speed the boarding process and reduce overall travel time. Pace's Pulse program also provides opportunities for art space on wind screens for community designed etched images. Stations could be implemented independent of any roadway treatments.

FIGURE 3.4: PACE PULSE STATION CONCEPTUAL RENDERING

[5] Milwaukee Corridor Arterial Rapid Transit – Project Definition Report, December 2014. https://pulse.pacebus.com/images/reports/TR_PMO_MilwaukeeARTProjectDefinition_2014-12-31.pdf

[6] Pulse Dempster Line: Project Definition, August 2016. https://pulse.pacebus.com/images/TR_PMO_DEMP_ProjectDefinition.pdf

3.3. STAKEHOLDER INPUT

Preliminary Concept 1: Queue Jumps, Concept 2: Bus Lanes, and the proposed location of limited stops were presented to the Corridor Advisory Group (CAG) on October 16, 2018. Eighteen CAG members were in attendance representing City of Chicago Aldermen, South Suburban communities, and partner agencies. The meeting recapped the existing conditions discussed during the first CAG meeting and provided an overview of the preliminary concepts and evaluation criteria. Below are comments and recommendations received for these preliminary concepts. Appendix B: CAG Meeting 2 Summary provides additional detail regarding this CAG meeting.

3.3.1. Comments/Recommendations: Roadway Concepts

Overall, the CAG members were in support of the decreased travel times and increased reliability that would result from either queue jumps or bus lanes. There was no opposition to the concept of bus lanes. However, the CAG members did express concerns regarding the potential loss of parking and roadway widening, especially if sidewalk widths were reduced. Narrowing medians was a preferred approach. When there were questions about how bike infrastructure was being accounted for in the study, several participants indicated that they did not support extending bike lanes. Regarding parking, there was concern for loss of parking in commercial and residential areas along the north end of the corridor. CAG members proposed that the team explore areas along the corridor where parking is underutilized or near businesses that open after AM peak hours. Also, CAG members requested that person throughput and economic development opportunities be added and grant funding be eliminated as a measure of effectiveness.

3.3.2. Comments/Recommendations: Limited Stops

Overall, CAG members were in support of station upgrades that create a sense of place, provide for branded transit service, and provided greater lighting as proposed as part of Pace's Pulse Station Program. In general, CAG members agreed with the project team's identification of high ridership bus stops and the general locations of proposed limited stop stations. There was a desire by several members that stations should be located close to proposed new developments along the corridor.

4. Screen 2: Refined Corridor Improvement Alternatives

With results from Screen 1, three refined alternatives for the South Halsted Bus Corridor Enhancement Project were developed including:

- Alternative 1: Queue Jumps Entire Corridor Length
- Alternative 2: Queue Jumps with Bus Lanes South of 129th Place
- Alternative 3: Queue Jumps with Bus Lanes South of 100th Street

This section includes:

- Description of each of the three refined alternatives including updated measures of effectiveness
- Results of additional analysis completed following Screen 1 for each refined alternative including traffic analysis, parking utilization, bus speed and reliability, ridership and person throughput, economic impact potential, and environmental considerations
- Concept Station Locations
- Stakeholder Input.

4.1. REFINED CORRIDOR IMPROVEMENT ALTERNATIVES

Three refined alternatives for the South Halsted Bus Corridor Enhancement Project were developed for Screen 2 including Alternative 1: Queue Jumps Entire Corridor Length, Alternative 2: Queue Jumps with Bus Lanes South of 129th Place, and Alternative 3: Queue Jumps with Bus Lanes South of 100th Street. Overviews of each alternative and its measures of effectiveness are described below. Additional analyses performed following Screen 1 are found in Section 4.2: Improvement Alternatives Additional Analysis.

4.1.1. Alternative 1: Queue Jumps Entire Corridor Length

Alternative 1 involves queue jumps throughout the corridor as well as two small sections with bus lanes, as shown on the map in Figure 4.1. A typical intersection is shown in Figure 4.2. Though there is some variation of lane and median width along the corridor, Figure 4.3 shows a typical cross section sample. All queue jumps from 79th Street to 129th Place would require removing parking spaces. In many cases, median narrowing or roadway widening would be required at intersections in this section. Where widening does occur, the remaining sidewalks would be wider than the required minimum standards for ADA compliance. The remaining queue jumps in the southern portion of the corridor would be created by occupying the rightmost travel lane at the intersection and shifting general traffic lanes. This would convert existing low volume left turn lanes to a through and left lane. Alternatively, retaining the low volume left-turn lane by widening the roadway is possible.

Queue jumps are also proposed at signalized intersections along 79th Street and 95th Street. On South Halsted from 98th Street to 100th Street, several consecutive traffic signals are close together, allowing the queue jumps to operate much like a bus lane. This proposed bus lane would reduce a travel lane. The proposed bus lane on 79th Street from South Halsted Street to South Lowe Avenue would remove parking, as per the *CTA 79th Street Slow Zone Study*. Conceptual Improvement Plans for Alternative 1 are included as Appendix A: Conceptual Corridor Improvement Plans.

FIGURE 4.1: ALTERNATIVE 1

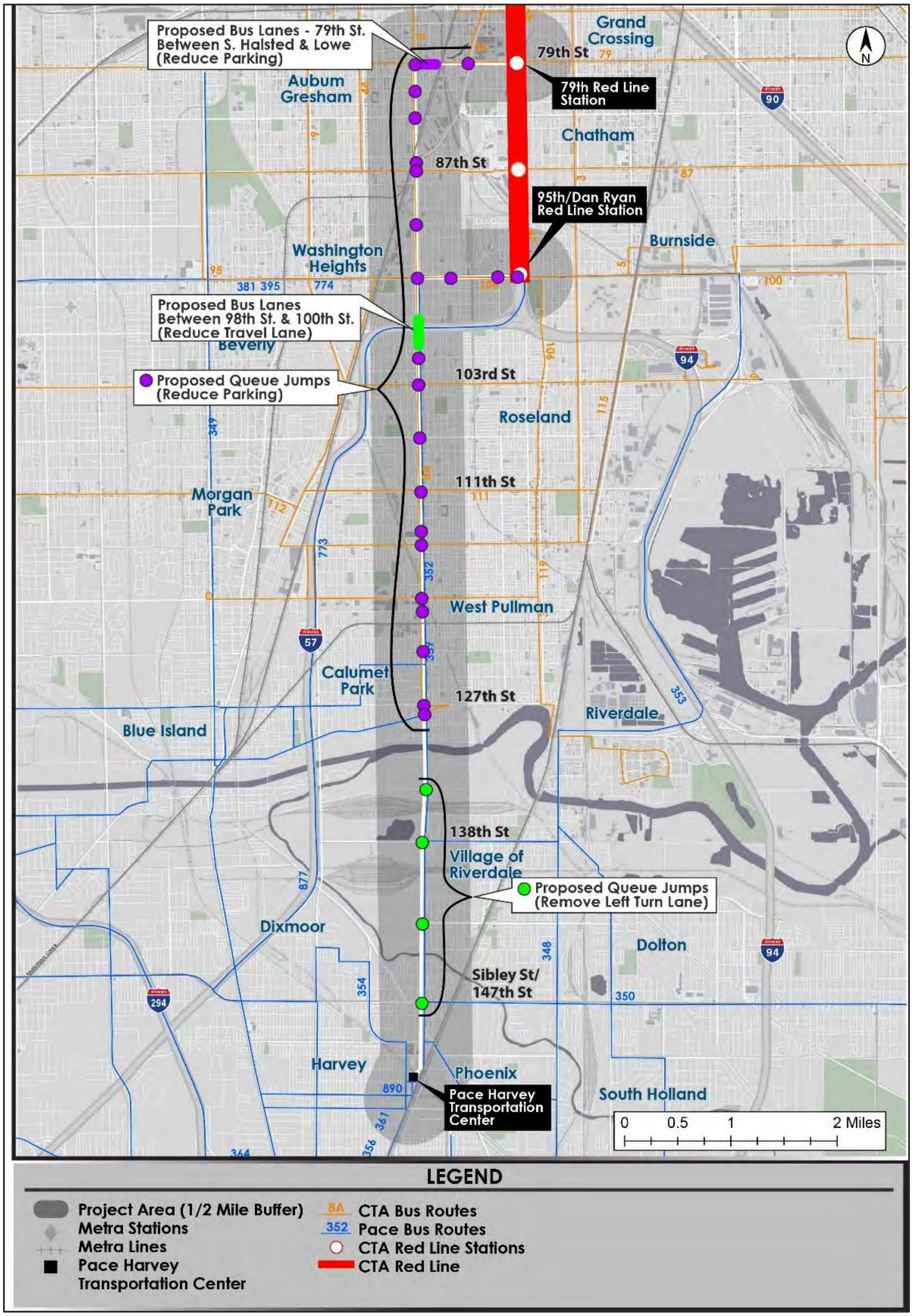


FIGURE 4.2: ALTERNATIVE 1 TYPICAL INTERSECTION

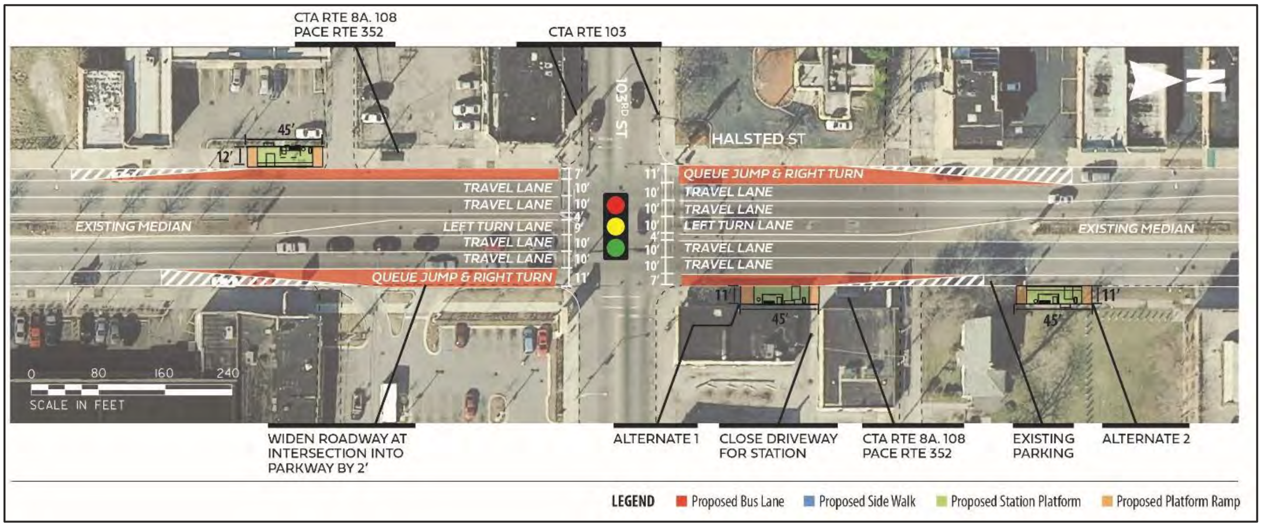
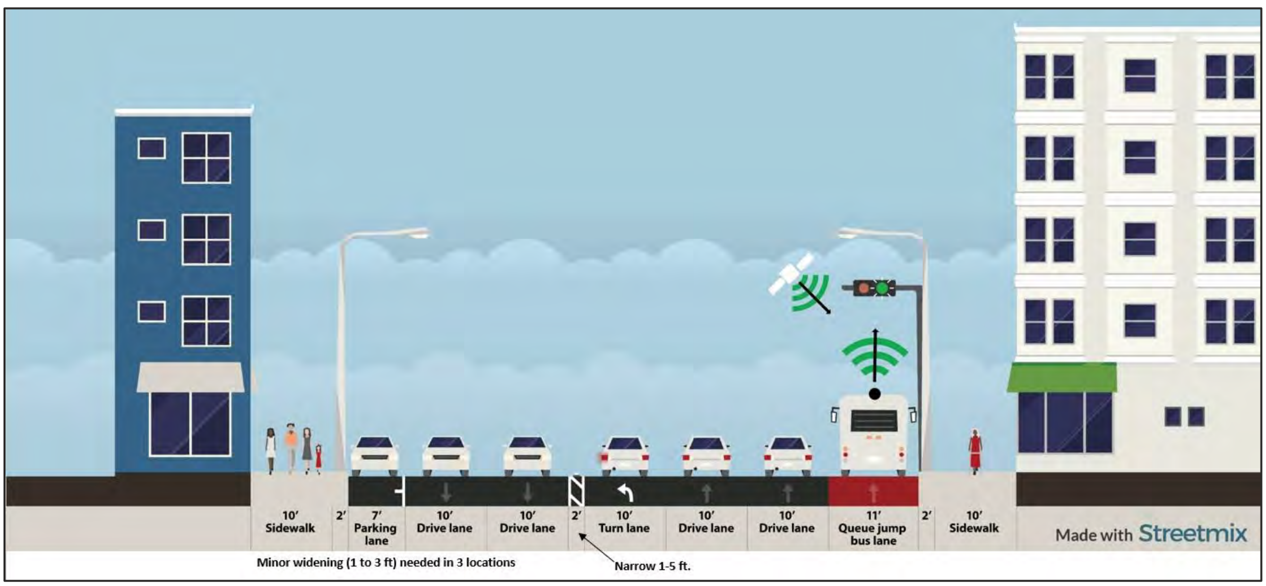


FIGURE 4.3: ALTERNATIVE 1 TYPICAL INTERSECTION CROSS SECTION



Alternative 1 would include up to 28 intersections within the South Halsted Corridor which would accommodate queue jumps and short sections of bus lanes. These improvements are estimated to decrease bus travel time by approximately 5% for the entire corridor, which includes savings from TSP and Signal Optimization. Queue jumps would also improve bus service reliability as buses will be able to jump ahead of queuing vehicles at signals when traffic is heavy. Section 4.2.3: Bus Speed and Reliability provides additional details. The addition of queue jumps would pose minor impacts to general traffic at intersections. Section 4.2.1: Traffic, provides additional details. The queue jumps and the associated bus lanes would require approximately nine parking spaces per intersection. At 18 intersections, medians would need to be narrowed by one to five feet to accommodate the queue jumps. At three intersections where the median cannot be narrowed sufficiently, roadway widening of one to two feet is required. Two of these widening locations would require narrowing of the sidewalk; the other would require narrowing of the parkway. Where widening does occur, the remaining sidewalks are wider than the required minimum standards for ADA compliance. These measurements are based on preliminary estimates and will be confirmed when field survey is completed in the advanced conceptual design phase of the program. Alternative 1 is relatively low in cost compared to Alternatives 2 and 3. Modest improvements in passenger throughput would also occur. Section 4.2.4: Ridership and Person Throughput provides additional information. Also, there may be opportunities for economic development at bus station locations. Table 4.1 below provides a summary of the updated measures of effectiveness for Alternative 1.

TABLE 4.1: ALTERNATIVE 1 MEASURES OF EFFECTIVENESS

Measure	Impact
Bus Travel Time	Average savings of approximately 4-8 seconds[7] per intersection; Approximately 5% for entire corridor (only available/necessary at 28 intersections) plus 3% savings from TSP and Signal Optimization
Reliability	Increase travel time reliability
Traffic Impacts	Low traffic impacts, some minor impacts at intersections
Parking Impacts	Total of 314 spaces impacted at 28 intersections (approximately 11 spaces per intersection) plus up to 53 additional spaces to integrate far side bus stations (approximately 10 per intersection)
Median/Widening Impacts	Narrow median 1 to 5 feet at 18 intersections (typical) and Widen roadway (parkway or sidewalk) at 3 intersections 1 to 2 feet (typical)
Relative Cost	Low as compared to Alternatives 2 and 3
Person Throughput	Modest improvements in passenger throughput with current service levels based on: Modest increases in persons on transit; estimated transit ridership increase of 3% (Estimated increase of 300 riders per day and 13 peak hour, peak direction riders) No change to persons in autos; no significant impacts on auto traffic capacity Potential for greater improvements in person throughput capacity with additional transit service frequencies leading to increased transit ridership without affecting road capacity
Economic Impact Potential	Opportunities for development at many station areas

[7] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-3

4.1.2. Alternative 2: Queue Jumps with Bus Lanes South of 129th Place

Alternative 2 builds on the concepts of Alternative 1 and adds a section of bus lanes in the southernmost section of the corridor, from 129th Place to the Pace Harvey Transportation Center, as shown in Figure 4.4. From 129th Place to 154th Street, Alternative 2 converts a general purpose lane to a bus lane.

Figure 4.5 shows an aerial view of a typical bus lane in this section. As with queue jumps, right turns and business access to driveways for general traffic would be allowed from the bus lane.

Figure 4.6 shows a typical cross section for this area of South Halsted with bus lanes. In most areas, widening is not required. Generally, existing traffic volumes in this section of the corridor are low enough that consideration can be given to replacing a travel lane with a bus lane. Current annual average daily traffic (AADT) on this section of the corridor is up to 16,100 vehicles per day, which translates to a peak period, peak direction hourly volume of approximately 600 to 1,000 vehicles per hour. Single lane capacity for an urban arterial is approximately 1,900 vehicles per hour. Alternative 2 considers what is needed for today and reserves space for future transit needs. Conceptual drawings for Alternative 2 are included as Appendix A: Conceptual Corridor Improvement Plans.

FIGURE 4.4: ALTERNATIVE 2

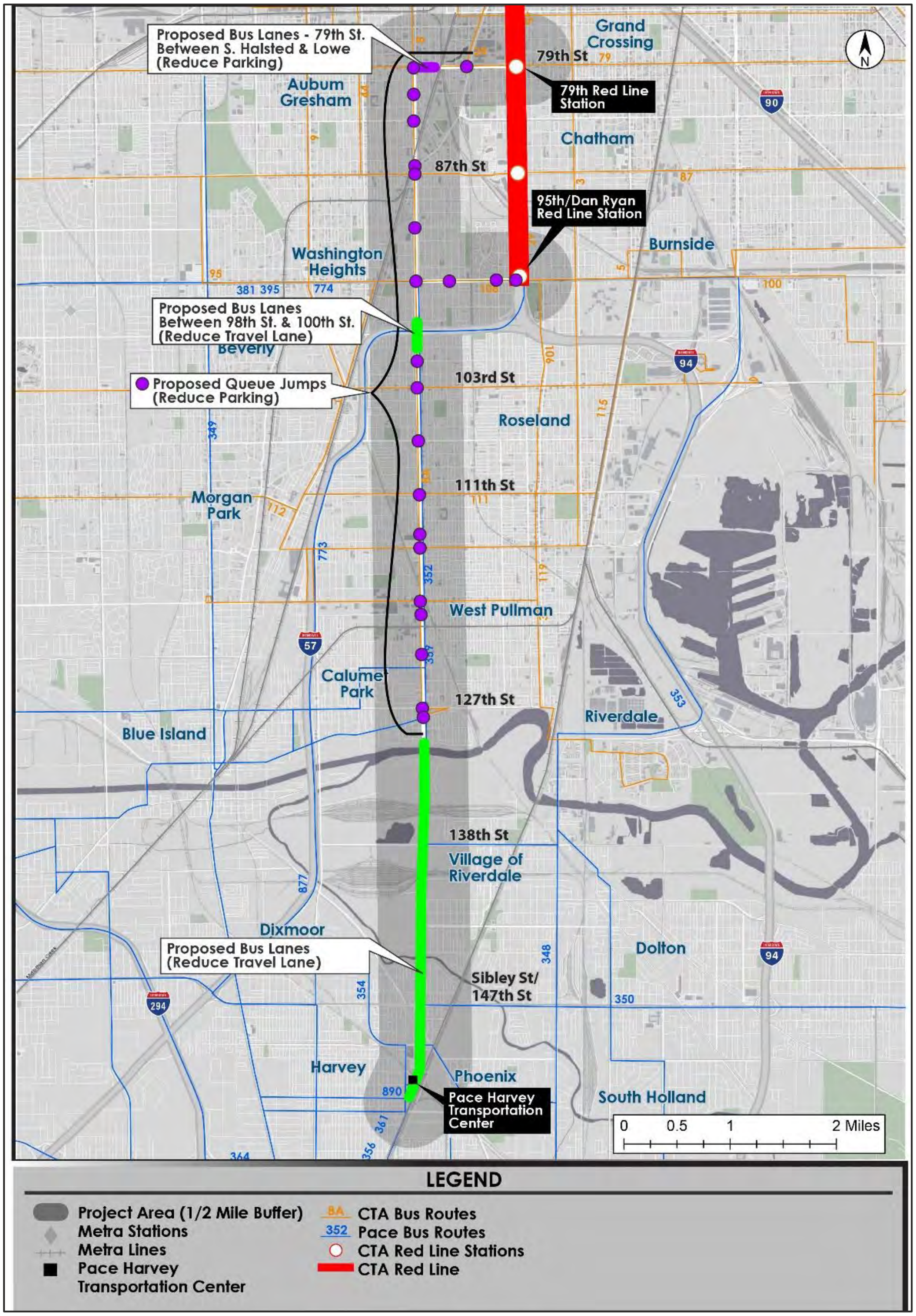


FIGURE 4.5: ALTERNATIVE 2 TYPICAL INTERSECTION

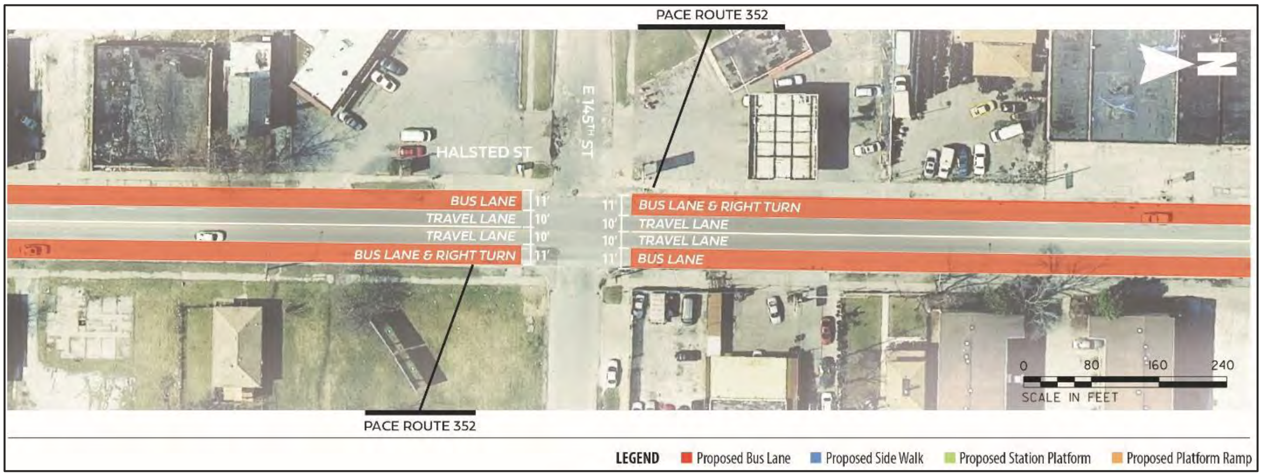


FIGURE 4.6: ALTERNATIVE 2 TYPICAL CROSS SECTION

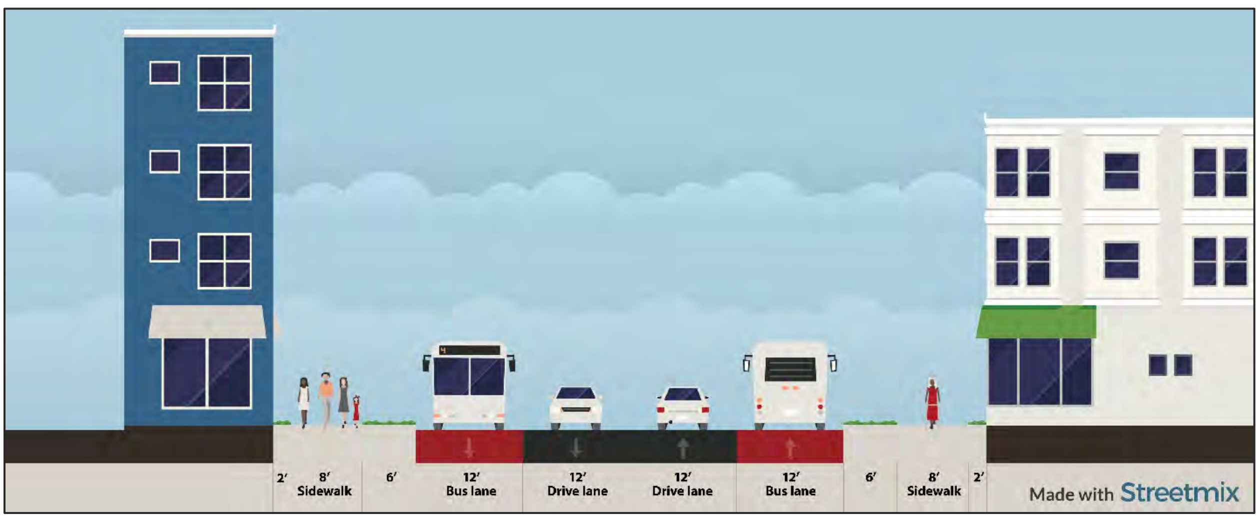


Table 4.2 provides a summary of the updated measures of effectiveness for Alternative 2. Alternative 2 is estimated to decrease bus travel time by approximately 8% for the entire corridor. Section 4.2.3: Bus Speed and Reliability provides additional details. Due to the bus lane on South Halsted from 129th Place to 154th Street, Alternative 2 would provide greater reliability compared to Alternative 1. The southern section of the corridor currently experiences less congestion, therefore, repurposing a travel lane would have a low to moderate impact on the general traffic. Section 4.2.1: Traffic, provides additional details. The queue jumps would require up to 10 parking spaces per intersection with farside stations. Additional roadway space would be required to accommodate the queue jumps. Primarily, this could be achieved through

narrowing medians, though some minor road widening may also be required at intersections, including some locations where sidewalks would need to be narrowed. The extents of the proposed widening will be further refined during the advanced conceptual design phase base on field survey of roadway widths. No widening is needed for the bus lane south of 129th Place. While the relative cost is greater than Alternative 1, no additional significant changes to roadway geometry would be required. Alternative 2 would have a greater person throughput per hour of revenue service compared to Alterative 1; additional details are provided in Section 4.2.4: Ridership and Person Throughput. Alternative 2 also provides opportunities for increased economic development at bus station locations and in the southern section of the corridor because of the increased sense of permanence that bus lanes provide.

TABLE 4.2: ALTERNATIVE 2 MEASURES OF EFFECTIVENESS

Measure	Impact
Bus Travel Time	Queue jump performance is the same as Alternative 1; in addition, average savings from bus lanes of approximately 1 minute per mile[8] in typical urban environment, or 8% savings total for this alternative plus 3% savings from TSP and Signal Optimization
Reliability	Significantly improve travel time and reliability beyond queue jumps
Traffic Impacts	Medium/Low traffic impacts, removing travel lanes in southern section where traffic is light
Parking Impacts	Total of 314 spaces impacted at 28 intersections (approximately 11 spaces per intersection) plus up to 53 additional spaces to integrate far side bus stations (approximately 10 per intersection)
Median/Widening Impacts	Narrow median 1 to 5 feet at 18 intersections (typical) and Widen roadway (parkway or sidewalk) at 3 intersections 1 to 2 feet (typical)
Relative Cost	Greater than Alternative 1, but no additional significant changes to roadway geometry
Person Throughput	Increased improvements in passenger throughput with current service levels based on: Modest increases in persons on transit; estimated transit ridership increase of 4% (Estimated increase of 500 riders per day and 21 peak hour, peak direction riders) No change to persons in autos; no significant impacts on auto traffic capacity Potential for greater improvements in person throughput capacity with additional transit service frequencies leading to increased transit ridership without affecting road capacity
Economic Impact Potential	Opportunities for development at many station areas and in the South section of corridor because of increased sense of permanence that bus lanes provide

[8] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-2

4.1.3. Alternative 3: Queue Jumps with Bus Lanes South of 100th Street

Alternative 3 builds on Alternative 2 by providing an additional section of bus lanes from 100th Street to 129th Place. In this case, lanes would be created by converting underutilized existing on-street parking into a bus lane. This would create a continuous bus lane from 98th Street to 154th Street, as shown in Figure 4.7.

As shown in the typical intersection plan in Figure 4.8, bus lanes would be deployed in the existing curbside parking lane throughout this section of the corridor. General traffic would be permitted to use the bus lane to make right turns at intersections and to access local driveways. Conversion of an approximately 7 to 8-foot-wide parking lane into an 11-foot-wide bus lane would necessitate changes to the roadway cross section to create additional space, mostly through narrowing medians. Section 4.2.6: Median Narrowing/Roadway Widening provides additional analysis regarding current expectations for the extent and impacts of median narrowing. The extents of the proposed widening will be further refined during the advanced conceptual design phase based on field survey of roadway widths. Some roadway widening at intersections may also be needed. Figure 4.9 illustrates a typical cross section in this area of the project.

The project team identified this area along South Halsted Street for parking to potentially be repurposed for a dedicated bus lane, because it is primarily commercial rather than residential, and off-street parking in this area is prevalent. A survey of on-street parking use found relatively low utilization of on-street spaces, on average between 7 and 11%, and no block exhibited utilization over 45%. The study team estimated that only 11 out of approximately 800 parcels in this section of the corridor do not have off-street parking on or directly adjacent to the parcel. Refer to Section 4.2.2: Parking of this report for details. Conceptual plans for Alternative 3 are included as Appendix A: Conceptual Corridor Improvement Plans.

FIGURE 4.7: ALTERNATIVE 3

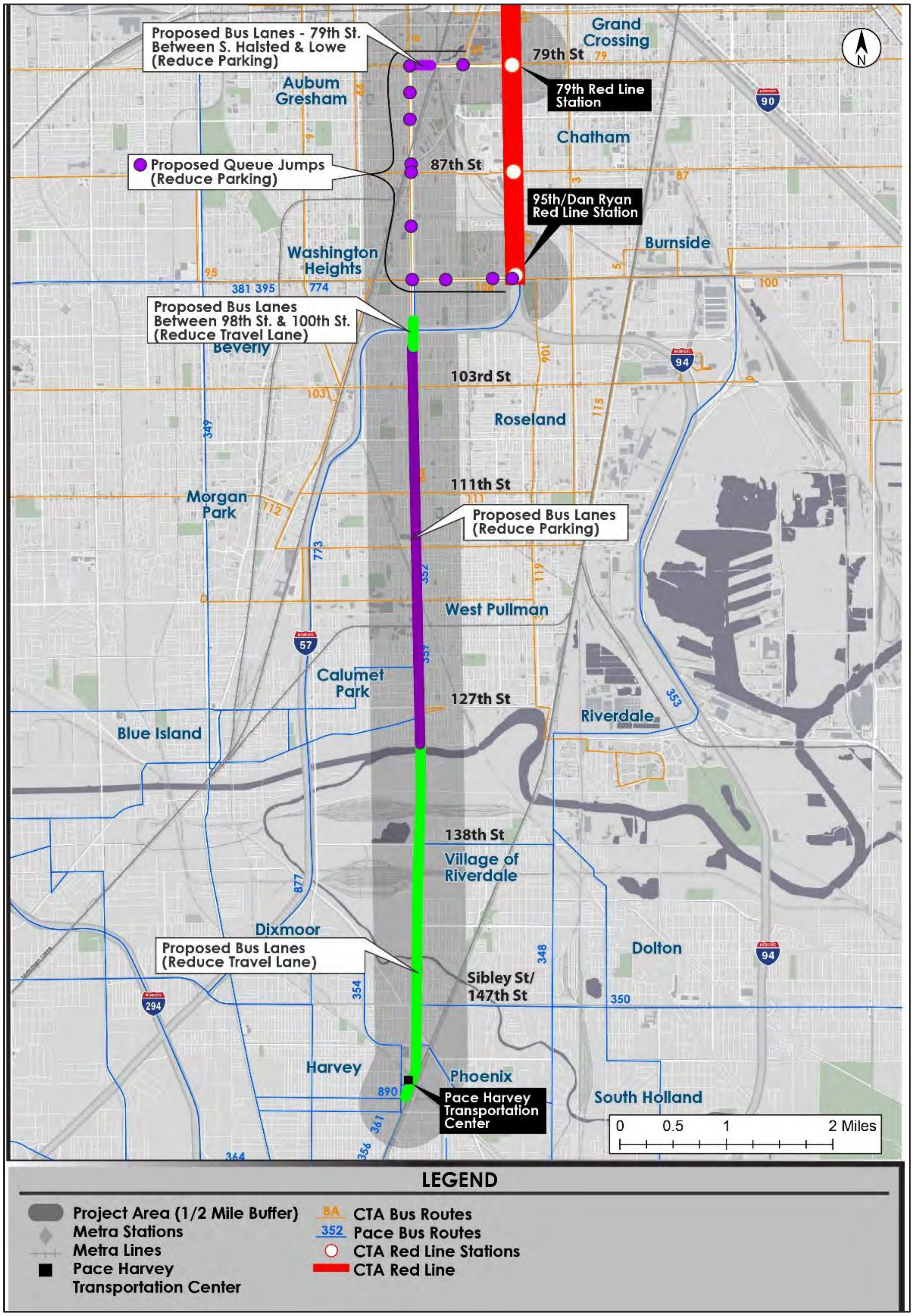


FIGURE 4.8: ALTERNATIVE 3 TYPICAL INTERSECTION

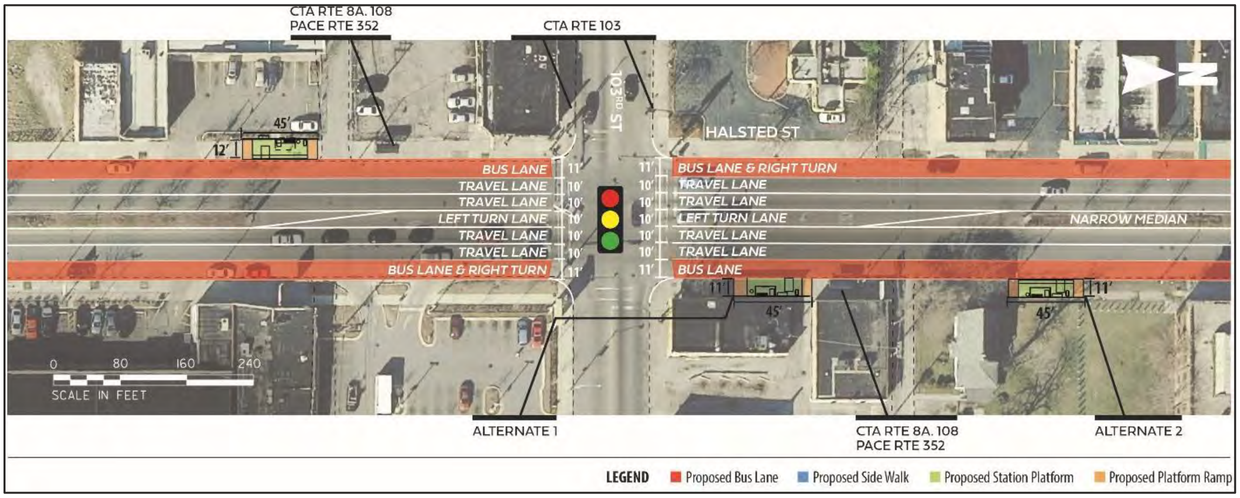


FIGURE 4.9: ALTERNATIVE 3 TYPICAL CROSS SECTION

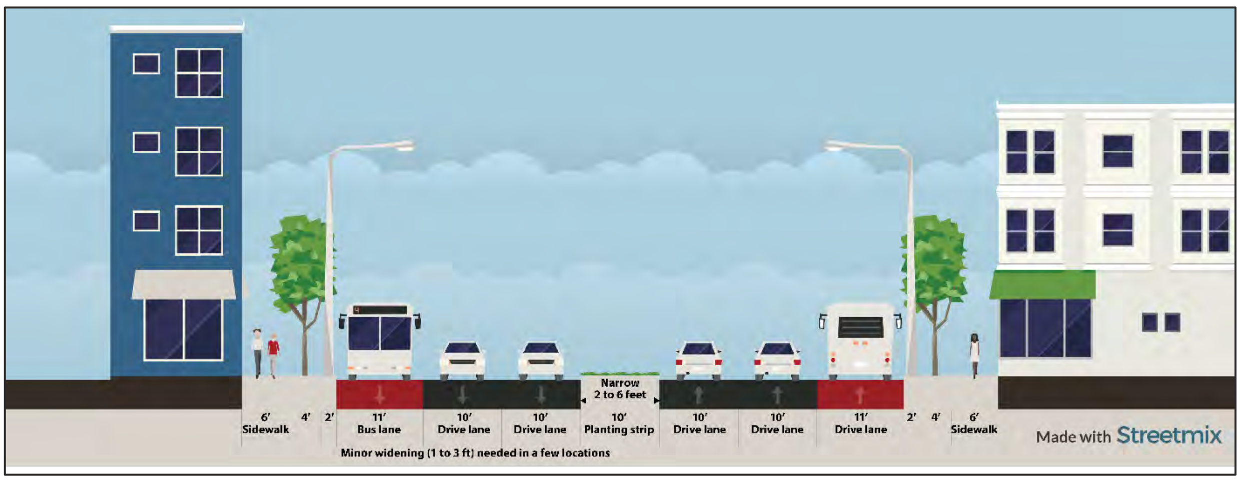


Table 4.3 lists the updated measures of effectiveness for Alternative 3. Alternative 3 is estimated to improve bus travel time by approximately 10% for the entire corridor. Time savings from TSP and stop consolidation would provide additional time savings. Section 4.2.3: Bus Speed and Reliability, provides additional details. Since Alternative 3 would add a greater length of designated bus lanes, buses would be expected to experience an increase in average speed along a longer portion of the corridor. This not only improves bus travel times but also increases reliability since buses are less subject to traffic delays. Alternative 3 would have a low to moderate impact on traffic beyond Alternative 2, because the bus lanes would remove parking in the more congested areas of the corridor instead of a travel lane. Section 4.2.1: Traffic provides additional details. The impacts to parking, however, would be greater than Alternatives 1 and 2.

Median narrowing and/or roadway widening would be required throughout the section between 100th Street and 129th Place. Narrowing requirements would be one to six feet at 26 locations and 7.5 feet at two locations. In 22 locations, the remaining median would be 7 feet wide or greater, which would leave the median wide enough to retain street trees. In addition to median narrowing, roadway widening of 1 to 2.5 feet would be required in 37 locations with three additional locations requiring up to 3 feet of widening. Widening would require the reduction of only parkway in eight locations, only sidewalk in 27 locations, and a mix of parkway and sidewalk in four locations. In all cases, the remaining sidewalk would be at least one foot wider than is required to meet the CDOT and IDOT minimum required widths. Section 4.2.6: Median Narrowing/Roadway Widening provides additional analysis regarding the narrowing/widening requirements for this alternative. The relative cost is higher than Alternative 1 and 2. This alternative would have the greatest person throughput per hour of revenue service. Section 4.2.4: Ridership and Person Throughput, provides additional information.

TABLE 4.3: ALTERNATIVE 3 MEASURES OF EFFECTIVENESS

Measure	Impact
Bus Travel Time	Queue jump performance is same as Alternative 1 and 2; bus lane performance is the same as Alternative 2, or 10%[9] savings total for this alternative plus 3% savings from TSP and Signal Optimization
Reliability	Significantly improve travel time and reliability within city limits
Traffic Impacts	Same as Alternative 2; low traffic impacts, removing travel lanes in southern section where traffic is light
Parking Impacts	Same spaces impacted as Alternative 1 and 2 between 79th and 98th St.; total of 183 spaces (plus up to 6 additional if far side stations) impacted at 10 intersections (approximately 9 spaces per intersection) plus approximately 970 spaces between 98th St. and 129th on Halsted (approximately 32 spaces per block)
Median/Widening Impacts	Narrow median 1 to 6 feet (typical) in 26 locations with 2 locations up to 7.5 feet and Widen roadway 1 to 2.5 (typical) in 37 locations with 3 locations up to 3 feet
Relative Cost	Greater than Alternative 2, but no additional major changes to roadway geometry
Person Throughput	Greatest improvements in passenger throughput with current service levels based on: • Modest increases in persons on transit; estimated transit ridership increase of 5% (Estimated increase of 550 riders per day and 24 peak hour, peak direction riders) • No change to persons in autos; no significant impacts on auto traffic capacity • Potential for greater improvements in person throughput capacity with additional transit service frequencies leading to increased transit ridership without affecting road capacity
Economic Impact Potential	Opportunities for development at many station areas; increased investment from bus lanes in south section of corridor as well as between 100th and 129th Place which contains several designated TIF Districts, Special Service Areas, and Thrive Zones

[9] TCRP Report 118, BRT Practitioner's Guide, Page S-9, Exhibit S-2

4.2. IMPROVEMENT ALTERNATIVES ADDITIONAL ANALYSIS

The following section provides details regarding the additional analysis completed for each alternative. This includes traffic, parking, bus speed and reliability, ridership and person throughput, environmental screening, median narrowing and roadway widening, and bump outs.

4.2.1. Traffic

The proposed transit improvements for the South Halsted Bus Corridor Enhancement Project include three different running way improvements. Descriptions of each of the alternatives are summarized in Table 4.4.

TABLE 4.4: SUMMARY OF ALTERNATIVES FOR SOUTH HALSTED CORRIDOR

Halsted Street Segment	Alternative 1	Alternative 2	Alternative 3
79th Street to 98th Street (2.4 miles)	Queue Jumps (Repurpose parking)		
98th Street to 100th Street (0.25 miles)	Bus Lane (Repurpose travel lane)		
100th Street to 129th Place (3.7 miles)	Queue Jumps (Repurpose parking)		Bus Lane (Repurpose parking/Narrow medians)
129th Place to 154th Street (3.4 miles)	Queue Jumps (Convert left turn lane to shared through-left lane)	Bus Lane (Repurpose travel lane)	
79th Street (1.0 mile)	Queue Jumps (Repurpose parking)		
95th Street (1.0 mile)	Queue Jumps (Repurpose parking)		

METHODOLOGY

The traffic impacts for the South Halsted Bus Corridor Enhancement Project were analyzed using Synchro, a traffic analysis and signal optimization program created by Trafficware. Synchro is designed to approximate travel conditions at signalized intersections, unsignalized intersections, and roundabouts. Users input existing or proposed roadway geometry and signal layout along with observed turning movement counts and traffic volume data. Synchro then estimates the average travel delay expected at the intersection.

For the purposes of this study, all Synchro models were created with a design year of 2019, and existing CDOT and IDOT traffic signals were optimized for the existing volumes in each of the three alternatives. The modelling performed with Synchro examined the addition or removal of approach lanes. The analysis did not account for TSP which would require other modelling tools. Turning movement counts and traffic volume data collected for previous studies were used where available from CDOT. A complete list of turning count movements and intersections that were analyzed in Synchro is included in Appendix D: Traffic Analysis.

Signalized intersection level of service (LOS) is described in terms of the average observed delay for the intersection. LOS of A, B, or C indicates an intersection that is performing well, while a LOS of D is used as the minimum acceptable design standard. Intersections with a LOS of E are considered as performing poorly, and intersections with a LOS of F as failing. Table 4.5 summarizes the LOS criteria for signalized intersections as defined by the Highway Capacity Manual (2016). The analysis reviews intersection performance for the AM Peak (7-9 AM) and PM Peak (4-6 PM) periods.

TABLE 4.5: INTERSECTION LEVEL OF SERVICE STANDARDS

Level of Service	Delay	Performance
A	≤ 10 seconds	Well
B	10-20 seconds	Well
C	20-35 seconds	Well
D	35-55 seconds	Acceptable
E	55-80 seconds	Poor
F	> 80 seconds	Failure

ALTERNATIVE 1

Implementation of Alternative 1 would result in improved operations at the two intersections with an existing LOS of E during the AM peak period (103rd and 111th Street) because of right turning vehicles being allowed to use the queue jump lane. During the AM peak period, only Halsted Street & 99th Street and Parnell Avenue & 95th Street experience a reduction in LOS, from C to D and from A to B, respectively.

During the PM peak period, implementation of Alternative 1 would result in seven intersections improving their LOS at least one letter grade because of right turning vehicles being allowed to use the queue jump lane. Furthermore, implementation of Alternative 1 would result in LOS D or better for all but one intersection. The proposed changes under Alternative 1 at the intersection of Halsted Street & 87th Street result in a deterioration from LOS D to LOS E. With the benefits to transit riders and the increased volume of people being moved through the intersection via transit, a LOS of E may be considered acceptable. This intersection would potentially benefit from additional modifications to help improve traffic flow and minimize delay due to the unique geometry and high traffic volumes present at the intersection. Further analysis utilizing other traffic simulation software such as Vissim (a more advanced traffic modeling tool) may help to explore other operational improvements.

ALTERNATIVE 2

South of 129th Place, where bus lanes are provided in Alternative 2, the level of service at all signalized intersections maintain LOS D or better during the AM peak period. During the PM peak period, all intersections maintain acceptable LOS of D or better except for Halsted Street & 147th Street, which reduces from D to E. Due to the benefits to transit riders and increased volume of people being moved through the intersection via transit, a LOS of E may be acceptable. Table 4.6 shows intersection performance from 128th Street to 154th Street under Alternative 2.

TABLE 4.6: ALTERNATIVE 2 INTERSECTION PERFORMANCE

Intersection	Existing Performance (AM Peak)	Proposed Bus Lane Performance (AM Peak)	Existing Performance (PM Peak)	Proposed Bus Lane Performance (PM Peak)
134th St & Halsted St	A	B	A	A
138th St & Halsted St	C	C	C	C
144th St & Halsted St	B	B	B	B
147th St & Halsted St	D	D	D	E
149th St & Halsted St	D	D	D	D
149th St & Morgan St	A	B	B	B
150th St & Morgan St	B	B	B	B
154th St & Park Ave	B	B	A	A

ALTERNATIVE 3

Between 100th Street and 129th Place, where Alternative 3 proposes a bus lane that allows right turning vehicles, all signalized intersections maintain LOS C or better during the AM and PM peak periods. In addition to the LOS improvement at Halsted Street & 103rd Street and Halsted Street & 111th Street, all other intersections maintain their existing LOS or improve. The 11 intersections north of 103rd Street exhibit similar delay and LOS to those found in Alternative 1, where queue jumps are used in place of the addition of a dedicated bus lane as described in Alternative 3.

NEXT STEPS

As the South Halsted Bus Corridor Enhancement project advances into the National Environmental Policy Act (NEPA) phase, advanced traffic analyses will need to be performed including but not limited to the following:

- More detailed analysis using Vissim modeling to review the impact that the proposed alternatives would have on CTA and Pace bus operations at key locations, e.g., 87th Street and 100th Street. This may include effects on bus timeliness and connectivity between other nearby transit options, such as the CTA Red Line.
- Further exploration into overall access for pedestrian and bicyclists from the proposed changes to geometry and signal timings.
- Detailed crash analysis.
- Detailed traffic analysis using the Highway Safety Manual methodology for each proposed cross-section.
- Road-diet analysis south of 129th Place, including the impact of removing travel lanes and/or turning lanes on queue management. IDOT has previously developed methods for analyzing road diets, including the effects of queuing in areas where travel lanes and turn lanes are narrowed or removed. Successful implementation of road diets, such as those found in Geneva along Route 31 and in Chicago along Sheridan Road, might serve as an appropriate blueprint for analysis on the South Halsted Corridor.
- Continue to gather input from stakeholders along the corridor including local businesses, neighborhood groups, and transit riders.

4.2.2. Parking

Parking is an important consideration for an urban roadway improvement project. Each of the proposed alternatives would require the removal of on-street parking to create space for proposed bus lanes and queue jumps. Table 4.7 summarizes the total number of parking spaces in sections of the corridor as well as the number of on-street spaces required for a queue jump or bus lane, as per the proposed alternatives. In the case of queue jumps, the number of required spaces included both nearside spaces for the queue jump lane as well as several spaces on the far side of the intersection to provide space for the bus to remerge into traffic. Finally, to account for cases where there is consideration for moving an existing nearside bus stop to the far side of an intersection, the table also includes the estimated number of additional spaces needed to accommodate Pace Pulse stations. The length of the queue jumps and the number of parking spaces required should be confirmed with additional analysis in the next phase of the study. Additional details regarding parking impacts, including block-by-block impacts are included as Appendix E: Parking.

In total, Alternative 1 and 2 would impact approximately 321 spaces at 28 intersections (approximately 11 spaces per intersection) plus up to 53 additional spaces to integrate far-side bus stations. Alternative 3 would impact the same spaces as Alternatives 1 and 2 between 79th Street and 98th Street. A total of 183 spaces (plus up to 6 additional if far-side stations are selected) are impacted at 10 intersections (approximately 18 spaces per intersection). In addition, Alternative 3 would impact approximately 970 spaces between 100th Street and 129th Place on Halsted Street (approximately 32 spaces per block).

Table 4.7 also includes the observed parking utilization for on-street spaces in each section of the corridor. For Alternative 3, parking removal is proposed to create space for a dedicated lane from 101st Street to 129th Place on South Halsted Street. This section of the corridor is primarily commercial rather than residential. A survey of on-street parking use found relatively low utilization of on-street spaces, on average between 7% and 11%, and no block exhibited utilization over 45%. There is also a significant amount of off-street parking in this area. The study team estimates that only 11 out of approximately 800 parcels in this section of the corridor do not have off-street parking on or directly adjacent to the parcel. A map showing the locations of these parcels is included in Appendix E: Parking.

TABLE 4.7: PARKING IMPACTS

	Approximate Number of Current Parking Spaces			Approximate Number of Spaces Required for Alternatives 1 & 2		Approximate Number of Spaces Required for Alternatives 3		Approximate Number of Additional Spaces Required for Farside Stations	
Block	East Side of Street	West Side of Street	Parking Utilization*	West Side of Street	East Side of Street	West Side of Street	East Side of Street	West Side of Street	East Side of Street
79th to 95th	241	236	11%	38	39	38	39	1	5
95th to 100th	62	56	14%	8	8	8	8	0	0
101st to 129th	476	494	8%	62	76	476	494	19	28
129th to 154th	0	0	N/A	0	0	0	0	0	0
79th Street	42	45	4%	23	28	23	28	0	0
95th Street	118	120	23%	20	19	20	19	0	0
Total	**939**	**951**	**11%**	**151**	**170**	**565**	**588**	**20**	**33**

**Utilization rates are based on walkthrough of the corridor from 10 AM to 3:30 PM on Wednesday, June 13, 2018 and from 9 to 9:30 AM on Thursday, June 14, 2018.*

4.2.3. Bus Speed and Reliability

Improving bus speed and reliability is one of the key goals of this project. The roadway treatments proposed as part of Alternative 1, 2, and 3 would improve speed and reliability for CTA and Pace buses operating on the corridor. Bus speed was analyzed by applying accepted factors developed by the Transit Cooperative Research Program (TCRP) and applied to the various elements in each alternative. Reliability was not independently measured but is expected to improve in conjunction with travel time and reduced operation in mixed traffic.

Existing PM peak travel times were used as a basis for the analysis as shown in Table 4.8. The run times used in the table include the estimated travel time for each section of the corridor, from 79th Street and Perry Avenue to Pace Harvey Transportation Center plus the travel time between 95th Street Red Line Station and 95th Street & Halsted Street. The average existing bus speeds are based on current scheduled run-time during the PM peak plus average observed delay. Generally, implementing TSP is expected to provide approximately 4 to 8 seconds of improved running time per intersection, which would result in approximately 3% travel time savings along the entire corridor. Providing an express service offers the largest time savings. It is estimated that upwards of 22% time savings is achieved by reducing the number of instances that a bus must deaccelerate, stop, board and alight passengers, and accelerate. However, when the bus stops less frequently it also has fewer opportunities to pick up passengers. Though 98% of passengers currently board within a ¼ mile of a proposed station, some passengers would continue to need or desire to board at local stops. Under all infrastructure improvement alternatives, CTA and Pace intend to continue local service. Pairing express service with local alternatives can help minimize potential ridership losses. Queue jumps are estimated to provide approximately 4-8 seconds of travel time savings per intersection. Implementing queue jumps throughout the corridor, as is proposed for Alternative 1, is anticipated to provide approximately 5% travel time savings. Bus lanes are expected to provide approximately 45 seconds of time savings per mile in a typical urban environment like the South Halsted Corridor. The bus lane improvements proposed as part of Alternative 2 and 3 are anticipated to provide approximately 8% and 10% additional travel time savings, respectively. Table 4.8 shows a comparison between each alternative, including the total travel time savings for each alternative when combined with TSP and express service. Appendix F: Bus Speed provides additional detail regarding estimating bus speed.

TABLE 4.8: ESTIMATED BUS SPEED IMPROVEMENT SUMMARY

Segment	Travel Time (min.)	Travel Time Savings (min.)	Percent Savings
Existing Conditions	60.1	-	-
TSP	58.3	1.8	3%
Express Service - 1/2 Mile Stations	47.2	13.0	22%
Alternative 1 Only	57.3	2.8	5%
Alternative 2 Only	55.1	5.0	8%
Alternative 3 Only	53.8	6.3	10%
Alternative 1 with TSP & 1/2 Mile Stations	42.6	17.6	29%
Alternative 2 with TSP & 1/2 Mile Stations	40.4	19.8	33%
Alternative 3 with TSP & 1/2 Mile Stations	39.0	21.1	35%

4.2.4. Ridership and Person Throughput

Improved transit service, particularly faster service, has been shown to directly lead to increased ridership. Many factors have the potential to impact ridership including running speed, headway, span of service, stop location, and the perceived ride quality. Because these factors are interrelated, accurately predicting how changes to these combined factors along the South Halsted Corridor would affect overall ridership is difficult. For this study, the ridership analysis was limited to comparisons amongst the three proposed alternatives. This allows for an isolated comparison. The analysis is based on the anticipated runtimes shown in the previous section. Studies have shown a conservative estimated elasticity between speed and ridership of 2:1, meaning that a 2% speed improvement would lead to a 1% ridership increase.[10] Using these assumptions, Table 4.9 shows the anticipated ridership increase under each alternative. The table also shows the expected increase in peak hour throughput, which assumes the same

[10] http://www.vtpi.org/elasticities.pdf

percent increase based on observed average hourly loads and amount of service in the corridor during that time.

TABLE 4.9: RIDERSHIP AND PERSON THROUGHPUT

Segment	Travel Time (min.)	Travel Time Savings (min.)	Percent Savings	Ridership Increase	Ridership	Avg Hourly Passenger Throughput
Existing Conditions	60.1	N/A	N/A	-	11,600	500
Alternative 1	57.1	3.0	5%	300	11,900	+13
Alternative 2	55.1	5.0	8%	500	12,100	+21
Alternative 3	54.4	5.8	10%	550	12,150	+24

Note: Numbers are rounded.

4.2.5. Environmental Screening

To streamline the environmental review process and prepare CTA and Pace for the next phase of the study, the study team conducted a preliminary environmental screening for the proposed transit improvements within the project area. This environmental screening focuses on the elements included in the FTA's NEPA CE checklist, which would serve as the template for future environmental analysis. The checklist includes impacts to land-use, traffic, historic resources, noise and vibration levels, right-of-way, hazardous materials, social impacts, environmental justice, recreational resources, natural resources, endangered species, safety and security, and construction. The screening considers potential environmental impacts and mitigation strategies to minimize impacts to sensitive environmental resources.

The most sensitive issues regarding environmental impacts for the corridor include:

- Traffic Impacts – The project would implement designated bus lanes and queue jumps within the South Halsted Corridor. To accommodate the bus lanes and queue jumps, geometric alterations to the roadway and intersections are proposed. This would include repurposing a travel lane or parking in certain areas. This would result in low to moderate impacts to traffic and parking. The exact placement of bus stations is still under consideration, but the final determination may have additional minor impacts to the general traffic and parking. Further traffic analysis would be required to gain approval from IDOT and CDOT.

- Historic Resources – The project area is located within or adjacent to several designated or eligible National Register of Historic Places, National Historic Landmark, or Chicago Landmark properties. However, no impacts are anticipated. The project would not significantly impact the visual quality, noise levels, or vibration levels near these resources due to the existing traffic and bus activity.

- Use of Public Parkland and Recreation Areas – There are recreational areas and trails along the South Halsted Corridor within the project area. The most notable impact to these Section 4(f) properties occurs at 144th Street. Kickapoo Woods is a forest preserve located on the west side of South Halsted Street between 142nd Street and the Little Calumet River. The 144th Street southbound Pulse station footprint is proposed to be located on the edge of the preserve, which would require a permanent easement. The station is not anticipated to adversely affect any of the activities, features, or attributes associated with Kickapoo Woods and would likely result in a de minimis impact finding for this resource under Section 4(f).

These sensitive items were identified and flagged for further study as part of NEPA analysis in Phase 2. Other items that would require additional study in Phase 2 include confirming that there are no impacts to historic properties and the location and extent of any easements for stations footprints.

The environmental impacts of each alternative are similar in most cases. The primary difference between the alternatives would be that Alternative 1 would have the least impact on traffic, parking, and construction. Alternative 2 would have additional traffic and construction impacts from 129th Place to 154th Street as compared to Alternative 1. Similarly, Alternative 3 shares these impacts and would also have additional parking and construction impacts from 100th Street to 154th Street as compared to Alternative 2.

The complete screening is included in Appendix G: Environmental Screening

4.2.6. Median Narrowing/Roadway Widening

As described in Section 4.1: Refined Corridor Improvement Alternatives, each of the proposed alternatives would require median narrowing and roadway widening in some locations north of 129th Place to accommodate queue jumps and bus lanes. South of 129th Place, the proposed improvements would not require median narrowing or roadway widening. Throughout the corridor, the impacts caused by queue jumps would be limited to areas adjacent to intersections.

The figures in this section regarding median narrowing and roadway widening requirements are based on GIS or other mapping. Field survey is required to confirm precise narrowing/widening requirements in the next phase. The greatest extent of median narrowing and roadway widening is proposed as part of Alternative 3 between 100th Street and 129th Place. In most cases, remaining medians widths would be sufficient for tree planting where planted medians currently exist. In all cases, the remaining sidewalk width would be greater than the CDOT and IDOT required minimum widths. The IDOT Bureau of Design and Environment Manual specifies that urban sidewalks must be a minimum of four feet wide with a recommended buffer area (i.e. parkway) of two to three feet.[11] In locations without a buffer, sidewalks should be seven feet wide.[12] CDOT Street and site Plan Design Standards specifies that that the minimum sidewalk width is 6 feet, "clear of light poles, fire hydrants, and other street furniture."[13]These changes are discussed in greater detail below.

For Alternative 3, the section from 100th Street to 129th Place requires median narrowing to provide 10-foot travel lanes and 11-foot bus lanes. Along 26 blocks in this section of the corridor, median narrowing is required, varying from one to six feet. Two locations require narrowing outside that range: 1) between 119th Street and 120th Street and 2) between the Metra Electric District Railroad Tracks and 122nd Street. These locations would require narrowing medians by 7.5 feet. Following construction, 22 of the medians along this section would be 7 feet wide or greater. Four medians would have a remaining width of 6.5 feet or less. Two medians with an existing width of five feet would be removed completely. Refer to Appendix K: Median Narrowing and Roadway Widening for additional details.

Many medians from 100th Street to 129th Place are planted with trees. This alternative requires some narrowing of medians, as described above. Columnar and decorative trees can safely grow in planters that are as narrow as 7 feet wide, preserving the look and feel of this section of the corridor. There are several varieties of columnar trees and decorative trees which have been specifically bred to ensure a narrow profile. Figure 4.10 shows an example of trees planted in an 8-foot-wide median as implemented as part of the HealthLine BRT in Cleveland, Ohio. Figure 4.11 shows several varieties of these narrow profile trees including the Columnar Ginkgo, Thornless Honeylocust, and Columnar Pin Oak. CDOT and IDOT typically recommend 10 feet as the minimum median width to accommodate street trees. Narrower medians may require a design exception.

[11] IDOT Bureau of Design and Environment Manual. 58-1.06. http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Split/Design-And-Environment/BDE-Manual/Chapter%2058%20Special%20Design%20Elements.pdf

[12] IDOT Bureau of Design and Environment Manual. 48-2.04. http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Split/Design-And-Environment/BDE-Manual/Chapter%2048%20Urban%20Highways%20and%20Streets.pdf

[13] CDOT Street and site Plan Design Standards. https://www.chicago.gov/dam/city/depts/cdot/StreetandSitePlanDesignStandards407.pdf

FIGURE 4.10: NARROW MEDIAN STREET TREES, HEALTHLINE BRT, CLEVELAND, OHIO

FIGURE 4.11: COLUMNAR TREE VARIETIES: COLUMNAR GINKGO (LEFT), THORNLESS HONEYLOCUST (MIDDLE), COLUMNAR PIN OAK (RIGHT)

In addition to median narrowing, additional roadway widening impacting sidewalks and/or parkways would also be required in some locations. Alternatives 1 and 2 would require additional roadway widening of one to two feet of roadway in three locations. Two of these locations would require narrowing of the sidewalk; the third would require narrowing of the parkway. In all cases, the remaining sidewalk is greater than required IDOT and CDOT minimums. Alternative 3 would require additional widening, between one and three feet, at 40 locations.[14] Roadway widening would require the narrowing of only parkway in six locations, only sidewalk in 27 locations, and a mix of parkway and sidewalk in seven locations. In all cases where sidewalk is being affected, the remaining sidewalk and parkway width would be nine feet

[14] Note: For the purposes of this analysis, a "location" is a single east or west side of a block on the corridor. As such, widening for a single intersection could require up to four locations, one for each corner of the intersection.

or greater, as compared to the CDOT and IDOT required minimum widths. In 23 of the 34 locations where sidewalk narrowing is required, the remaining sidewalk and parkway would be at least 11 feet wide. In general, widening is only required near intersections where the presence of a turn lane does not allow for any median narrowing. Appendix K: Median Narrowing and Roadway Widening provides additional detail regarding locations where median narrowing and roadway widening would be required for each alternative.

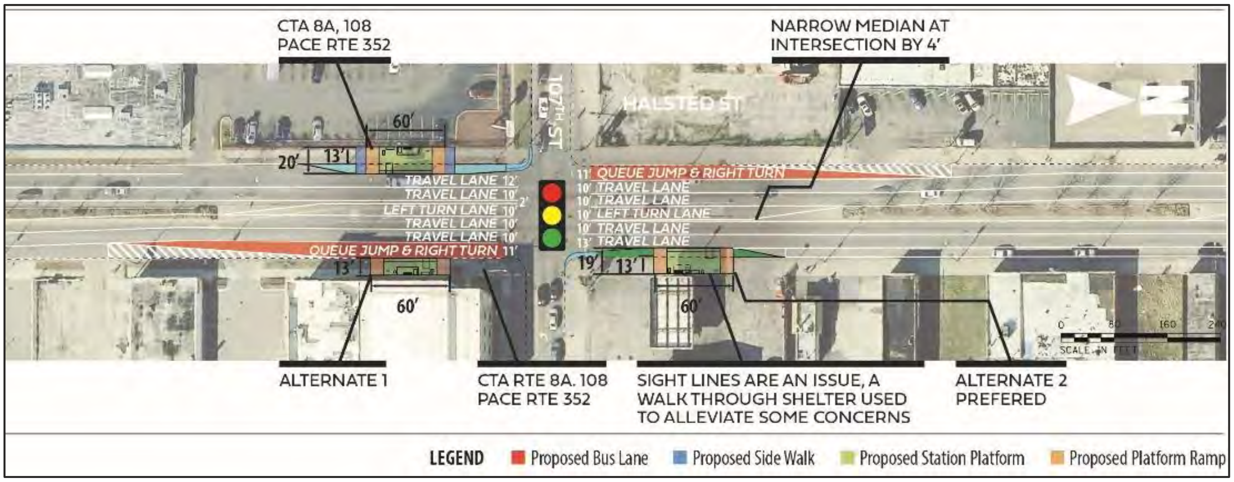
4.2.7. Bus Bump Outs

A bump out, also called a bus bulb, is an extension of the sidewalk for a bus stop or station. Typically, the bump out replaces the roadway that would otherwise be part of a parking lane. Bump outs allow a bus to stay in its traffic lane to board and alight passengers rather than pulling over to the curb, thereby improving operating efficiency by limiting the need for the bus to merge in and out of traffic. However, any vehicles behind the bus must wait or change lanes to bypass the bus while customers are boarding and alighting. Figure 2.1 shows a bus stopped at a station with a bump out.

FIGURE 4.12: BUS BUMP OUT AT TRANSIT STATION

Bus bump outs would be most effective on sections of the corridor without bus lanes, since the bus would need to pull out of traffic to access the station. For segments with bus lanes, the bus is already travelling adjacent to the curb and does not need to merge back into general traffic. Figure 4.13 shows a sample of a bus bump out at 107th Street that could be implemented along with a queue jump. The primary drawback of bus bump outs on the South Halsted Corridor is that it limits the opportunity for more than one bus to board and alight at the same time, which is of concern due to the volume of service on the corridor. Bus bump outs are not included in the concept plans in Appendix A: Conceptual Corridor Improvement Plans or in the overall evaluation of alternatives, but should be considered as plans are further refined.

FIGURE 4.13: QUEUE JUMP WITH BUMP OUT

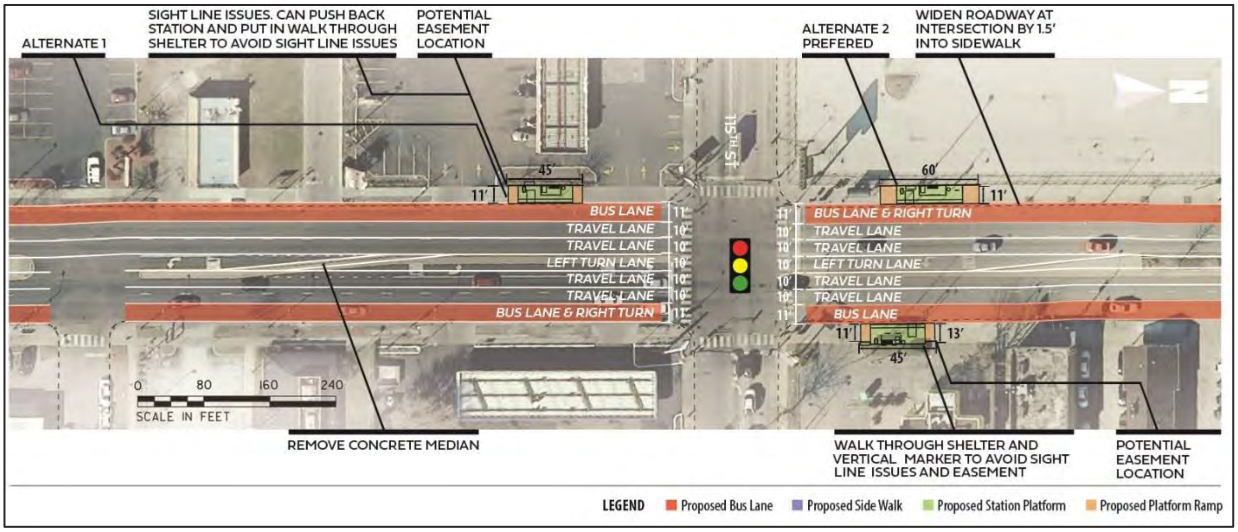


4.3. STATION LOCATION CONCEPTS

The South Halsted Corridor would feature limited-stop Pulse service with stations located approximately every half mile between the CTA Red Line 95th Street/Dan Ryan Station and the Pace Harvey Transportation Center. Local service would be maintained along the corridor by both Pace and CTA though frequencies may be adjusted. Separate northbound and southbound platforms would be required. For Screen 1, limited station locations were identified at key intersections based on ridership and walkshed considerations. For Screen 2, proposed station platform footprints were identified within the intersection or station area. Alternate station footprints have been shown for instances where multiple options should be considered in future project phases. Several factors were considered for station placement including ridership patterns, site constraints, safety concerns, sidewalk connections, proximity to other transit services, land use, transit signal priority benefits, impacts on adjacent property owners, and stakeholder input. These factors should continue to be taken into consideration as project development continues.

Well placed stations further enhance the efficiency of service and increase safety for riders. Ideally, stations would be placed on the far side of the intersections and allow convenient access to any nearby transit stops. Far side station placement gives buses the advantage of TSP by getting the bus through the signal before stopping to board passengers. At some locations, site constraints such as driveways, utilities, existing building access, and narrow right-of-way require further evaluation and will be refined during the advanced conceptual design phase based on-site constraints. Station locations are included in each set of conceptual plans included in Appendix A: Conceptual Corridor Improvement Plans. In general, station placement would be decided independent of the roadway treatments noted above. Figure 4.14 shows a typical intersection along the corridor highlighting several alternate station locations for northbound and southbound stations.

FIGURE 4.14: TYPICAL STATION PLACEMENT



4.4. RESULTS OF CAG MEETING NO. 3

Refined Alternatives 1, 2 and 3 as well as concept plans depicting station locations were presented to the CAG on February 14, 2019, for the South Halsted Bus Corridor Enhancement Project. Eleven CAG members were in attendance representing South Suburban communities, and partner agencies. The meeting recapped the items discussed at CAG meetings No. 1 and 2, described the refined corridor improvement alternatives, and provided information on station locations. Appendix C: CAG Meeting 3 Summary provides detailed meeting notes. Below are comments and recommendations received for the refined alternatives and station locations.

4.4.1. Comments/Recommendations for Refined Alternatives

Overall, the CAG members were in support of Alternative 3 which would maximize the transit improvements and opportunities for economic development in the corridor. There was also support for 24-hour bus lanes based on the significant number of off-peak riders who may use the bus routes.

Additional comments were received regarding the roadway treatments. There was some concern regarding a reduction to 10' lanes and if they are wide enough to accommodate motor vehicles. Members recognized the need to narrow medians. CAG members also noted concern regarding the need for enforcement mechanisms for the bus lanes, including ways to deter drivers from driving in bus-only lanes. Other comments related to the importance of a high-quality pedestrian environment, community and business outreach, and IDOT coordination in the next phase of the project.

4.4.2. Comments/Recommendations for Station Locations

CAG members provided several specific comments regarding station locations. A member requested that CTA and Pace review the inclusion at a Pulse stop at 134th Street, where two trailheads for the Major Taylor Trail are located. Members also pointed out the need to identify bus stations that may have a significant number of riders and may require a larger station, e.g. 147th Street/Sibley Avenue. An importance was placed on locating stations close to new developments. Members also noted the importance of considering safety in station siting.

5. Recommended Alternatives

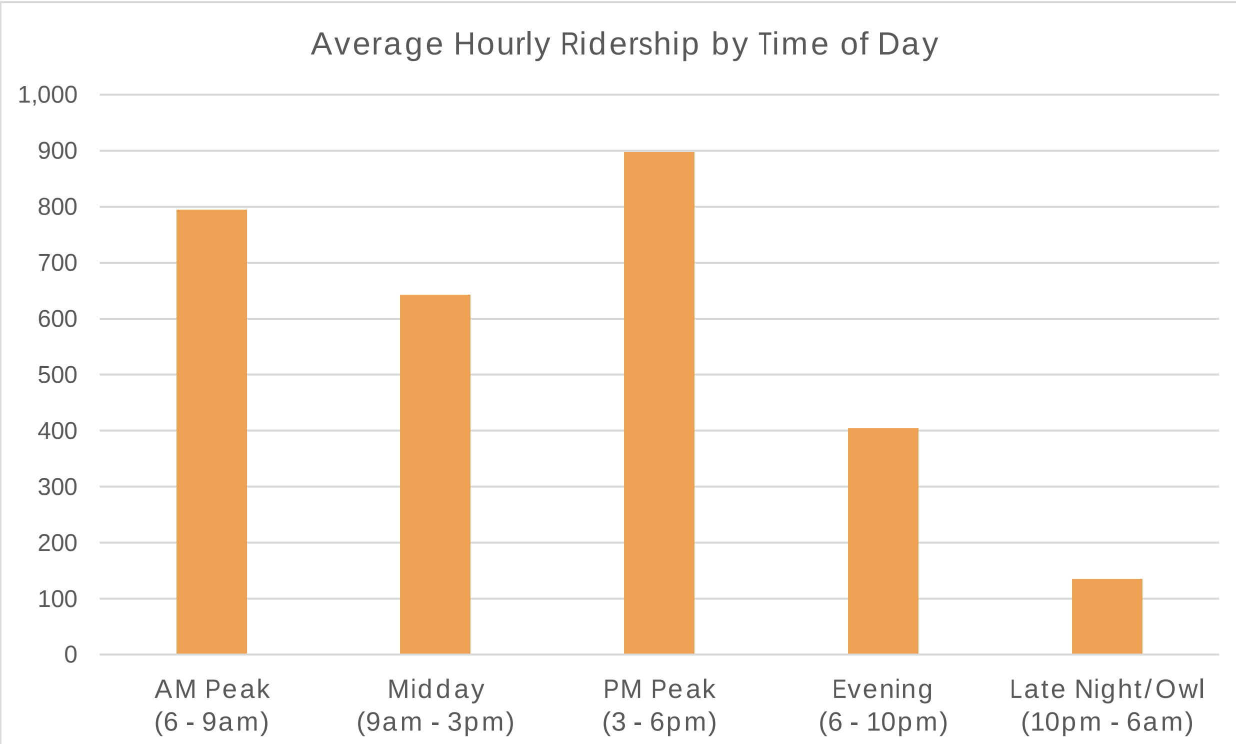
Based on the screening analysis and feedback from the CAG, the study team, CTA, and Pace recommend advancing the bus lane alternatives (Alternatives 2 and 3) to the next phase of planning. The following section provides additional details regarding this recommendation and the related bus enhancements.

5.1. RECOMMENDED CORRIDOR IMPROVEMENTS

The analysis conducted as part of this phase of the study and feedback from the CAG has demonstrated that bus lanes are feasible for the South Halsted Corridor. Alternative 2 and 3 represent the lesser and greater extent, respectively, that bus lanes would be implemented in the corridor as part of this project. However, additional study and public outreach is recommended to confirm the extent to which bus lanes are preferred from 100th Street to 129th Place, on either the entirety of this section of the corridor or along some subsections. In particular, because at least some roadway widening is anticipated in this section, a detailed survey is required to know precise roadway dimensions which would allow for a more accurate assessment of the impacts and potential tradeoffs with respect to implementing bus lanes, which could include impacts to one or more of the following: parking, traffic/turn lanes, medians, sidewalks, and parkways. Local stakeholders and the public should have an opportunity for comment on these tradeoffs before a Locally Preferred Alternative is selected.

The study team recommends that any curbside bus lanes be reserved for buses and right turning vehicles 24 hours per day, rather than peak hours only which was also considered. While the highest average hourly ridership occurs during the peak hours, as shown in Figure 5.1, there is also significant off-peak ridership. While 44% of transit trips occur during the peak, over half of the trips are taken during off peak periods. Demand continues to be especially high during the midday, such that hourly midday demand is about 75% of peak demand. Based on average daily boardings, approximately 40% of the people on the South Halsted Corridor are making their trips on buses during the AM and PM peak periods, meaning that 60% of trips occur at other times of the day. Therefore, 24-hour bus lanes are recommended.

FIGURE 5.1: PEAK VS. OFF-PEAK RIDERSHIP (ROUTES 8A, 108, 352, 359; OCTOBER 2017)



Source: CTA and Pace

5.2. BUS STATION LOCATIONS

The South Halsted Corridor project would implement upgraded bus stations throughout the length of the corridor, as shown in Figure 5.2. Upgraded bus service would serve 22 station areas along the corridor, including existing bus terminals at the Pace Harvey Transportation Center, CTA 95th Red Line Terminal, Halsted Street & 79th Street Terminal, and 79th Street & Perry Avenue bus turn around. This would include 6 station areas served by only CTA, 6 served by only Pace, and 10 served by both agencies. Station areas would generally consist of a station for each direction, though there would be some variation, as described in Table 5.1. In the shared section of the corridor between the 95th Street Red Line Station and 129th Place, Pace Pulse stations would be constructed and maintained by Pace and served by both Pace and CTA buses. North of 95th Street and east of Hasted along 79th Street, CTA would install its own upgraded stations and retain local stops, as noted in the table. South of 127th Street, Pace would also install Pulse stations, which would only be served by Pace buses.

FIGURE 5.2: STATION LOCATIONS

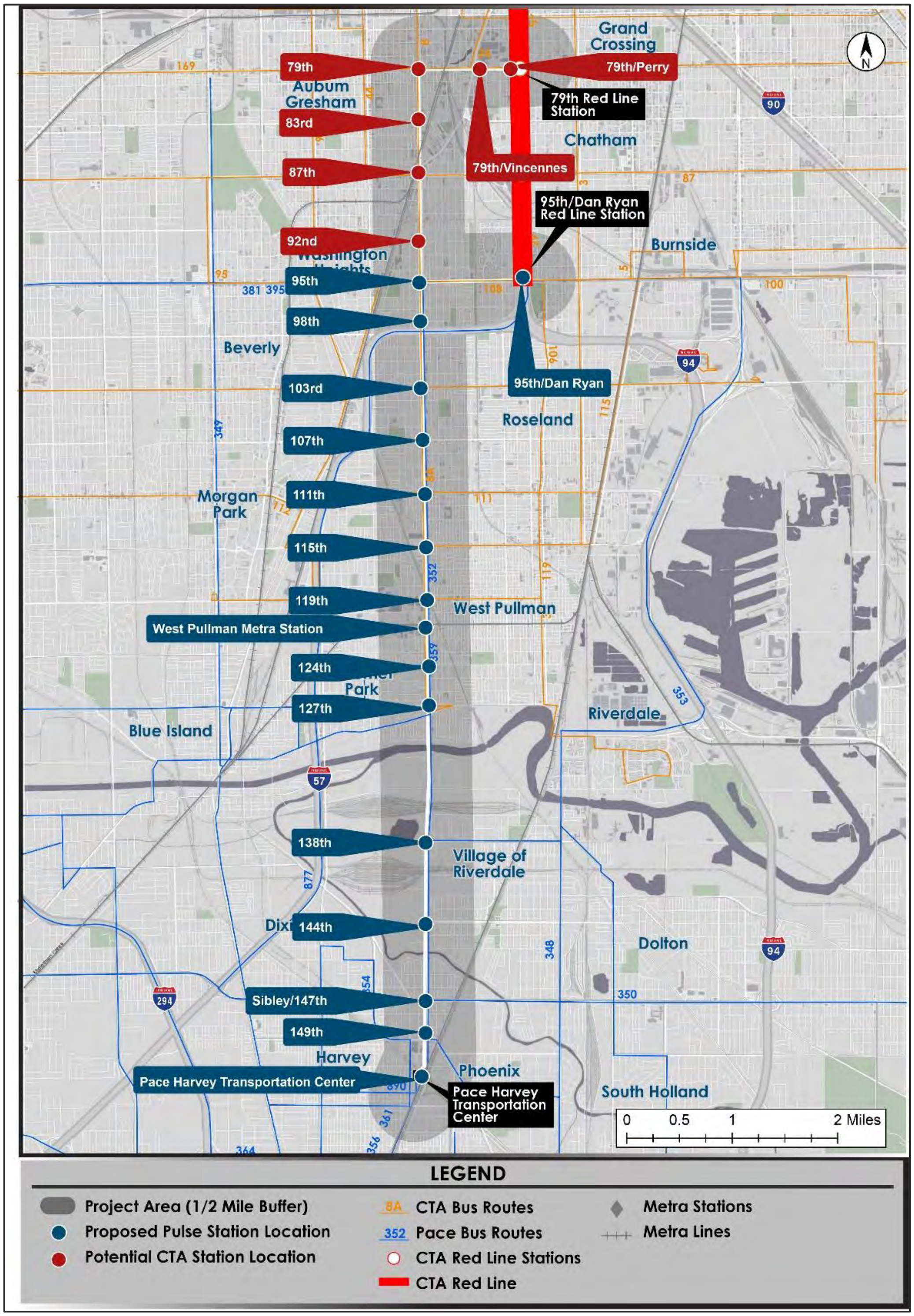

Grand Crossing
79th
Auburn Gresham
79th/Perry
79th Red Line Station
83rd
Chatham
87th
79th/Vincennes
95th/Dan Ryan Red Line Station
92nd
Washington Heights
Burnside
95th
98th
Beverly
103rd
95th/Dan Ryan
Roseland
107th
Morgan Park
111th
115th
119th
West Pullman
West Pullman Metra Station
124th
Park
127th
Riverdale
Blue Island
138th
Village of Riverdale
144th
Dixmoor
Dolton
Sibley/147th
149th
Harvey
Phoenix
Pace Harvey Transportation Center
Pace Harvey Transportation Center
South Holland
0 0.5 1 2 Miles
LEGEND
Project Area (1/2 Mile Buffer)
Proposed Pulse Station Location
Potential CTA Station Location
8A CTA Bus Routes
352 Pace Bus Routes
CTA Red Line Stations
CTA Red Line
Metra Stations
Metra Lines

TABLE 5.1: STATION CHARACTERISTICS

Station Areas	Stations	Agency Providing Service to this Location
79th & Perry	1 station (turnaround) and 1 platform (Perry)	CTA only
79th & Vincennes	1 station (WB) and retain local stop (EB)	CTA only
79th & Halsted	None, use 79th Bus Terminal	CTA only
83rd & Halsted	2	CTA only
87th & Halsted	2	CTA only
92nd & Halsted	1 station (SB) and 1 platform-only (NB)	CTA only
95th & Halsted	2	CTA & Pace
95th & Dan Ryan	None, use existing transit center	CTA & Pace
98th & Halsted	2	CTA & Pace
103rd & Halsted	2	CTA & Pace
107th & Halsted	2	CTA & Pace
111th & Halsted	2	CTA & Pace
115th & Halsted	2	CTA & Pace
119th & Halsted	2	CTA & Pace
West Pullman Metra Station	2	CTA & Pace
124th & Halsted	2	CTA & Pace
127th & Halsted	2	Pace only, due to CTA operations
138th & Halsted	2	Pace only
144th & Halsted	2	Pace only
147th/Sibley & Halsted	2	Pace only
149th & Halsted	2	Pace only
Pace Harvey Transportation Center	None, use existing transit center	Pace only

5.3. STATION AMENITIES

Bus stations along the segment of the corridor where Pace would operate Pulse service, from the 95th Street Red Line Station to the Harvey Transportation Center, would feature upgraded Pulse stations. These stations would be like Pulse stations designed for the Pulse Milwaukee and Dempster Lines. As shown in Figure 5.3, these upgraded Pulse shelters feature infrared heating, seating, bicycle racks, trash receptacles, pavement snowmelt system, and a 15’ vertical marker with real time and static information displays. In some cases, based on the availability of space and a maintenance agreement with the local municipality, updated landscaping design to match the local community may also be included. Some station features can be further customized based on community input. Stations would generally be 60 feet long and at least 8 feet deep. Where required, stations could be reduced to 45 feet long. Where the station or its vertical marker is expected to block traffic sight lines, “walk-through” stations can be considered.

FIGURE 5.3: PULSE STATION CONCEPTUAL RENDERING

Stations would also feature near-level boarding. Near-level boarding speeds up the boarding process, especially for disabled, elderly, or other passengers with limited mobility who may have otherwise require the bus to extend a ramp or use its suspension system to lower its height. Pace is pursuing a standard of 12-inch near-level boarding platforms at Pulse stations, based on the floor heights of Pace vehicles. CTA utilizes 11-inch near-level boarding platforms at their Loop Link stations. At shared stations, an 11-inch curb should be used to accommodate both fleets. Concrete bus pads would be installed at stations to maximize the life of the roadway in front of the station, where buses would stop frequently and increase wear and tear on the roadway.

CTA-only stations would feature some but not all the amenities described above. Due to site constraints, the northbound station located at 92nd Street would only be a platform rather than a full shelter. Additional planning and design would be required to confirm what amenities would be provided.

Upgrades are needed at the existing CTA bus turnaround at Halsted Street and 79th Street to provide an improved customer experience, which should be included in the South Halsted Bus Enhancement Project. Some of the needed improvements include making the station ADA compliant, upgrading pedestrian accommodations by connecting sidewalks to the bus platform, concrete repair/replacement, and electrical upgrades.

Concept plans showing the locations of the proposed stations are included in Appendix A: Conceptual Corridor Improvement Plans.

5.4. EASEMENTS

Most of the transit and station improvements for the South Halsted Corridor would be constructed within the existing right of way (ROW). However, in ten locations along the corridor the proposed improvement may extend beyond the existing right of way. These easements are all “sliver” takes which are not anticipated to negatively impact the ability of the owner to continue to use the property for its intended use. Nonetheless, to implement the design as planned, CTA and Pace would require an easement to obtain rights to use the proposed land. This would involve an agreement with the property owner. It is also important to note that this assessment is based on GIS data rather than a field survey, which would be required in a future phase to confirm final easement requirements.

Table 5.2 includes the list of potential locations along the corridor where an easement may be required based on available GIS data. All easements are related to station improvements and each would be required regardless of the roadway improvement alternatives. Avoiding an easement, however, may be possible at select locations. At stations where the electrical cabinet is the only item outside of the ROW, relocating the electrical cabinet onto the platform instead may be possible. Additional easements for utility runs may be required at Pulse stations due to the energy needed to power station heaters and pavement snowmelt systems. At stations where the platform is pushed back outside of the ROW, to keep the bus shelter out of sight lines, a walk-through shelter could be used to limit or eliminate the need for an easement.

Where the vertical marker is also pushed back to avoid sight lines, the marker could be moved to the other side of the platform to attempt to avoid sight lines.

TABLE 5.2: POTENTIAL EASEMENT LOCATIONS

Intersection Location	Locations Where Easements Are Needed	Distance from ROW Line (ft)	Sidewalk is part of ROW?	Type of land impacted	Notes
87th Street	NE stations (Alt 2)	13	No	Grass and sidewalk	
98th Street	NW Station	7.5	Mostly	Grass and Sidewalk	Bus shelter in sight lines
98th Street	SE station	5	Partially	Sidewalk	
115th Street	SW station	2	Yes	Planter/fence-Citgo	Electrical cabinet is only part of station outside the ROW
124th Street	SW station	3.5	Yes	Gravel residential parking lot	
138th Street	NE station	2.5	Yes	Parking lot-Grand Coffee Shop	Bus shelter and vertical marker in sight lines
144th Street	SW station	9	N/A	Grass area Kickapoo Woods	
144th Street	NE station	9	No	Grass area and sidewalk-Pamasco	
147th Street/ Sibley Blvd	SE (Alt 1) station	0.33	Yes	Grass area- Cash America Jewelry & Loan	
79th Street & Vincennes Ave	NE station	1	Yes	Gravel in parking lot of CTA 79th Street Bus Garage facility	Electrical cabinet is only part of station outside ROW

5.5. ACCESS CONSIDERATIONS

At some intersection locations, the roadway is proposed to be widened or the median removed to accommodate bus lanes or queue jumps. At intersections where the roadway is widened, this would increase the distance that pedestrians need to walk to get across the street and would require a longer pedestrian cycle time.

Several proposed stations in the southern areas of the corridor currently lack sidewalk access including at 144th Street and 149th Street. Gaps in sidewalk connectivity should be filled, particularly to ensure a safe connection to adjacent crosswalks. Additional upgrades to crosswalks may also be recommended. All sidewalk upgrades will be designed to meet ADA standards.

Due to their height, the bus shelter and the vertical marker for each station have the potential to partially block the sight lines, which allow drivers to adequately see oncoming traffic and pedestrians. In siting potential locations for bus stations, the study considered the sight lines for turning vehicles, including those exiting parking lots and other driveways. Though station placement aimed to minimize sight line issues, sight line issues remain at select station locations. For these, the shelter may be converted to a walk-through shelter to alleviate some of the sight line issues. However, not all stations are able to fully avoid affecting the sight lines. Moving forward, the project's design should follow all engineering best practices and IDOT design criteria. However, some stations may require design exceptions and coordination with IDOT or larger easements.

5.6. SAFETY

As noted in the *Existing Conditions and Needs & Deficiencies Report,* no part of the corridor was identified by the City of Chicago as a high crash corridor or high crash area in the Vision Zero Framework Plan, released in June 2017.[15] However, IDOT would require more detailed analysis of crashes in the corridor, especially at any 5% locations, as designated by IDOT. 5% locations are locations along state highways that are identified as within the top 5% of locations statewide with the greatest potential for safety improvement, based on crash severity and frequency. A map of these locations is shown in Appendix H: IDOT 5% Locations.

5.7. PLANNING LEVEL COST ESTIMATES

5.7.1. Methodology

Costs were calculated using approximate dimensions provided in conceptual drawings of each alternative and block lengths measured in Google Earth. Unit prices are based on previously prepared cost estimates for similar projects, such as the CTA's Jeffery Bus Rapid Transit project (2012), CDOT's Walk to Transit project (2014), CDOT's Grand Ave. project (2016), and IDOT unit pricing. Costs have been escalated to FY2023 dollars, the estimated year for construction, using the US Bureau of Economic Analysis (BEA) Consumer Price Index (CPI).

Proposed changes for each of the three alternatives were categorized into the following categories:

[15] CDOT, Vision Zero Chicago, High Crash Corridor Framework Plan, June 2018. http://visionzerochicago.org/wp-content/uploads/2018/06/VZ_HCC_FrameworkPlan_2018-06-15.pdf

- Civil: This includes proposed changes relating to roadway work, such as median and curb removal, and new pavement markings. Roadway resurfacing and pavement improvements for all alternatives is assumed to be a separate cost.
- Traffic Signal Installation: This includes the traffic pre-signals and other equipment necessary for queue jumps at signalized intersections. TSP was not included as part of the cost estimate, as this is expected to be performed via a separate RTA contract. However, coordination of queue jump and TSP signal upgrades may provide for equipment and installation cost savings.
- Stations/Facilities: This includes the costs for CTA stations, Pace Pulse stations, a CTA bus turnaround, shared CTA/Pace station terminals, as well as costs associated with ITS to provide relevant travel time information to passengers at bus stops and stations. These stations/facilities are anticipated to be included in all alternatives.
- Lighting: This includes the removal and relocation of light poles and foundations due to changes in the geometry of the proposed roadway. Lighting improvements are assumed to be included in alternatives where roadway is widened. For queue jumps, this widened area is assumed to be within 150 feet of the intersection.

A detailed breakdown of these categories is found in Appendix I: Cost Estimate.

5.7.2. Summary of Results

The proposed changes between 79th Street to 98th Street are identical between all three alternatives, and therefore incur the same costs through these sections. Alternative 1 involves the least amount of roadway work when compared to the other alternatives due to the proposed queue jumps south of 129th Place instead of the bus lanes proposed in Alternatives 2 and 3. In Alternative 2 and 3, the cost increases due to the additional work required to install bus lanes on large portions of South Halsted Street. Alternative 3 incorporates bus lanes along South Halsted Street from 98th Street to the terminus of the corridor at the Pace Harvey Transportation Center at 154th Street. Bus lanes would require pavement markings if implemented as part of Alternative 2 or 3. Bus lanes could also include colorized pavement to more clearly designate the lanes, which has been included as an option in the cost estimate. As described in Section 4.2.6: Median Narrowing/Roadway Widening, Alternative 3 would require additional median narrowing and roadway widening between 100th Street and 129th Place beyond what is required for Alterative 1 and 2.

Table 5.3 includes the total costs for each alternative. Construction costs include civil work, traffic signal installation, stations/facilities, and lighting improvements. In addition to these construction costs, other costs related to preliminary engineering, final design, project and construction management, insurance and permits, survey, and contingency are also shown. These additional professional services and contingency costs calculated are based on percentages of the total construction costs. These percentages are in line with best practices for a project at this phase of development. A separate cost is also included for pavement resurfacing including colorized bus lanes.

TABLE 5.3: SOUTH HALSTED CORRIDOR COST SUMMARY BY ALTERNATIVE (FY 2023)

Item	Alt 1	Alt 2	Alt 3
Construction Costs	$22,382,775	$22,727,314	$30,325,769
Soft Costs	$17,234,737	$17,500,032	$23,350,842
Total (without Pavement Resurfacing)	$39,617,511	$40,227,346	$53,676,611
Pavement Resurfacing without Colorization – Total including soft costs	$10,580,813	$10,580,813	$10,580,813
Pavement Colorization – Total including soft costs	$1,347,855	$4,181,873	$6,979,889
Total (with Pavement Resurfacing including Colorization)	**$51,546,180**	**$54,990,032**	**$71,237,313**

Additional details regarding these costs is included in Appendix I: Cost Estimate.

6. Operating Plan

Upgraded roadway treatments and stations in the South Halsted corridor would be complemented by the introduction of new Pulse service operated by Pace. CTA and Pace would also continue to operate local service on the corridor, though some changes would occur to the headways of local service. The travel time savings achieved by the roadway treatments would provide costs savings for all services on South Halsted. Additional time savings would be achieved through TSP and stop consolidation.

6.1. ROUTING & LIMITED STOP SERVICE

CTA is currently evaluating proposals for restructuring service for Route 8, Route 8A, and Route 108, including expanded service hours. Changes to the routes are likely to be proposed, but public input is needed. Pending public outreach, CTA service patterns would remain unchanged. Route 8A would still provide service between 79th Street & Perry Avenue, near the 79th Street Red Line station, and Halsted Street & 127th Street. Similarly, Route 108 would provide service to the 95th Street Red Line station. Both routes would still serve existing local bus stops. Express or limited-stop service would not be provided for either route. Additional details regarding concepts to reschedule these routes is included in Appendix J: Bus Operation.

Pace is pursuing limited-stop service as part of the Pulse program for the South Halsted Corridor between the Pace Harvey Transportation Center and the 95th Street Red Line Station. Service is proposed as follows:

- Ten (10) minute peak headways (three morning and three afternoon hours)
- 15-minute off-peak headways (most of the day)
- 30-minute off-peak headways (three late night hours)
- Service span of 20 hours per day

With the implementation of Pulse service, Pace anticipates that current Route 352 service would be reduced for trips between the Pace Harvey Transportation Center and the 95th Street Red Line Station. Frequencies would likely be reduced throughout the day in this segment. Route 352 service would likely be improved between Chicago Heights and the Pace Harvey Transportation Center. Route 352 would continue to operate 24-hour service between the Pace Harvey Transportation Center and the 95th Red Line Station.

Any service reductions would be subject to public hearing based on Title VI requirements.

6.2. OPERATING COSTS

The project would introduce Pulse service to the corridor. CTA would continue its current operations in the near term. Table 6.1 shows the expected changes to Pace daily service hours and costs. The table uses $93.15 per service hour as an estimate for the cost of operations in 2023, the expected first full year of revenue service. The implementation of this updated service plan would require approximately $3.7 million per year in annual operating costs.

TABLE 6.1: CURRENT AND PROPOSED PACE ANNUAL HOURS AND COSTS

Type	Route	Day	Hours per day	Days per year	Annualized Gross Cost (2023 Dollars)	Total Annualized Gross Cost	Difference in 2023
Current	Route 352	Weekday	208.02	255	$4,941,151.07	$6,492,685.41	
		Saturday	163.68	52	$792,833.18		
		Sunday	140.43	58	$758,701.16		
Proposed	Route 352 (Local)	Weekday	201.58	255	$4,788,180.14	$10,230,143.79	$3,737,458.38
		Saturday	128.53	52	$622,573.61		
		Sunday	114.37	58	$617,906.80		
	South Halsted Pulse	Weekday	130.77	255	$3,106,212.50		
		Saturday	109.75	52	$531,607.05		
		Sunday	104.33	58	$563,663.69		

While the Pulse Halsted Line would be the only new service introduced to the corridor, local service operating on the corridor would experience operating costs savings through shorter travel times. This would result because the same bus would require fewer operating hours to complete each trip. Operating hours would decrease for CTA Route 8A, CTA Route 108, and Pace Route 352, as shown in Table 6.2. For this local service, since buses would still make all local stops, travel time savings would only be realized through roadways improvements, i.e., queue jumps, dedicated lanes, TSP, and signal optimization. Pace Route 359 is also expected to see similar improvement for the section it operates along the corridor. In addition, the number of trips on the Pace Route 352 between the Pace Harvey Transportation Center and the 95th Red Line station would be reduced by approximately 46% from 1,234 trips to 672 trips. Frequencies south of the Pace Harvey Transportation Center are not expected to be reduced.

TABLE 6.2: LOCAL SERVICE OPERATING SAVINGS

	8A	108	352
Current Travel Time (min)	40.3	23.7	39.1
Updated Travel Time (min)	35.8	20.1	32.4
Percent Savings	**11%**	**15%**	**17%**

7. Implementation Strategy

As the project development phase continues, it is important to outline the additional steps required to complete the project in a timely and cost-effective manner. The next phase of the project requires additional environmental analysis and concept design. The following section outlines a proposed timeline for implementation, the expected level of environmental documentation, and potential funding sources.

7.1. PROJECT TIMELINE

Figure 7.1 provides a proposed schedule for implementation including environmental review, design, and construction, subject to funding availability.

FIGURE 7.1: PROPOSED SCHEDULE

7.2. EXPECTED LEVEL OF ENVIRONMENTAL ANALYSIS

Due to the project's implementation along a well-established urban transportation corridor, a Categorical Exclusion is the anticipated level of environmental analysis required for this project to move forward. On July 22, 2019, a NEPA Class of Action Determination Memorandum was provided by CTA and Pace to FTA providing evidence for this justification.

The South Halsted Corridor Enhancement Project would improve service along the South Halsted Corridor utilizing bus lanes, queue jumps, and enhanced stations. Construction would take place primarily within the existing right-of-way. To accommodate the bus lanes and queue jumps, geometric alterations to the roadway and intersections would be required. This would include conversion of a travel lane or parking in certain areas. Minimal additional permanent right-of-way would be required. Several permanent easements in the form of "sliver" takes are anticipated. One such take would be required adjacent to a park area. As no change in use is expected, a de minimis impact is anticipated. Nonetheless, Section 4(f) documentation would be required. No relocations would be required.

There would be minimal impacts related to the other aspects required for environmental review. There are several potential historic resources identified along the South Halsted Corridor which will be documented in future phases, but no impacts are anticipated. The project would not significantly impact the visual quality, noise levels, or vibration levels due to the existing traffic and bus activity. There is no known hazardous contamination within the project area. There is a high percentage of minority and low-income populations living within the study area, and a project goal is to support the underserved communities in the area. Land-use along this section of South Halsted Street has traditionally been used for industrial, commercial, business, and residential properties. No impacts to wetlands, floodplains, waterways, or endangered and threatened species is anticipated. The project would employ standard safety practices and all construction impacts would be minimized to the greatest extent possible. Overall, the project would be limited to minor impacts in the project area; no significant impacts are anticipated to occur.

As per 40 CFR 1508.4, Categorical Exclusions (CEs) “means a category of actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by a Federal agency.” Therefore, neither an environmental assessment nor an environmental impact statement is required. 23 CFR 771.118 further clarifies environmental documentation requirements for CE documents, including the action that FTA determines are appropriate for a CE. Three of those items pertain to the South Halsted Corridor Project, as follows:

- Section 771.118(c)(8): Maintenance, rehabilitation, and reconstruction of facilities that occupy substantially the same geographic footprint and do not result in a change in functional use, such as: Improvements to bridges, tunnels, storage yards, buildings, stations, and terminals; construction of platform extensions, passing track, and retaining walls; and improvements to tracks and railbeds.

- Section 771.118(c)(9): Assembly or construction of facilities that is consistent with existing land use and zoning requirements (including floodplain regulations) and uses primarily land disturbed for transportation use, such as: Buildings and associated structures; bus transfer stations or intermodal centers; busways and streetcar lines or other transit investments within areas of the right-of-way occupied by the physical footprint of the existing facility or otherwise maintained or used for transportation operations; and parking facilities.

- Section 771.118(c)(12): Projects, as defined in 23 U.S.C. 101, that would take place entirely within the existing operational right-of-way. Existing operational right-of-way means all real property interests acquired for the construction, operation, or mitigation of a project. This area includes the features associated with the physical footprint of the project including but not limited to the roadway, bridges, interchanges, culverts, drainage, clear zone, traffic control signage, landscaping, and any rest areas with direct access to a controlled access highway. This also includes fixed guideways, mitigation areas, areas maintained or used for safety and security of a transportation facility, parking facilities with direct access to an existing transportation facility, transportation power substations, transportation venting structures, and transportation maintenance facilities.

Based on this classification, the preparation of an EIS or EA does not appear to be warranted for the South Halsted Project, and the project team's recommended course of action would be to request from FTA that a CE document be prepared to meet the environmental documentation requirements. A CE document would provide for a means to conduct detailed analysis where required, including traffic, parking, and pedestrian impacts while streamlining areas where no significant analysis is expected to be required (e.g. ecological, navigable waterways, etc.). CTA and Pace will continue to conduct public outreach to ensure that local stakeholders, residents, and businesses are well informed about the project's goals, schedule, benefits, and impacts.

7.3. POTENTIAL FUNDING SOURCES

The South Halsted Bus Enhancement Project, like may transit projects, would likely need multiple sources of funding to provide all the necessary improvements. This section presents potential funding sources to implement the improvements recommended in this report. Each funding source has its own criteria for applicable projects, application cycles, and requirements for applying. The final package of funding would likely include a combination of local, state, and federal funding.

ON TO 2050, the regional comprehensive plan developed by CMAP, has identified this project as a fiscally-constrained Regionally Significant Project (RSP 108) due to the project's benefits of reducing air emissions, increasing transit ridership, increasing job access, and benefitting communities on the South Side of Chicago and Cook County. This project is also a potential candidate for FTA Small Starts funding, and it is recommended that an application for Small Starts funding be submitted to FTA.

The following summarize potential funding grants.

7.3.1. Invest in Cook Grants

Invest in Cook is a relatively new grant program initiated in 2017 by Cook County and programmed by the Cook County Department of Transportation and Highways. Cook County dedicates $8.5 million annually from its local portion of the state Motor Fuel Tax (MFT) revenue to implement the goals and objectives outlined in its Long-Range Transportation Plan (LRTP). While a modest amount of funding is available each year, it is one of the more flexible sources of grant funding in that it can fund planning and feasibility studies, engineering, right-of-way acquisition, and construction. As a local, non-federal funding source, Invest in Cook grants can also serve as local match to any federal grant awards received on the project.

Pace has already received a $500,000 Invest in Cook grant in 2017 that will be used in 2019 and 2020 to complete environmental documentation for the project required by the National Environmental Protection Act (NEPA). CTA and Pace would contribute to local matching funds of $100,000 for this grant. This project could be eligible for further Invest in Cook grant funding after the $500,000 funding has been spent. The Invest in Cook grant call for projects typically opens in early January of each year.

7.3.2. Congestion Mitigation and Air Quality Improvement Program

The Congestion Mitigation and Air Quality Improvement (CMAQ) program is a federal funding source through the Federal Highway Administration (FHWA) and programmed by CMAP. CMAQ funds are used to fund transportation projects that improve air quality and mitigate congestion. This project is a candidate for CMAQ funding as it improves air quality and mitigates congestion by increasing transit ridership and improving travel time reliability, thereby reducing the number of Single-Occupancy Vehicles and decreasing congestion on the transportation network. Pace applied for CMAQ funding in the most recent call for projects that closed in March 2019.

Each region that receives CMAQ funding programs their funds using different evaluation criteria. In the Chicago region, CMAP scores transit projects based on expected ridership increase, travel time reliability, existing asset condition (applicable to transit facility projects), and the presence of transit-supportive land uses. The CMAQ funding cycle opens with a call for projects in January of each year.

7.3.3. Surface Transportation Program Shared Fund Program

The Surface Transportation Program (STP) Shared Fund program is a recent program initiated in 2019 by CMAP amounting to $40 million annually. This funding source allocates a portion of federal STP dollars from FHWA to fund important regional projects that further the goals of the regional comprehensive plan, ON TO 2050. Eligible projects must either be a multijurisdictional application or the total project cost is $5 million or more. Pace applied for Shared Use STP funds in the call for projects that closed in March 2019.

Projects are evaluated in three categories: project readiness, transportation impact, and planning factors. For transit projects, the planning factors considered include inclusive growth, complete streets, and transit supportive density. The STP Shared Fund funding cycle opens with a call for projects in January of each year.

7.3.4. FTA Small Starts Program

The FTA Small Starts program is a discretionary grant program where projects are either new fixed guideway projects, extensions to existing fixed guideway systems, or corridor-based bus rapid transit projects. Eligible projects have cost requirements where the project must be under $300 million and Small Starts funding must be less than $100 million. The first step to begin the Small Starts process is to enter the Project Development phase where project sponsors can complete the environmental review process, select a Locally Preferred Alternative, gather funding commitments, and make progress on engineering and design. Work completed while in the Project Development phase can be counted toward local match. It is critical to get this approval early in the planning phase. From there, FTA evaluates the project and assigns a rating. If approved and recommended for funding by the FTA, the project can enter into a construction grant agreement between FTA and the Project Sponsor.

Because the corridor has sufficient ridership, travel-demand modeling may not be necessary. Instead, “warrants” could be used to achieve automatic medium ratings on some of the evaluation criteria. A modeling vs. warrants approach should be further explored. Modeling is beneficial when the results would provide for a higher rating.

Many elements are needed to enter a Small Starts application. However, a key element is the financial plan. A higher rating is assigned to projects that require less than 50% of FTA’s Capital Improvement Grant. As this grant process is competitive nationally, it is critical to develop a strategy for the project that achieves the highest potential rating.

Appendices List

1. Appendix A: Conceptual Corridor Improvement Plans
2. Appendix B: CAG Meeting 2 Summary
3. Appendix C: CAG Meeting 3 Summary
4. Appendix D: Traffic Analysis
5. Appendix E: Parking Inventory
6. Appendix F: Bus Speed
7. Appendix G: Environmental Screening
8. Appendix H: IDOT 5% Locations
9. Appendix I: Cost Estimate
10. Appendix J: Bus Operations
11. Appendix K: Median Narrowing and Roadway Widening