Project Definition

TECHNICAL MEMORANDUM

95th Street Line

May 2019

PULSE pace Connecting Communities HNTB

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Executive Summary

As part of Pace's Vision 2020 plan to modernize public transportation, Pace identified a 24-line rapid transit network to enhance mobility and suburb-to-suburb travel options. Seven priority routes have been identified for near term development including Milwaukee Avenue, Dempster Street, Halsted Street, 95th Street, Cermak Road, Harlem Avenue, and Roosevelt Road. Pace's rapid transit service has been branded as Pulse, with the development of the Milwaukee, Dempster and Halsted lines already underway. The Milwaukee Pulse Line is now under construction, the Dempster Pulse Line will enter final design in 2019, and project definition for the Pulse Halsted Line will soon enter the environmental review process. The Pulse 95th Street Line will be the fourth branded Pulse route, anticipated to enter service in 2024, provided that project funding is secured. In 2015, Pace completed a 95th Street Corridor Transportation Plan that identified preliminary station locations along the corridor and served as the basis for the Project Definition study.

FIGURE ES 1 PULSE 95TH STREET LINE WITH MAJOR TRANSIT CONNECTIONS

Note: Figure ES 1 reflects the current proposed stations, which vary from the original station set suggested in the 2015 Plan.
Source: Pace, PMO

As refined through this study and documented in this report, the Pulse 95th Street Line is defined by the following characteristics:

- Approximately 12.8 miles in length.
- 21 station locations are recommended to be evaluated during the National Environmental Policy Act (NEPA) phase, including two terminals, 18 intermediate station pairs, and a potential future station at Harlem, which may be constructed should the Harlem Avenue/95th Street interchange be reconfigured.
- Runs east-west between the CTA Red Line 95th/Dan Ryan Station in the City of Chicago on the east and the intersection of 95th Street and 76th Avenue in Hickory Hills on the west, then north-south along 76th Avenue to serve the Cook County Fifth Municipal District Courthouse (Bridgeview Courthouse) at 76th Avenue and 103rd Street in the City of Bridgeview before continuing southwest via 103rd Street, Roberts Road, and 107th Street to terminate at Moraine Valley Community College in Palos Hills. Alternate routing was also considered between 95th Street and the Bridgeview Courthouse. From the intersection of 95th Street and Harlem Avenue in Hickory Hills, Pulse would travel north-south on Harlem Avenue and then west along 103rd Street to serve the Bridgeview Courthouse at 76th Avenue and 103rd Street. Final routing will be determined during the NEPA phase.
- Connects to the CTA Red Line 95th/Dan Ryan Station, the Metra Rock Island District Main Line Vincennes Avenue and Longwood Stations, and the Metra Southwest Service Line Oak Lawn Patriot Metra Station in addition to numerous Pace and CTA bus services.
- Significant destinations along the route include Little Company of Mary Hospital, Advocate Christ Medical Center, Oak Lawn High School, and Moraine Valley Community College. Additional destinations include Chicago Ridge Mall, Evergreen Plaza, Evergreen Marketplace and Oak Lawn Shopping Center.

As Pace's fourth Pulse line, the 95th Street service will improve connectivity and increase transit service levels through higher frequencies, travel time savings, and station amenities. The Pulse 95th Street Line will connect to the Pulse Halsted Line, and eventually to high capacity transit service on Harlem and Cicero Avenues.

Defining the Project

Pace has undertaken this planning effort to define the features and characteristics of the Pulse 95th Street Line. This summary describes the results of the analysis regarding station locations and amenities, vehicles, technology, operating plans, and cost estimates. This Project Definition Report will serve as a reference and resource for Pace, project

stakeholders, and the general public regarding the analysis and decisions made during the Project Definition phase.

Project Features and Characteristics

Infrastructure Improvements

The Pulse 95th Street Line service will operate in mixed traffic, with an off-street eastern terminal station at the CTA Red Line 95th/Dan Ryan Station in the City of Chicago. The western terminal station is proposed at Moraine Valley Community College. Eighteen additional intermediate station pairs were evaluated, for a total of 20 station locations. Harlem Avenue will be considered for a future station should the Harlem Avenue/95th Street interchange be reconfigured. The Pulse 95th Street Line will traverse bidirectionally east-west through the communities of Chicago, Evergreen Park, Oak Lawn, Chicago Ridge, Bridgeview, Hickory Hills, and Palos Hills.

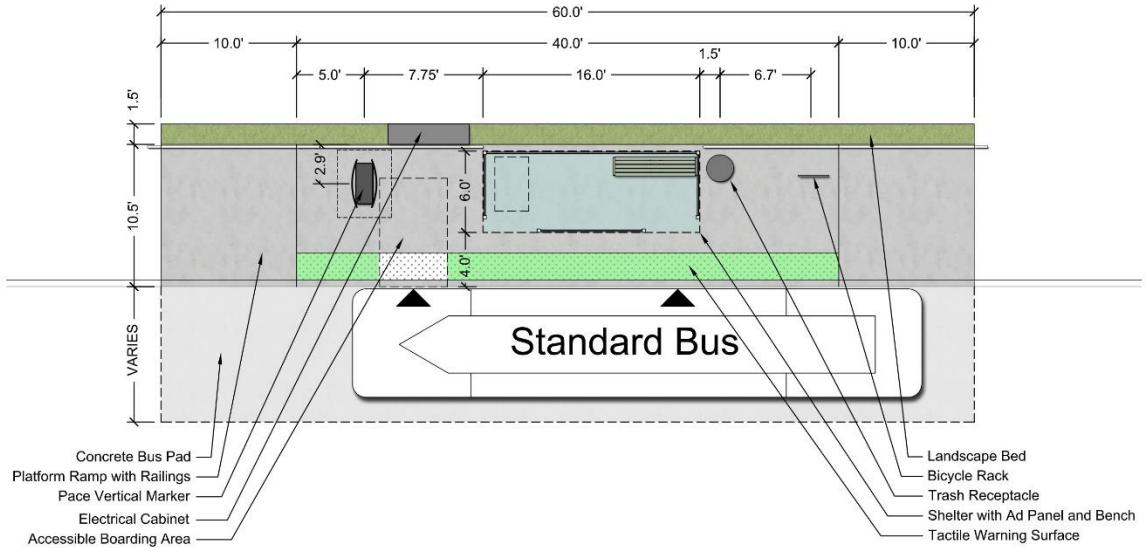
The majority of the 95th Street Line on-street stations will use the typical station design and configuration developed for the Pulse Milwaukee and Dempster Lines. Figure ES 2 illustrates the typical station which has a 12-foot by 60-foot footprint, featuring a 12-inch near-level boarding platform with Americans with Disabilities Act (ADA) accessible ramps at both ends connecting the station to the surrounding sidewalk network. Smaller, more compact stations with a modified feature set will be used where necessary to accommodate constrained right-of-way conditions along 95th Street.

Planned station amenities include the following features (see Figure ES 3.):

- Raised platform for near-level boarding, enabling passengers to enter the bus without the need to step up.
- Semi-custom branded shelters.
- Benches, trash receptacles, and bicycle racks.
- A vertical marker conveying the Pulse brand and featuring real-time next-bus signage and Pulse route information.
- Infrared heating within the shelter.
- Electric pavement snow-melt system.
- Railings along the back of the platform and along the access ramps.
- Landscaping.

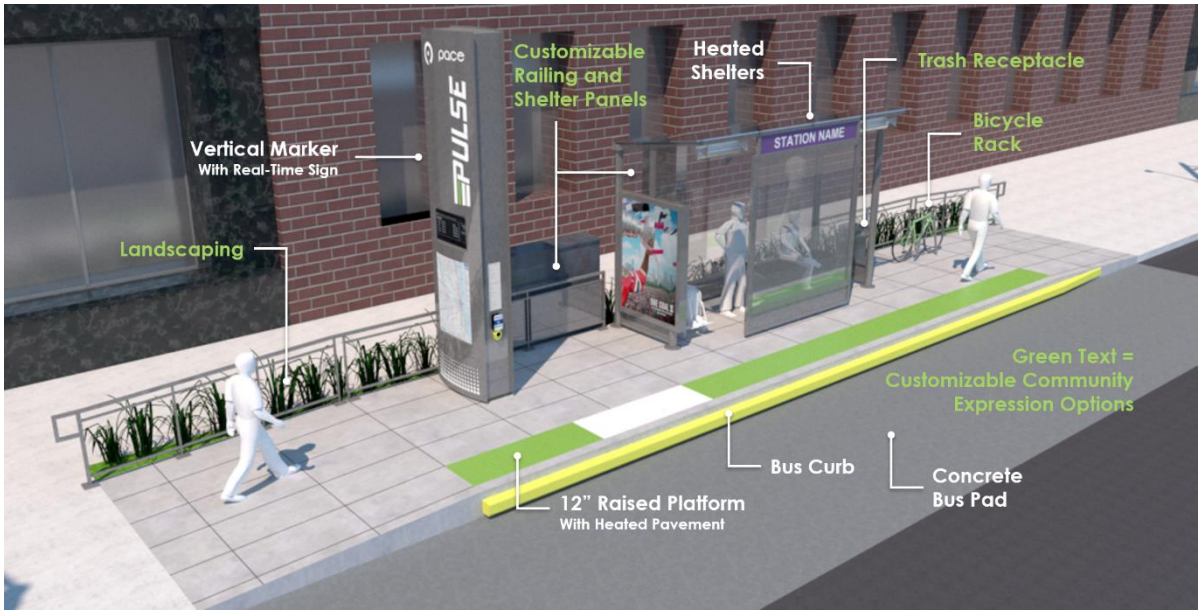
Other project improvements include curb bulb-outs, crosswalks and queue jumps.

FIGURE ES 2 TYPICAL STATION LAYOUT



Source: Pace, PMO

FIGURE ES 3 TYPICAL STATION LAYOUT RENDERING



Source: Pace, PMO

Financial Plan

A capital cost estimate was developed to a level of detail appropriate for the Project Definition phase. Capital costs consist primarily of those related to station construction and vehicle procurement. Based on the cost of the Milwaukee Line, the current average station cost is approximately $480,434 (in 2019 dollars). The estimated total capital cost for station construction is approximately $31.2 million (in 2019 dollars). The cost of Pulse vehicles is approximately $9.6 million (in 2019 dollars). The total capital costs for both stations and vehicles are estimated at approximately $40.8 million in 2019 dollars.

Implemented through a separate project, Transit Signal Priority (TSP) is anticipated to improve schedule reliability for the 95th Street Line. TSP is anticipated to be implemented along the 95th Street Line corridor as a separate project prior to the commencement of Pulse service. TSP costs are not included in the capital cost estimate for the 95th Street Line.

Pace intends to fund the Pulse 95th Street Line with local, regional, and federal sources, potentially including a federal Congestion Mitigation and Air Quality (CMAQ) grant, a Regional Transportation Authority (RTA) Innovation, Coordination, and Enhancement (ICE) grant, and Federal Transit Administration (FTA) Section 5307 formula funds.

Operating Plan

A preliminary operating plan, based on running time and ridership analyses, reflects implementation of the new Pulse service and corresponding changes to local Route 381 service. The preliminary operating plan would require 16 Pulse vehicles (13 regular service plus three spares). Reducing the number of intermediate stops enables time savings compared to the existing Route 381 while providing improved service to nearly all existing riders and improved traffic flow. Approximately 90% of all Route 381 ridership is captured within ¼ mile of a Pulse station. The operating plan summarized in Table ES 1.

TABLE ES 1 PRELIMINARY OPERATING PLAN

	Current Route 381 (Route 381 to be modified)	Pulse	Modified Local
		Span of Service	
Weekday	5 AM – 12 AM	5 AM – 1 AM	5:30 AM – 10 PM
Saturday	5:30 AM – 11 PM	5 AM – 12 AM	6 AM – 10 PM
Sunday	7:30 AM – 8 PM	6 AM – 12 AM	7 AM – 10 PM
		Frequency (weekdays only)	
Peak	20 min	10 min	60 min
Off-Peak	20 – 60 min	15 – 30 min	60 min

Operations and maintenance (O&M) costs are estimated based on annual revenue-hours of service. For the combined Pulse and future local service, the estimated annual revenue hours of the Pulse 95th Street Line (via 76th Ave) are 56,536. The estimated annual revenue hours of the Pulse 95th Street Line (via Harlem Ave) are 57,436. This represents a 103% increase over the 27,787 annual revenue hours via 76th Avenue, and a 106% increase over the 27,787 annual revenue hours via Harlem Avenue. Pulse 95th Street Line and the modified Route 381 O&M costs results show that the introduction of Pulse service adds between $2.9 and $3.0 million in 2019 dollars.

Ridership

The ridership forecast for the Pulse 95th Street Line project was developed using the Federal Transit Administration's Simplified Trips-on-Project Software (STOPS) model. The model incorporates the proposed baseline operating plan, including any proposed service changes on Route 381, as well as demographic and trip data. STOPS model inputs include Census Transportation Planning Products (CTPP) Journey to Work Data, Metropolitan Planning Organization (MPO) travel time skims (i.e. highway travel times), MPO demographic data, ridership data, and General Transit Feed Specification (GTFS) transit data. The STOPS model forecasts 4,288 weekday trips combined on the Pulse 95th Street Line and Route 381, compared to the 3,513 existing weekday trips on Route 381.

Stakeholder Involvement Process

Throughout the Project Definition phase, stakeholder involvement activities for the Pulse 95th Street Line focused on coordination with government agencies at the local, state, and federal level as well as local agencies and institutions. A Corridor Advisory Group (CAG) was established and consisted of representatives from municipalities, agencies, hospitals and schools. Two CAG meetings were held during the Project Definition phase. The first was held in December 2018 and was attended by 22 stakeholders. During the CAG, the project team introduced the project and asked for feedback on the Purpose and Need, project features and benefits as well as general station locations. At the second CAG, held in May 2019, 20 stakeholders attended and the team presented the refined station locations, sites and layouts, preliminary operating plan, and project capital costs. Stakeholder provided feedback on site selections and station layouts.

As the Project Definition phase concludes and the project advances into the environmental phase, stakeholder involvement and outreach efforts will be a priority as the NEPA documentation is prepared. Coordination with communities, government officials, public agencies, and individual interest groups will continue, and emphasis will be placed on public involvement and broad community outreach. Guided by established plans, Pace will connect with its customers, the general public, affected property owners, and business groups through outreach activities including a project website, project newsletters, public meetings, and one-on-one Stakeholder meetings.

Next Steps

The Pulse 95th Street Line project is expected to enter the federally mandated NEPA review process in 2020.

1 Introduction

FIGURE 1.1 95TH STREET LINE CORRIDOR

Source: Pace, PMO

Pulse 95th Street Line is defined by the following characteristics:

- Approximately 12.8 miles in length.
- 21 station locations are recommended for evaluation during the National Environmental Policy Act (NEPA) phase, including two terminals, 18 intermediate station pairs, and a potential future station at Harlem. An additional station may be constructed at Harlem Avenue should the Harlem Avenue/95th Street interchange be reconfigured[1].
- Runs east-west between the CTA Red Line 95th/Dan Ryan Station in the City of Chicago on the east and the intersection of 95th Street and 76th Avenue in Hickory

[1] Station siting at this location is dependent on an Illinois Department of Transportation (IDOT) Interchange Design Study (IDS) plan, which would result in the restructuring of the full cloverleaf interchange at this location.

Hills on the west, then north-south along 76th Avenue to serve the Cook County Fifth Municipal District Courthouse (Bridgeview Courthouse) at 76th Avenue and 103rd Street in the City of Bridgeview before continuing southwest via 103rd Street, Roberts Road, and 107th Street to terminate at Moraine Valley Community College (MVCC) in Palos Hills. Alternate routing is also being considered between 95th Street and the Bridgeview Courthouse. From the intersection of 95th Street and Harlem Avenue in Hickory Hills, Pulse would travel north-south on Harlem Avenue and then west along 103rd Street to serve the Bridgeview Courthouse at 76th Avenue and 103rd Street. Final routing will be determined during the NEPA phase.

- Connects to the CTA Red Line 95th/Dan Ryan Station, the Metra Rock Island District 95th St.-Longwood and 95th St.-Beverly Hills stations, and the Metra Southwest Service Oak Lawn Patriot Station in addition to numerous Pace and CTA bus services.
- Significant destinations along the route include Little Company of Mary Hospital, Advocate Christ Medical Center, Oak Lawn High School and Moraine Valley Community College. Additional destinations include Chicago Ridge Mall, Evergreen Plaza, Evergreen Marketplace and Oak Lawn Shopping Center.

1.1 Defining the Project

Pace is undertaking a planning effort to define the features and characteristics of the Pulse 95th Street Line. This report describes preliminary assumptions, station locations, and station amenities; the development of the station designs, vehicle specifications, and technology requirements; the application of brand elements; the operating plan; and cost estimates. At the conclusion of this planning effort, the Project Definition Report will serve as a reference and resource for Pace, project stakeholders, and the general public.

1.2 95th Street Line Project Goals

The following goals have been identified for the Pulse 95th Street Line:

- Encourage suburban transit usage through the establishment of a network of higher-quality line-haul routes;
- Improve the visibility and perception of suburban bus transit service;
- Improve access to and efficiency of bus passenger travel; and
- Connect communities and encourage transportation, land use, and economic development objectives identified in the study corridor.

1.3 Organization of this Plan Document

The following sections of this Project Definition Report are generally organized around the six elements of bus rapid transit (BRT) that distinguish premium bus service: stations, running way, vehicles, technology, branding, and the operating plan.[2] The remaining sections address the corridor context and existing ridership conditions, stakeholder involvement process, NEPA documentation, project delivery, and the next steps needed to advance the project. Technical memoranda available under separate cover, as noted throughout the report, document technical analyses and findings in more detail. This Project Definition Report serves to summarize the relevant conclusions that will inform design and engineering in the next phase of the project.

The following sections present initial assumptions based on past analyses, summarize additional analysis, and document confirmed and pending decisions. The general content of the sections that follow is described briefly below:

- Corridor Context: Existing conditions in the corridor are presented, including physical infrastructure, land uses, existing and planned transit service, local plans and studies, historical resources, and a detailed conditions inventory by subsection.
- Existing Ridership Analysis: Route 381 ridership from 2000 to 2017 was analyzed to examine local route operation in the corridor and inform station location development.
- Stations: General station locations and specific station sites were refined through technical analysis, stakeholder involvement, and conceptual design. Functional requirements and conceptual layouts for both terminal stations and intermediate stations are defined. Station designs are based on design standards for the Pulse Milwaukee Line with refinements as needed for the operation of the Pulse 95th Street. The functional requirements inform the cost estimates and serve as the basis of design for the engineering phase.
- Running Way: After conducting physical conditions and travel time inventories, a strategy for station area roadway treatments was identified, including general right-of-way requirements, opportunities for curb modifications as well as crosswalk and sidewalk improvements. Planned Transit Signal Priority (TSP) improvements are also identified as appropriate.

[2] Transportation Research Board. Transit Cooperative Research Program. *Bus Rapid Transit Practitioner's Guide (TCRP Report 118).* Transportation Research Board, 2007.

- Running Time Analysis: More detailed analysis of Route 381 operations, including on-time performance and on-board travel time data, was conducted to inform the Preliminary Operating Plan development.
- Vehicles: Preliminary requirements for Pulse vehicles are documented, reflecting specifications used in recent Pulse vehicle purchases that ensure a unique identity.
- Technology: As the Pace system evolves it is anticipated to add additional technologies on the vehicles. Connected and Autonomous Vehicle (CAV) technologies have the potential to provide significant benefits to the Pulse service but also pose some unique challenges. The technology recommendations in this Project Definition Report focuses on opportunities as well as some of the potential impediments. The focus of research and development for both transit and personal vehicles has been on CAV technologies. CAV technologies are advancing rapidly. Connected Vehicle technologies enable vehicles to communicate with other vehicles and road infrastructure such as traffic signals. Automation technologies have the capability of performing or assisting with driving tasks.

  Connected Vehicles can exchange data between other vehicles (vehicle-to-vehicle or V2V), the roadside (vehicle-to-infrastructure, or V2I), and other transportation users (vehicle-to-anything, or V2X), using wireless communications. Equipment on the vehicles continuously broadcasts data (including location, speed, acceleration, heading, and other parameters) to nearby vehicles that can use the information to identify and alert a driver to a potential maneuver that may be a threat outside of their immediate field of view, such as an upstream vehicle suddenly stopping. Automated vehicle technologies can range from driver assistance applications to fully automated systems. The following are some recommendations for ways to prepare for and incorporate CAV technologies for the 95th Street Line:

  - Conduct further research and review of Driver Assistance technologies such as adaptive cruise control, around vehicle monitoring system, lane departure warning, Emergency Brake Assist (EBA), Driver fatigue / inattention alert and pedestrian and cyclist detection (i.e. Mobileye Shield+).
  - Incorporate these technologies into the next bus specification.
  - Consider developing a demonstration project using aftermarket versions of one or more of these technologies possibly in coordination with CTA.
  - Consider piloting CV applications that increase bus and pedestrian safety as well as mobility applications such as Dynamic Ridesharing (D-RIDE) and Connection Protection (T-CONNECT) possibly in coordination with other

regional agencies. The CV technology could be provided through the use of aftermarket systems.

- Engage and coordinate with CTA, the Illinois Tollway and other regional stakeholders currently involved with CAV technologies.

- Preliminary Operating Plan: The Preliminary Operating Plan includes running time estimates for Pulse 95th Street Line service and Route 381, an initial baseline service plan, and alternative operating plans. The Preliminary Operating Plan informed the development of the Operating and Maintenance Cost Estimate included in the Financial Plan. The operating plan provides a preliminary schedule that reflects Pulse frequency and service span, station locations and fleet requirements, and also includes service reallocation recommendations for the overlapping local Route 381.

- Branding: Based on a branding strategy developed concurrently with the Pulse Milwaukee Line, the Pulse 95th Street Line Project Definition report documents the continued application of the Pulse brand to Pulse features.

- NEPA Documentation: The Purpose and Need Statement and Categorical Exclusion checklist documentation required to meet NEPA requirements are summarized.

- Stakeholder Involvement: Outreach and coordination with federal, state, and local agencies; municipalities; interest groups; and the general public, are summarized.

- Financial Plan: Preliminary capital cost estimates are provided for project implementation, documenting provisions for stations, technology equipment, roadway improvements, property acquisition, vehicles, other station elements, and estimated costs of engineering and other professional services. An operations and maintenance (O&M) cost estimate for the initial phase of implementation includes provisions for vehicle operations, fuel, vehicle maintenance, station maintenance, technology elements, fare collection, and allocated general administration costs.

- Ridership Forecast: A ridership forecast for the initial year of operation was developed by applying a forecasting method that pivots from Route 381 ridership, reflecting service enhancements planned for the corridor and BRT experience in similar corridors elsewhere.

- Project Delivery: A project schedule provides key elements of the various project delivery phases and discusses relevant considerations and recommendations regarding intergovernmental agreements.

- Next Steps: An overview of the next steps required to implement the Pulse 95th Street Line and a summary of upcoming project activities are provided.

2 Corridor Context

The following sections briefly discuss relevant policies or projects related to infrastructure improvements, urban design plans, station area development plans, planned changes in transit services, and land use developments in each community along the planned Pulse 95th Street Line. Studies and plans relevant to each community are referenced as appropriate in the discussion.

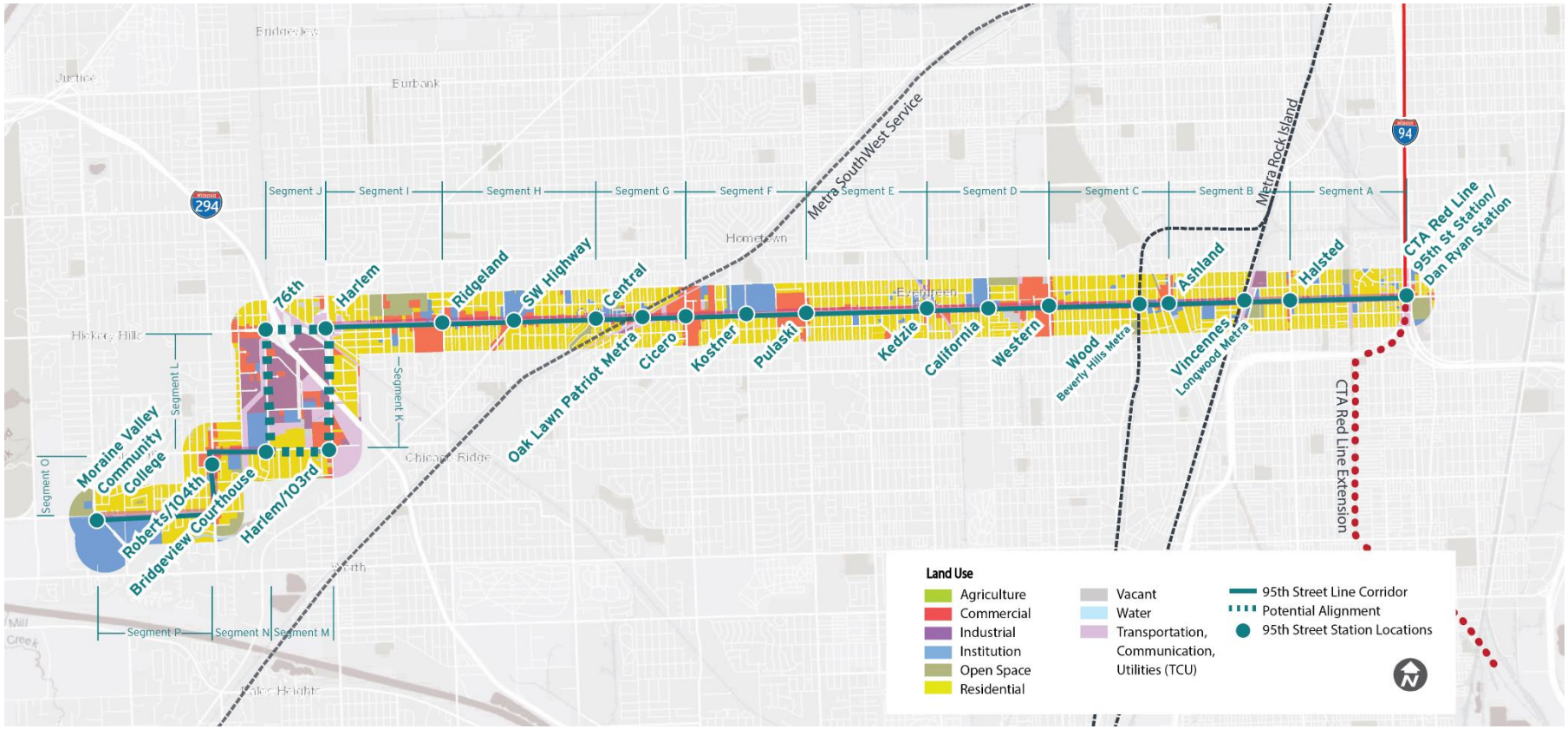
2.1 Corridor Route Description

The Pulse 95th Street Line will operate in mixed traffic, with an eastern terminus station at the CTA Red Line 95th/Dan Ryan Station in the City of Chicago, and a western terminus at Moraine Valley Community College. Twenty-one station locations were evaluated, including two terminals, 18 intermediate station pairs, and a potential future station at Harlem and 95th Street. The corridor is 12.8 miles in length and will travel bi-directionally east-west through the municipalities of Chicago, Evergreen Park, Oak Lawn, Chicago Ridge, Bridgeview, Hickory Hills, and Palos Hills.

2.2 Land Use Character

Land use data was obtained from a 2013 geographic information system (GIS) dataset compiled by Chicago Metropolitan Agency for Planning (CMAP) and was evaluated at a quarter mile buffer from the 95th Street Line corridor. The western portion of the corridor, between the western terminus at MVCC and Harlem and 103rd, consists mostly of residential, some commercial, and institutional uses. Land uses near the potential alignment along 76th, 103rd, and Harlem, consists mainly of industrial, institutional, and residential uses. Land uses along 95th Street consists primarily of commercial, residential, with some institutional, industrial, and open space. These uses continue east along the corridor, approaching the CTA Red Line 95th Street Station/Dan Ryan Station terminus. Figure 2.1 shows the corridor, station locations, and land use within a quarter mile of the corridor.

FIGURE 2.1 LAND USE ALONG THE 95TH STREET LINE CORRIDOR



Source: Chicago Metropolitan Agency for Planning (CMAP) Land Use 2013

2.3 Existing & Planned Transit Service

2.3.1 Pace Suburban Bus

Pace Route 381 operates along the 95th Street Line corridor between MVCC in Palos Hills and the CTA Red Line 95th/Dan Ryan Station in Chicago. Other Pace route connections include Route 349 near Western Avenue and 95th Street, Routes 352 and 359 near Halsted Street and 95th Street, and Routes 385 and 386 that run north and south through 95th Street on the western end of the corridor. Existing Pace Routes 353, 382, 383, 384, 395 and 895 and the future Pulse Halsted Line, Pulse Cicero Line, and Pulse Harlem Line will also serve the area along and near the 95th Street corridor.

2.3.2 Chicago Transportation Authority (CTA)

The 95th Street Line will connect to the CTA "L" heavy rail system at the CTA Red Line 95th/Dan Ryan Station at the eastern terminus of the corridor, as well as other CTA routes. Other transfers at this station include N5, N9, 29, 34, 95, 100, 103, 105, 106, 108, 111, 112, and 119. CTA routes that connect throughout the corridor include Route 112 at Vincennes and 95th Street, express bus Routes 9/X9 at Ashland and 95th Street, Route 52A at Kedzie and 95th Street, Route 53A at Pulaski and 95th Street, Route 95 at Western and 95th Street, Routes 8A and 108 at Halsted and 95th Street.

2.3.3 Metra

The 95th Street Line will connect to the Metra Rock Island District Service (RI) at the Vincennes (Longwood Metra) station and the Wood (Beverly Hills Metra) station. This line travels between downtown Chicago and Joliet, IL. The 95th Street Line will also connect to the Metra Southwest Service (SWS) at the Oak Lawn Patriot Metra station. This line travels between downtown Chicago and Manhattan, Illinois.

2.4 Local and Regional Plans

As Pace began outreach activities with local communities and transportation agencies, local and regional plans affecting the 95th Street Line corridor were researched and documented in the Community Plan Review technical memorandum. Most communities have comprehensive plans that address housing, transportation, land use, economic development, public facilities, recreation, and other issues of local concern. Many communities include multi-modal, transit-oriented development, and urban design plans in the comprehensive plan or have separate plans addressing these topics.

As the 95th Street Line project advances towards implementation, Pace will continue to coordinate with local communities on planning activities along the 95th Street Line corridor. In addition to coordinating, Pace will pay close attention to the following projects:

- Proposed redevelopment project at the southwest corner of 95th Street and Pulaski Road.
- Future development activity along the south side of 95th Street between California Avenue and Fairfield Avenue in Evergreen Park.
- Potential new transit-oriented development along the east side of Harlem Avenue at 103rd Street in Chicago Ridge.
- Potential changes to the interchange between Harlem Avenue and 95th Street in Oak Lawn and Bridgeview

2.4.1 Regional Transit Plans

As the 95th Street Line project progresses, Pace will need to coordinate with regional transportation agencies including the CTA and Metra. In 2018, Pace and CTA jointly initiated the South Halsted Bus Corridor Enhancement project, which seeks to implement premium transit amenities along South Halsted Street, including the implementation of Pulse service along Halsted Street between 95th Street and the Harvey Transit Center. The Pulse Halsted Line will intersect with the Pulse 95th Street Line and will share a terminus at the CTA Red Line 95th/Dan Ryan station. Pace anticipates that the Pulse Halsted Line will be implemented before the 95th Street Line. Pace will continue to coordinate with CTA on that project and will jointly plan for both the Halsted and 95th Street Lines.

The CTA is also advancing its plans for the Red Line Extension (RLE) project. This multibillion-dollar project will entail extending the Red Line beyond its current terminus at 95th Street to four new stations at 103rd Street, 111th Street, Michigan Avenue, and 130th Street. When implemented, the RLE project is expected to substantially alter travel patterns among transit users at the CTA Red Line 95th Street Station/Dan Ryan Station, where currently more than three quarters of all rail passengers access the station using feeder bus service. Pace will continue to actively participate in discussions with CTA over the development of the RLE project and potential adjustments to local bus service, including any impacts to existing Route 381 service as well as future Pulse service on both 95th Street and Pulse Halsted Street.

2.5 Historical Resources

Documentation of historical resources relative to the 95th Street Line was based on data from the Historic and Architectural Resources Geographic information System (HARGIS)[3]

[3] Illinois Historic Preservation Agency. Historic Architectural Resources Geographic Information System. Retrieved in November 2018 from http://gis.hpa.state.il.us/hargis/

database maintained by the Illinois State Historic Preservation Office (SHPO). The HARGIS database includes properties, structures, buildings, landscapes, or objects of historic significance in Illinois that are identified as being listed in the National Register (NR), are deemed eligible for the NR, or have been surveyed as a potentially historic or architecturally significant property but their significance has not yet been confirmed or determined. The database is not a comprehensive resource of historic and architecturally significant properties, as there may be historic or architecturally significant properties along the corridor that are not documented in the database. Additionally, it is noted by the SHPO that the data is not guaranteed to be accurate or current, as properties may have changed, been demolished or moved since they were added to the database. This notwithstanding, HARGIS data is a reasonable research and screening tool to identify potential historic or architecturally significant properties that may exist along the corridor. This information can then be used to inform station site selection as well as the potential historic resource impacts that may need to be documented during the environmental review phase of the Pulse 95th Street Line project.

2.5.1 HARGIS Data

All HARGIS data points that were within the screening area were selected and downloaded as a csv database file. Each HARGIS record included an address, which was geocoded to place the historic property relative to the 95th Street corridor. The geocoding process transformed the historic data into spatially referenced points in ArcGIS, which were then layered with the corridor map and station locations. Table 2.1 the results from this process and includes the total number HARGIS records within the screening area, as shown in Appendix A.

TABLE 2.1 HARGIS PROPERTY TYPE

HARGIS Property Type	Count
Undetermined	206
Part of a NR Historic District	506
Entered in the NR	5
Determined eligible for the NR	1
Part of a NR Historic District – contributing	23
No Information	1
Total	*742*

Of the 742 properties and districts, there are five properties that are listed as both "Part of a NR Historic District" and "Part of a NR Historic District – contributing." Appendix B and Appendix C identify these five properties and their HARGIS reference number.

2.5.2 Historic Districts and Properties

Based on the HARGIS data, 742 historic properties and four historic districts were identified within the HARGIS screening area which encompasses a one-half mile corridor buffer. Of the total properties and districts within the screening area, depicted in Appendix A, two historic districts and 85 historic properties are within a quarter mile of the 95th Street Line corridor, as summarized in Table 2.2.

TABLE 2.2 HARGIS PROPERTY TYPE AND HISTORIC DISTRICTS

HARGIS Property Type	Count
Undetermined	19
Part of a NR Historic District	58
Entered in the NR	1
Part of a NR Historic District – contributing	7
Total	*85*

Of the 85 properties and two historic districts within a quarter mile of the 95th Street Line corridor, a majority are concentrated on the eastern end of the 95th Street corridor in Chicago, between the preliminary Ashland and Western stations, mostly within a quarter mile from the preliminary Wood (Beverly Hills Metra) station. Table 2.3 identifies the number of historic properties and/or districts within a quarter mile of the stations, which are shown in the station area maps in Appendix D. All HARGIS properties and districts within a quarter mile of the corridor are listed in Appendix B and Appendix C.

TABLE 2.3 PROPERTIES AND DISTRICTS ALONG 95TH STREET LINE CORRIDOR

Station Location	Count
Oak Lawn Patriot Metra	1
California	1
Western	2
Wood (Beverly Hills Metra)	51 Properties 1 District
Ashland	4 Properties 1 District
Vincennes	2 Properties 1 District

2.6 Detailed Conditions Inventory

This section details the existing conditions along the 95th Street Line corridor that may affect the design and/or operation of Pulse service. The conditions inventory is organized by corridor segment in sections that follow and are summarized in Table 2.4.

TABLE 2.4 95TH STREET LINE CORRIDOR CONDITIONS INVENTORY SUMMARY

Segment	95th Street Line Segment	Lane Configuration[4]	Average Daily Traffic[5]	On-Street Parking	Sidewalks
A	95th Street: Dan Ryan Expressway to Halsted Street	Four through lanes	23,000	Both sides	Both sides
B	95th Street: Halsted Street to Ashland Avenue	Four through lanes	21,600	Both sides	Both sides
C	95th Street: Ashland Avenue to Western Avenue	Four through lanes east of Leavitt, five through lanes West of Leavitt	31,000	South side only from Leavitt to Western, then both sides	Both sides
D	95th Street: Western Avenue to Kedzie Avenue	Six through lanes, center turn lane	30,900	Partial on both sides	Both sides

[4] Lane Configuration, On-Street Parking, and Sidewalk information was retrieved from Google satellite imagery and Street View in July 2016.
[5] Illinois Department of Transportation. *Average Daily Traffic Counts GIS Application*. Retrieved in May 2019 from http://www.idot.illinois.gov/transportation-system/Network-Overview/highway-system/illinois-travel-statistics

Segment	95th Street Line Segment	Lane Configuration[4]	Average Daily Traffic[5]	On-Street Parking	Sidewalks
E	95th Street: Kedzie Avenue to Pulaski Road	Six through lanes	38,900	Partial on both sides	Both sides
F	95th Street: Pulaski Road to Cicero Avenue	Six through lanes	38,900	Partial on both sides	Both sides
G	95th Street: Cicero Avenue to Central Avenue	Six through lanes, center turn lane	35,600	Partial on south side	Both sides
H	95th Street: Central Avenue to Ridgeland Avenue	Six through lanes, center turn lane	41,900	None	Both sides
I	95th Street: Ridgeland Avenue to Harlem Avenue	Six through lanes until 69th St, then four through lanes	41,900	None	Both sides until 69th St
J	95th Street: Harlem Avenue to 76th Avenue	Four through lanes	41,900	None	None
K	Harlem Avenue: 95th Street to 103rd Street	Four through lanes, center turn lane south of 100th Pl, grade separated at 95th Street	41,800	None	Both sides south of Frontage
L	76th Avenue: 95th Street to 103rd Street	Four through lanes	10,150	None	None
M	103rd Street: Harlem Avenue to 76th Avenue	Four through lanes, center turn lane	15,100	None	South side only until 73rd Ct then both sides
N	103rd Street: 76th Street to Roberts Road	Four through lanes, center turn lane	15,100	None	South side only until 78th Ave then both sides
O	Roberts Road: 103rd Street to 107th Street	Four through lanes, center turn lane	16,100	None	Both sides
P	107th Street: Roberts Road to Moraine Valley Community College	Two through lanes	5,650	None	Both sides

2.6.1 95th Street: Dan Ryan Expressway to Halsted Street (Segment A)

This segment of the 95th Street Line corridor is located in the City of Chicago. The station locations in this segment include the eastern terminus at the CTA Red Line 95th Street

Station/Dan Ryan Station and Halsted. Existing route connections include Route 381 and other Pace routes as well as CTA rail, CTA bus, and Greyhound intercity buses. Land use consists mostly of residential with commercial and institutional uses along the corridor. This includes the Woodson Regional Library at the southeast corner of 95th Street and Halsted Street. Roadway jurisdiction belongs to the State. The following tables include the direction of travel, including the eastbound (EB) and westbound (WB) directions.

TABLE 2.5 BUS STOPS BETWEEN DAN RYAN EXPRESSWAY AND HALSTED STREET

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th/Dan Ryan CTA Station	EB/WB	619.6	485.6	Bus Bay	Bus Bay
95th St & Wentworth Ave	EB/WB	23.5	123.1	Sign	JCD Shelter
95th St & Princeton Ave	EB/WB	14.3	20.5	Sign	Sign
95th St & Eggleston Ave	EB/WB	13.2	40	Sign	Sign
95th St & Normal Ave	EB/WB	17.3	39.3	Sign	JCD Shelter
95th St & Wallace St	EB/WB	17.5	33.6	Sign	Sign
95th St & Union St	EB/WB	8.8	11.7	Sign	Sign
95th St & Halsted St	EB/WB	121.6	176.5	JCD Shelter	JCD Shelter

2.6.2 95th Street: Halsted Street to Ashland Avenue (Segment B)

This segment of the corridor is located in the City of Chicago and includes the station locations of Halsted, Vincennes (Longwood Metra), and Ashland. Connecting routes include CTA bus Routes 8A, 112, and 108, Pace bus Routes 352 and 359, Metra Rock Island District commuter rail station, and the future Pulse Halsted Line. Existing routes along this segment also include Pace Routes 381 and 395. Land use in this segment consists primarily of residential with commercial and institutional uses along the corridor. This includes the Southpoint Nursing and Rehabilitation Center, and Loomis Primary and CICS Longwood. Roadway Jurisdiction belongs to the State.

TABLE 2.6 BUS STOPS BETWEEN HALSTED STREET AND ASHLAND AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Peoria St	EB/WB	20.9	7	Sign	Sign
95th St & Morgan St	EB/WB	12.1	11.3	Sign	Sign
95th St & Vincennes Ave	EB	48.9	N/A	JCD Shelter	JCD Shelter
95th St & Vincennes Ave (NE) - Longwood Metra	WB	N/A	45.7	Sign	
95th St & Racine Ave	EB/WB	22.9	24.9	Sign	Sign
95th St & Throop St	EB/WB	27.1	44.6	Sign	Sign
95th St & Loomis St	EB/WB	31.2	33.8	JCD Shelter	JCD Shelter
95th St & Bishop St	EB/WB	19.2	12.2	Sign	Sign
95th St & Laflin St	WB	N/A	19		Sign
95th St & Winston Ave	EB	19.2	N/A	Sign	
95th St & Justine St	WB	N/A	7.7		Sign

2.6.3 95th Street: Ashland Avenue to Western Avenue (Segment C)

This segment of the corridor is located in City of Chicago and includes the station locations of Ashland, Wood (Beverly Hills Metra), and Western. Connecting routes include the CTA bus/express bus Routes 9/9X near Ashland, the Metra Rock Island District service, and Pace Route 349 and CTA bus Route 95 on Western. Existing routes along this segment also include Pace Routes 381 and 395. Land use consists of residential with commercial and institutional uses along the corridor. This includes the Chicago Fire Department between Wood Street and Beverly Boulevard, the Vanderpoel Elementary Magnet School between Ashland Avenue and Wood Street, Ridge Park at the southwest corner of 95th Street and Wood Street, and the Beverly Branch, Chicago Public Library. Roadway jurisdiction along this segment belongs to the State.

TABLE 2.7 BUS STOPS BETWEEN ASHLAND AVENUE AND WESTER AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Ashland Ave	EB/WB	242.7	239.7	Sign	JCD Shelter
95th St & Vanderpoel Ave	EB/WB	12.6	17.3	JCD Shelter	JCD Shelter
Beverly Hills Metra (95th St & Wood St)	EB/WB	32.6	36.9	Sign	JCD Shelter
95th St & Longwood Dr	EB/WB	8.3	4.3	Sign	Sign
95th St & Damen	EB/WB	25	9.3	JCD Shelter	Sign
95th St & Hoyne Ave	WB	N/A	9.3		Sign
95th St & Leavitt St	EB/WB	15.9	20.4	Sign	Sign
95th St & Oakley Ave	WB	N/A	25.5		Sign
95th St & Claremont Ave	EB	71.7	N/A	Sign	

2.6.4 95th Street: Western Avenue to Kedzie Avenue (Segment D)

This segment is located in the Village of Evergreen Park and includes the station locations of Western, California, and Kedzie. Connecting routes include Pace Route 349 and CTA bus Route 95 near Western, and CTA Route 52A near Kedzie. Existing routes along this segment also include Pace Routes 381 and 395. Land use consists of residential with major commercial and institutional uses along the corridor. These include the Evergreen Plaza and the southwest corner of 95th Street and Western Avenue, and the Little Company of Mary Hospital at the intersection of 95th Street and California Avenue. Roadway jurisdiction belongs to the State.

TABLE 2.8 BUS STOPS BETWEEN WESTERN AVENUE AND KEDZIE AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Western Ave	EB/WB	115.3	160.9	IC&SC Shelter	Sign
95th St & Campbell Ave	EB/WB	100.1	88.2	Sign	Sign
2555 W 95th St	EB	38.2	N/A	Sign	
2620 W 95th St	WB	N/A	49.7		Sign
2603 W 95th St	EB	0.3	N/A	Sign	
95th St & California Ave	EB/WB	51.8	59.9	Sign	Sign
95th St & Francisco Ave	EB/WB	25.4	25.1	Sign	Sign
95th St & Utica Ave	EB/WB	16.1	14.5	Sign	Sign
95th St & Troy Ave	EB/WB	98.2	22.5	Sign	Sign

2.6.5 95th Street: Kedzie Avenue to Pulaski Road (Segment E)

This segment is located in the Village of Evergreen Park and includes the station locations of Kedzie and Pulaski. Connecting routes include CTA Route 52A along Kedzie, and CTA Route 53A along Pulaski. Existing routes along this segment also include Pace Routes 381 and 395. Land use consists of residential with some commercial and institutional uses. This includes the Evergreen Police Department and the Central Junior High School both at the northwest corner of 95th Street and Kedzie Avenue, and the Most Holy Redeemer School before the 95th Street and Pulaski Road intersection. Roadway jurisdiction belongs to the State.

TABLE 2.9 BUS STOPS BETWEEN KEDZIE AVENUE AND PULASKI ROAD

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Kedzie Ave	EB/WB	23.6	117.2	Sign	Sign
95th St & Spaulding Ave	EB/WB	10.8	9.8	Sign	Sign
95th St & Homan Ave	EB/WB	24.3	22.3	Sign	Sign
95th St & St Louis Ave	EB/WB	5.5	7.5	Sign	Sign
95th St & Central Park Ave	EB/WB	8.7	10.2	Sign	Sign
95th St & Lawndale Ave	EB/WB	13.4	16.9	Sign	Sign
95th St & Hamlin Ave	EB/WB	9	11.4	Sign	Sign
95th St & Springfield Ave	EB/WB	9.4	11.2	Sign	Sign

2.6.6 95th Street: Pulaski Road to Cicero Avenue (Segment F)

This segment is located in the Village of Oak Lawn and includes the station locations of Pulaski, Kostner, and Cicero. Connecting routes include CTA Route 53A near Pulaski. Existing routes along this segment include Pace Routes 381 and 395. Land uses include major commercial and institutional uses. The Oak Lawn Shopping Center is located at the southwest corner of 95th Street and Pulaski Road. The Advocate Christ Medical Center is located at 95th Street and Kostner Avenue. The Green Oak Shopping Center is another major commercial attraction at the southeast corner of 95th Street and Cicero Avenue. There is also the Central Park and Pool north of the corridor, between Kostner Avenue and Cicero Avenue. Roadway jurisdiction belongs to the State.

TABLE 2.10 BUS STOPS BETWEEN PULASKI ROAD AND CICERO AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Pulaski Rd	EB/WB	172.8	178.7	IC&SC Shelter	Sign
4060 W 95th St	WB	N/A	22		Sign
4101 W 95th St	EB	17.4	N/A	Sign	
95th St & Keeler Ave	EB/WB	46.7	37	Sign	
95th St & Kildare Ave	EB/WB	13.4	14.2	Sign	Sign
95th St & Kostner Ave	EB/WB	71.8	92.7	IC&SC Shelter	IC&SC Shelter
95th St & Kilbourn Ave	EB/WB	25.6	29.5	Sign	Sign
95th St & Kenton Ave	EB/WB	18	13.2	Sign	Sign
95th St & Kilpatrick Ave	WB	N/A	43.5		Sign
95th St & Cicero Ave	EB/WB	128.8	115.7	Sign	Sign

2.6.7 95th Street: Cicero Avenue to Central Avenue (Segment G)

This segment is located in the Village of Oaklawn and includes the station locations of Cicero, Oak Lawn Patriot Metra, and Central. Connecting transit includes the Metra SouthWest Service near the Oak Lawn Patriot Metra station. Existing routes along this segment include Pace Routes 381 and 395, as well as Pace Route 383 along Cicero Avenue. Major uses along this segment include the Oak Lawn Public Library and the Oak Lawn Village Hall and Police Department. Roadway jurisdiction belongs to the State.

TABLE 2.11 BUS STOPS BETWEEN CICERO AVENUE AND CENTRAL AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & 49th Ave	EB	10.7	N/A	Sign	
95th St & Brandt Ave	EB/WB	6.7	6.7	Sign	Sign
95th St & Museum Dr	WB	N/A	21.7		Sign
95th St & 51st Ave	EB	17.8	N/A	Sign	
95th St & 52nd Ave	EB/WB	23.8	23.8	Sign	Sign
95th St & Raymond Ave	WB	N/A	15.9		Sign
95th St & 53rd Ave	EB	15.9	N/A	Sign	
95th St & 54th Ave	EB/WB	25.2	24.6	Sign	Sign
95th St & Lawton Ave/55th Ave	EB	1.7	N/A	Sign	
95th St & 55th Ave	WB	N/A	1.1		Sign
95th St & Central Ave	EB/WB	20.6	23.8	Sign	Sign

2.6.8 95th Street: Central Venue to Ridgeland Avenue (Segment H)

This segment is located in The Village of Oak Lawn and includes the station locations of Central, SW Highway, and Ridgeland. Existing routes include Pace Routes 381 and 395 running east-west, and Pace Route 382 running north-south along Central Avenue. Major uses along this segment include the Oak Lawn Community High School just north of the corridor at 95th Street and SW highway. Roadway jurisdiction belongs to the State.

TABLE 2.12 BUS STOPS BETWEEN CENTRAL AVENUE AND RIDGELAND AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
95th St & Major Ave	EB/WB	9.2	12.1	Sign	Sign
95th St & Mansfield Ave	EB/WB	18.5	17.7	Sign	Sign
95th St & Southwest Hwy	WB	N/A	60.4		Sign
95th St & Austin Ave	EB	63.4	N/A	Sign	
95th St & McVicker Ave	WB	N/A	35		Sign
95th St & Meade Ave	EB	27.7	N/A	Sign	
95th St & Melvina Ave	EB/WB	19.7	14.4	Sign	Sign
95th St & Merton Ave	EB	9.9	N/A	Sign	
95th St & Mobile Ave	WB	N/A	26.5		Sign
95th St & Ridgeland Ave	EB/WB	47.6	143.5	Sign	Sign

2.6.9 95th Street: Ridgeland Avenue to Harlem Avenue (Segment I)

This segment is located in the Village of Chicago Ridge and the Village of Oak Lawn. It also includes the station locations of Ridgeland and the potential future station of Harlem. Existing routes along this segment include Pace Routes 381 and 395. Major uses include the Chicago Ridge Mall at the southwest corner of 95th Street and Ridgeland Avenue, the Oak Lawn Park District located north of the corridor and west of Ridgeland Avenue. Roadway jurisdiction belongs to the State.

TABLE 2.13 BUS STOPS BETWEEN RIDGELAND AVENUE AND HARLEM AVENUE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
Chicago Ridge Mall (6500 W 95th St)	EB/WB	142.1	43.7	IC&SC Shelter	Sign
95th St & Nashville Ave	EB/WB	11.6	7.7	Sign	Sign
95th St & Normandy Ave	EB/WB	4.7	5.7	Sign	Sign
95th St & Oak Park Ave	EB/WB	12.5	24.5	Sign	Sign
95th St & New England Ave/69th Ave	EB	11.7	N/A	Sign	Sign
95th St & 69th Ave	WB	N/A	6		Sign

2.6.10 95th Street: Harlem Avenue to 76th Avenue (Segment J)

This segment is located in the Village of Bridgeview and the City of Hickory Hills. Station locations along this segment include the potential future station of Harlem as well as 76th. Existing routes along this segment include Pace Route 381. Land use in this area consists primarily of commercial, institutional, and some residential and office. Roadway jurisdiction along this segment belongs to the State. There are Route 381 stops along this segment.

2.6.11 Harlem Avenue: 95th Street to 103rd Street (Segment K)

This segment is located in The Village of Bridgeview, The Village of Oak Lawn, and the Village of Chicago Ridge. Station locations located along this segment include the potential future station of Harlem as well as Harlem/103rd. Land use consists of residential and manufacturing just south of 95th Street and Harlem Avenue, and mainly commercial north of Harlem Avenue and 103rd Street. Roadway jurisdiction belongs to the State. There are no stops along this segment.

2.6.12 76th Avenue: 95th Street to 103rd Street (Segment L)

This segment is located in the City of Hickory Hills and the Village of Bridgeview. It includes the station locations of 76th and Bridgeview Courthouse. Existing routes along this segment include Pace Routes 381 and 386. The major use along this segment includes the Bridgeview Courthouse directly west of 76th Avenue. There is also the United States Postal Service located east of 76th. Roadway jurisdiction belongs to the Village of Bridgeview.

TABLE 2.14 BUS STOPS ALONG 76TH AVENUE BETWEEN 95TH STREET AND 103RD STREET

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
76th Ave & 95th St	EB/WB	37.5	40.7	IC&SC Shelter	Sign
76th Ave & 100th Pl	EB	2.7	N/A	Sign	
Fifth District Courthouse (10220 S 76th Ave)	EB/WB	67.4	60.4	IC&SC Shelter	IC&SC Shelter

2.6.13 103rd Street: Harlem Avenue to 76th Avenue (Segment M)

This segment is located in the Village of Bridgeview and the City of Palos Hills. The station locations along this segment include Harlem/103rd and Bridgeview Courthouse. Existing routes include Pace Routes 381 and 386. Land uses along this segment consists primarily of residential with some commercial uses near 103rd Street and Harlem Avenue. Roadway jurisdiction belongs to the State. There are no Route 381 stops along this segment.

2.6.14 103rd Street: 76th Street to Roberts Road (Segment N)

This segment is located in the City of Palos Hills and the Village of Bridgeview. Station locations along this segment include Bridgeview Courthouse and Roberts/104th. Existing routes include Pace Route 381. Land use consists primarily of residential with commercial uses near 103rd Street and Roberts Road. The Bridgeview Courthouse is located northwest of 103rd Street and 76th Street. The Sorrick Elementary School is also located south along 103rd Street between 76th Street and Roberts Road. Roadway jurisdiction belongs to the County.

TABLE 2.15 BUS STOPS ALONG 103RD STREET BETWEEN 76TH AND ROBERTS

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
103rd St & 78th Ave	EB/WB	0.9	0.7	Sign	Sign

2.6.15 Roberts Road: 103rd Street to 107th Street (Segment O)

This segment is located in the City of Palos Hills and includes the station location of Roberts/104th. Existing bus routes includes Pace Route 381. Land use along this segment consists primarily of commercial and residential uses as well as some institutional uses. These include the Palos Hills City Administration, Palos Hills Healthcare, and the North Palos Fire Protection. Jurisdiction along Roberts Road belongs to the County.

TABLE 2.16 BUS STOPS ALONG ROBERTS ROAD BETWEEN 103RD STREET AND 107TH STREET

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
Roberts Rd & 103rd St	EB/WB	12.4	12.1	IC&SC Shelter	Sign
Roberts Rd & 105th St	EB/WB	6.8	8	Sign	Sign
Roberts Rd & 107th St	EB/WB	5.9	7.2	Sign	Sign

2.6.16 107th Street: Roberts Road to Moraine Valley Community College (Segment P)

This segment is located in the City of Palos Hills and includes the western terminus of the 95th Street Line Corridor at Moraine Valley Community College. Connecting Pace routes include Route 379, 381, and 385.

TABLE 2.17 BUS STOPS ALONG 107TH STREET BETWEEN ROBERTS ROAD AND MORAINE VALLEY COMMUNITY COLLEGE

Segment	Direction	Average Weekday Boardings/Alightings (2017)		Treatment	
		EB	WB	EB	WB
107th St & Christa Ct	EB	0.3	N/A	Sign	
107th St & 81st Ave	WB	N/A	0.4		Sign
107th St & 82nd Ave	WB	N/A	0.3		Sign
107th St & Olympia Circle	EB	1.7	N/A	Sign	
107th St & 83rd Ave	WB	N/A	1.8		Sign

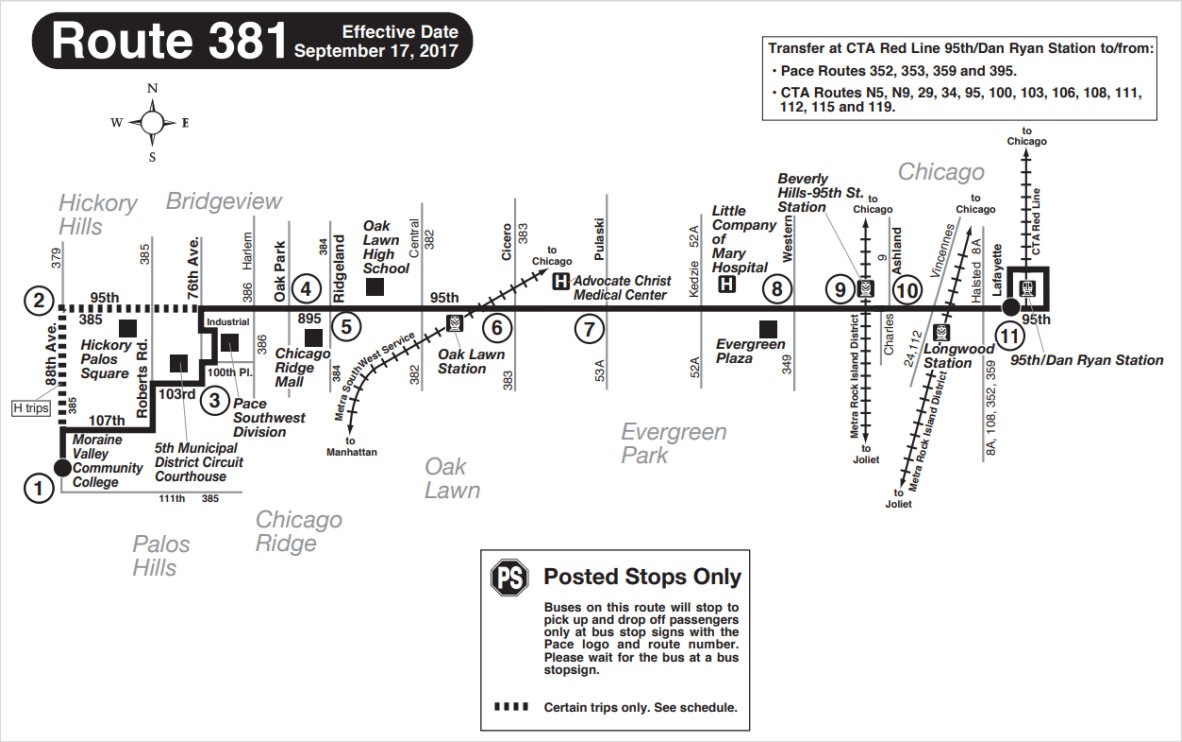
107th St & Meadow Ln	EB	1.4	N/A	Sign	
107th St & 84th Ave	EB/WB	0.6	1.4	Sign	Sign
107th St & 86th Ave	EB/WB	0.7	0.8	Sign	Sign
Moraine Valley Community College	EB/WB	216.8	211.9	Shelter	Shelter

3 Existing Ridership Analysis

Ridership data was analyzed to better understand boarding, alighting, and transfer patterns along the 95th Street corridor. This analysis informed the development of the Pulse 95th Street Line, including the placement of preliminary station locations and routing. Analysis of existing ridership also informed Pace's understanding of how well Pulse service would serve current Route 381 riders.

The Pulse 95th Street Line generally aligns with local Pace Route 381. Route 381 provides daily service to several communities along the 95th Street corridor, including Chicago, Evergreen Park, Oak Lawn, Chicago Ridge, Bridgeview, Hickory Hills, and Palos Hills. The service serves destinations between the CTA Red Line 95th Street Station in Chicago and Moraine Valley Community College in Palos Hills, as shown in Figure 3.1.

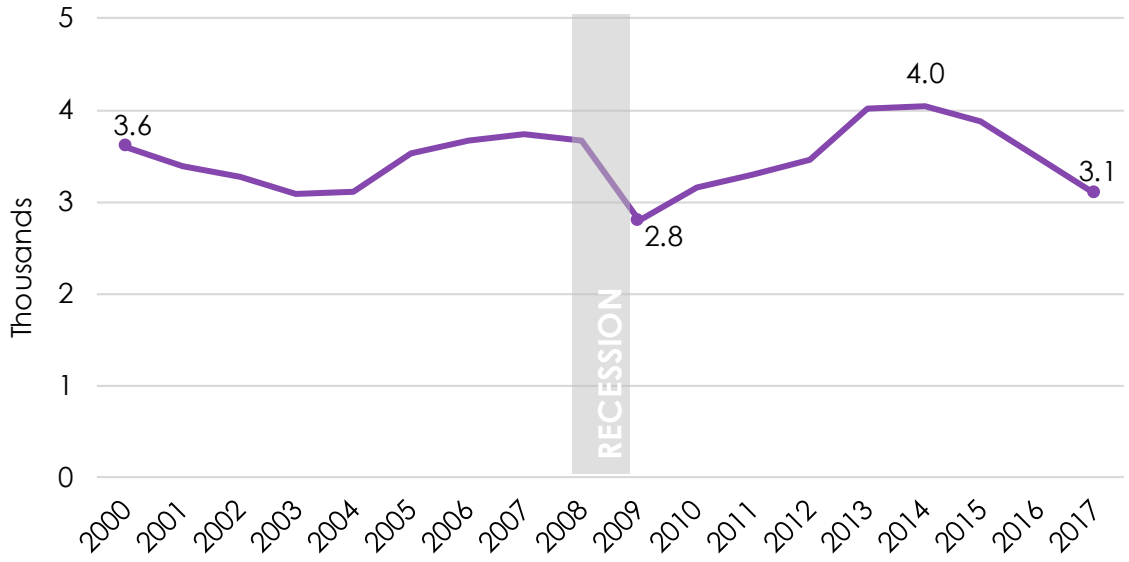
FIGURE 3.1 PACE ROUTE 381 MAP



Source: Pace Suburban Bus

Route 381 ridership has declined since its post-recession Peak of more than 4,000 average weekday riders in 2014. Several factors may have contributed to this decline, such as the 2013 CTA Red Line South Reconstruction Project, service coordination with CTA Route 95W, the subsequent consolidation of Route 95E and 95W in 2016, and declining CTA Red Line Dan Ryan branch ridership trends. Figure 3.2 represents Route 381 average weekday ridership from 2000 to 2017.

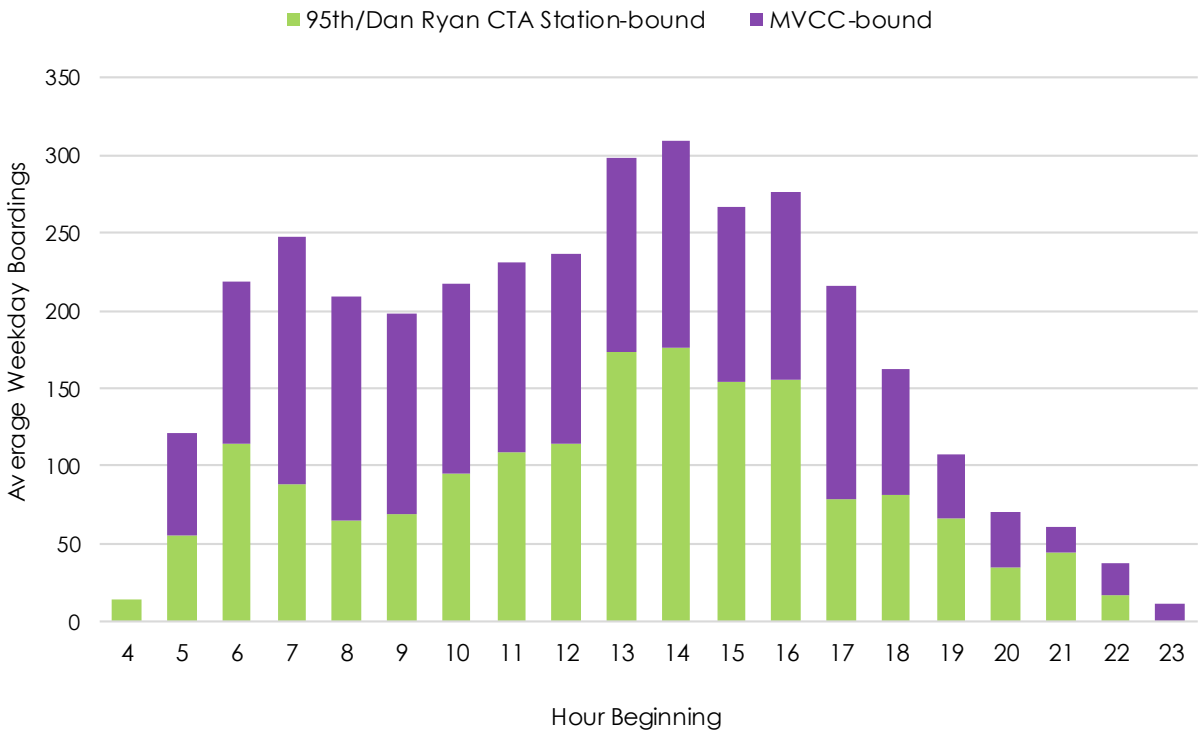
FIGURE 3.2 ROUTE 381 AVERAGE WEEKDAY RIDERSHIP, 2000-2017



Source: RTAMS

Analysis of Route 381 boardings by hour shows that Route 381 is utilized by riders throughout the day with the highest ridership occurring between 1PM and 3PM. This is an atypical pattern compared to more typical AM/PM Peak commute patterns, as shown in Figure 3.3. This data demonstrates the higher amount of non-commute trips along the 95th Street corridor, including school trips and after-work trips to commercial clusters along the route.

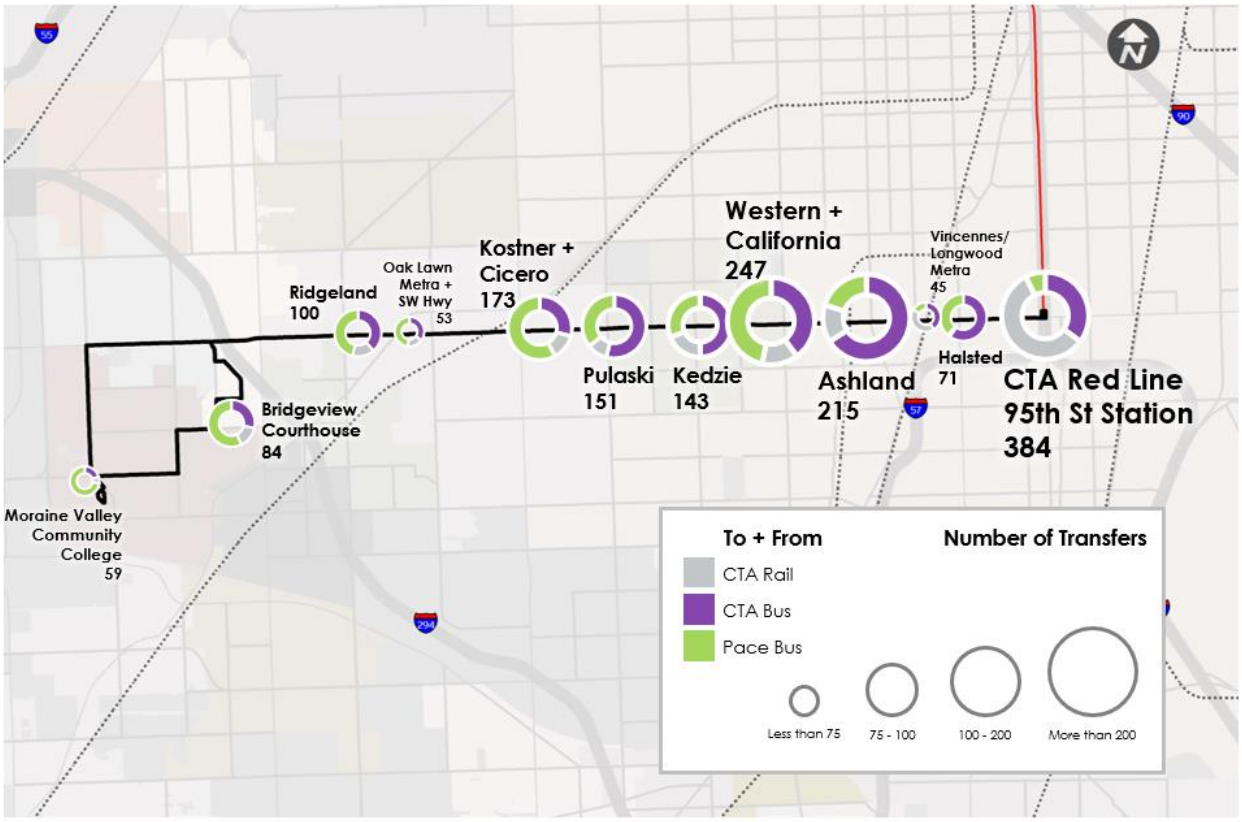
FIGURE 3.3 ROUTE 381 - BOARDINGS BY HOUR



Note: Based on Pace APC data for Oct 2017.
Source: Pace

Figure 3.4 shows the locations of transfer activity to or from the Route 381 service. The Pace-provided data only reflects transfers immediately before boarding Pace Route 381 or immediately after alighting Pace Route 381 for the month of October 2017. The data includes weekday Ventra activity and does not include Metra transfers. Some preliminary Pulse 95th Street station locations were aggregated by Pace staff into broader route segments.

FIGURE 3.4 AVERAGE WEEKDAY TRANSFERS TO/FROM ROUTE 381, OCTOBER 2017



Note: Data represents weekday Ventra transfers immediately before boarding pace Route 381 or immediately after alighting pace Route 381 for the month of Oct 2017. Dataset does not include Metra transfers.
Source: Pace-aggregated Ventra data.

The data shows more transfer activity on the eastern half of Route 381, specifically within the City of Chicago. This transfer activity often corresponds with areas of denser population and connections to other transit services, including other Pace bus routes, CTA bus routes, and CTA rail. The highest transfer activity occurs at the CTA Red Line 95th Street Station/Day Ryan station – the southern terminus of the CTA Red Line and a connection point to several CTA and Pace bus routes.

Pace identified select Route 381 bus stops to serve as a basis for the Pulse 95th Street Line station locations. Analysis of existing ridership data helped evaluate the suitability of these preliminary station locations and led to the recommendation of additional and alternative locations.

The following tables show the Route 381 stop pairs with the highest total weekday boardings (Table 3.1) and weekday alightings (Table 3.2). Stop pairs capture bi-directional ridership activity at a given location. This analysis is based on weekday ridership data from October 2017.

Locations with high boarding and alighting activity largely corresponded with the Pace-identified preliminary station locations. The highest boarding and alighting activity occurred at the Pace 95th/Dan Ryan CTA Station stop, where Route 381 terminates and connects to the CTA Red Line 95th Street Station Dan Ryan terminal. The bus stop at Moraine Valley Community College on the route's western terminus also logged high levels of boarding and alighting activity. Other notable locations include stops where transfer activity occurs (Ashland Avenue; Halsted Street) and areas with commercial activity (Western Ave/Campbell Avenue; Chicago Ridge Mall/Ridgeland Avenue).

TABLE 3.1 ROUTE 381 TOP 10 STOPS BY WEEKDAY BOARDINGS

	Stop	Municipality	Weekday Boardings
1	95th/Dan Ryan CTA Station	Chicago	484
2	Ashland Ave	Chicago	242
3	Western Ave/Campbell Ave	Evergreen Park	215
4	Moraine Valley Community College	Palos Hills	215
5	Pulaski Rd	Oak Lawn	184
6	Halsted St	Chicago	177
7	Cicero Ave	Oak Lawn	130
8	Chicago Ridge Mall	Oak Lawn	126
9	Wentworth Ave	Chicago	123
10	Kostner Ave	Oak Lawn	81

TABLE 3.2 ROUTE 381 TOP 10 STOPS FOR WEEKDAY ALIGHTINGS

	Stop	Municipality	Weekday Alightings
1	95th/Dan Ryan CTA Station	Chicago	621
2	Western Ave/ Campbell Ave	Evergreen Park	250
3	Ashland Ave	Chicago	241
4	Moraine Valley Community College	Palos Hills	214
5	Pulaski Rd	Oak Lawn	168
6	Ridgeland Ave	Chicago Ridge/ Oak Lawn	137
7	Halsted St	Chicago	121
8	Cicero Ave	Oak Lawn	115
9	Kostner Ave	Oak Lawn	84
10	Troy Ave	Evergreen Park	67

A "capture analysis" was conducted to evaluate how many existing Route 381 riders the Pulse 95th Street Line would serve. The capture analysis was based on the refined preliminary station locations (summarized further in Chapter 4) along the 76th Avenue route variant.

Boarding and alighting data associated with Route 381 stops was "captured" by one-eighth mile and one-fourth mile buffers around each preliminary Pulse station location. The preliminary station locations capture an estimated 90% of Route 381 ridership within a one-fourth mile buffer, and 73% within a one-eighth mile buffer. Table 3.3 tabulates ridership by preliminary station location.

TABLE 3.3 ROUTE 381 RIDERSHIP CAPTURE NEAR PRELIMINARY PULSE STATION LOCATIONS

Station Location	1/4 Mile Buffer Ridership	1/8 Mile Buffer Ridership
CTA Red Line 95th St Station	1,252	1,105
Halsted	387	314
Vincennes (Longwood Metra)	232	143
Ashland	627	509
Wood (Beverly Hills Metra)	612	112
Western	578	436
California	250	137
Kedzie	335	271
Pulaski	458	383
Kostner	307	222
Cicero	330	245
Oak Lawn Patriot Metra	127	63
Central	132	69
SW Highway	223	160
Ridgeland	455	360
Harlem [1]	-	-
76th	112	85
Bridgeview Courthouse	129	60
Roberts/104th	39	33
Moraine Valley Community College	430	429
Harlem/103rd [2]	N/A	N/A
Ridership in Merged Buffers [3]	**6,400**	**5,100**

Total Route 381 Ridership [4]	**Capture as % of Total Ridership**	
7,048	**90%**	**73%**

Note: Based on Pace APC data for Oct 2017. Totals were rounded. Source: Pace
[1] Route 381 data N/A at this location. Future Station siting at this location is dependent on an Illinois Department of Transportation (IDOT) Interchange Design Study (IDS) plan, which would result in the restructuring of the full cloverleaf interchange at this location.
[2] Route 381 data N/A at this location (located off Route 381).
[3] Total does not reflect a sum of the counts above to prevent double counting due to overlapping buffers at some locations.
[4] Ridership includes boarding and alighting counts.

4 Stations

This section documents the proposed Pulse 95th Street Line station set and furthers station-related subtasks delivered under the Pulse 95th Street Line Project Definition task order. Deliverables for the following subtasks were submitted to Pace staff for review between November 2018 and January 2019: Station Locations (2.3.3); Typical Station Concepts (2.3.6); and Conceptual Station Layouts (2.3.7). This section supports those deliverables and documents the Station Functional Requirements (2.3.4), Station Area Roadway Treatments (2.3.5), and subsequent station-related feedback from Pace staff and project stakeholders.

Figure 4.1 illustrates the preliminary Pulse 95th Street Line with two potential routes between 95th Street and 103rd via 76th Avenue or Harlem Avenue. The routing between 95th Street and 103rd Street will be determined based on supporting improvement plans for the Tri-State Tollway (I-294) and the Pulse Harlem Line, among other factors. Some station location decisions on the west end of the Pulse 95th Street Line are subject to this routing decision.

FIGURE 4.1 PULSE 95TH STREET LINE

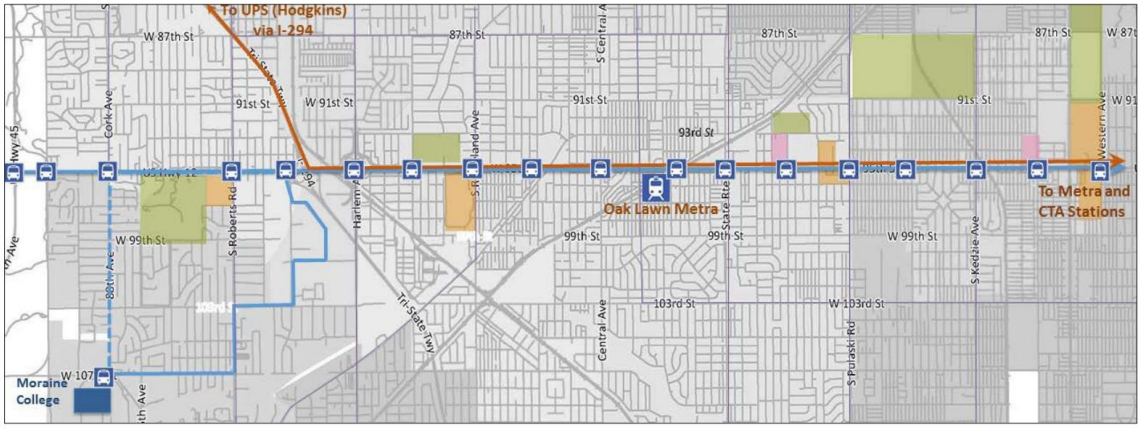
Source: Pace, PMO

4.1 Overview

In April 2015, the Pace 95th Street Corridor Transportation Plan[6] identified a preliminary set of station locations[7] along the 95th Street corridor between Western Avenue in Chicago/Evergreen Park to LaGrange Road in Palos Township (Figure 4.2). The PMO used this work as a starting point to evaluate the suitability of the preliminary station locations and recommend additional or alternative station locations for the Pulse 95th Street Line.

The PMO based subsequent station location and siting recommendations on several variables, including a ridership analysis of local Pace Route 381 and connecting transit services, multi-modal connection points, existing and future land use patterns, street cross-sections, field observations, and stakeholder input. Recommended station locations and sites were presented to Pace staff for review in November 2018. Refined station sites were provided in December 2018 to inform Pace's consideration of station sites to be developed with station layouts.

FIGURE 4.2 PRELIMINARY PULSE 95TH STREET LINE STATION LOCATIONS, 2015 PACE 95TH STREET CORRIDOR TRANSPORTATION PLAN



Source: 2015 Pace 95th Street Corridor Transportation Plan

[6] For more information on the 95th Street Corridor Transportation Plan, refer to: http://www.pacebus.com/pdf/Initiatives/95th_St_Transportation_Final_Report.pdf

[7] The Plan identified potential Pace Arterial Rapid Transit (ART) stations along the 95th Street corridor. Note that the route analyzed differs from the preliminary Pulse 95th Street Line route. For more information, see Appendix B1.

4.1.1 Station Location Evaluation

The PMO evaluated 21 station locations. Of that total, 20 station locations were developed and are recommended for evaluation during the National Environmental Policy Act (NEPA) phase. An additional station may be constructed at Harlem Avenue should the Harlem Avenue/95th Street interchange be reconfigured. These 20 stations are included in Conceptual Station Improvement Plans in Appendix E. The CTA Red Line 95th/Dan Ryan Station is included in the plan set, though a station layout was not necessary at the as there are no station improvements planned here; the CTA has assigned a bus bay for Pace Route 381 at the renovated CTA Red Line 95th/Dan Ryan Station North Terminal and will do the same for the Pulse 95th Street Line. Table 4.1 summarizes the total number of station locations and sites[8] identified early in the project definition phase (December 2018), In January 2019, after the Corridor Advisory Group held in December, sites were eliminated based on fatal flaws or operational issues. Table 4.2 summarizes the station locations by their source (either as a Pace or PMO recommendation), and the current recommendation for inclusion of the station.

TABLE 4.1 TOTAL NUMBER OF STATION LOCATIONS AND SITES

	December 2018	January 2019
Station Locations	21	20
Eastbound Sites	46	22
Westbound Sites	39	19
Total Station Sites	85	41

Source: Pace, PMO

TABLE 4.2 PULSE 95TH STREET LINE STATION LOCATION STATUS SUMMARY

Station Location	Source	Recommendation
CTA Red Line 95th/Dan Ryan Station	Pace	Concur
Halsted	Pace	Concur
Vincennes (Longwood Metra)	Pace	Concur
Ashland	Pace	Concur

[8] Station "locations" refer to the general bi-directional location of a Pulse station proximate to an intersection. Station "sites" refer to the specific sites where a station platform may be constructed at a particular station location.

Station Location	Source	Recommendation
Wood (Beverly Hills Metra)	PMO	Add New Station
Western	Pace	Concur
California	Pace	Concur
Kedzie	Pace	Concur
Pulaski	Pace	Concur
Kostner	Pace	Concur
Cicero	Pace	Concur
Oak Lawn Patriot Metra	Pace	Concur
Central	PMO	Add New Station
SW Highway	Pace	Concur
Ridgeland	Pace	Concur
76th [1]	PMO	Potential Station
Bridgeview Courthouse	Pace	Concur
Harlem/103rd [2]	Pace	Potential Station
Roberts/104th	PMO	Add New Station
Moraine Valley Community College	Pace	Concur
Harlem [3]	PMO	Potential Future Station

Note: [1] [2] Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing yet to be determined. These station locations are subject to this routing decision.
[3] Potential Station siting dependent on the restructuring of the Harlem interchange at this location.
Source: Pace, PMO

4.1.1.1 Added Stations

As previously noted, the basis of the original station location set was the 95th Street Corridor Transportation Plan. During the course of this project development phase, the following station locations were added to the Pulse 95th Street Line. The rationale for the inclusion of the added stations is as follows:

- **Wood (Beverly Hills Metra):** Provides a convenient interagency transfer to the Metra Rock Island District service via the 95th Street – Beverly Hills Metra station. The infill station would capture an estimated 112 net new weekday riders.[9]
- **Central:** Provides consistent station spacing between the Oak Lawn Patriot Metra and SW Highway station locations. The infill station would capture an estimated 120 net new weekday riders.[10]
- **Roberts/104th:** Provides consistent station spacing between the Bridgeview Courthouse station location and MVCC terminus, serving nearby multi-family residential, medical, and institutional uses. The infill station would capture an estimated 50 net new weekday riders.[11]

4.1.1.2 Potential Stations

The following station locations were added as Potential Station locations for consideration along the Pulse 95th Street Line, based on the following rationale:

- **76th:** Provides consistent station spacing between the Harlem and Bridgeview Courthouse station locations. The infill station would bring Pulse service to the City of Hickory Hills and capture an estimated 111 net new weekday riders.[12] Station siting at this location is dependent on the Pulse 95th Street Line route variant selected.
- **Harlem/103rd:** Ultimately, station siting at this location is dependent on the Pulse 95th Street Line route variant selected. However, the addition of this station would provide consistent station spacing between the Harlem and Bridgeview Courthouse station locations. An estimated ridership capture is not available as this station location is located off the local Pace Route 381 route. This location would provide an opportunity for shared Pulse stations associated with the future Pulse Harlem Line and I-294 express services. A vacant site located at the southeast corner of Harlem Avenue and 103rd Street in Chicago Ridge may provide a potential redevelopment opportunity for Pace and the Illinois Tollway for use as a bus terminus.
- **Harlem:** Provides consistent station spacing between the Ridgeland and 76th station locations and would provide an east-west connection to the future Pulse Harlem Line. Station siting at this location is dependent on an Illinois Department of

[9] Based on Pace-provided weekday Route 381 APC data for October 2017.
[10] Based on Pace-provided weekday Route 381 APC data for October 2017.
[11] Based on Pace-provided weekday Route 381 APC data for October 2017.
[12] Based on Pace-provided weekday Route 381 APC data for October 2017.

Transportation (IDOT) Interchange Design Study (IDS) plan, which would result in the restructuring of the full cloverleaf interchange at this location.

4.1.2 Station Site Evaluations

Station sites were qualitatively evaluated on several factors, including: operations; constructability; available right-of-way; traffic movements; ridership and passenger markets including proximity to high ridership stops, ridership generators, and transfer connections; impacts on adjacent properties; pedestrian movement and access; ADA implications; current and future land use; local context; stakeholder input; and potential impacts on project schedule and cost. Existing Park-and-Ride (PnR) were evaluated as well. These factors (detailed below) were considered when evaluating each station site for potential further development with a station layout and advancement to the NEPA screening phase. The qualitative evaluation of individual station sites is documented in Section 4.3.

4.1.2.1 Passenger Comfort and Accessibility

- Proximity to a signalized intersection or safe protected pedestrian crossing;
- Sidewalk connections;
- ADA implications including available space for constructing accessible ramps;
- Proximity to major trip generators;
- Proximity to the corresponding station platform in the opposite direction of travel;
- Proximity to other local bus routes, including the potential for a shared station to serve connecting local buses;
- Connections to proposed Pulse Lines on Halsted Street, Cicero Avenue, and Harlem Avenue; and
- Aesthetic considerations and place-making potential.

4.1.2.2 Right-of-Way and Property Impacts

- Sufficient curb length and sufficient right-of-way width for development of a station (based on a typical Pulse station requiring contiguous space of approximately 60 feet in length and 12 feet in width (see Section 4.2.3), although a smaller footprint could accommodate constrained sites (see Section 4.2.3));
- Cost and schedule impacts associated with modifications, additional features, and/or remediation associated with construction at specific sites;

- Potential impacts on adjacent property owners, particularly the need to acquire land or to relocate or close driveways (these impacts should be minimized unless substantially outweighed by other benefits of a particular location); and
- Future development plans along the corridor.

4.1.2.3 Operations and Maintenance

- Transit signal priority (TSP) opportunities, particularly for locations where TSP is recommended. Farside stations are preferred for TSP intersections to maximize TSP benefits, and also at locations where preliminary analysis did not result in a TSP recommendation in order to facilitate future signal priority or other intersection treatments; and
- Traffic movements such as right turn lanes.

4.1.2.4 Stakeholder Feedback

- Input received from local communities, agencies, and project partners

4.2 Station Design

In 2013 and 2014, the Pulse station functional requirements, features, and layouts were established during the project definition phase of the first Pulse corridor, the Pulse Milwaukee Line. These were refined through the advanced conceptual design and design phases for the Pulse Milwaukee Line and Pulse Dempster Line and provide a foundation for the Pulse 95th Street Line.

The following sections describe the Pulse station functional requirements, including key passenger, operational, branding, and naming considerations; primary station feature characteristics; and two typical station layout concepts examples.

4.2.1 Station Functional Requirements

Station facilities will be the most visible physical elements associated with Pulse service throughout the Pace system. Stations along the 95th Street corridor should balance the need to express permanence and consistency throughout the Pulse system with a desire to accommodate local community context and preferences.

Station design priorities include providing passenger amenities for comfort and safety, operational considerations, and aesthetic and branding considerations that make the service attractive, legible, and recognizable. These design priorities informed the development of the station functional requirements and influenced the development of appropriate site-specific station solutions. Functional requirements include the following key design considerations:

4.2.1.1 Passenger Comfort and Safety Considerations

- The Chicago region's climate requires that adequate station shelter be provided for waiting passengers.
- Stations shall be fully compliant with the Americans with Disabilities Act (ADA).
- Safety shall be a primary consideration in all shelter designs.
- Nearby driveways may require modified design solutions to ensure that pedestrian-vehicle conflicts are minimized.
- Stations shall preserve adequate sight distance and visibility for pedestrians as well as cyclists, bus drivers, and other motorists.
- Stations near bicycle lanes shall be designed to minimize bicycle-pedestrian conflicts as well as bus-bicycle conflicts.
- Stations shall be designed to function as part of the surrounding sidewalk network when space or local preferences preclude routing the sidewalk behind the station.

4.2.1.2 Operational Considerations

- Local bus routes operating within the corridor shall be accommodated at Pulse stations where appropriate. This may include buses operated by Pace and CTA. Where Pulse stations are located near, but not concurrent with, existing stops, the existing stops may be considered for closure. Stations served by CTA buses may require modifications to platform height in order that they may serve both Pace and CTA fleet vehicles.
- Stations shall provide appropriate drainage for rain and snow within the public right-of-way and shall not direct drainage toward buildings or onto private property.
- The use of heated pavement for de-icing and the additional power requirements for all station heating elements shall be incorporated into preliminary station planning and design documents.
- Station platforms shall be designed for clear, intuitive operational usage.
- Stations shall be located to preserve bus driver sight distance requirements for nearby streets and access drives.
- Stations and the adjacent roadway shall be laid out to ensure safe operation of the bus as it approaches, dwells, and departs the station.

- Stations shall be located and designed to minimize the impact to adjacent properties, sidewalks, and access drives.
- Stations shall be designed to facilitate maintenance. Maintenance may include shelter repairs, snow removal, and vertical marker upkeep.
- Pace and/or its contractors shall maintain Pulse stations. Pace may establish local community partnerships for the maintenance of some elements, including any landscaping.

4.2.1.3 Branding Considerations

- Stations shall provide a consistent user experience, even if their physical configuration may vary due to unique site or service conditions.
- Vertical markers that are separate from the shelter structure shall serve as the primary visual expression of the Pulse brand, with near-level boarding platforms as another key distinguishing feature.
- Branding elements shall be applied to the vertical marker (illustrated in Figure 4.3).
- Opportunities have been identified to customize selected station features to express local community character while preserving the distinct Pulse brand. More details regarding community expression and cost sharing are provided in the Station Feature Set subsection.
- The Pulse Station Naming Guidelines were developed in November 2015 to establish consistency throughout the Pulse program and finalize the Pulse Milwaukee Line station names. These standards will also be used for the Pulse 95th Street Line. Station names for each station shall be incorporated into the shelter design to enhance each station's identity as part of the rapid transit line.

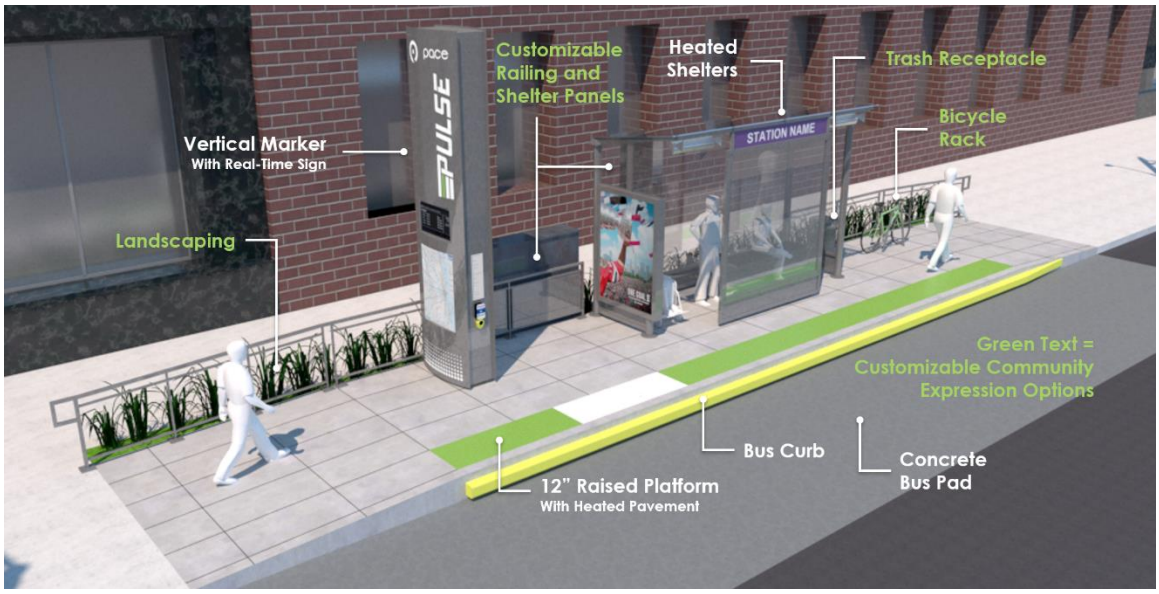
FIGURE 4.3
VERTICAL MARKER WITH BRANDING

4.2.2 Station Feature Set

The station feature set was established during the Pulse Milwaukee Line Project Definition based on Pace's design priorities and typical station functional requirements. The features

depicted in Figure 4.4 and described below were refined during the design of the Pulse Milwaukee Line and have been incorporated into the Pulse 95th Street Line station layout concepts. Portions of these station features can be customized by local communities to reflect local community character and context[13].

FIGURE 4.4 TYPICAL PULSE STATION AND FEATURE SET



Source: Pace, PMO

The following features shall be incorporated into the Pulse 95th Street Line stations:

4.2.2.1 Shelters

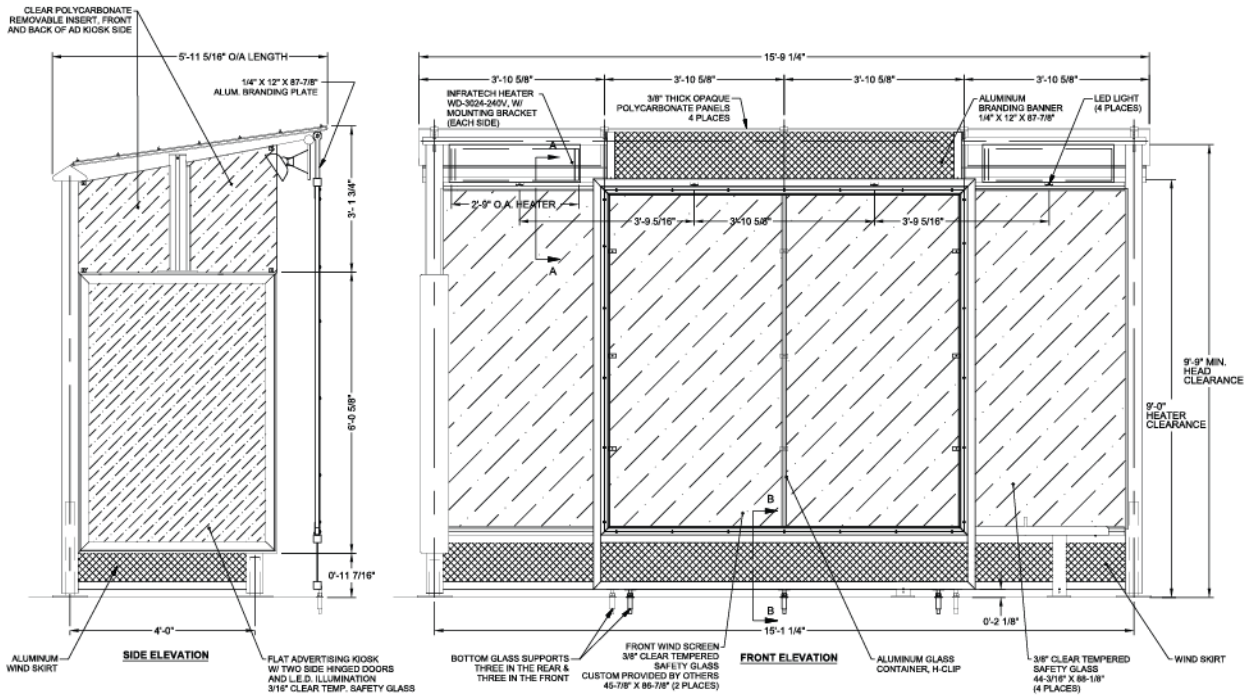
- Each station shall include a partially enclosed, fully accessible shelter structure to include rear, side, and, when space allows, front panels for weather protection. The shelter will be approximately 16 feet long and six feet deep based on the designs used for the Pulse Milwaukee line[14]. The shelter is to be furnished and installed by the construction contractor hired by Pace, based on approved design and palette options. Some stations may require a modified station shelter, which shall be based upon the selected typical Pulse shelter. Figure 4.5 shows the side and front standard

[13] In early 2016, Pace developed guidelines as part of the Pulse Milwaukee Line design to establish standards for the customization of some station elements as well as maintenance and cost sharing responsibilities associated with customization. These standards are detailed in the guidance document entitled *Community Expression Features: Cost Sharing Strategy and Coordination Guidelines*.

[14] The original design was based on the Tolar 16' Ad 'Orion' shelter.

shelter elevations for the shelter designed for use on the Pulse Milwaukee Line and throughout the Pulse Program, provided that some modifications to the shelter may be warranted in the future.

FIGURE 4.5 STANDARD SHELTER ELEVATIONS (SIDE AND FRONT)



Source: Pace

- The front shelter panel shall be etched with the Pulse frit pattern and shall include the station name. Rear and approach-side shelter panels will be transparent glass. Communities may opt to include a customized rear etched glass panel. The side panel toward the departing end of the platform will be a two-sided advertising/information panel.
- All glass shelter panels shall be vandal-resistant and have an anti-graffiti film or coating.
- For cleanliness and comfort, there shall be a gap of approximately two to four inches between the shelter walls and the platform surface. A wind skirt may be incorporated into the shelter walls to further protect waiting passengers from the elements.
- Shelters shall have an angular roof made of metal, glass, or other approved materials. Shelters shall not have flat or curved roofs.

- A wheelchair waiting area, bench, and additional standing waiting area shall be accommodated within the shelter. Shelter bench seats shall be flat, have seat dividers, and be made of recycled plastic or wood and steel.
- Shelter interiors shall be wheelchair accessible and ADA-compliant.
- Shelters shall be illuminated via interior lighting integrated within the structure. The lighting shall be sufficient for passenger comfort as well as to illuminate the station name on the front panel.
- Pending local policies, advertising panels on the shelter and the real-time arrival sign on the vertical marker shall be positioned to maximize visibility and sight lines at the stations.
- Shelters shall provide overhead infrared heating for passenger comfort in cold weather. Durable, tamper-proof activation mechanisms, such as piezoelectric buttons, shall be utilized along with theft deterring hardware.
- Pace shall coordinate with communities to determine if cameras/call boxes are desired at the shelters. If desired, Pace can provide pre-wired accommodations but shall not pay for installation, nor monitor or maintain any such systems.

4.2.2.2 Station Platforms and Loading Areas

- Each station shall include a vertical marker or signage element placed so as to indicate to riders and the bus driver the general front-door boarding location.
- Flag signs for local Pace routes do not need to be provided at Pulse stations. Transfer connections to local routes stopping at a Pulse station shall be indicated on the vertical marker if applicable. CTA may continue to require flag signs at stations where CTA buses will stop; this shall be coordinated with CTA. The typical station platform shall provide near-level boarding at a height of 12 inches above the roadway surface, which is six inches above a typical adjacent sidewalk, and shall be accessed via ADA-compliant pedestrian ramps at a 1:20 slope at either end. Alternative pedestrian access options shall be considered on a case-by-case basis to accommodate site constraints. The 12-inch high boarding platform shall be constructed of concrete over a minimum of four inches of compacted granular sub-base. Where stations are also planned to serve CTA fixed routes, the near-level boarding height shall be 11 inches above the roadway surface.
- Standard concrete is assumed for platforms.
- An electric pavement heating system sufficient for prevention of snow and ice buildup shall be embedded in the concrete platform and ramps, thus mitigating slip hazards. Snow melt systems elements can be detected prior to any future concrete penetrations, and can be repaired if inadvertently damaged. The snow

melt system has been designed into the station platforms for the Pulse Milwaukee Line. The snow melt system on the Pulse Milwaukee Line shall be continually monitored and evaluated for any modifications that may need to be incorporated into the installation on the Dempster Line.

    - The pavement heating systems, as well as the shelter heaters, will be significant power draws when in operation (between 200A and 250A). Therefore, the local energy utility, ComEd, will need to evaluate the impact on the power distribution system along the corridor; coordination with ComEd will also be needed to locate a 120/240V power source and determine how it will route to the utility meters. This shall be an early coordination item during advanced conceptual design.

- The rear of the platform shall be separated from the surrounding area by pipe railing. This standard design will allow for community expression in the form of two panels mounted to the railing along the back of the platform. A community may customize these infill panels subject to standards established in the Community Expression Features: Cost Sharing Strategy and Coordination Guidelines document.
- Per individual station site plans, concrete curb and gutter shall be removed and reconstructed with gutter widths matching existing conditions (either B6.12 or B6.24) unless otherwise specified. The height of the barrier curb will slope from the existing curb height to the 12-inch high curb.
- A green detectable warning strip shall be installed at the back of curb along the open boarding edge of the raised platform. A segment of warning strip having a contrasting color (e.g. white) shall be installed in a location that indicates the front door boarding area. Color selections for the detectable warning strip and the contrasting segment should match or approximate approved colors of the Pulse brand.
- A bus curb shall be installed along the face of the curb to facilitate near level boarding, optimize curb to bus distance for boarding and alighting passengers, and to limit damage to the curb, vehicle, and tire.
- A 60 feet long and at least 10 feet wide concrete bus loading pad shall be installed adjacent to each station platform to provide for a consistent platform-to-roadway height tolerance at the loading edge of the platform and a durable pavement solution for bus operations. Consistent with the design for the Milwaukee Line, the design specifications for the bus pad shall be based on CDOT standards, which call for 10 inches of concrete pavement over a minimum of eight inches of granular sub-base. The concrete pad shall be tied to the existing pavement and curb and

gutter with dowel bars, and joint sealer shall be poured along the full perimeter of the pad. The bus pad shall extend 10 feet from the gutter, or to the existing pavement joint, whichever distance is greater.

- Figure 4.6 depicts a typical concrete bus loading pad in relation to the platform.

FIGURE 4.6 PULSE STATION RENDERING WITH TYPICAL CONCRETE BUS PAD EXTENTS

Source: Pace, PMO

- Station electrical cabinets shall be located adjacent to each station platform in an area that is accessible for maintenance purposes. Where possible, the electrical cabinet shall be installed at the end of the platform, near the bicycle rack, or behind the shelter, facing away from the road. This will avoid obstructing movement on the platform and minimize its visual appearance. To the extent possible, the electrical cabinets shall be sited to minimize impacts to adjacent properties. The cabinet shall be a NEMA 4X enclosure and shall be made of a brushed stainless steel designed for exterior installation with extra corrosion resistance to road salt. The cabinets shall be rectangular and shall not exceed 60 inches wide by 18 inches deep by 74 inches in height. However, the actual size of cabinet may vary and should be minimized to the greatest extent possible to reduce potential property impacts. The enclosure shall be mounted on a solid concrete foundation.

- The power and control cabinet shall be equipped with two doors: one side of the cabinet shall contain power distribution equipment, while the other side shall be designated for various control and communication equipment. The site's utility meter

shall be installed on the side of the cabinet adjacent to the 120/240V distribution panel. The dimensions indicated assume that all planned electrical components will be included in the station. If certain components, particularly the shelter heaters and/or pavement snow melt system, are excluded, the required size of the electrical cabinet may be reduced and/or eliminated provided that the vertical marker is able to serve as an electrical cabinet.

4.2.2.3 Station Furnishings and Amenities

- Each station shall include a vertical marker, incorporating the Pulse brand and informational signage. The vertical marker was designed as part of the Pulse Milwaukee Line design contract and has been refined during fabrication. As the Pulse 95th Street Line progresses, these updates to the vertical marker will be incorporated. The vertical marker shall be designed and bid as a comprehensive system with all necessary hardware and software.
    - Sign height ordinances may limit the height of the vertical marker in some communities along the Pulse 95th Street Line. For this reason, design options may be needed, and the placement of reduced height markers shall be considered on an as-needed basis while maximizing visibility of the Pulse station.
    - Real-time information signs shall be located within the vertical marker and visible from the platform and the street. The signs shall be visible from both sides of the marker. The real time information sign system shall be designed, detailed, and bid as part of the Pulse 95th Street Line construction or as part of an integrated technology contract, which is to be determined by Pace.
    - In addition to the real-time arrival display, additional signage incorporated into the vertical marker shall include a static route map, wayfinding signage, and information on connecting CTA and Pace routes, if appropriate. All static information shall be easily updated and modified, while also being vandal-resistant.
    - To the extent possible, the vertical marker may be designed to accommodate electrical power and control equipment sufficient to supply all electrical components at the station, except for those needed for the pavement snow melt and shelter heater systems. This allows for the separate electrical cabinet to have a more modest size to accommodate the pavement snow melt and shelter heating systems.
- Bicycle storage shall be provided at every station where feasible. Racks shall allow for both front and rear wheel attachment, rather than being narrow in configuration.

Where space allows, at least one rack, capable of accommodating two bicycles, shall be provided at each typical Pulse station. Although a standard bicycle rack will be included in the typical Pulse station design, Pace will install a substitution of the community's choice that meets the design requirements subject to the Community Expression Features: Cost Sharing Strategy and Coordination Guidelines. Pace has selected the *Landscape Forms Bola* model as its standard bicycle rack.

- A metal-body trash receptacle shall be provided at every station. Trash receptacles should be of a 30- to 40-gallon capacity and fire resistant. Receptacles shall be bolted to the station platform and have a removable liner. Like the bicycle rack, Pace will install a substitution trash receptacle at the preference of a local community subject to the Community Expression Features: Cost Sharing Strategy and Coordination Guidelines. Pace selected the *Landscape Forms Steely Can* model as the standard for Pulse stations.

- The typical station shall include an 18-inch wide landscaping strip located along the back edge of the ramps and the boarding platform where space allows and where appropriate based on the surrounding context. The landscaping will be provided only if a local partner (e.g. community, ward office, Special Service Area (SSA), chamber of commerce, or local business) is willing to maintain it. The landscaping shall be irrigated in part via runoff from the shelter roof and shall feature drought-tolerant plants requiring minimal upkeep. The landscaping shall also serve as a community expression option (subject to local commitments for ongoing maintenance noted above). The station layouts indicate whether landscaping has been included in each station. Landscaping may be widened (or removed) as appropriate to fit the available space. Pace shall coordinate with local communities to select the planting palette provided that a local partner has agreed to maintain it.

- If local communities desire to provide cameras/call boxes at Pulse stations, they shall notify Pace during project development so that appropriate wiring accommodations can be provided.

- Ventra fare vending machines are installed at the CTA Red Line 95th/Dan Ryan Station terminal as part of other regional coordination efforts. Tickets are also available for purchase via the Ventra smartphone application. Pace is not procuring or installing any fare vending machines for the Pulse 95th Street Line.

4.2.3 Station Layout Concepts

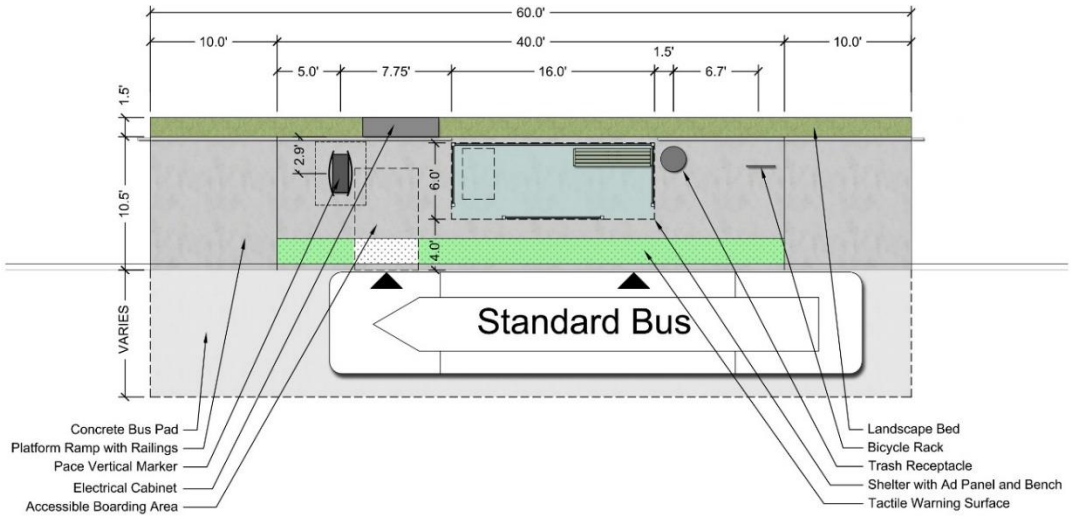
Station layout concepts were developed and refined through the planning and design of the Pulse Milwaukee Line and Dempster Line. Three station layouts, a "typical" layout, a

"compact" layout and an "ultra compact" layout, were established and used as the basis for the development of site-specific station layouts for the Pulse 95th Street Line.

4.2.3.1 Typical Station Layout

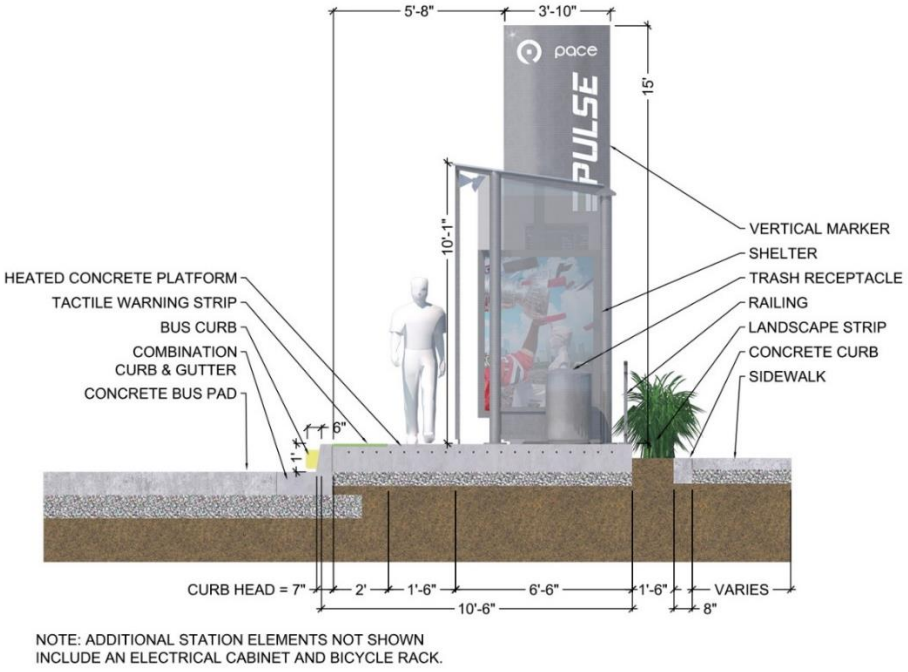
The typical layout reflects an ideal, preferred station configuration and feature set and shall be used in locations where the available right-of-way is not constrained. The typical station layout has a footprint of 60 feet in length by 12 feet in width. Figure 4.7 shows the typical station layout in plan view, Figure 4.8 provides a section of the typical station, and Figure 4.4 above shows a rendering of a typical station.

FIGURE 4.7 TYPICAL STATION LAYOUT



Source: Pace, PMO

FIGURE 4.8 SECTION OF A TYPICAL STATION



Source: Pace, PMO

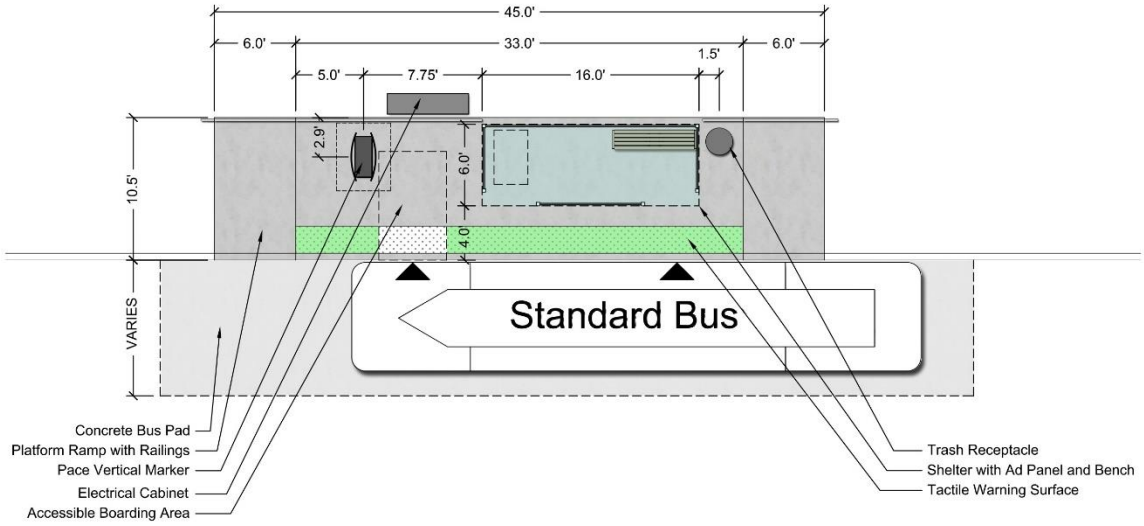
4.2.3.2 Compact Station Layout

The compact layout reflects a station configuration to be used in locations where available right-of-way width and/or length are limited at the selected site. The compact station layout, with a footprint of 45 feet by 11 feet, differs from the typical station layout in the following ways:

- The raised platform is reduced in length to 33 feet, with access ramps at a 1:12 slope at both ends.
- The bicycle rack is eliminated.
- The landscape bed is eliminated.

Figure 4.9 shows the compact station layout and Figure 4.10 shows a rendering of a compact station.

FIGURE 4.9 COMPACT STATION LAYOUT



Source: Pace, PMO

FIGURE 4.10 COMPACT STATION LAYOUT RENDERING

Source: Pace, PMO

4.2.3.3 Ultra Compact Station Layout

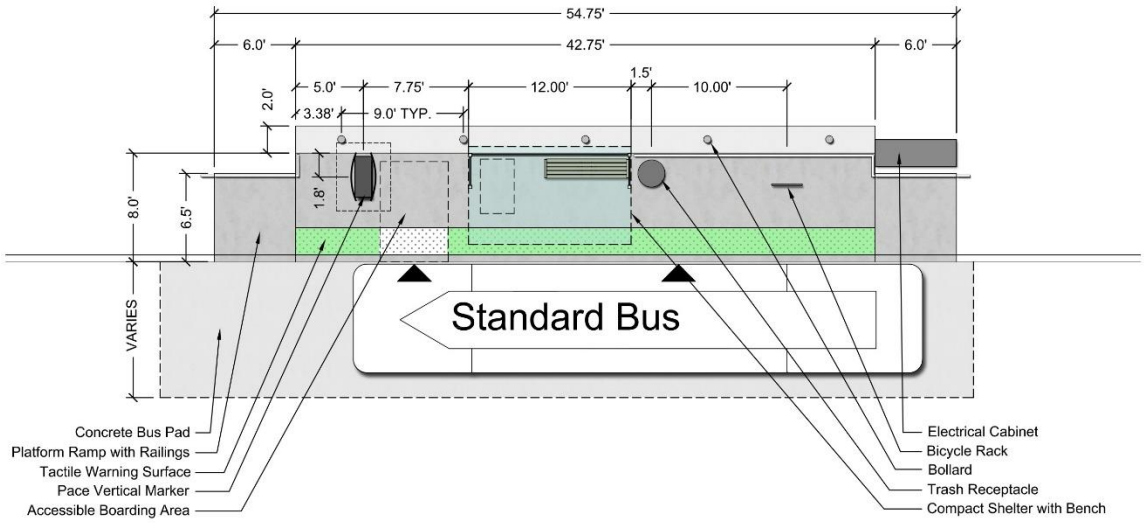
The ultra compact layout reflects a station configuration to be used in locations where available right-of-way width and/or length are limited at the selected site. The ultra

compact station layout, with a footprint of 54.75 feet by 10 feet, differs from the typical station layout in the following ways:

- The platform depth is eight feet, with bollards placed behind the platform in a two-foot buffer.
- The shelter structure is anticipated to be shorter (12 feet in length instead of 16 feet), with the same depth as the typical station shelter but without a front panel to allow adequate space for a bench and wheelchair waiting area. This configuration allows for a minimum 60-inch clear width between the platform edge and the shelter.
- The raised platform is reduced in length to 42.75 feet, with access ramps at a 1:12 slope at both ends.
- The landscape bed is eliminated.

Figure 4.11 shows the compact station layout and Figure 4.12 shows a rendering of a compact station.

FIGURE 4.11 ULTRA COMPACT STATION LAYOUT



Source: Pace, PMO

FIGURE 4.12 ULTRA COMPACT STATION LAYOUT RENDERING

Source: Pace, PMO

Along the Pulse 95th Street corridor, each of the station sites has varied conditions and constraints. Station layouts will be adapted to accommodate unique site characteristics and right-of-way constraints while still adhering to the functional requirements documented herein. In some cases where multiple local bus routes are expected to share a Pulse station, a larger station may be proposed to accommodate the additional vehicular and passenger traffic.

4.3 Station Locations

Overall, the PMO evaluated 21 potential station locations and 85 specific station sites. For ease of reference, each station site is identified as an alternate and is generally numbered according to location and direction of travel (e.g. Halsted Eastbound Alternate 1). During the evaluation process, the PMO consulted with Pace and conducted outreach activities with Pace and project stakeholders to inform the evaluation of station locations and sites. Table 4.3 shows each evaluated station location, the origin or source of the station, and the status as of March 2019 which indicates whether the station is included in the packet of conceptual station layouts in Appendix E and recommended for advancement to the conceptual design phase.

TABLE 4.3 PULSE 95TH STREET LINE STATION LOCATION SUMMARY

Station Location	Source	Status (February 2019)
CTA Red Line 95th/Dan Ryan Station	Pace	Included
Halsted	Pace	Included
Vincennes (Longwood Metra)	Pace	Included
Ashland	Pace	Included
Wood (Beverly Hills Metra)	PMO	Included
Western	Pace	Included
California	Pace	Included
Kedzie	Pace	Included
Pulaski	Pace	Included
Kostner	Pace	Included
Cicero	Pace	Included
Oak Lawn Patriot Metra	Pace	Included
Central	PMO	Included
SW Highway	Pace	Included
Ridgeland	Pace	Included
76th	PMO	Included
Bridgeview Courthouse	Pace	Included
Harlem/103rd	Pace	Included
Roberts/104th	PMO	Included
MVCC	Pace	Included
Harlem	Pace	Included

Source: Pace, PMO

4.3.1 Station Sites

The Pulse 95th Street Line will include 18 pairs of intermediate stations and two terminal stations at the CTA Red Line 95th/Dan Ryan Station and Moraine Valley Community College (MVCC). The western terminus station will be constructed on the MVCC campus adjacent to a dedicated bus lane. The eastern terminus will be co-located within the newly constructed CTA Red Line 95th/Dan Ryan Station as part of the CTA 95th Terminal Improvement Project[15]. An assigned bus bay will accommodate Pace Route 381 and Pulse

[15] For more information, see: https://www.transitchicago.com/95thTerminal/

95th Street service. Therefore, minimal, if any, capital investments will be needed to support Pulse service at the eastern terminus. Intermediate stations serving the Pulse 95th Street Line will typically consist of curbside stations serving buses in a mixed traffic lane.

As noted above, 85 station sites were evaluated using several factors including: operations, constructability, available right-of-way, traffic movements, passenger markets, transfer connections, impacts on adjacent properties, passenger convenience, pedestrian movements and access, ADA implications, current and future land use, local context, community and agency input, potential impacts on project schedule, and the potential cost to remediate site issues. For each site evaluated, a determination was made as to whether it would be developed with a Conceptual Station Improvement Plan and advanced to the environmental review phase. An overview of the number of alternates evaluated and their status is summarized in Table 4.4.

TABLE 4.4 STATUS OF STATION SITES EVALUATED

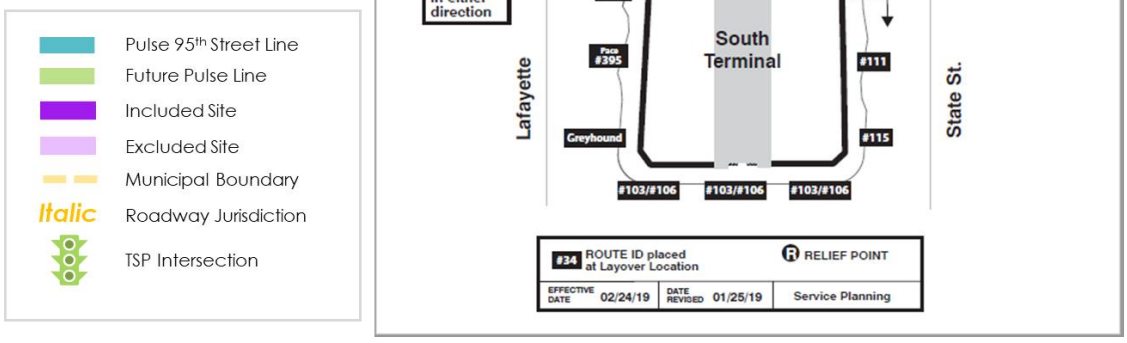
	Eastbound Alternatives					Westbound Alternatives				
Station	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CTA Red Line 95th/Dan Ryan Station	-	-	-	-	-	*	-	-	-	-
Halsted	✓	-	-	-	-	✓	-	-	-	-
Vincennes (Longwood Metra)	✓	E	-	-	-	✓	E	E	-	-
Ashland	E	✓	-	-	-	✓	E	-	-	-
Wood (Beverly Hills Metra)	E	✓	E	-	-	E	✓	-	-	-
Western	✓	E	✓	-	-	✓	E	-	-	-
California	✓	E	-	-	-	E	✓	-	-	-
Kedzie	✓	-	-	-	-	✓	E	-	-	-
Pulaski	E	✓	-	-	-	✓	-	-	-	-
Kostner	✓	✓	-	-	-	✓	-	-	-	-
Cicero	E	✓	E	-	-	E	✓	-	-	-
Oak Lawn Patriot Metra	✓	-	-	-	-	E	E	✓	-	-
Central	E	E	✓	-	-	✓	E	-	-	-
SW Highway	✓	-	-	-	-	✓	-	-	-	-
Ridgeland	✓	E	-	-	-	✓	E	-	-	-
76th [1]	E	✓	-	-	-	✓	E	E	-	-
Bridgeview Courthouse	E	✓	E	✓	E	E	✓	✓	E	-
Harlem/103rd [2]	E	E	✓	E	E	✓	E	-	-	-
Roberts/104th	E	✓	E	E	-	-	-	-	-	-
Moraine Valley Community College	E	✓	E	-	-	-	-	-	-	-
Harlem [3]	*	-	-	-	-	*	-	-	-	-
✓	Included in Conceptual Station Improvement Plans									
E	Eliminated from consideration; NOT included in Conceptual Station Improvement Plans									
*	Station was evaluated but a layout was not required									

Note: [1] [2] Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing yet to be determined. These station locations are subject to this routing decision.
[3] Potential Station siting dependent on the restructuring of the Harlem interchange at this location.
Source: Pace, PMO

4.3.2 CTA Red Line 95th/Dan Ryan Station

Municipality	**City of Chicago**
Jurisdiction	State
Eastbound Alternatives	0
Westbound Alternatives	1*
TSP Possible	N/A

FIGURE 4.13 CTA RED LINE 95TH/DAN RYAN STATION



Note: *Due to the nature of operations at the transit center, no infrastructure improvements are planned at this station for the Pulse 95th Street Line. The bus bay assignment for Route 381 is assumed to be the boarding location for westbound Pulse service.
Source: Pace, PMO, CTA Service Planning (received February 2019)

TABLE 4.5 CTA RED LINE 95TH/DAN RYAN STATION WESTBOUND STATION SITE SUMMARY

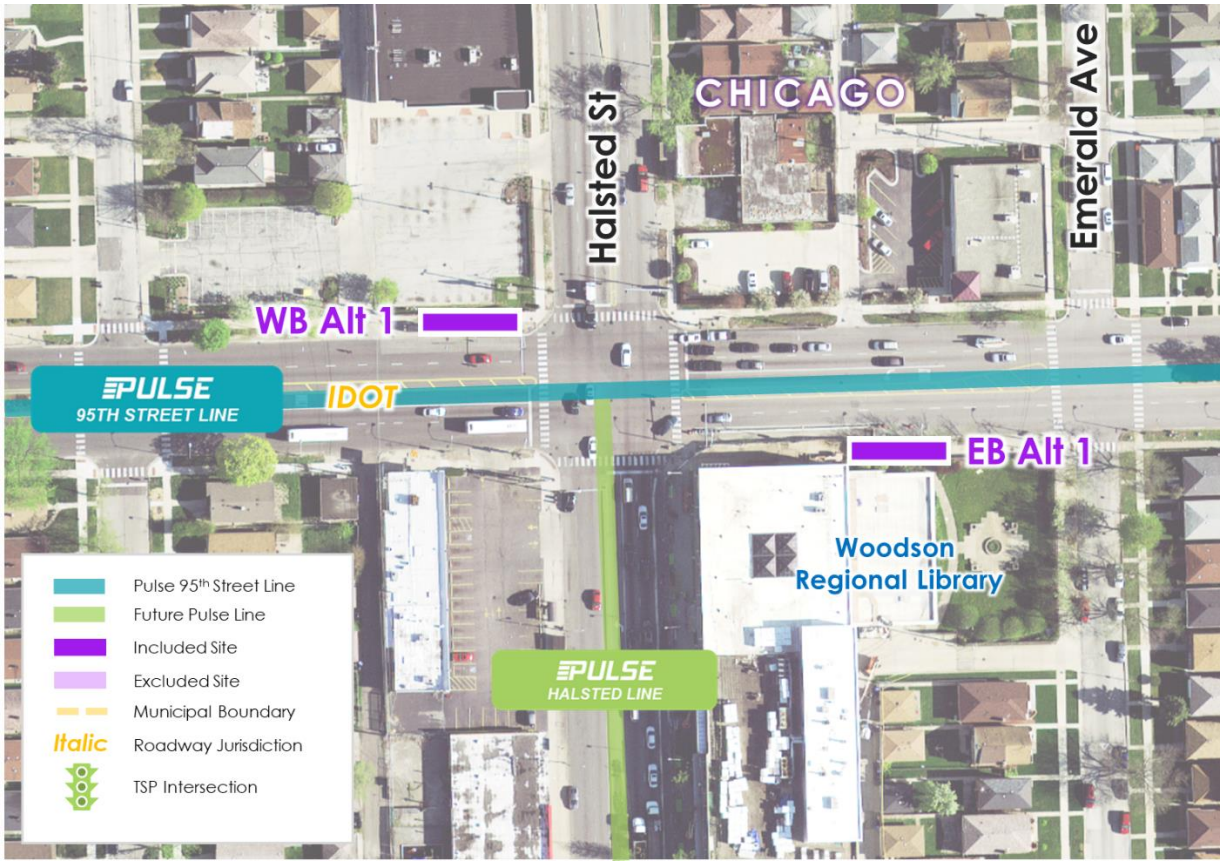
	Opportunities	Challenges
Alt 1	• Highest ridership location on Pulse route • Assigned bus bay for Route 381 in newly renovated CTA terminal • Minimal, if any, capital improvements planned at this location • Dedicated layover location • Connection to other Pace routes • Connection to CTA rail, CTA bus, and Greyhound intercity bus	• Bus bay assignment location means Pace "competes" with the highly visible CTA Route 95 • Bus must circle the North Terminal to enter the 95th Street corridor for westbound travel

Note: Other site alternatives limited due to the bus bay assignment.

4.3.3 Halsted

Municipality	**City of Chicago**
Jurisdiction	State
Eastbound Alternatives	1
Westbound Alternatives	1
TSP Possible	Unknown

FIGURE 4.14 95TH AND HALSTED ST



Source: Pace, PMO

TABLE 4.6 HALSTED EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Potential for shared oversized station to accommodate other Pace and CTA routes • Near future Pulse Halsted Line eastbound station to be located on Halsted Street, south of 95th Street • Near other Pace and CTA bus routes • Serves Woodson Regional Library • Farside: potential TSP benefits maximized • Near signalized crossing	• Station may block building signage and/or right-of-way

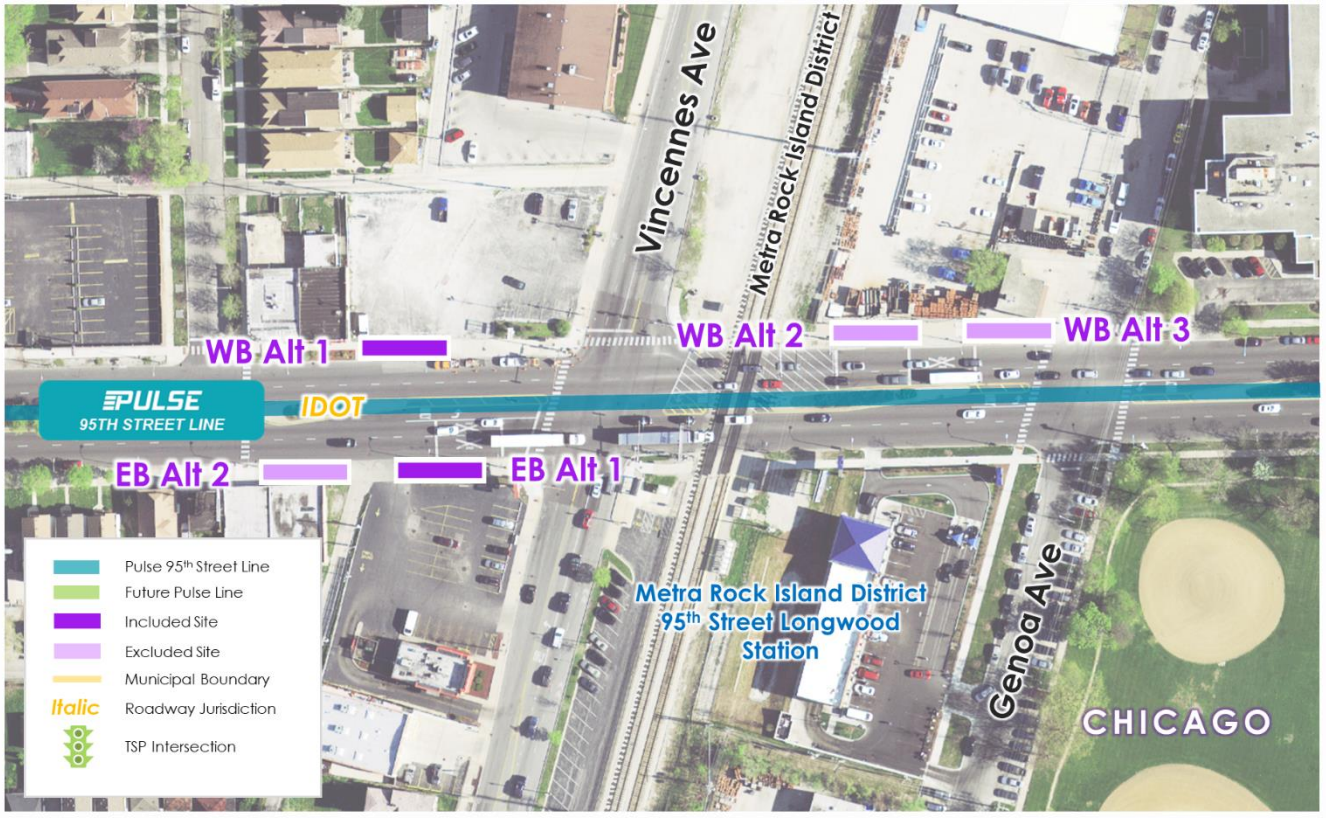
TABLE 4.7 HALSTED WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Connection to other Pace and CTA bus routes • Serves Woodson Regional Library • Near signalized crossing	• Would require removal of JCDecaux shelter

4.3.4 Vincennes (Longwood Metra)

Municipality	**City of Chicago**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	3
TSP Possible	Unknown

FIGURE 4.15 95TH AND VINCENNES AVE (LONGWOOD METRA)



Source: Pace, PMO

TABLE 4.8 VINCENNES (LONGWOOD METRA) EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near Metra Rock Island District commuter rail station • Near CTA Route 112 • Available right-of-way for standard layout • Near signalized crossing	• Nearside siting may hinder potential TSP implementation • Would require removal of JCDecaux shelter • Requires riders to cross train tracks and intersection to access Metra station
Alt 2	• Near Metra Rock Island commuter rail station • Near CTA Route 112	• Farther from a signalized crossing and Metra station • Requires riders to cross train tracks and intersection to access Metra station • Potential sightline interference • Would block business frontage

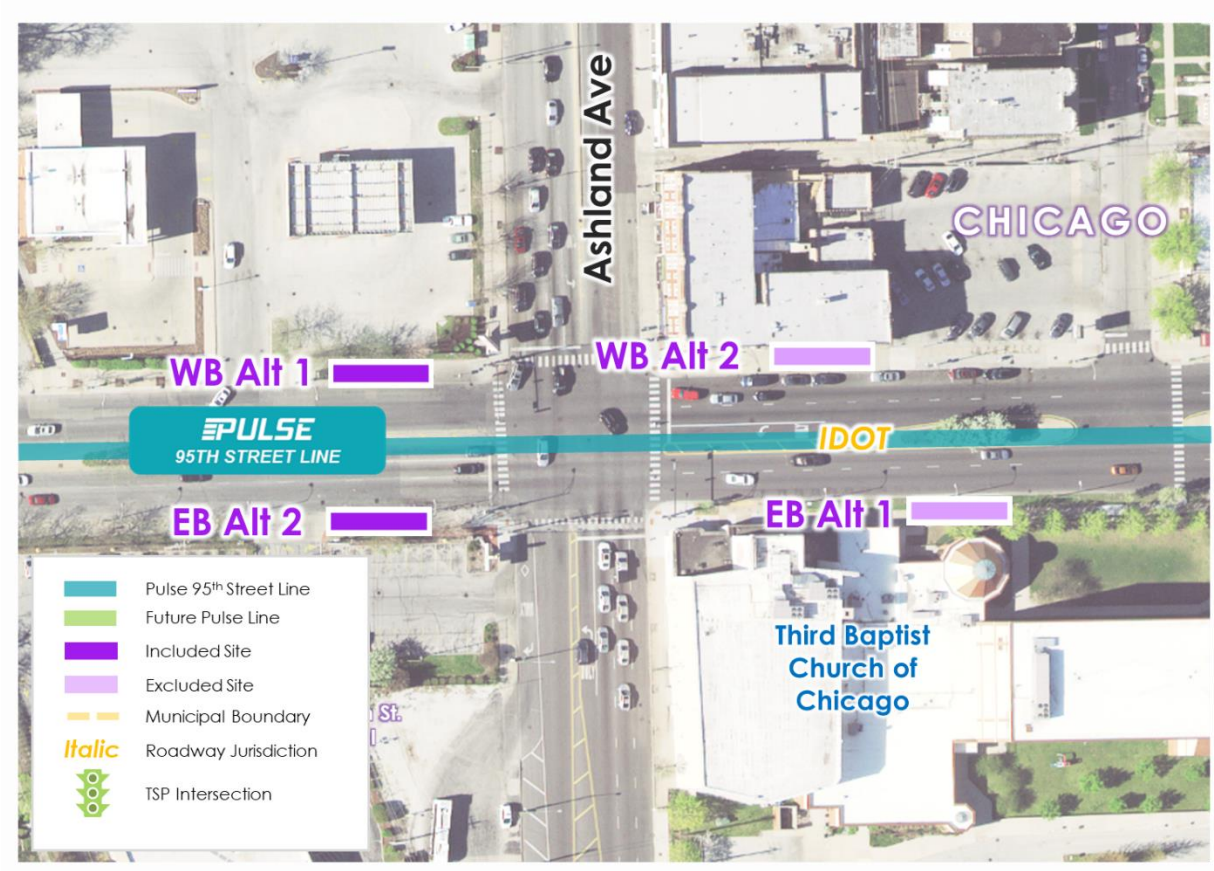
TABLE 4.9 VINCENNES (LONGWOOD METRA) WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near Metra Rock Island District commuter rail station • Near CTA Route 112 • Available right-of-way for standard layout • Near signalized crossing • Farside: potential TSP benefits could be maximized	• Would require removal of JCDecaux shelter • Requires riders to cross train tracks and intersection to access Metra station
Alt 2	• Near Metra Rock Island District commuter rail station • Near CTA Route 112 • Near signalized crossing	• Nearside siting may hinder potential TSP implementation • May interfere with Chicago Department of Water Management (CDWM) Storage Yard driveway • Passengers may use the midblock crossing or jaywalk to access Metra
Alt 3	• Near Metra Rock Island District commuter rail station • Near CTA Route 112	• Nearside siting may hinder potential TSP implementation • May interfere with CDWM Storage Yard driveway • Passengers may use the midblock crossing or jaywalk to access Metra

4.3.5 Ashland

Municipality	**City of Chicago**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	2
TSP Possible	Unknown

FIGURE 4.16 95TH AND ASHLAND AVE



Source: Pace, PMO

TABLE 4.10 ASHLAND EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Near CTA bus/express bus Routes 9/X9 • High ridership and high transfer activity in area • Farside: potential TSP benefits could be maximized	• Partial blockage of Third Baptist Church building
Alt 2	• Near a signalized crossing • Near CTA bus/express bus Routes 9/X9 • High ridership and high transfer activity in area • Available right-of-way for standard layout	• Nearside siting may hinder potential TSP implementation • Pending CDOT coordination, may require relocation of red-light cameras

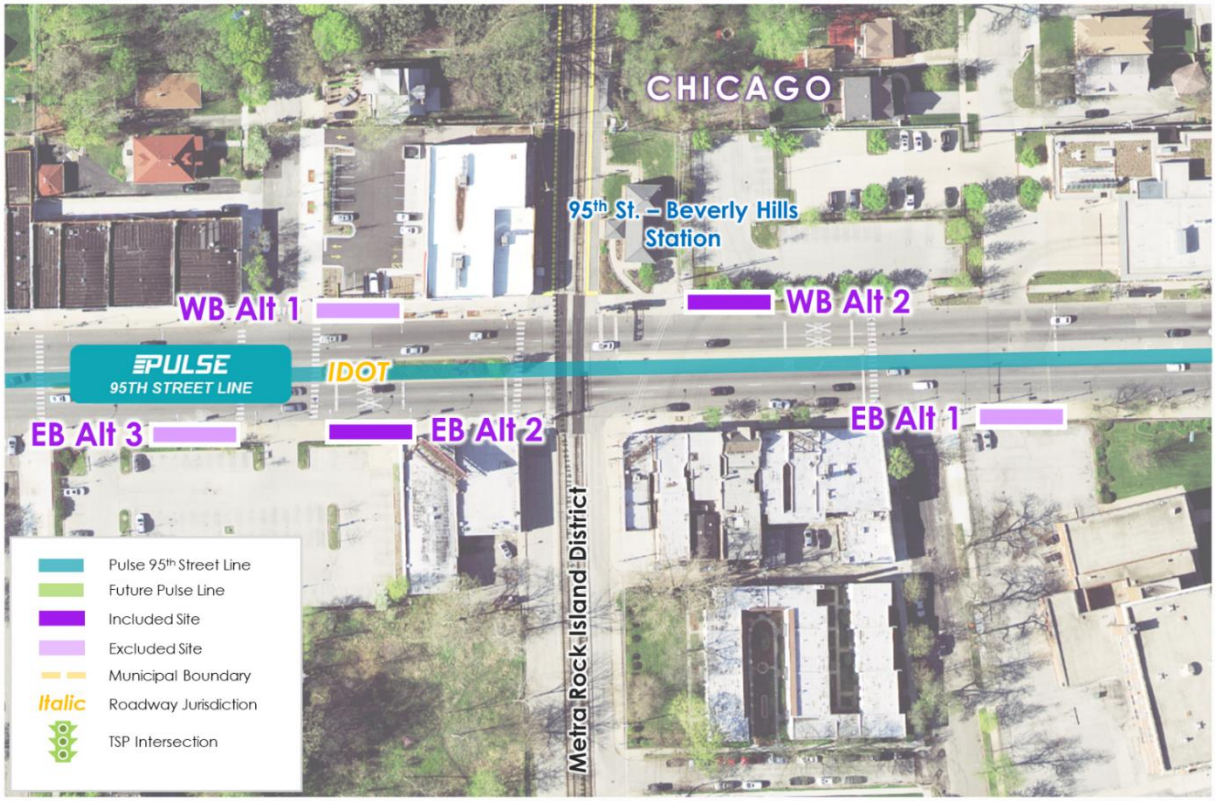
TABLE 4.11 ASHLAND WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Near CTA bus/express bus Routes 9/X9 • High ridership and high transfer activity in area • Farside: potential TSP benefits could be maximized • Available right-of-way for standard layout • Close to Major Taylor Trail	• Would require removal of JCDecaux shelter
Alt 2	• Near signalized crossing • Near CTA bus/express bus Routes 9/X9 • High ridership and high transfer activity in area	• Nearside siting may hinder potential TSP implementation • Partially blocks business frontage

4.3.6 Wood (Beverly Hills Metra)

Municipality	**City of Chicago**
Jurisdiction	State
Eastbound Alternatives	3
Westbound Alternatives	2
TSP Possible	Unknown

FIGURE 4.17 95TH AND WOOD (BEVERLY HILLS METRA)



Source: Pace, PMO

TABLE 4.12 WOOD (BEVERLY HILLS METRA) EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Convenient transfer to Metra Rock Island District service via the 95th Street - Beverly Hills station • Generous clearance of railroad crossing • Farside of Vanderpoel Avenue: potential TSP benefits could be maximized	• Requires riders to cross railroad tracks to access Metra station • Farside of railroad tracks
Alt 2	• Convenient transfer to Metra Rock Island District service via the 95th Street - Beverly Hills station • Nearside (before railroad crossing) for enhanced safety • Near City of Chicago Park & Ride (PnR) lot	• Requires riders to cross railroad tracks to access Metra station • Potential grade issues
Alt 3	• Convenient transfer to Metra Rock Island District service via the 95th Street - Beverly Hills station • Nearside (before railroad crossing) for enhanced safety • Near City of Chicago PnR lot	• Farther from Metra station • Potential grade issues

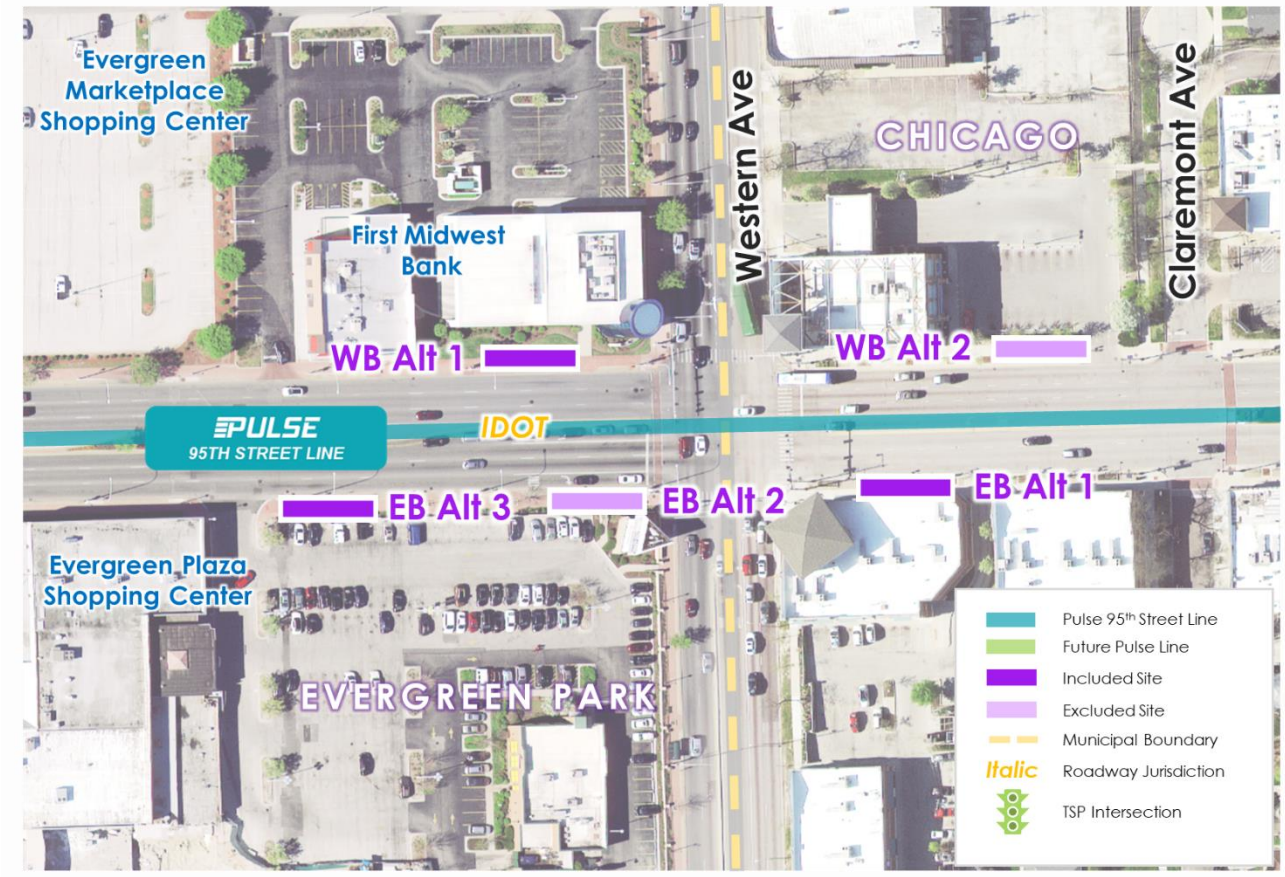
TABLE 4.13 WOOD (BEVERLY HILLS METRA) WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Convenient transfer to Metra Rock Island District service via the 95th Street - Beverly Hills station • Generous clearance of railroad crossing • Farside of Vanderpoel Avenue: potential TSP benefits could be maximized	• Requires riders to cross railroad tracks to access Metra station • Potential grade issues
Alt 2	• Convenient transfer to Metra Rock Island District service via the 95th Street - Beverly Hills station • Near commuter rail PnR lot • Farside of Vanderpoel Avenue: potential TSP benefits could be maximized	• N/A

4.3.7 Western

Municipality	**Village of Evergreen Park / City of Chicago**
Jurisdiction	State
Eastbound Alternatives	3
Westbound Alternatives	2
TSP Possible	No

FIGURE 4.18 95TH AND WESTERN AVE



Source: Pace, PMO

TABLE 4.14 WESTERN EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near a signalized crossing • Connects to Pace and CTA routes • High ridership and high transfer activity in area • Farside: potential TSP benefits could be maximized	• Blocks multiple business frontages • Would require a compact station • Farther from shopping centers and high ridership stop near Campbell Avenue
Alt 2	• Near a signalized crossing • Connects to Pace and CTA routes • High ridership and high transfer activity in area • Close to shopping centers and high ridership stop near Campbell Avenue	• Nearside siting may hinder potential TSP implementation • Significant grade change between sidewalk and parking lot; retaining wall present
Alt 3	• Connects to Pace and CTA routes • High ridership and high transfer activity in area • Closest to shopping centers and high ridership stop near Campbell Avenue • Available right-of-way for standard layout	• Nearside siting may hinder potential TSP implementation • Further from signalized intersection at Western Avenue • Passengers may use the midblock crossing or jaywalk to access nearby shopping centers • Significant grade change between sidewalk and parking lot; retaining wall present

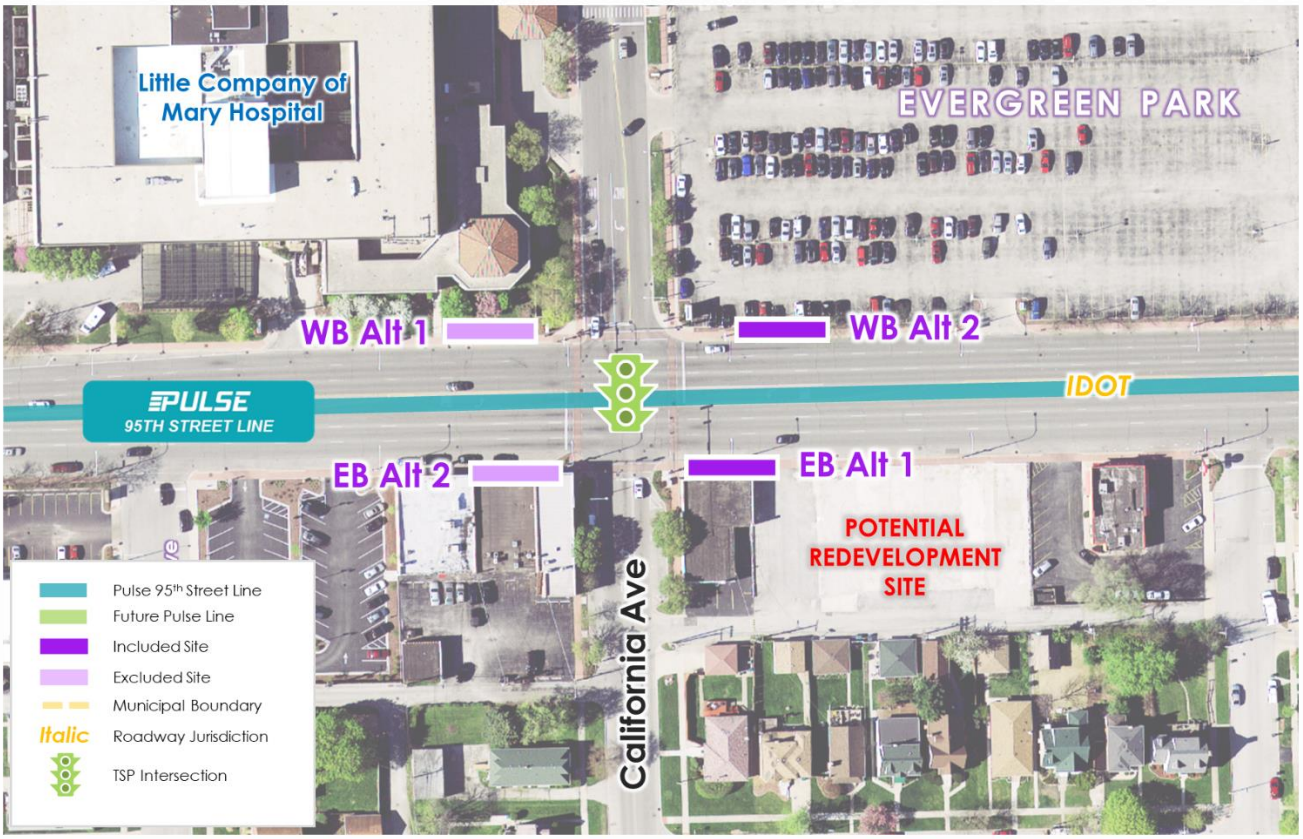
TABLE 4.15 WESTERN WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near a signalized crossing • Connects to Pace and CTA routes • Farside: potential TSP benefits could be maximized • Available right-of-way for standard layout • Close to shopping centers and high ridership stop near Campbell Avenue	• N/A
Alt 2	• Connects to Pace and CTA routes • High ridership and high transfer activity in area	• Farther from signalized crossing • Farther from shopping centers and high ridership activity near Campbell Avenue • Nearside siting may hinder potential TSP implementation

4.3.8 California

Municipality	**Village of Evergreen Park**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	2
TSP Possible	Yes

FIGURE 4.19 95TH AND CALIFORNIA AVE



Note: EB Alt 1 shifted west to be located closer to the intersection and includes a curb bump out to improve pedestrian connections.
Source: Pace, PMO

TABLE 4.16 CALIFORNIA EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near Little Company of Mary Hospital • Near a signalized crossing • Farside: potential TSP benefits could be maximized • Station could be integrated into redevelopment of adjacent properties	• Narrow right-of-way • Pending survey, potential need for ultra-compact layout • Station bump-out may displace on-street parking • Requires riders to make two street crossings to access Hospital
Alt 2	• Serves Little Company of Mary Hospital • Near a signalized crossing	• Narrow right-of-way • Bump-out element may displace on-street parking • Would block business frontages • Nearside siting would hinder TSP benefit

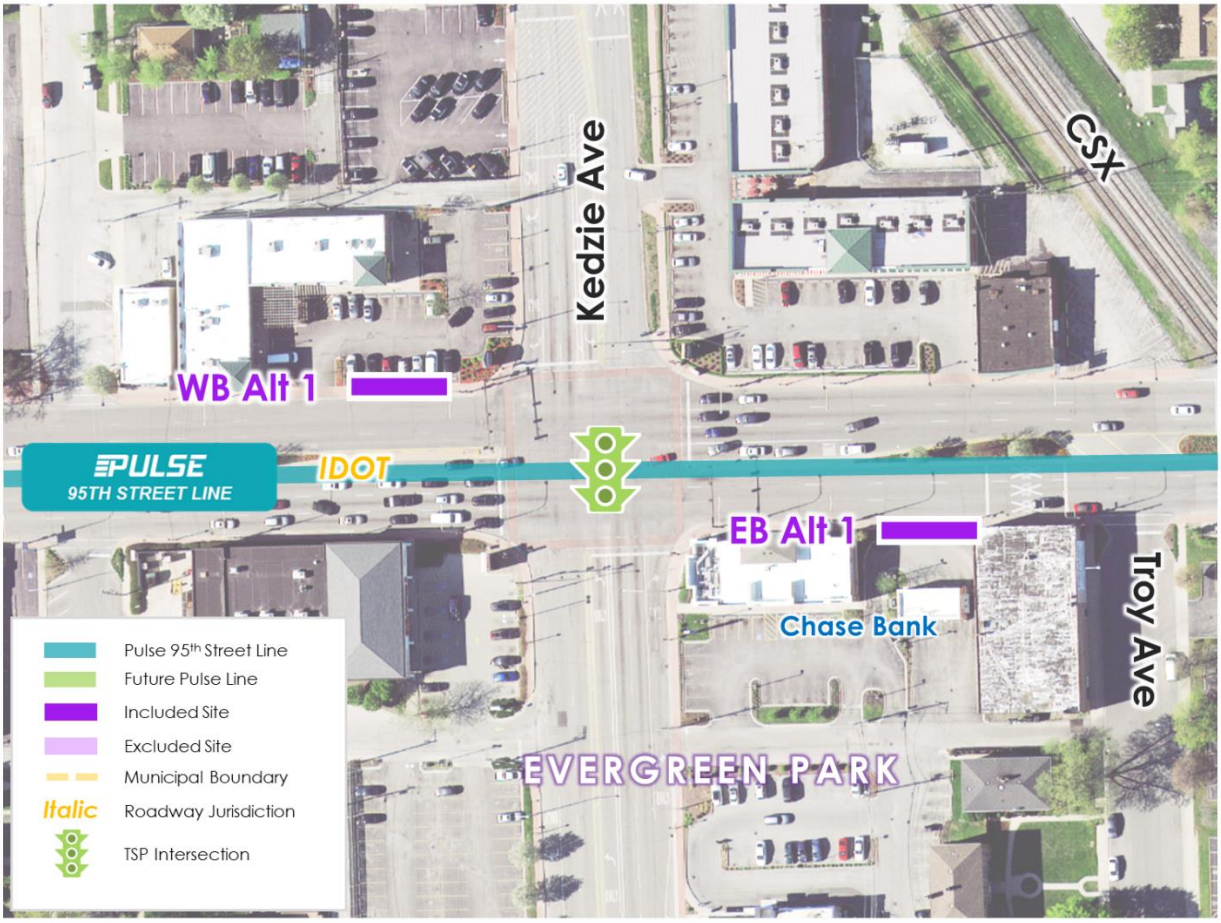
TABLE 4.17 CALIFORNIA WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Direct access to Little Company of Mary Hospital • Farside: potential TSP benefits could be maximized	• Pending survey, potential need for permanent easement and ultra-compact layout • Would conflict with Little Company of Mary Hospital plans for emergency room addition
Alt 2	• Higher ridership stop • Serves Little Company of Mary Hospital • Near a signalized crossing	• Pending survey, potential need for permanent easement and ultra-compact layout • Nearside siting may limit potential TSP benefit • May block hospital signage

4.3.9 Kedzie

Municipality	**Village of Evergreen Park**
Jurisdiction	State
Eastbound Alternatives	1
Westbound Alternatives	1
TSP Possible	Yes

FIGURE 4.20 95TH AND KEDZIE AVE



Source: Pace, PMO

TABLE 4.18 KEDZIE EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Farside: potential TSP benefits could be maximized • Proximate to CTA Route 52A • Potential site on right-of-way near Chase bank drive-through	• Pending survey, potential need for permanent easement and ultra-compact layout • Mid-block siting may encourage jay-walking

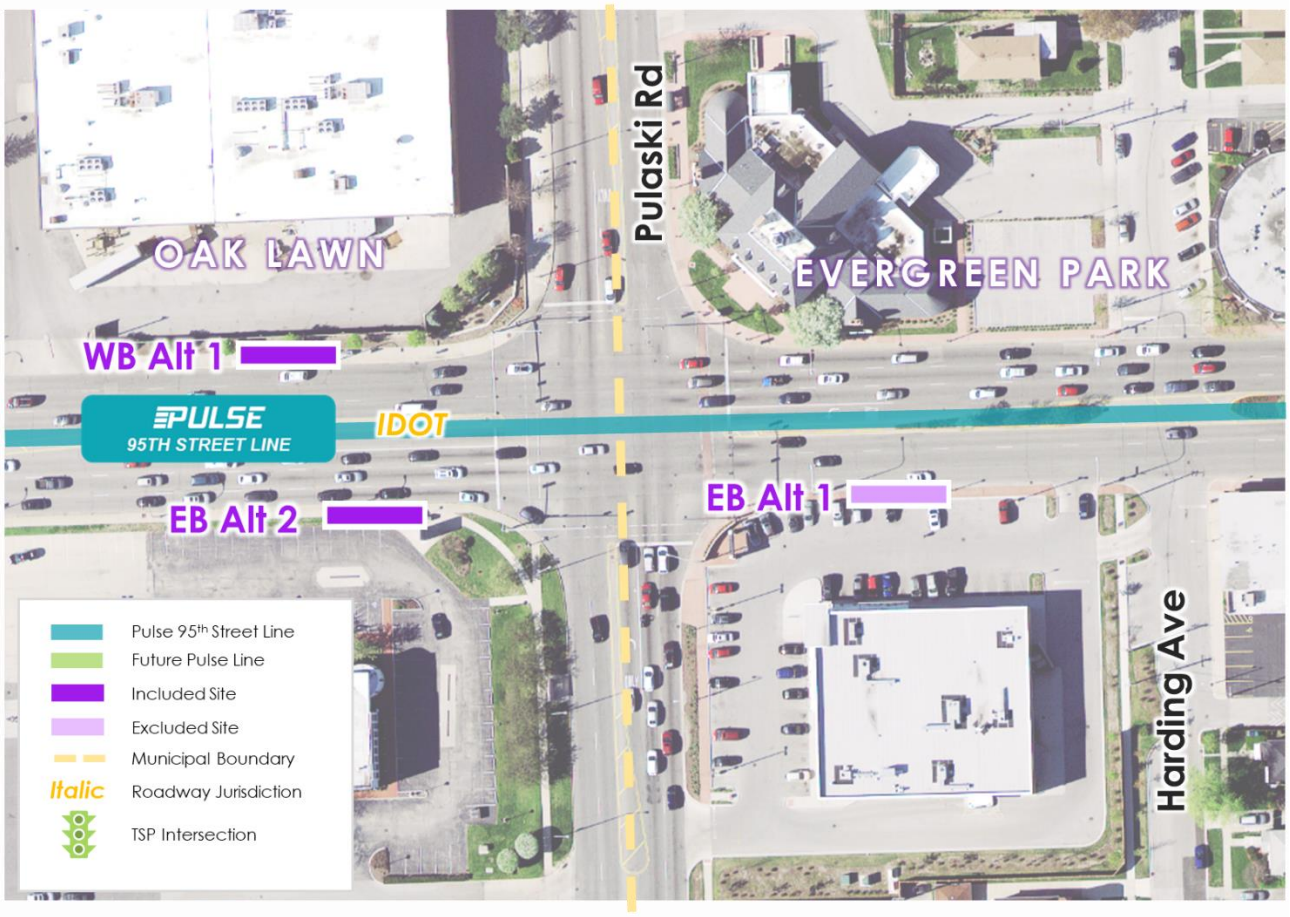
TABLE 4.19 KEDZIE WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Farside: potential TSP benefits could be maximized • Proximate to CTA Route 52A	• Pending survey, potential need for permanent easement and ultra-compact layout • Location near intersection may cause congestion from right-turn lane or gridlock from WB traffic

4.3.10 Pulaski

Municipality	**Village of Oak Lawn / Village of Evergreen Park**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	1
TSP Possible	No

FIGURE 4.21 95TH AND PULASKI RD



Source: Pace, PMO

TABLE 4.20 PULASKI EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Farside: potential TSP benefits could be maximized • Proximate to CTA Route 53A	• Narrow right-of-way • Inhospitable pedestrian environment • Station would likely displace Walgreens parking spaces
Alt 2	• Near signalized crossing • More hospitable pedestrian environment • Proximate to CTA Route 53A	• Nearside siting may limit potential TSP benefits

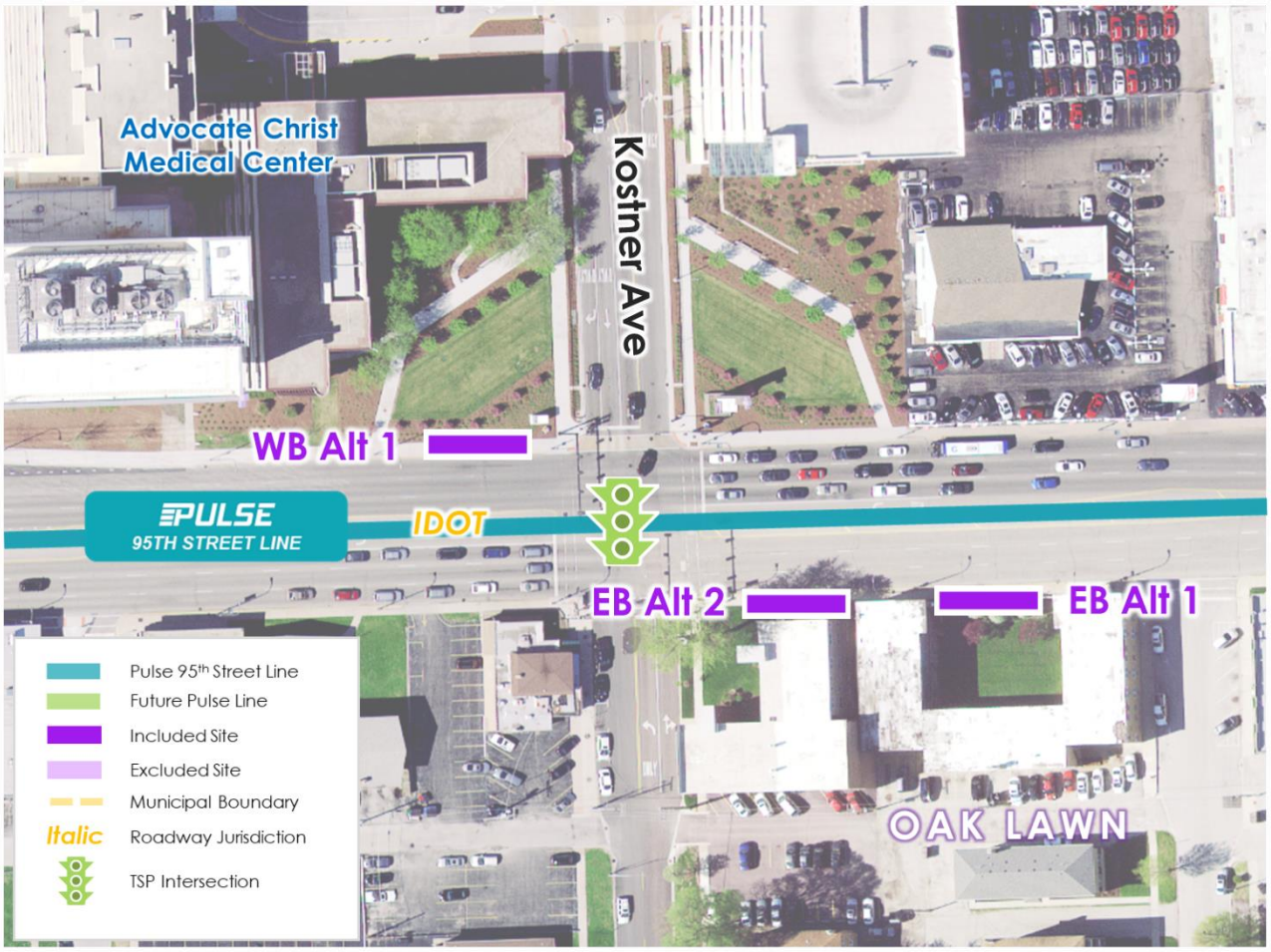
TABLE 4.21 PULASKI WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Farside: potential TSP benefits could be maximized • Proximate to CTA Route 53A • Higher ridership stop • Close to shopping centers	• Pending survey, potential need for permanent easement and compact layout

4.3.11 Kostner

Municipality	**Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	1
TSP Possible	Yes

FIGURE 4.22 95TH AND KOSTNER AVE



Source: Pace, PMO

TABLE 4.22 KOSTNER EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Farside: potential TSP benefits could be maximized • Would encourage waiting bus riders to use the bus shelter instead of trespassing on private property	• Farther from Advocate Christ Medical Center • Narrow right-of-way • Abuts private property and may require removal of decorative fence • Pending survey, potential need for permanent easement and compact-type layout • Requires riders to cross two streets to access hospital
Alt 2	• Near signalized crossing • Near existing stop and shelter • Farside: potential TSP benefits could be maximized • Would encourage waiting bus riders to use the bus shelter instead of trespassing on private property	• Narrow right-of-way • Abuts private property and may require relocation of building access sidewalk • Pending survey, potential need for permanent easement and compact-type layout • Requires riders to use two crosswalks at intersection to access hospital

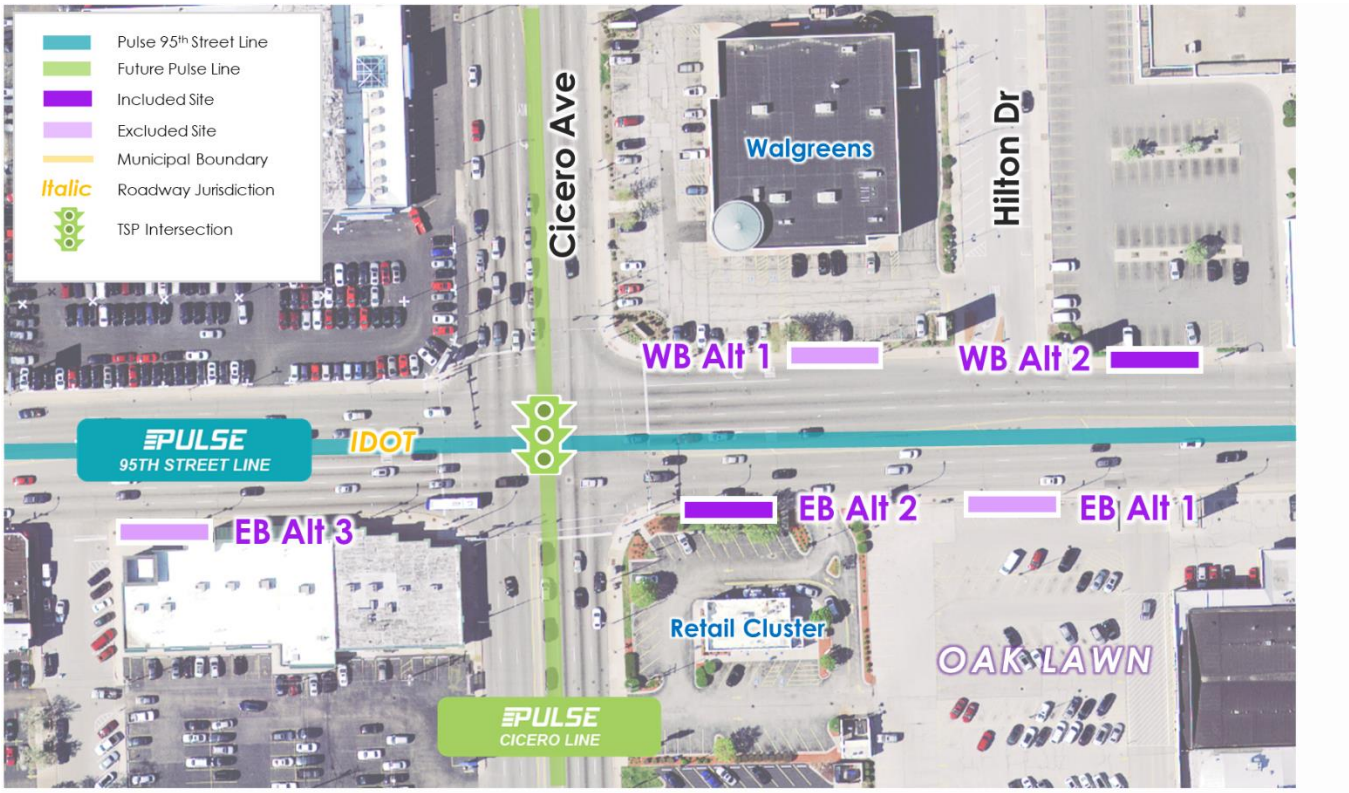
TABLE 4.23 KOSTNER WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized crossing • Farside: potential TSP benefits could be maximized • Direct access to Advocate Christ Medical Center • Highly suitable site	• Pending survey, potential need for permanent easement and compact-type layout • Need to coordinate with Advocate Christ Medical Center improvements, including potential daycare and playlot

4.3.12 Cicero

Municipality	**Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	3
Westbound Alternatives	2
TSP Possible	Yes

FIGURE 4.23 95TH AND CICERO AVE



Source: Pace, PMO

TABLE 4.24 CICERO EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Farside: potential TSP benefits could be maximized • Serves nearby shopping centers	• Farther from signalized intersection • Station would displace several parking spaces • Inhospitable pedestrian environment
Alt 2	• Near signalized intersection • Farside: potential TSP benefits could be maximized • Serves nearby shopping centers • Future connection to Pulse Cicero Line	• Pending survey, potential need for permanent easement and compact-type layout
Alt 3	• Existing 12-inch curb near Lacrosse Avenue	• Farther from signalized intersection • Would block business frontage • Pending survey, potential need for permanent easement and compact-type layout • Nearside siting may limit potential TSP benefits

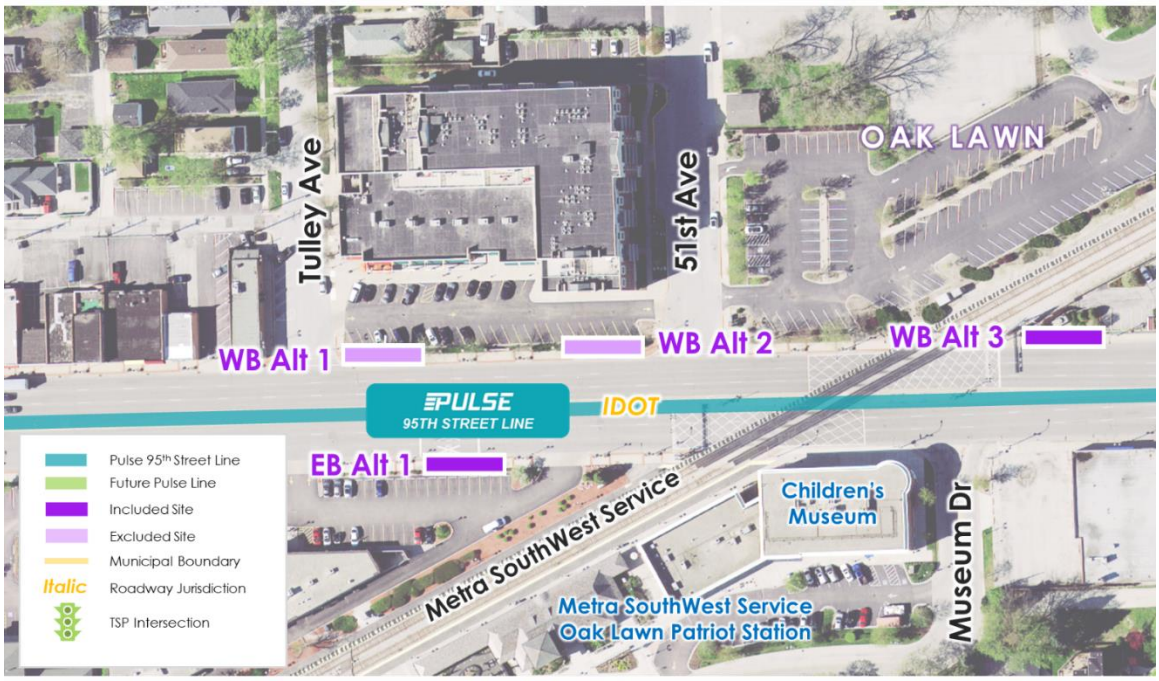
TABLE 4.25 CICERO WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized intersection • Serves nearby shopping centers and hotel • Future connection to Pulse Cicero Line	• Inhospitable pedestrian environment • Narrow right-of-way • Operational challenges between Hilton Drive and right turn lane to Cicero Avenue • Nearside siting may limit potential TSP benefits
Alt 2	• Serves nearby shopping centers and hotel	• Farther from signalized intersection • Nearside siting may limit potential TSP benefits

4.3.13 Oak Lawn Patriot Metra

Municipality	**Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	1
Westbound Alternatives	3
TSP Possible	No

FIGURE 4.24 95TH AND OAK LAWN PATRIOT METRA



Note: During Site evaluations, EB Alt 1 shifted west to be located nearside of drive due to utility conflicts at existing stop

Source: Pace, PMO

TABLE 4.26 OAK LAWN PATRIOT METRA STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Convenient transfer to Oak Lawn Patriot Metra station • Serves shopping centers and downtown Oak Lawn • Nearside (before railroad crossing) for enhanced safety • Available right-of-way for standard layout	• Requires riders to cross railroad tracks to access Children's Museum

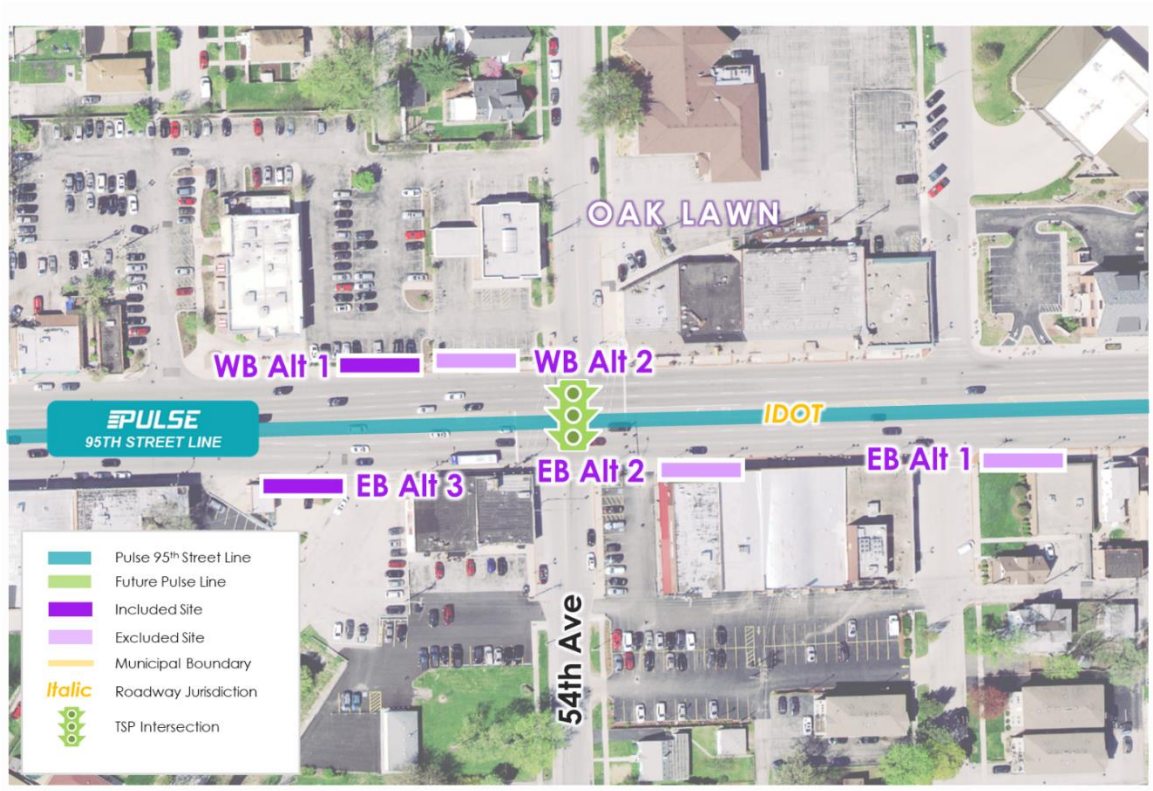
TABLE 4.27 OAK LAWN PATRIOT METRA STATION SITE METRA

	Opportunities	Challenges
Alt 1	• Generous clearance of railroad tracks • Serves Metra station and downtown Oak Lawn	• Farther from Oak Lawn Patriot Metra station and Children's Museum • Lack of signalized intersection and crosswalks at Tulley Avenue encourages jaywalking to access Metra station
Alt 2	• Generous clearance of railroad tracks • Serves Metra station and downtown Oak Lawn	• Lack of signalized intersection at 51st Avenue encourages jaywalking to access Metra station
Alt 3	• Nearside (before railroad crossing) for enhanced safety • Serves Metra station and downtown Oak Lawn • Pending discussions with IDOT, a reconfigured Museum Drive would improve vehicle access and the pedestrian environment by adding signals and crosswalks	• Pending survey, potential need for permanent easement and compact-type layout • May visually obstruct local war memorial/tank

4.3.14 Central

Municipality	**Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	3
Westbound Alternatives	2
TSP Possible	Yes

FIGURE 4.25 95TH AND CENTRAL/54TH AVE



Source: Pace, PMO

TABLE 4.28 CENTRAL EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Farside: potential TSP benefits could be maximized	• Farther from signalized intersection • Lack of crosswalk may encourage jaywalking to municipal uses to the north • Pending survey, potential need for permanent easement and compact-type layout
Alt 2	• Near signalized intersection • Farside: potential TSP benefits could be maximized • Pending plans, potential opportunity with redevelopment of grocery store	• Would block business frontage • Pending survey, potential need for permanent easement and compact-type layout
Alt 3	• Near signalized intersection • Closest location to Central Avenue	• Nearside siting may hinder potential TSP implementation • Pending survey, potential need for permanent easement and compact-type layout

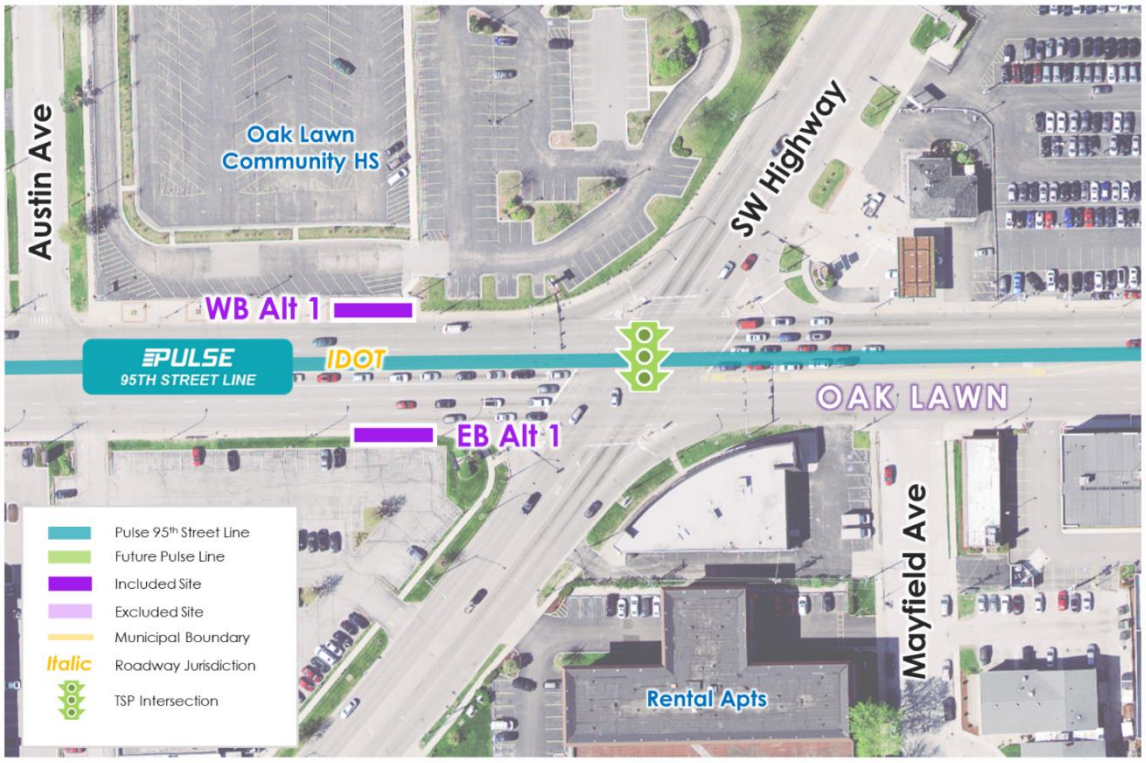
TABLE 4.29 CENTRAL WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized intersection • Farside: potential TSP benefits could be maximized • Available right-of-way for standard layout, pending survey and permanent easement	• May block business signage • Farther from signalized crossing
Alt 2	• Near signalized intersection • Farside: potential TSP benefits could be maximized • Available right-of-way for standard layout, pending survey and permanent easement	• May block business signage

4.3.15 SW Highway

Municipality	**Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	1
Westbound Alternatives	1
TSP Possible	Yes

FIGURE 4.26 95TH AND SW HIGHWAY



Source: Pace, PMO

TABLE 4.30 SW HIGHWAY EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized intersection • Location prioritizes the convenience and safety of Oak Lawn High School (OLHS) riders crossing 95th Street • Pending permanent easement, adequate right-of-way for standard layout	• Nearside siting may hinder potential TSP implementation • Slight grade change from right-of-way to parking lot

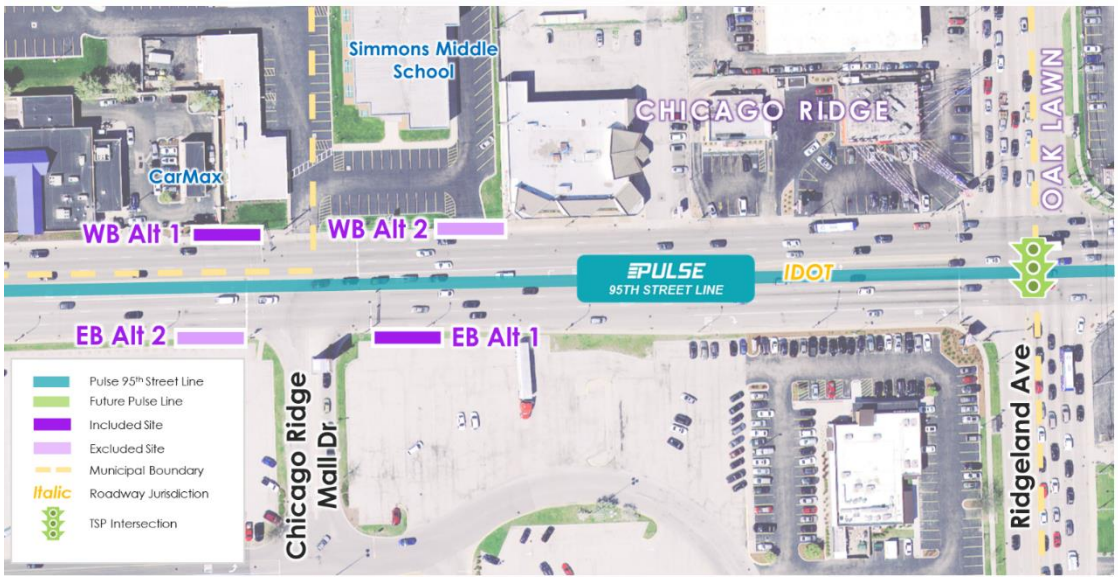
TABLE 4.31 SW HIGHWAY WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Near signalized intersection • Location prioritizes the convenience and safety of OLHS riders • Adjacent to crosswalks and sidewalks leading north to OLHS entrance • Farside: potential TSP benefits could be maximized	• N/A

4.3.16 Ridgeland

Municipality	**Village of Chicago Ridge / Village of Oak Lawn**
Jurisdiction	State
Eastbound Alternatives	2
Westbound Alternatives	2
TSP Possible	Yes

FIGURE 4.27 95TH AND RIDGELAND AVE



Source: Pace, PMO

TABLE 4.32 RIDGELAND EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Serves Chicago Ridge Mall • Farside: potential TSP benefits could be maximized • High ridership activity	• Existing IC&SC shelter would be removed • Would likely require additional crosswalk striping and ADA improvements • May require permanent easement
Alt 2	• Serves Chicago Ridge Mall • Near signalized intersection	• Nearside siting may hinder potential TSP implementation • Would likely require additional crosswalk striping and ADA improvements

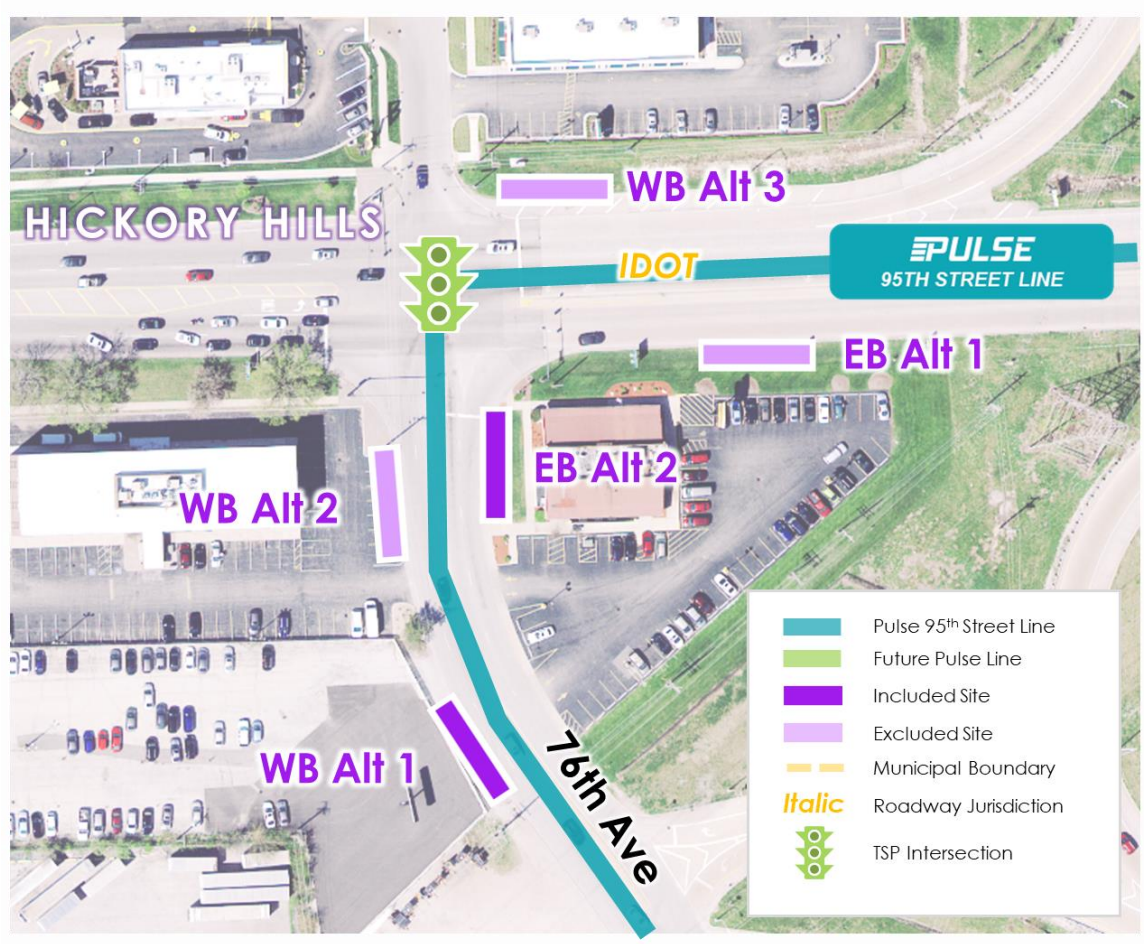
TABLE 4.33 RIDGELAND WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Serves Chicago Ridge Mall and Simmons Middle School • Near signalized crossing • Farside: potential TSP benefits could be maximized	• Would likely require additional crosswalk striping and ADA improvements
Alt 2	• Serves Chicago Ridge Mall and Simmons Middle School	• Would require the closure of one Simmons Middle School driveway • May interfere with school signage • Location and lack of crosswalk may encourage jaywalking • Would likely require additional crosswalk striping and ADA improvements • Nearside siting may limit potential TSP benefits

4.3.17 76th

Municipality	**City of Hickory Hills**
Jurisdiction	State / Municipality
Eastbound Alternatives	2
Westbound Alternatives	3
TSP Possible	Yes

FIGURE 4.28 95TH AND 76TH AVE



Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.
Source: Pace, PMO

TABLE 4.34 76TH EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Proximate to retail uses • Farside: potential TSP benefits could be maximized • Available right-of-way for standard layout • Possible integration into the mid-term west extension	• Requires bus to accelerate from dwell into the fastest posted speed limit along the route (45 MPH) and into a fast-moving interchange lane • Farther from high alighting activity near industrial park • Inhospitable pedestrian environment
Alt 2	• Proximate to retail uses and nearby industrial park • Near signalized intersection	• Road curvature complicates siting and visibility • Nearside siting may hinder potential TSP implementation • Limited pedestrian access

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

TABLE 4.35 76TH WESTBOUND STATION SITE SUMMARY

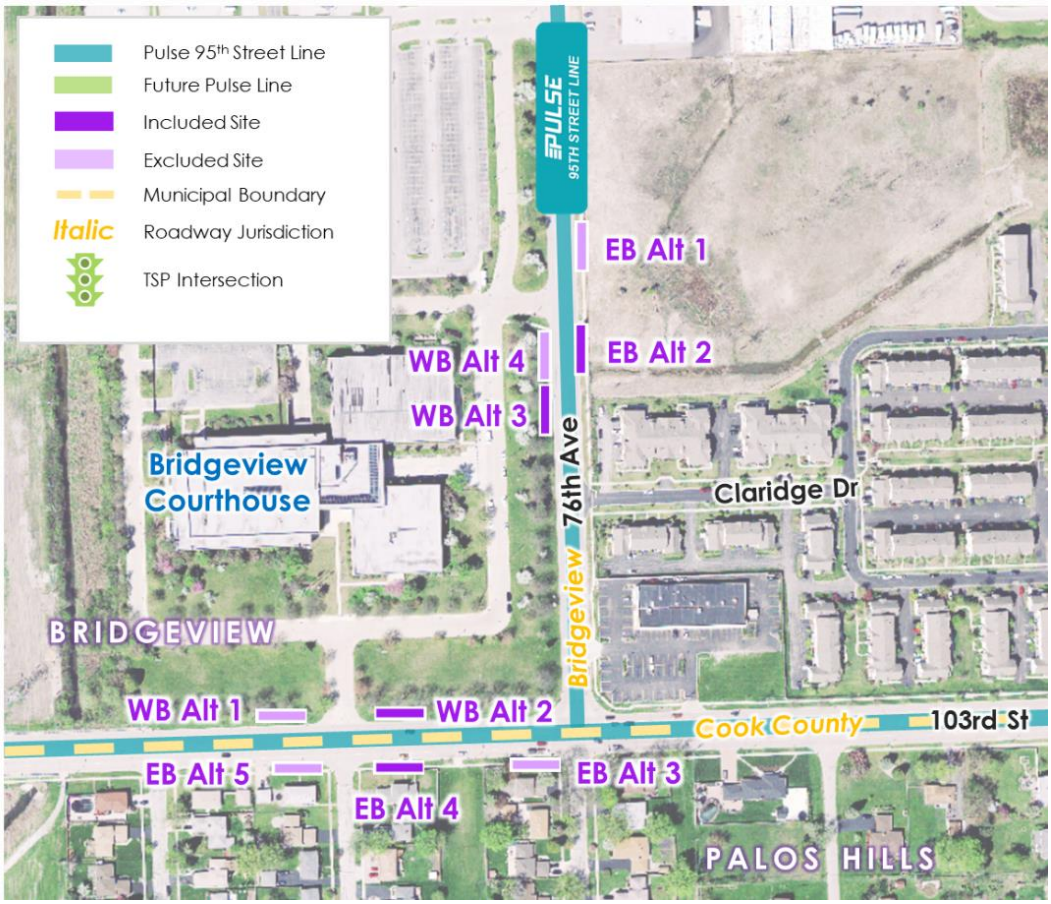
	Opportunities	Challenges
Alt 1	• Farside: potential TSP benefits could be maximized • Proximate to high alighting activity near industrial park	• Limited pedestrian facilities • Lack of crosswalk/signalized intersection may encourage jaywalking • Pending survey, potential need for permanent easement
Alt 2	• Near signalized intersection • Farside: potential TSP benefits could be maximized • Proximate to high alighting activity near industrial park	• Limited pedestrian facilities • Would displace several parking spaces • Road curvature complicates siting
Alt 3	• Near signalized intersection • Proximate to retail uses • Possible integration into the mid-term west extension	• Inhospitable pedestrian environment • Nearside siting may hinder potential TSP implementation • Far from improved crosswalks • Swale-related grading issue

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

4.3.18 Bridgeview Courthouse

Municipality	**City of Palos Hills / Village of Bridgeview**
Jurisdiction	Municipality / County
Eastbound Alternatives	5
Westbound Alternatives	4
TSP Possible	No

FIGURE 4.29 BRIDGEVIEW COURTHOUSE



Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.
Source: Pace, PMO

TABLE 4.36 BRIDGEVIEW COURTHOUSE EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Serves Bridgeview Courthouse • Available right-of-way for standard layout	• No signalized intersection • Farther from Courthouse entrance
Alt 2	• Serves Bridgeview Courthouse and higher density subdivision • Closer to existing sidewalks and eastern entrance of Courthouse • Available right-of-way for standard layout	• Existing IC&SC shelter would be removed • Known issues with stormwater management in the area • No signalized intersection
Alt 3	• Serves Bridgeview Courthouse and higher density subdivision • Near signalized intersection	• Residential private property impact concerns
Alt 4	• Serves Bridgeview Courthouse	• Residential private property impact concerns • Farther from signalized intersection
Alt 5	• Serves Bridgeview Courthouse	• Residential private property impact concerns • Farther from signalized intersection

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

TABLE 4.37 BRIDGEVIEW COURTHOUSE WESTBOUND STATION SITE SUMMARY

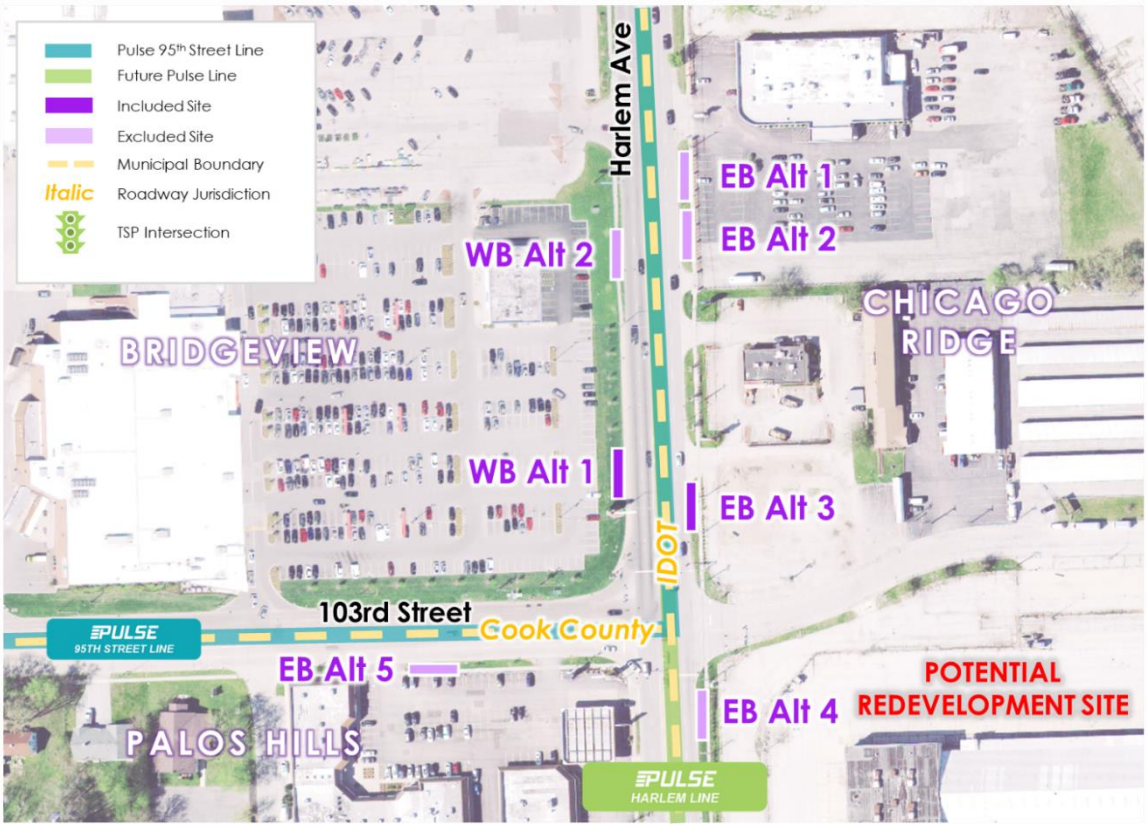
	Opportunities	Challenges
Alt 1	• Direct access to Bridgeview Courthouse • Supports the Harlem Avenue routing, which provides for future connection with Pulse Harlem Line	• Pending survey, potential need for permanent easement and compact-type layout • New pedestrian access routes would be required
Alt 2	• Direct access to Bridgeview Courthouse • Of the 103rd Street sites, closest to the eastern entrance of the Courthouse • Supports the Harlem Avenue routing, which provides for future connection with Pulse Harlem Line	• Pending survey, potential need for permanent easement and compact-type layout • New pedestrian access routes would be required
Alt 3	• Direct access to Bridgeview Courthouse	• New pedestrian access routes would be required • Existing IC&SC shelter would be removed
Alt 4	• Direct access to Bridgeview Courthouse • Close to existing sidewalk	• Existing IC&SC shelter would be removed

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

4.3.19 Harlem/103rd

Municipality	**Village Chicago Ridge / Village of Bridgeview / City of Palos Hills**
Jurisdiction	State / County
Eastbound Alternatives	5
Westbound Alternatives	2
TSP Possible	No

FIGURE 4.30 HARLEM AND 103RD



Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.
Source: Pace, PMO

TABLE 4.38 HARLEM/103RD EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Serves nearby shopping centers • Farside: potential TSP benefits could be maximized • Potential for shared double-standard station with future Pulse Harlem Line	• Farther from signalized intersection • Lack of crosswalk may encourage jaywalking to shopping centers to the west
Alt 2	• Serves nearby shopping centers • Farside: potential TSP benefits could be maximized • Potential for shared double-standard station with future Pulse Harlem Line	• Farther from signalized intersection • Lack of crosswalk may encourage jaywalking to shopping centers to the west
Alt 3	• Serves nearby shopping centers • Near signalized intersection • Farside: potential TSP benefits could be maximized • Near vacant redevelopment site, could present opportunity for design integration and/or use compatibility • Potential for shared double-standard station with future Pulse Harlem Line	• N/A
Alt 4	• Near vacant redevelopment site, could present opportunity for design integration and/or use compatibility • Potential for shared double-standard station with future Pulse Harlem Line	• Station site not located along the Pulse 95th Street Line route
Alt 5	• Serves nearby shopping centers	• Precludes opportunity to share station with Pulse Harlem Line

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

TABLE 4.39 HARLEM/103RD WESTBOUND STATION SITE SUMMARY

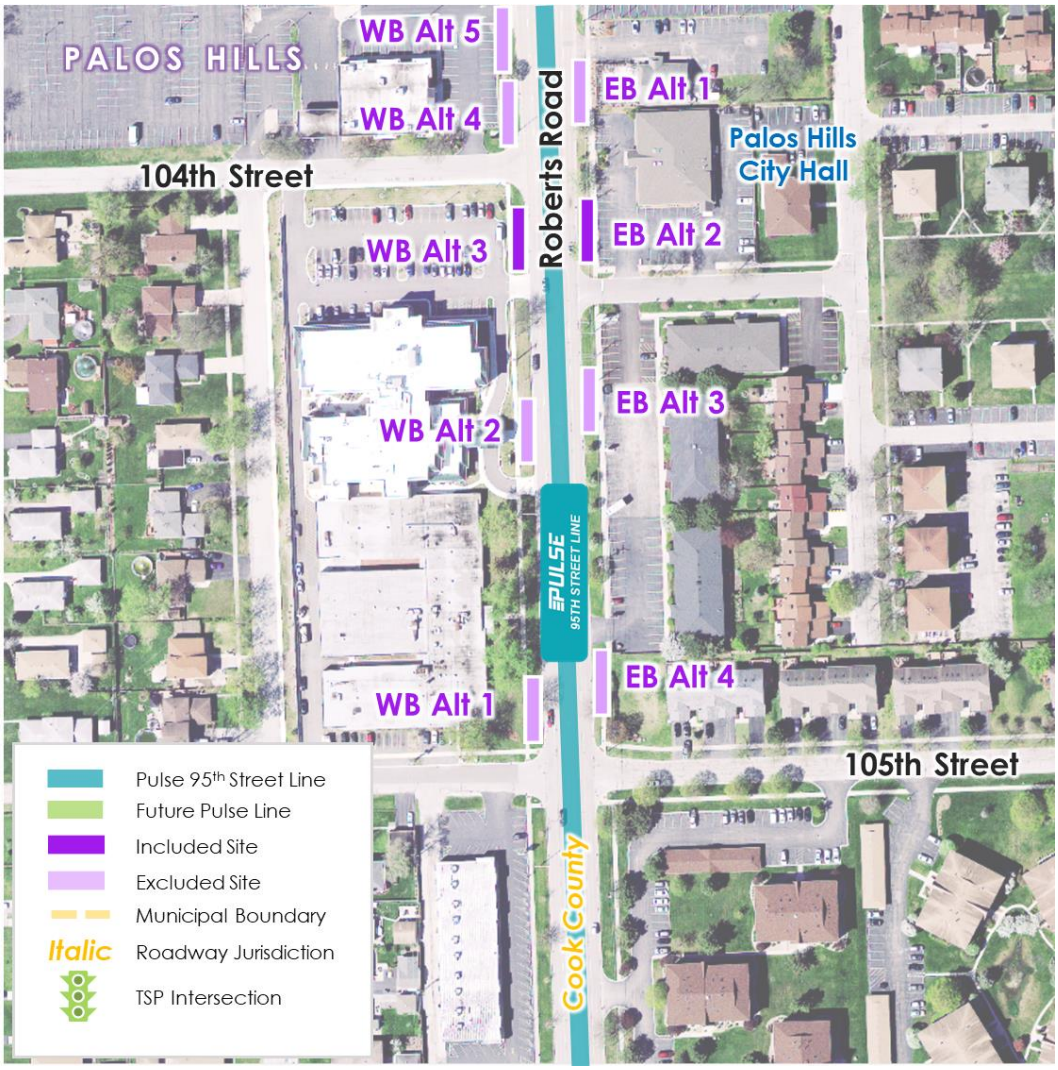
	Opportunities	Challenges
Alt 1	• Serves nearby shopping centers • Closer to signalized intersection	• May block low Village of Bridgeview sign • Nearside siting may limit potential TSP benefits
Alt 2	• Serves nearby shopping centers	• Farther from signalized intersection • Nearside siting may limit potential TSP benefits • Mid-block location may encourage jaywalking

Note: Two potential routes via 76th Avenue or Harlem Avenue are being considered for the Pulse 95th Street Line, with final routing to be determined. Siting dependent on the selection of the 76th Avenue or Harlem Avenue variant.

4.3.20 Roberts/104th

Municipality	**City of Palos Hills**
Jurisdiction	County
Eastbound Alternatives	4
Westbound Alternatives	5
TSP Possible	No

FIGURE 4.31 ROBERTS AND 104TH



Source: Pace, PMO

TABLE 4.40 ROBERTS/104TH EASTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Direct access to City Hall	• Low ridership segment of the corridor • Significant utility conflicts • Farther from nursing home and multi-family housing
Alt 2	• Centrally located among several uses • Direct access to City Hall • Provides good access to the nursing home	• Low ridership segment of the corridor
Alt 3	• Centrally located among several uses • Direct access to City Hall • Provides good access to the nursing home •	• Low ridership segment of the corridor • Midblock crossing may encourage jaywalking
Alt 4	• Serves multi-family housing to the east	• Low ridership segment of the corridor • Adjacency to residential uses may be more impactful than being adjacent to municipal use • Not near a signalized intersection

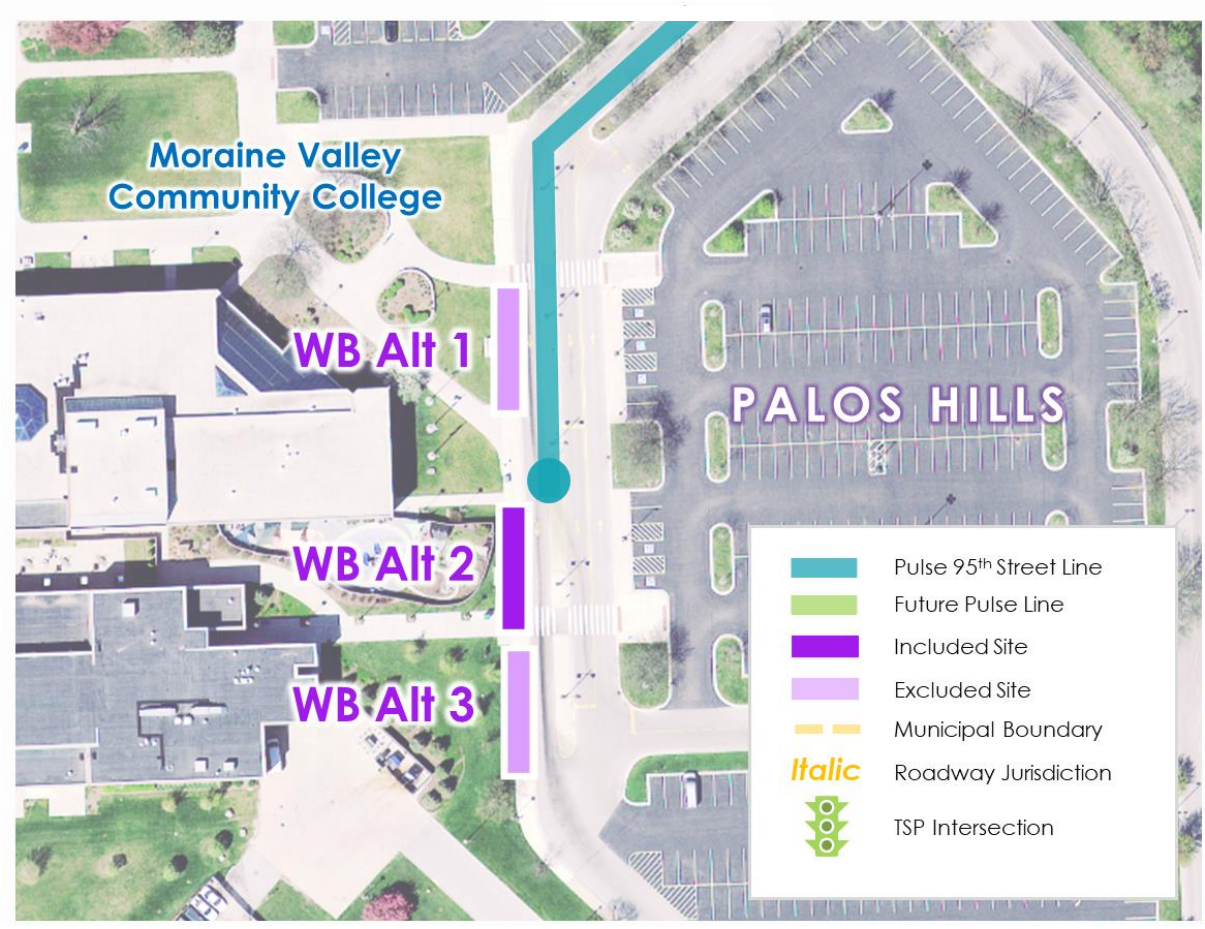
TABLE 4.41 ROBERTS/104TH WESTBOUND STATION SITE SUMMARY

	Opportunities	Challenges
Alt 1	• Serves multi-family housing to the east	• Low ridership segment of the corridor • Adjacency to residential uses may be more impactful than being adjacent to municipal use • Not near a signalized intersection
Alt 2	• Serves nursing home and multi-family housing	• Low ridership segment of the corridor • Midblock crossing may encourage jaywalking
Alt 3	• Centrally located among several uses • Adjacent to City Hall • Provides good access to the nursing home	• Low ridership segment of the corridor
Alt 4	• Adjacent to City Hall	• Low ridership segment of the corridor • Farther from nursing home and multi-family housing
Alt 5	• Adjacent to City Hall	• Low ridership segment of the corridor • Midblock crossing may encourage jaywalking • Farther from nursing home and multi-family housing

4.3.21 Moraine Valley Community College

Municipality	**City of Palos Hills**
Jurisdiction	Private
Eastbound Alternatives	3
Westbound Alternatives	0
TSP Possible	No

FIGURE 4.32 MORAINE VALLEY COMMUNITY COLLEGE



Source: Pace, PMO

TABLE 4.42 MORAINE VALLEY COMMUNITY COLLEGE EASTBOUND STATION SITE SUMMARY

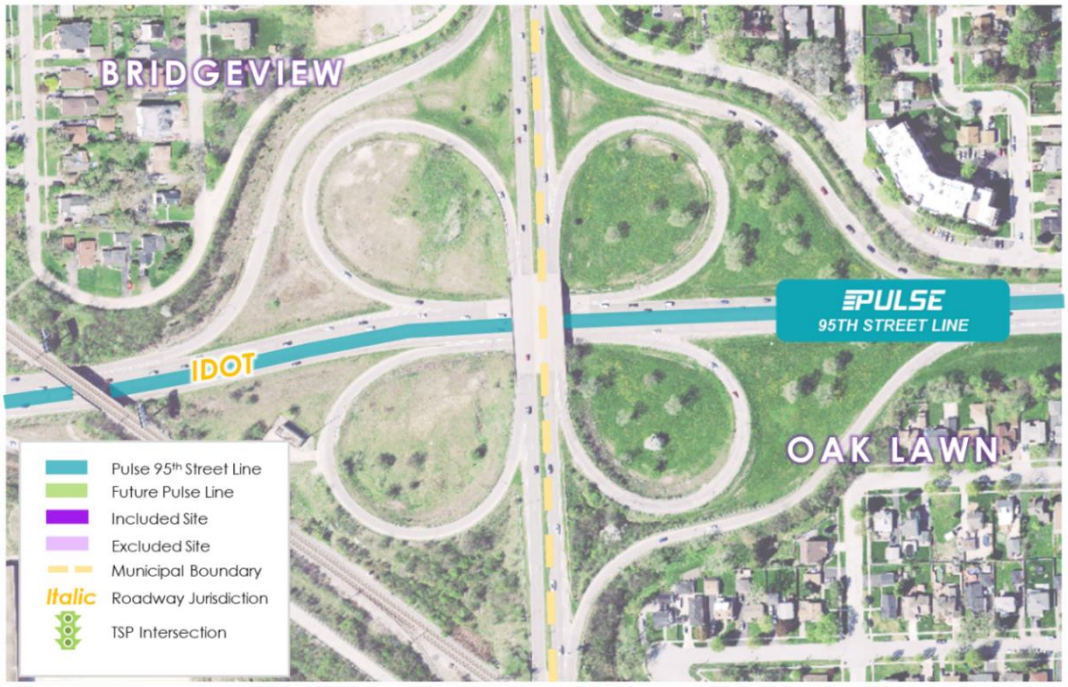
	Opportunities	Challenges
Alt 1	• Serves MVCC with direct access to campus • Available right-of-way for shared oversized station to serve as Pulse 95th St Line terminus	• Raised median islands would prevent bus-passing maneuver • Existing Pace shelter would be removed • Pedestrian walkway would need to be reconfigured to provide access to station
Alt 2	• Serves MVCC with direct access to campus • Available right-of-way for shared oversized station to serve as Pulse 95th St Line terminus • Raised median islands need to be modified but could facilitate bus-passing maneuver	• Existing Pace shelter would be removed • Pedestrian walkway would need to be reconfigured to provide access to station
Alt 3	• Serves MVCC with direct access to campus • Available right-of-way for shared oversized station to serve as Pulse 95th St Line terminus	• Raised median islands would prevent bus-passing maneuver • Existing Pace shelter would be removed • Pedestrian walkway would need to be reconfigured to provide access to station

4.3.22 Harlem

The Harlem station location is classified as a Potential Future Station. This location would create consistent station spacing between the Ridgeland and 76th station locations and would provide an east-west connection to the future Pulse Harlem Line. Station siting at this location is dependent on the IDOT Interchange Design Study (IDS) plan, which would result in the restructuring of the full cloverleaf interchange at this location. Therefore, station layouts have not yet been developed.

Municipality	**Village of Bridgeview / Village of Oak Lawn**
Jurisdiction	IDOT
Eastbound Alternatives	N/A
Westbound Alternatives	N/A
TSP Possible	No

FIGURE 4.33 95TH AND HARLEM



Note: Siting dependent on the restructuring of the Harlem interchange at this location.
Source: Pace, PMO

4.3.23 Summary

In total, 21 station locations and 85 individual station site options were evaluated, including stations along the two potential routes via 76th Avenue or Harlem Avenue. Table 4.43 provides a list of all station locations and sites that have been reviewed and identifies those recommended for advancement to the environmental review phase. At this time, 21 station locations and 41 individual station sites are recommended to advance. During the environmental review phase, a boundary and topographic survey will be conducted to confirm property lines and right-of-way limits and collect topographic data. This data will support the environmental review, the development of advanced conceptual designs, and Pace's selection of a preferred station site for each location that will advance forward to the design phase.

TABLE 4.43 PULSE 95TH STREET LINE STATION SITE SUMMARY

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
CTA Red Line 95th/Dan Ryan Station	N/A	Terminus	Pace	Terminus	City of Chicago	State		✓	
Halsted	Unknown	EB Alternate 1	Pace	Farside	City of Chicago	State		✓	
		WB Alternate 1	Pace	Farside	City of Chicago	State		✓	
Vincennes (Longwood Metra)	Unknown	EB Alternate 1	Pace	Nearside	City of Chicago	State		✓	
		EB Alternate 2	Pace	Nearside	City of Chicago	State	✓		Excluded due to narrow right-of-way and blockage of business frontage.
		WB Alternate 1	Pace	Farside	City of Chicago	State		✓	
		WB Alternate 2	Pace	Nearside	City of Chicago	State			Excluded due to proximity to railroad crossing and potential need to close the CDWM driveway.
		WB Alternate 3	Pace	Nearside	City of Chicago	State			Excluded due to proximity to railroad crossing and potential need to close the CDWM driveway.
Ashland	Unknown	EB Alternate 1	Pace	Farside	City of Chicago	State	✓		Excluded due to blockage of church.
		EB Alternate 2	Pace	Nearside	City of Chicago	State		✓	
		WB Alternate 1	Pace	Farside	City of Chicago	State		✓	
		WB Alternate 2	Pace	Nearside	City of Chicago	State	✓		Excluded due to blockage of business frontage and nearside location.
Wood (Beverly Hills Metra)	Unknown	EB Alternate 1	PMO	Midblock	City of Chicago	State			Excluded in favor of a more centralized location and to ensure safety of the bus and passengers near the railroad tracks.
		EB Alternate 2	PMO	Midblock	City of Chicago	State		✓	
		EB Alternate 3	PMO	Midblock	City of Chicago	State			Excluded in favor of a more centralized location and to avoid possible grade issues.

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
		WB Alternate 1	PMO	Midblock	City of Chicago	State			Excluded to avoid possible grade issues and to ensure the safety of passengers crossing the railroad tracks.
		WB Alternate 2	PMO	Midblock	City of Chicago	State		✓	
Western	No	EB Alternate 1	Pace	Farside	City of Chicago	State		✓	
		EB Alternate 2	Pace	Nearside	Village of Evergreen Park	State			Excluded to avoid significant grade issues and nearside location.
		EB Alternate 3	Pace	Nearside	Village of Evergreen Park	State	✓	✓	
		WB Alternate 1	Pace	Farside	Village of Evergreen Park	State		✓	
		WB Alternate 2	Pace	Nearside	City of Chicago	State			Excluded as it is farther from signalized crossing and high ridership activity near Campbell Avenue. Excluded in favor of a farside site.
California	Yes	EB Alternate 1	Pace	Farside	Village of Evergreen Park	State		✓	
		EB Alternate 2	Pace	Nearside	Village of Evergreen Park	State	✓		Excluded due to blockage of business frontage, narrow right-of-way, and nearside location.
		WB Alternate 1	Pace	Farside	Village of Evergreen Park	State			Would conflict with Little Company of Mary Hospital plans for emergency room addition
		WB Alternate 2	Pace	Nearside	Village of Evergreen Park	State	✓	✓	
Kedzie	Yes	EB Alternate 1	Pace	Farside	Village of Evergreen Park	State	✓	✓	
		WB Alternate 1	Pace	Farside	Village of Evergreen Park	State	✓	✓	
Pulaski	No	EB Alternate 1	Pace	Farside	Village of Evergreen Park	State			Excluded due to narrow right-of-way, inhospitable pedestrian environment, and parking space displacement at Walgreens.

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
		EB Alternate 2	Pace	Nearside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 1	Pace	Farside	Village of Oak Lawn	State	✓	✓	
Kostner	Yes	EB Alternate 1	Pace	Farside	Village of Oak Lawn	State	✓	✓	
		EB Alternate 2	Pace	Farside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 1	Pace	Farside	Village of Oak Lawn	State	✓	✓	
Cicero	Yes	EB Alternate 1	Pace	Farside	Village of Oak Lawn	State			Excluded due to location far from signalized intersection and displacement of several parking spaces.
		EB Alternate 2	Pace	Farside	Village of Oak Lawn	State	✓	✓	
		EB Alternate 3	Pace	Nearside	Village of Oak Lawn	State			Excluded due to location far from signalized intersection, nearside location, and blockage of business frontage.
		WB Alternate 1	Pace	Nearside	Village of Oak Lawn	State			Excluded due to narrow right-of-way, inhospitable pedestrian environment, nearside location, and operational challenges between Hilton Drive and the right turn lane to Cicero Avenue.
		WB Alternate 2	Pace	Nearside	Village of Oak Lawn	State	✓	✓	
Oak Lawn Patriot Metra	No	EB Alternate 1	Pace	Midblock	Village of Oak Lawn	State		✓	
		WB Alternate 1	Pace	Midblock	Village of Oak Lawn	State			Excluded due to location far from Oak Lawn Patriot Metra Station and Children's Museum and because lack of signalized intersection may cause jaywalking.
		WB Alternate 2	Pace	Midblock	Village of Oak Lawn	State			Excluded as lack of signalized intersection may cause jaywalking.
		WB Alternate 3	Pace	Midblock	Village of Oak Lawn	State	✓	✓	
Central	Yes	EB Alternate 1	PMO	Farside	Village of Oak Lawn	State			Excluded as it is farther from signalized crossing which may encourage jaywalking.

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
		EB Alternate 2	PMO	Farside	Village of Oak Lawn	State	✓		Excluded as site may block business frontage.
		EB Alternate 3	PMO	Nearside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 1	PMO	Farside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 2	PMO	Farside	Village of Oak Lawn	State	✓		Excluded as site may block business signage.
SW Highway	Yes	EB Alternate 1	Pace	Nearside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 1	Pace	Farside	Village of Oak Lawn	State	✓	✓	
Ridgeland	Yes	EB Alternate 1	Pace	Farside	Village of Chicago Ridge	State	✓	✓	
		EB Alternate 2	Pace	Nearside	Village of Chicago Ridge	State			Excluded due to nearside location.
		WB Alternate 1	Pace	Farside	Village of Oak Lawn	State	✓	✓	
		WB Alternate 2	Pace	Nearside	Village of Chicago Ridge	State	✓		Excluded due to nearside location, potential closure of Simmons Middle School driveway, interference with school signage, and jaywalking concerns.
76th	Yes	EB Alternate 1	PMO	Farside	City of Hickory Hills	State			Excluded due to inhospitable pedestrian environment, potentially unsafe bus travel conditions (high speeds; near on/off ramps), and distance from higher ridership activity.
		EB Alternate 2	PMO	Nearside	City of Hickory Hills	Municipality	✓	✓	
		WB Alternate 1	PMO	Farside	City of Hickory Hills	Municipality	✓	✓	
		WB Alternate 2	PMO	Farside	City of Hickory Hills	Municipality	✓		Excluded due to limited pedestrian access, displacement of parking spaces, and road curvature.
		WB Alternate 3	PMO	Nearside	City of Hickory Hills	State			Excluded due to inhospitable pedestrian environment, potential grading issues, and nearside location.

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
Bridgeview Courthouse	No	EB Alternate 1	Pace	Midblock	Village of Bridgeview	Municipality			Excluded due to lack of signalized intersection and distance from Courthouse entrance.
		EB Alternate 2	Pace	Midblock	Village of Bridgeview	Municipality		✓	
		EB Alternate 3	Pace	Midblock	City of Palos Hills	County	✓		Excluded due to residential private property impact concerns.
		EB Alternate 4	Pace	Midblock	City of Palos Hills	County	✓	✓	
		EB Alternate 5	Pace	Midblock	City of Palos Hills	County	✓		Excluded due to residential private property impact concerns and distance from signalized intersection.
		WB Alternate 1	Pace	Midblock	Village of Bridgeview	County			Excluded due to potential need for new pedestrian access routes and because station is located far away from east entrance of the Courthouse.
		WB Alternate 2	Pace	Farside	Village of Bridgeview	County		✓	
		WB Alternate 3	Pace	Midblock	Village of Bridgeview	Municipality		✓	
		WB Alternate 4	Pace	Midblock	Village of Bridgeview	Municipality			Excluded in favor of a stronger 103rd Street site.
Harlem/103rd	No	EB Alternate 1	Pace	Midblock	Village of Chicago Ridge	State			Excluded as site is far from signalized intersection and lack of crosswalk.
		EB Alternate 2	Pace	Midblock	Village of Chicago Ridge	State			Excluded as site is far from signalized intersection and lack of crosswalk.
		EB Alternate 3	Pace	Farside	Village of Chicago Ridge	State		✓	
		EB Alternate 4	Pace	Nearside	Village of Chicago Ridge	State			Excluded as site is not located along the Pulse 95th Street Line route.
		EB Alternate 5	Pace	Nearside	City of Palos Hills	County			Excluded as site is far from signalized intersection.
		WB Alternate 1	Pace	Nearside	Village of Bridgeview	State		✓	

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
		WB Alternate 2	Pace	Nearside	Village of Bridgeview	State			Excluded as site is a nearside location and far from signalized intersection.
Roberts/104th	No	EB Alternate 1	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area and significant utility issues.
		EB Alternate 2	Pace	Midblock	City of Palos Hills	County		✓	
		EB Alternate 3	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area and a midblock crossing that may encourage jaywalking.
		EB Alternate 4	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area and lack of proximity to a signalized intersection.
		WB Alternate 1	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area and lack of proximity to a signalized intersection.
		WB Alternate 2	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area.
		WB Alternate 3	Pace	Midblock	City of Palos Hills	County		✓	
		WB Alternate 4	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area.
		WB Alternate 5	Pace	Midblock	City of Palos Hills	County			Excluded due to lack of proximity to ridership generators in the area and a midblock crossing that may encourage jaywalking.
Moraine Valley Community College	No	Terminus: EB Alternate 1	Pace	Midblock	City of Palos Hills	Private			Raised median islands would prevent bus-passing maneuver.
		Terminus: EB Alternate 2	Pace	Midblock	City of Palos Hills	Private		✓	
		Terminus: EB Alternate 3	Pace	Midblock	City of Palos Hills	Private			Raised median islands would prevent bus-passing maneuver.

Station Location	TSP Intersection	Station Site	Source	Intersection Location	Municipality	Road/Site Jurisdiction	Private Property Impact Concern	Included (February 2019)	Reason Excluded
Harlem	N/A	N/A	Pace	N/A	Village of Oak Lawn/ Village of Bridgeview	State			Siting dependent on the restructuring of the Harlem interchange at this location.

5 Running Way

5.1 Vehicle Operations

The Pulse 95th Line will operate in mixed traffic with the vehicle generally occupying the right travel lane. Appendix E provides Conceptual Station Improvement Plans that include the following types of station sites: 1) the boarding platform will align with the current curb line and the bus will pull over to the curb and raised platform, 2) the boarding platform will be constructed to align with the travel lane and the bus will not pull over (e.g. California eastbound), 3) the bus will pull off of the roadway to board and alight passengers (e.g. Moraine Valley Community College), and 4) the bus will stop at an existing on-street transit facility with a standard curb height (e.g. CTA Red Line 95th Street Station/Dan ryan Station).

5.2 Station-Related and Collateral Improvements

Without dedicating running ways, the majority of Pulse 95th Line improvements will be directly related to station construction within the right-of-way. These include construction of new raised station platforms within the right-of-way at several locations and substantial curb, gutter, and sidewalk reconstruction. In Pace's preliminary evaluation on the potential for queue jumps around the region, the intersection of 95th & Western Avenue was identified as a candidate for an eastbound queue jump bypass lane. This location will be advanced during the conceptual design phase of the 95th Street Line. In addition to Western Ave, the intersection of 95th and Cicero is a candidate to further evaluate utilizing a queue jump. Other collateral improvements near Pulse station locations are proposed to facilitate safe and hospitable pedestrian access to the stations. These include upgraded, ADA compliant curb ramps; high-visibility crosswalks; and a pedestrian refuge island. Many of these improvements are not required for operation of Pulse service, but are incorporated to create a pedestrian-friendly environment and improve accessibility near the stations. It is expected that local communities will share some of the cost for these improvements when not required for the actual construction of Pulse stations.

5.3 Transit Signal Priority

Pace is actively participating in the Regional Transit Signal Priority (TSP) Implementation Program led by the Regional Transportation Authority (RTA). Figure 5.1 shows intersections along the 95th corridor recommended for implementation of TSP[16]. TSP is planned for 95th Street, and development of the TSP system will adhere to the Regional TSP Standards and

[16] Delcan. (March 11, 2013.) Pace Signal Coordination and Timing Project.

Implementation Guidelines, which were developed under the Regional Transit Signal Priority Implementation Program (RTSPIP). When TSP is implemented on 95th Street, it will be utilized by local services in addition to Pulse service. TSP is currently anticipated to be operational on 95th Street before the 95th Line's planned start of service.

FIGURE 5.1 PULSE 95TH STREET LINE LINE RECOMMENDED TSP INTERSECTIONS

Source: Pace, PMO

6 Running Time Analysis

6.1 Running Time Estimate

Several planned changes in the corridor will reduce the future running times for Pulse and modified local trips between the CTA Red Line 95th/Dan Ryan Station and MVCC. Planned changes that will contribute to reduced future running times include:

- **Stop Consolidation:** Each time the bus stops to board and alight passengers, running time is impacted in two ways. First is the time the bus spends decelerating as it approaches a stop and accelerating as it departs, which is a direct function of the number of stops served. Pulse 95th Street Line running times are expected to be lower than current Route 381 times primarily due to fewer stops, as less time would be spent accelerating and decelerating. Dwell time represents the second impact to running time, in which the bus is stopped while boarding and alighting passengers. This is a more complex matter, as some existing passengers who will not be well served by the reduced number of Pulse stations are unlikely to use the service (thus reducing passenger loads and dwell times), but the increase in service is expected to increase overall ridership at Pulse stations (thus increasing passenger loads and dwell times). This is discussed in greater detail in the *Running Time Methodology* section.

- **Level Boarding:** Pulse stations will feature a 12-inch raised boarding platform. Based on the Transit Capacity and Quality of Service Manual, raised platforms reduce boarding time by one-half second per passenger[17].

- **Higher Frequency and Increased Ridership:** Higher frequency service typically means fewer passengers per trip, which reduces running time. In practice, higher frequency service would also generate higher ridership, so these two factors are somewhat offsetting (further addressed in the *Running Time Methodology* section). The modified local Route 381 is expected to serve fewer passengers and operate at lower frequencies.

- **Transit Signal Priority (TSP):** TSP helps buses to stay on schedule by requesting extended green lights or shorter red lights when they are running behind. This allows more aggressive scheduling and can thus reduce the expected running times for Pulse and modified local trips.

[17] Transit Cooperative Research Program, *Report 165: Transit Capacity and Quality of Service Manual, Third Edition*, Transportation Research Board, Washington, DC. 2013.

6.1.1 Basis for Estimate

Future running time estimates are based on analysis of actual Route 381 running times by category (moving, non-moving, slowed in congestion, etc.). Analysis of existing conditions were based on the following data:

- Current scheduled running times from the Route 381 timetable dated September 17, 2017;
- On-board travel time survey conducted by Pace staff and analyzed by the PMO;
- On time performance (OTP) data provided by Pace and analyzed by the PMO;
- Posted speed limits obtained from observation;
- Route length by variant (measured using Google Maps); and
- The number and location of proposed Pulse stations.

6.1.2 Travel Time Analysis

As a component of the running time estimate, an analysis of travel time and travel conditions was conducted. A smartphone app was developed to collect travel condition data during a select sample of Pace Route 381 bus trips. Pace staff collected the data by riding the bus to and from each terminus and logging appropriate travel conditions throughout the run. The app captured eight different travel conditions within the following three categories:

- **Free Flow:** Moving; Stopped at a Traffic Light
- **Congestion:** Slowed; Stopped
- **Bus Stop:** Doors Open; Ramp Deployed; Bike Rack Used; Idling at a Time Point

Data was collected for 47 trips between November 6, 2018 and November 15, 2018, including 38 weekday trips and nine weekend trips. Thirty-seven trips (17 eastbound/northbound trips and 20 westbound/ southbound trips) were analyzed after quality control measures eliminated 10 trips. Weekday trips were categorized within one of the following defined time periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59PM), PM Peak (2:00PM-5:59PM), or Night (6:00PM-11:59PM and 12:00am-5:59am). Weekend trips were summarized as a single period. It should be noted that data collection occurred during the CTA Red Line South Reconstruction Project, causing a detour of Route 381 buses and likely resulting in several additional minutes of travel time.

6.1.2.1 Analysis

According to analysis of sampled trips, the average Route 381 trip length is approximately one hour. Buses stopped (i.e. opened the doors) an average of 27 times per trip. The average dwell time per stop was 15 seconds. The average dwell time was consistent across various time periods. See Table 6.1 for more details regarding the travel time survey data by period.

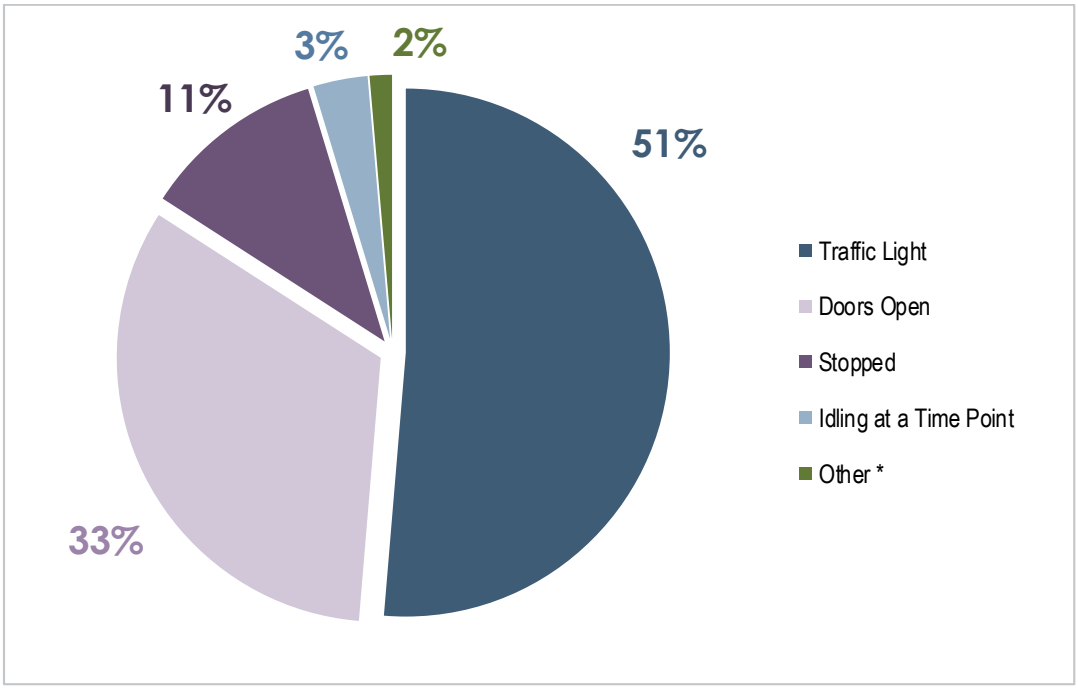
TABLE 6.1 ROUTE 381 TRAVEL TIME SUMMARY

	All Trips	EB/NB	WB/SB	Typical Weekday	AM Peak	PM Peak	Weekend
Avg Trip Length (h:mm:ss)	1:00:00	1:03:00	0:59:00	1:01:00	1:00:00	1:03:00	0:57:00
Avg Stops (Doors Open) per Trip	27	29	26	28	28	29	24
Avg Total Dwell Time per Trip (h:mm:ss)	0:06:45	0:07:18	0:06:17	0:06:53	0:06:29	0:06:41	0:06:16
Avg Dwell Time per Stop (h:mm:ss)	0:00:15	0:00:15	0:00:15	0:00:15	0:00:14	0:00:14	0:00:16
Total Stops with Dwell Time > 60 sec.	8	4	4	6	0	4	2
Dwell Time (% of Travel Time)	11%	12%	11%	11%	11%	11%	11%
Avg Idling Count per Trip	2	4	1	2	0	2	2

Source: Analysis of select Pace Route 381 travel time data collected via Android application. November 2018. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), PM Peak (2:00pm-5:59pm),. Weekend trips were summarized as a single period.

Overall, 62% of the total travel time for all trips was identified as Moving, 34% as Non-Moving, and 4% as Slowed in congestion. As shown in Figure 6.1 the Traffic Light and Doors Open categories represent 84% of Non-Moving travel conditions at 51% and 33%, respectively. The Other category, which includes Bike Rack Used or Ramp Deployed events, represents 2% of Non-Moving travel conditions.

FIGURE 6.1 ROUTE 381 NON-MOVING TRAVEL CONDITION SUMMARY (ALL TRIPS)



Note: Other category represents Bike Rack Used or Ramp Deployed events.
Source: Analysis of select Pace Route 381 travel time data collected via Android application. November 2018.

On average, PM Peak trips take an additional three minutes compared to AM Peak trips. Analysis of sampled trips suggests that traffic conditions are likely responsible for much of this difference. PM Peak trips spend more time in congestion (10.5%) than AM Peak trips (4.8%), likely attributable to evening commute patterns, school dismissals, and after-work trips to commercial clusters along the route. AM Peak trips spend nearly two additional minutes moving compared to PM Peak trips, while PM Peak trips spend nearly five additional minutes in Slowed, Stopped, or Idling states. The idling duration of nearly one minute per PM Peak trip suggests that there may be slack in the timetable. PM trips stop to idle an average of twice per trip. Variability in running times may be higher than average on this route because it includes six active railroad grade crossings (three used primarily by passenger trains and three used by freight trains).

PM Peak and AM Peak trips are otherwise similar in the count of average stops (Doors Open events), average dwell time per stop and dwell as a share of running time (11%), and average duration stopped at traffic lights. See Table 6.2 for more information about AM Peak and PM Peak travel time conditions.

Several travel conditions result in eastbound (EB)/northbound (NB) (CTA Red Line 95th/Dan Ryan Station-bound) trips that are nearly four minutes longer than westbound (WB)/southbound (SB) (MVCC-bound) trips. This travel time difference is largely attributable to four additional minutes spent Moving and one additional Dwell Time minute. The additional dwell time is attributable to an increase in the average number of stops per trip, which may be impacted by the overall small sample size.

TABLE 6.2 ROUTE 381 SUMMARY OF AVERAGE TOTAL DURATION PER TRIP, AM PEAK AND PM PEAK (H:MM:SS)

	All Trips	AM Peak (Weekday)	PM Peak (Weekday)	PM/AM Difference
Moving	0:37:27	0:38:17	0:36:47	(0:01:30)
Stopped at Traffic Light	0:10:34	0:11:39	0:11:59	0:00:20
Dwell Time	0:06:45	0:06:29	0:06:41	0:00:12
Slowed in Congestion	0:02:20	0:01:21	0:03:23	0:02:02
Stopped in Congestion	0:02:18	0:01:31	0:03:15	0:01:44
Idling at a Time Point	0:00:41	0:00:00	0:00:56	0:00:56
Total PM Peak/AM Peak Difference	-	-	-	**0:03:43**

Source: Analysis of select Pace Route 381 travel time data collected via Android application. November 2018. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am); PM Peak (2:00pm-5:59pm).

EB/NB trips took longer despite slightly less time spent in congested conditions (6.6% versus 8.7% WB/SB) and less time stopped per traffic light (25 seconds versus 29 seconds). It should be noted that Pace staff reported that road construction near the Cicero Avenue intersection in the westbound lane caused congested conditions for nearly all westbound trips sampled, which is likely reflected in the increased "Stopped in Congestion" status experienced on westbound trips. Conversely, ridership on eastbound 381 buses tends to be somewhat higher than westbound along the portions of the route that overlap with

CTA Route 95, due to the separate westbound boarding locations for the two routes at the CTA Red Line 95th/Dan Ryan Station. This higher ridership is likely reflected in the higher eastbound aggregate dwell time. See Table 6.3 for more information about travel time conditions by direction.

TABLE 6.3 ROUTE 381 SUMMARY OF AVERAGE TOTAL DURATION PER TRIP, WB AND EB (H:MM:SS)

	All Trips	WB/SB (Weekday)	EB/NB (Weekday)	EB/WB Difference
Moving	0:37:27	0:35:41	0:39:33	0:03:52
Stopped at Traffic Light	0:10:34	0:10:33	0:10:36	0:00:03
Dwell Time	0:06:45	0:06:17	0:07:18	0:01:01
Slowed in Congestion	0:02:20	0:02:19	0:02:21	0:00:02
Stopped in Congestion	0:02:18	0:02:46	0:01:46	(0:01:00)
Idling at a Time Point	0:00:41	0:00:41	0:00:41	0:00:00
Total PM Peak/AM Peak Difference	-	-	-	**0:05:55**

Source: Analysis of select Pace Route 381 travel time data collected via Android application. November 2018.

6.1.2.2 Findings

Analysis of select travel time survey data suggests the following:

- The Pulse 95th Street Line could realize travel time savings through stop consolidation. Route 381 buses stop 27 times for 15 seconds per stop on average. The nature of Pulse 95th Street Line service would consolidate stops to 18 intermediate station locations (excluding two termini), resulting in an average time savings of two minutes and sixteen seconds per trip. Consolidation would also lead to improved station spacing, allowing buses to spend more time moving.
- Time stopped at traffic lights represents 51% of non-moving time. Average duration per traffic light stop varies from 25 to 30 seconds among time periods. Transit Signal Priority (TSP) may provide travel time savings particularly during the PM Peak period. Although Pace has started testing TSP implementation on other Pulse lines in the system, the exact impact of TSP along the 95th Street Corridor has not yet been determined. TSP has resulted in up to 20% travel time savings in other parts of the

Pace service area, and this 20% savings per TSP-equipped intersection has been assumed for the 95th Street running time estimates presented in this memo.

6.1.3 On-Time Performance

The PMO analyzed On-Time Performance (OTP) data for Pace Route 381 between MVCC in Palos Hills and the CTA Red Line 95th/Dan Ryan Station in Chicago. Weekday trips were analyzed based on Pace-provided trip data for October 2017. Special trip deviations, such as "H Trips" via 88th Avenue, were excluded from the analysis.

The OTP analysis was used primarily as a "cross check" in support of the Travel Time Analysis findings. The OTP analysis helped to evaluate the current performance of Route 381, identify operating concerns, and estimate the running time for the Pulse 95th Street Line, which will follow approximately the same routing as Route 381 with limited stops, transit signal priority, and other Pulse amenities.

6.1.3.1 Analysis

Travel times were analyzed by time of day, including AM Peak, PM Peak, Midday, and Evening travel periods. The running time, dwell time, and total travel times by direction and time of day are summarized in Table 6.4. As shown, total travel times during the PM Peak and Midday are typically longer than AM Peak and Evening travel times – a finding consistent with Travel Time Analysis. This finding also underscores the known high utilization of the corridor during the Midday period due in part to school dismissals.

TABLE 6.4 SUMMARY RUNNING TIME AND DWELL TIME BY DIRECTION AND TIME PERIOD

Direction / Time Period	Running Time	Dwell Time at Time Points	Total Travel Time
Eastbound			
AM Peak	0:47:22	0:04:40	0:52:02
Midday	0:49:19	0:07:00	0:56:19
PM Peak	0:54:10	0:07:55	1:02:05
Evening	0:44:46	0:06:00	0:50:46
Westbound			
AM Peak	0:50:41	0:04:16	0:54:57
Midday	0:52:28	0:05:43	0:58:11
PM Peak	0:58:02	0:04:13	1:02:15
Evening	0:46:34	0:03:01	0:49:35

Note: Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am).
Source: Analysis of select Pace Route 381 OTP data collected via onboard GPS tracking systems. October 2017.

6.1.3.2 Overall Schedule Adherence

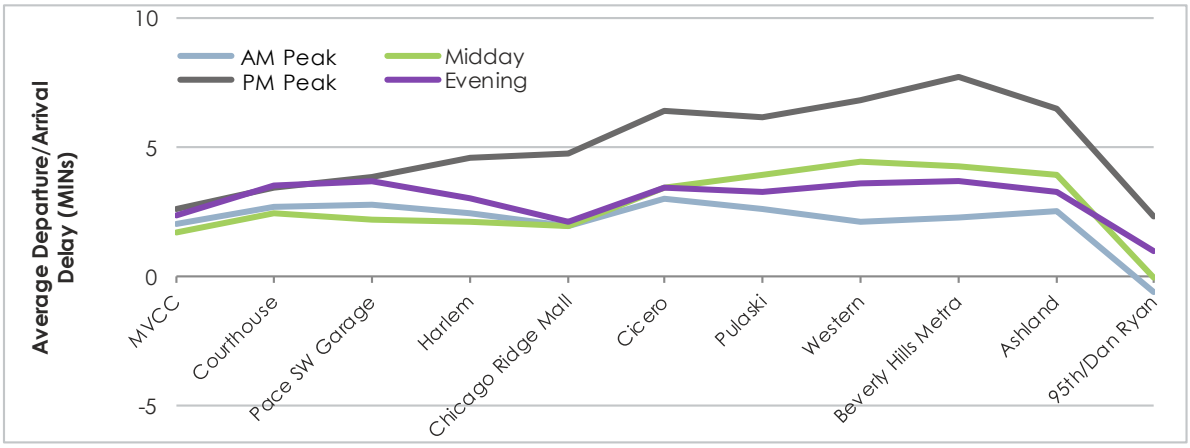
Route 381 OTP was analyzed in terms of the average arrival and departure at designated time points. Figure 6.2 and Figure 6.3 represent mean departure and arrival delays at major time points, in minutes, by travel period, and by direction. The origin terminus shows the departure delay only; the destination terminus shows the arrival delay only. The line graphs represent trips gaining or losing time versus the scheduled time as the bus travels between time points.

In the eastbound direction during the PM Peak period, buses experience increasing delays after entering the 95th Street corridor (Figure 6.2). Trips during all periods experience delays after Ridgeland Avenue (Chicago Ridge Mall), particularly during the PM Peak period when the bus is up to seven minutes behind schedule as it makes its way through Evergreen Park and into Chicago. Trips tend to recover time towards schedule adherence during the approach to the CTA Red Line 95th/Dan Ryan Station. This suggests that the current schedule has additional "slack" to allow buses that are late to intermediate time points to complete their trips on time. This slack presents an opportunity for tightening of the schedule to take advantage of TSP and the schedule reliability that it provides.

In the westbound direction, it appears that a data anomaly is present during the PM Peak (Figure 6.3). The CTA Red Line 95th/Dan Ryan Station reconstruction, layovers, and other factors may have caused Pace bus technology to log an incorrect trip start location. It

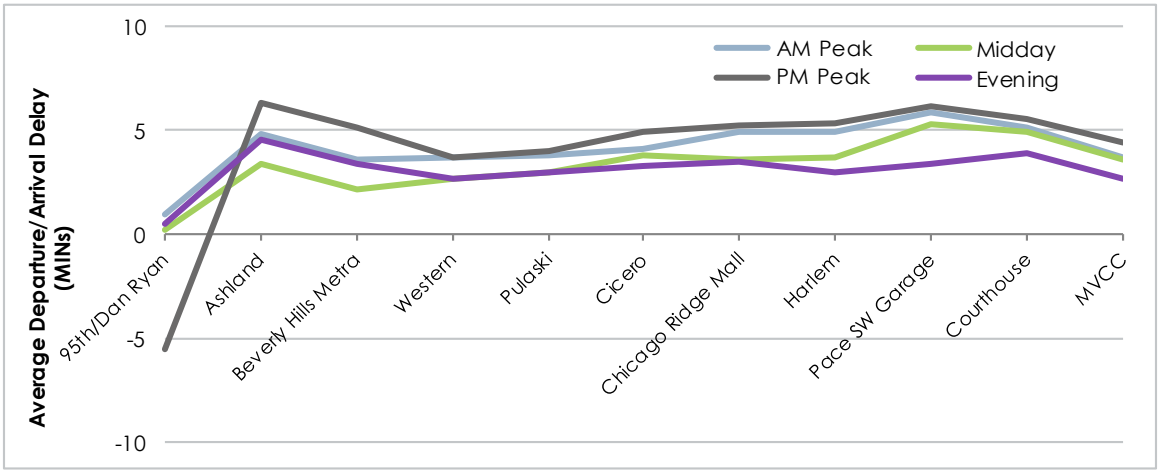
should be assumed that westbound PM trips depart the CTA Red Line 95th/Dan Ryan Station in accordance to the schedule. From that point, delays increase to between three and five minutes behind schedule as the bus progresses west through Chicago, remaining steady thereafter and arriving at MVCC similarly delayed. This suggests less overall slack in the westbound schedule, and may also be influenced by the construction at the eastern terminus.

FIGURE 6.2 EASTBOUND ON-TIME PERFORMANCE BY TIME PERIOD



Source: Analysis of select Pace Route 381 OTP data collected via onboard GPS tracking systems. October 2017. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am).

FIGURE 6.3 WESTBOUND ON-TIME PERFORMANCE BY TIME PERIOD



Source: Analysis of select Pace Route 381 OTP data collected via onboard GPS tracking systems. October 2017. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am).

6.1.4 Running Time Methodology

Running times were estimated for the Pulse 95th Street Line and modified local service based on the methodology described in this section. The running time analysis is based on a preliminary count of 18 intermediate Pulse stations plus two termini stations. For purposes of this analysis, the two termini station were counted as half of one station, resulting in a total of 19 Pulse stations. A route length of 12.8 miles was estimated using Google Maps.

6.1.4.1 Current Running Time Breakdown

The future running time analysis was estimated using current run times for Route 381 based on data collected during the Travel Time Survey explained above. Table 6.5 presents current running times for typical trips by direction and time period, as well as the impact of dwell time and acceleration/deceleration (A/D) time. Time logged during the survey as "idling at time point" was reclassified in the running time analysis due to survey data inconsistencies, as field surveys suggested buses were idling while operating behind schedule, which is not plausible. Therefore, idling time was reclassified as congestion and added back into the running time and is included in the run time shown in Table 6.5.

The Travel Time Survey provided an average number of Stops per Trip by direction and period, which was used to estimate the time impact of acceleration and deceleration. The running time was further reduced by subtracting A/D time from the average number of stops per trip. The deducted A/D time represents the difference between the time it takes the bus to stop and start at stations and the equivalent time if the bus were to continue along its route without stopping.

Finally, the Pulse 95th Street Line routing will differ from the local Route 381 routing by bypassing the Industrial Drive route segment. This will eliminate two turning movements and shorten the overall travel distance, resulting in an estimated 84-second time savings per trip. The Final Running Time represents the actual "stripped" running time, or theoretical time spent to travel the corridor with no station stops.

TABLE 6.5 ROUTE 381 OBSERVED RUNNING TIME BREAKDOWN

Direction/ Time Period	Run Time, No Dwell	Stops per Trip	Acceleration/ Deceleration (A/D) [1]	Run Time: No Dwell, No A/D	Bypass Industrial Drive Route Segment [2]	Final Running Time less dwell and A/D
Eastbound						
AM Peak	0:57:09	23	0:05:45	0:51:24	0:01:24	**0:50:00**
Midday	0:53:01	28	0:07:00	0:46:01	0:01:24	**0:44:37**
PM Peak	0:59:20	37	0:09:15	0:50:05	0:01:24	**0:48:41**
Evening	0:48:19	20	0:05:00	0:43:19	0:01:24	**0:41:55**
Westbound						
AM Peak	0:52:26	29	0:07:15	0:45:11	0:01:24	**0:43:47**
Midday	0:54:27	29	0:07:15	0:47:12	0:01:24	**0:45:48**
PM Peak	0:54:50	24	0:06:00	0:48:50	0:01:24	**0:47:26**
Evening	0:41:42	21	0:05:15	0:36:27	0:01:24	**0:35:03**

Notes: [1] Based on 30 MPH posted speed limit and an A/D rate of 2.0 MPH/second. [2] Represents time savings from the omission of a local route segment through an industrial park. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am). Source: Analysis of select Pace Route 381 travel time data collected via Android application. November 2018.

6.1.4.2 Pulse Running Time Estimate

The Pulse running time was estimated using the "stripped" running time estimated previously, and by calculating travel time changes attributable to modified bus operations, corridor enhancements, and station features.

6.1.4.2.1 *Transit Signal Priority*

TSP will help buses to stay on schedule by requesting extended green lights or shorter red lights when they are running behind. This enables more aggressive scheduling and can thus reduce the expected running time for both Pulse and modified local trips. Potential TSP-related time savings are based on Travel Time Analysis data and Pace-provided TSP location data, as tabulated in Table 6.6.

The ratio of eligible TSP intersections was calculated using Pace-provided TSP location data for a segment of intersections along the 95th Street corridor. Because TSP locations have only been determined between Western Avenue and 76th Avenue, this ratio was extrapolated to signalized intersections within Chicago city limits. This estimation resulted in a TSP-eligible intersection ratio of 76% (31 of 41 signalized intersections per direction of travel). It was further assumed that 20% of existing time spent "stopped at a traffic signal"

could be eliminated for each of the 31 TSP-equipped intersections. Table 6.6 shows a resultant TSP time savings estimate of between one to two minutes per trip.

TABLE 6.6 TSP TIME SAVINGS ESTIMATE

Time Period	Existing Signal Time per Trip [1]	Eligible TSP Intersections [2]	Assumed Time Savings per TSP Intersection	Net TSP Time Savings
AM Peak	0:11:39	76%	20%	**0:01:46**
Midday	0:09:30	76%	20%	**0:01:26**
PM Peak	0:11:59	76%	20%	**0:01:49**
Evening	0:05:31	76%	20%	**0:00:50**

[1] Time spent stopped at traffic signals based on Travel Time Analysis data. [2] Based on an extrapolation of Pace-provided TSP location data. Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am). Source: Analysis of select Pace Route 381 travel time data collected via Android application (November 2018); Pace-provided TSP equipped intersection location data.

6.1.4.2.2 *Dwell Time*

The future Pulse dwell time estimate is based on existing dwell times by period derived from Travel Time Analysis data. The following changes were applied to existing dwell times by period:

- Current dwell time was *reduced* by 15% to represent the share of existing Route 381 boardings beyond ¼ mile from a proposed Pulse station that would be unlikely to use the new limited-stop service.
- The remaining dwell time was then *increased* by 35% to represent anticipated growth in ridership resulting from the improved limited-stop service. For AM and PM Peak periods, it is assumed that 85% of this growth will occur on Pulse. During Midday and Off-Peak (Nights and Saturdays[18]) periods, 80% and 75% was assumed, respectively. It is assumed that many passengers would likely continue boarding whichever vehicle (modified local or Pulse) arrives at a Pulse station first.
- The new subtotal dwell time was *reduced* by 57% during Peak periods, 40% during the Midday, and 0% during Off-Peak to represent the increased or same frequency of service (see *Service Planning Assumptions* section). More frequent service results in lower passenger loads – and lower dwell time – per trip.

[18] Sunday data was excluded due to inadequate sample size.

- The second subtotal was *reduced* by 15% to represent level boarding time savings. The reduction is based on the *Transit Capacity and Quality of Service Manual*, which estimates level boarding to reduce boarding time per-passenger from 3.25 seconds to 2.75 seconds, assuming smart card payment on board[19].

6.1.4.3 Route 381 Running Time Estimate

The modified local Route 381 is also expected to experience a decline in running time attributable to the introduction of new Pulse service. Modified local service running time would not benefit from fewer stops or bypassing Industrial Drive; however, speed on the modified local service should improve due to TSP and reduced overall passenger loads resulting from increased overall corridor service as well as a shift in most passengers from local service to Pulse. The following adjustments were made to the existing local running times to estimate the modified local Route 381 running time by period:

- The same Pulse TSP time savings were assumed (see Table 6.6).
- Dwell time savings assumed through a substantial reduction in ridership (85% of existing riders are expected to use Pulse), partly offset by growth at Pulse stations (approximately one-fourth of which will use local Route 381 trips) and by frequency reductions (higher loads per vehicle at stations far from Pulse service).

6.1.5 Final Estimated Running Time

6.1.5.1 Pulse 95th Street Line (via 76th Avenue)

Table 6.7 shows the estimated end-to-end running times for the Pulse 95th Street Line by time period and direction. Running times are expected to decrease by 5% to 21% compared to existing local service.

[19] Transit Cooperative Research Program, *Report 165: Transit Capacity and Quality of Service Manual, Third Edition*, Transportation Research Board, Washington, DC. 2013.

TABLE 6.7 ESTIMATED PULSE 95TH STREET LINE RUNNING TIME

Direction / Time Period	Moving time (No dwell or accel/decel)	Accel/ Decel Time	Adjusted Dwell Time	TSP Time Savings	Pulse Running Time	Existing Route 381 Run Time	% Run Time Improvement
Eastbound							
AM Peak	0:50:00	0:04:45	0:02:36	0:01:46	**0:55:35**	1:01:13	9%
Midday	0:44:37	0:04:45	0:04:19	0:01:26	**0:52:15**	1:00:30	14%
PM Peak	0:48:41	0:04:45	0:02:40	0:01:49	**0:54:18**	1:08:43	21%
Evening	0:41:55	0:04:45	0:04:09	0:00:50	**0:49:59**	0:52:59	6%
Westbound							
AM Peak	0:43:47	0:04:45	0:02:36	0:01:46	**0:49:22**	0:59:44	17%
Midday	0:45:48	0:04:45	0:04:19	0:01:26	**0:53:26**	1:02:47	15%
PM Peak	0:47:26	0:04:45	0:02:40	0:01:49	**0:53:03**	0:59:50	11%
Evening	0:35:03	0:04:45	0:04:09	0:00:50	**0:43:07**	0:45:34	5%

Note: Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am). Source: Analysis of select Pace Route 381 travel time data collected via Android application (November 2018); Pace-provided TSP equipped intersection location data.

6.1.5.2 Pulse 95th Street Line (via Harlem Avenue)

An analysis of the Harlem Avenue alternative shows that it would add approximately 1 minute of travel time to the end to end travel times developed for the 76th Avenue alternative, A summary of the travel times is shown in Table 6.8.

TABLE 6.8 TRAVEL TIME SUMMARY BY ALTERNATIVE

	via 76th Ave		via Harlem Ave	
	EB	WB	EB	WB
AM Peak	0:55:35	0:49:22	0:56:35	0:50:22
Midday	0:52:15	0:53:26	0:53:15	0:54:26
PM Peak	0:54:18	0:53:03	0:55:18	0:54:03
Evening	0:49:59	0:43:07	0:50:59	0:44:07

Note: Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am)

6.1.5.3 Modified Route 381

Table 6.9 shows the estimated end-to-end running times for the modified local service by time period and direction. Running times are expected to decline by 2% to 14% compared with existing local service.

TABLE 6.9 ESTIMATED MODIFIED LOCAL RUNNING TIME

Direction / Time Period	Moving time (no dwell or accel/decel)	Accel/Decel Time	Adjusted Dwell Time	TSP Time Savings	Revised Route 381 Run Time	Existing Route 381 Run Time	% Run Time Improvement
Eastbound							
AM Peak	0:51:24	0:06:45	0:03:47	0:01:46	**1:00:10**	1:01:13	2%
Midday	0:46:01	0:06:45	0:04:55	0:01:26	**0:56:15**	1:00:30	7%
PM Peak	0:50:05	0:06:45	0:03:54	0:01:49	**0:58:55**	1:08:43	14%
Evening	0:43:19	0:06:45	0:02:00	0:00:50	**0:51:14**	0:52:59	3%
Westbound							
AM Peak	0:45:11	0:06:45	0:03:47	0:01:46	**0:53:57**	0:59:44	10%
Midday	0:47:12	0:06:45	0:04:55	0:01:26	**0:57:26**	1:02:47	9%
PM Peak	0:48:50	0:06:45	0:03:54	0:01:49	**0:57:40**	0:59:50	4%
Evening	0:36:27	0:06:45	0:02:00	0:00:50	**0:44:22**	0:45:34	3%

Note: Weekday periods (based on the time of departure): AM Peak (6:00am-8:59am), Midday (9:00am-1:59pm), PM Peak (2:00pm-5:59pm), or Evening (6:00pm-11:59pm and 12:00am-5:59am). Source: Analysis of select Pace Route 381 travel time data collected via Android application (November 2018); Pace-provided TSP equipped intersection location data.

Running Times by Segment

Table 6.10 represents an example of Pulse and Modified Local running times by segment during the PM Peak period in the eastbound direction based on the 76th Avenue routing. The running times by segment and time period were used to produce draft schedules for the Pulse 95th Street Line and modified local Route 381.

TABLE 6.10 PULSE AND LOCAL RUNNING TIMES BY SEGMENT, PM PEAK HOUR, EASTBOUND

Segment	Pulse Travel Time	Modified Local Travel Time
MVCC to Courthouse	0:05:56	0:06:27
Courthouse to Oak Park Ave	0:05:56	0:06:27
Oak Park Ave to Ridgeland	0:02:33	0:02:46
Ridgeland to Cicero	0:08:29	0:09:12
Cicero to Pulaksi	0:05:05	0:05:31
Pulaski to Western	0:08:29	0:09:12
Western to Beverly Hills Metra	0:03:24	0:03:41
Beverly Hills Metra to Ashland	0:03:24	0:03:41
Ashland to CTA Red Line 95th/Dan Ryan Station	0:11:02	0:11:58
Total	**0:54:18**	**0:58:55**

Source: Analysis of select Pace Route 381 travel time data collected via Android application (November 2018)

6.1.5.4 Preliminary Timetables

Detailed draft timetables for the Pulse 95th Street Line and for the modified local route are included in Appendix F.

7 Vehicles

Pulse vehicles will vary from the standard Pace fleet vehicle in several important and highly visible ways to provide passengers with an enhanced experience and to clearly differentiate the Pulse service and vehicle fleet from Pace's traditional fixed route bus service. This chapter outlines the interior and exterior components of the vehicle, and in particular how they will differ from the regular Pace fixed route fleet. A general schedule for vehicle procurement is also provided here.

7.1 General Vehicle Specifications

Pace is exploring various alternative propulsion technologies that may be implemented before the Project enters service, including CNG and electric buses. Currently, it is anticipated that Pulse 95th Street Line vehicles will be diesel fueled. Vehicles will have the following design specifications:

- Minimum expected life of 12 years or 500,000 miles, whichever comes first
- Capacity of up to 43 seated passengers; 61 with standees
- 14-inch step height at both doors
- ADA compliant front and rear passenger doors with passenger lift
- Compatibility with Pace's Intelligent Bus System (IBS)
- Vehicle video surveillance
- Automatic passenger counters (APC)
- Transit Signal Priority compatibility
- Several additional features specific to the Pulse fleet will enhance the passenger experience. These include:
- In-vehicle passenger information including digital route maps and automated stop announcements
- In-vehicle Wi-Fi
- USB charging ports for electronic devices

7.2 Pulse Vehicle Exterior

When procured, the vehicles will be painted with Pace's standard paint scheme to allow for flexibility of use over the course of their useful life. Once received by Pace, a Pulse branded wrap will be applied to the vehicles. A vehicle wrap was chosen as it is easier to remove and/or modify and it also allows for the vehicle's windows and doors to be covered, making for a bolder design that features the service brand graphics and color scheme. A wrapped Pulse vehicle is illustrated in Figure 7.1. Figure 7.2 shows how the vehicle wrap will be applied around all sides of the vehicle.

FIGURE 7.1 BRANDED PULSE VEHICLE

Source: Pace

FIGURE 7.2 FOUR-SIDED DETAIL OF THE PULSE VEHICLE WRAP

Source: Pace

In an effort to further distinguish the Pulse vehicles from other Pace buses, particularly the front of the bus as it approaches stations, a modified full-color destination sign will show the Pulse logo along with the Pulse route name (see Figure 7.3). The route name will alternate with the terminal station name, which will vary depending on the direction of the bus. This will make Pulse vehicles easily distinguishable from a distance of several hundred feet.

FIGURE 7.3 PULSE DESTINATION SIGN

Source: Pace

7.3 Pulse Vehicle Interior

The finish options throughout the interior of Pulse vehicles will differ in appearance from standard Pace buses. As shown in Figure 7.4, the Pulse brand colors will be applied to the stanchions and floor accents and the Pulse logo will be added to the interior vehicle walls.

FIGURE 7.4 BRANDED PULSE VEHICLE INTERIOR

Source: Pace

7.4 Vehicle Procurement Schedule

Sixteen dedicated Pulse vehicles will be needed at the commencement of 95th Street Line service, which is assumed to be 2024 contingent upon funding. These 16 vehicles will provide for 13 vehicles required per the operating plan as well as three spares (see Sections 9.2 and 12.1.3).

7.5 Specialized Tools, Equipment, and Training Needs

It is anticipated that the 12" high platform curb will be faced with a bus curb to help protect the curb face as well as the bus wheels (see Figure 4.4). It will also help the driver guide the bus into the station, allowing them to get as close as possible to the platform edge, thus facilitating boarding and alighting. Operators assigned to a Pulse route will need to be trained on the proper technique needed to approach the platform and bus curb to maximize the near-level boarding opportunities. As the Milwaukee Line stations are being constructed in a similar fashion, it is expected that the Milwaukee Avenue corridor will provide an appropriate training ground for Pulse 95th Street Line operators.

Because other local bus routes may also use certain Pulse stations, training on proper use of the bus curb should be integrated into Pace's regular driver training program.

8 Technology

Project Definition reports for the Pulse Milwaukee Line and the Pulse Dempster Line clearly defined the technological elements and strategy for these corridors. These strategies will also be implemented for the 95th Street Line. The following sections address issues that are unique to implementation of this corridor and also provide a high-level discussion of emerging technologies that may impact the implementation of the 95th Street Line in the future.

8.1 Transit Signal Priority

8.1.1 Planned Implementation on the Corridor

For the 95th Street Line, Pace plans to implement the same Transit Signal Priority (TSP) system that was developed for the Milwaukee Line and anticipates that TSP should be completed well before the Pulse 95th Street Line is constructed. A prototype of the platform solution for the implementation of TSP has been developed. The central software has also been developed and is being tested. Trapeze is also providing a software solution, using existing Cradlepoint technology. Pace will be deploying a proof of concept first on the Milwaukee Line corridor, then on the Dempster and Halsted corridors and finally on the 95th Street corridor. Figure 8.1 shows the intersections on the corridor where TSP implementation is currently planned.

FIGURE 8.1 PLANNED TSP IMPLEMENTATION

Source: Pace, PMO

No intersections within the City of Chicago are currently identified but continuing TSP into the parts of the corridor within the City is anticipated and will be coordinated with the Chicago Department of Transportation.

Queue jump is an advanced feature of TSP, allowing transit vehicles to move during a separate or dedicated phase and effectively "jump" the queue of passenger vehicles at a signalized intersection approach. A system-wide evaluation of Pace routes and locations that could benefit from a queue jump was conducted, and the intersection of 95th & Western Avenue was identified as a candidate for an eastbound queue jump bypass lane. This location will be advanced during the conceptual design phase of the 95th Street Line.

The intersection at 95th & Cicero is identified as a candidate to evaluate the use of queue jumps. This will accommodate a near-side stop for westbound buses. Placement for a stop at Cicero is challenging due to a right turn lane on the westbound approach and limited right of way on the west (far) side of the intersection. The right turn lane could be used for the stop as well as a queue jump lane. After loading passengers and ready to move, the system would utilize TSP to notify the traffic signal controller to bring up a queue jump phase for the bus. To accommodate passenger vehicles, this phase could be designed to be long enough to clear out a queue of right turning vehicles in advance of the bus. The bus

would use the right turn lane to travel into the intersection and merge back into the westbound through lanes on the far side of the intersection while all other movements are prohibited.

Further traffic analysis should be performed to asses and confirm how TSP operations would affect this intersection, as it is not currently selected for deployment of TSP.

8.2 Communications Network

8.2.1 Existing Technology

Pace employs a variety of communications technology on vehicles and at stations, including:

- STARCOM – The statewide two-way radio communications network. This currently includes a two radio system so that voice and data can be communicated at the same time. This system is primarily used for dispatch to communicate with operators.
- 5 GHz wireless network used for Vehicle to Infrastructure (V2I) communications for Automated Vehicle Location (AVL) and Transit Signal Priority (TSP) calls to local signal controllers.
- RNC - Private network on buses for connections at garages to download operational data, undergoing upgrades separate from this project.
- Cellular – cellular communications are used for the TSP poller system to the cloud-based server. Polling rate is currently every 30 seconds; second by second data is stored on vehicles and manually downloaded for analysis. Cellular is also used for passenger Wi-Fi.
- Shelter signs - Cellular connection for arrival signs and connection to cloud-based content management system.

8.2.2 Potential Technologies Recommendations

As the Pace system evolves it is anticipated to add additional technologies on the vehicles such as active route maps. Additionally, an increase from 30-second to at least 5-second polling is desired, with TSP benefiting the most with second-by-second data.

With 5G cellular networks commercially available in the next several years, Pace should look to consolidate and migrate all vehicle-based systems that require an internet or remote data connection to a unified cellular modem. Utilization of a layer 3 switch or firewall could provide port-based security and separation between networks as needed, while utilizing one cellular modem for backhaul. Operational costs could be reduced by

maintaining a single cellular connection to each bus, in addition to voice and TSP radios. Voice should remain on the statewide network.

8.3 Technologies for Enhancing Bus Specifications

8.3.1 Overview of Potential Technologies

The focus of research and development for both transit and personal vehicles has been on Connected and Autonomous Vehicle (CAV) technologies. Connected Vehicle technologies enable vehicles to communicate with other vehicles and road infrastructure such as traffic signals. Automation technologies have the capability of performing or assisting with driving tasks. The following is a brief description of each of these technologies as they relate to transit.

8.3.1.1 Connected Vehicle (CV) Technologies

The U.S. Department of Transportation's (USDOT's) Connected Vehicle program is working with state and local transportation agencies, vehicle and device makers, and the public to test and evaluate technology that will enable cars, buses, trucks, trains, roads and other infrastructure, and our smartphones and other devices to "talk" to one another.

Connected Vehicles can exchange data between other vehicles (vehicle-to-vehicle or V2V), the roadside (vehicle-to-infrastructure, or V2I), and other transportation users (vehicle-to-anything, or V2X), using wireless communications. Equipment on the vehicles continuously broadcasts data (including location, speed, acceleration, heading, and other parameters) to nearby vehicles that can use the information to identify and alert a driver to a potential maneuver that may be a threat outside of their immediate field of view, such as an upstream vehicle suddenly stopping. Applications that have been developed that have the potential to provide the greatest benefit to transit include the following:

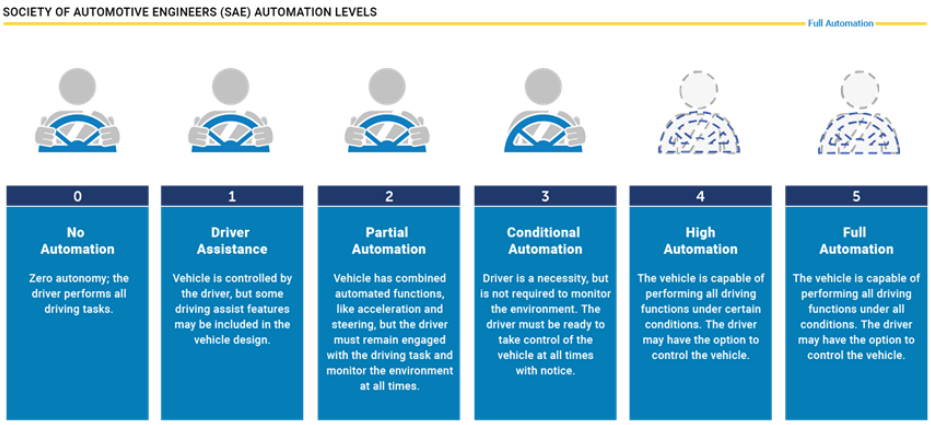
- *Connection Protection* – Gives passengers real-time transit information to predict whether they will make their next connection and make a request for the connection to wait. Transit providers can adjust departures to accommodate delayed vehicles.
- *Pedestrian in Signalized Crosswalk* – Warns the bus driver if a pedestrian is crossing as a bus is making a left or right turn.
- *Motorist Advisories and Warnings*- Alerts can be issued to drivers about road or weather conditions for specific road segments.
- *Emergency Electronic Brake Light Warning* – Notifies the driver if there is a sudden braking vehicle ahead (or several vehicles ahead).

- *Forward Collision Warning* – Warns the driver when a vehicle is stopped or moving slowly and there is a risk of a rear-end collision
- *Intersection Movement Assist* – Warns the driver if it's not safe to enter an intersection for example if a vehicle is making a sudden turn or running a red light.
- *Lane Change Blind Spot Warning* – Warns drivers when changing lanes that there is a vehicle in a blind spot.
- *Transit Bus Stop Pedestrian Warning* – Uses sensors mounted on light poles to warn pedestrians if they are in danger of being struck by a transit bus approaching or departing a bus stop, as well as warn bus drivers of the presence of pedestrians. Also warns pedestrian getting off the bus of any vehicles in the immediate vicinity of the bus stop that may be out their line of sight.
- *Vehicle Turning Right in Front of Bus* - Warns the driver when a vehicle attempts to turn right in front of a bus as it is pulling away from the bus station.

8.3.1.2 Automated Vehicle (AV) Technologies

Automated vehicle technologies can range from driver assistance applications to fully automated systems. The Society of Automotive Engineers defines the levels of automation on a scale from 0 to 5 as shown in Figure 8.2.

FIGURE 8.2 LEVELS OF AUTOMATION



Source: USDOT

The Federal Transit Administration (FTA) is exploring the use of automation technologies in transit bus operations to enable driver assistance features like lane-keeping, precision docking and automatic emergency braking. Pace has no plans to move towards full

automation but is interested in investigating technologies for future bus specifications that could provide assistance but would require a driver to control the vehicle.

The following provides a brief description of the potential areas of bus automation technologies:

- *Communications and Agency Interface* - enable the vehicle to interface with agency systems and communicate with stakeholders.
- *Actuation* - enable vehicle control like acceleration, braking, and steering. In combination with sensing, these technologies also enable lane keeping assistance and precision docking.
- *Exterior Sensing* - enable the vehicle to sense surroundings and other road users. These technologies also enable automated emergency braking and other safety technologies.
- *Interior Sensing* – These technologies sense occupants and conditions inside the vehicle and enable and assist agency response to emergency situations, vehicle actions such as smooth acceleration and deceleration, and other features.
- *Localization and Orientation* These technologies enable the vehicle to orient itself within the environment, including understanding routing and destination.
- *Human Interface and Fare Payment* These technologies will link people with the automated vehicle, whether through technology or other servicing.

8.3.2 INDUSTRY BEST PRACTICE

A number of transit agencies have implemented or are testing Connected Vehicle or Automated Vehicle technologies either independently or as part of pilot projects. The following provides a brief description of examples of these efforts.

8.3.2.1 Metropolitan Transit Authority (MTA)

As part of the New York City Pilot led by the NYCDOT, connected vehicle technology was deployed on 1,250 MTA buses. The pilot is testing both Vehicle-to-Vehicle and Vehicle-to-Infrastructure safety applications including Pedestrian in Signalized Crosswalk and Blind Spot Warning.

8.3.2.2 Pierce Transit

Collision warning and automated braking systems are currently being tested in Washington State by one of the Washington State Department of Transportation's local transit providers, Pierce Transit.

8.3.2.3 Minnesota Valley Transit

Minnesota Valley Transit buses were equipped with sensors and lateral guidance controls that autonomously keep the bus centered in a narrow shoulder as part of a Bus on Shoulder project on I-35 West.

8.3.2.4 Lane Transit District

The Lane Transit District in Eugene, Oregon conducted a test that demonstrated the feasibility of autonomous precision docking on its Emerald Express Bus Rapid Transit line. The FTA sponsored pilot project, the Vehicle Assist and Automation (VAA) Demonstration, equipped a 60-foot articulated bus with a lateral guidance system that followed a trail of magnets embedded in the pavement. The magnetic guidance system consistently achieved horizontal gap standard deviations less than 0.76 inches from the target gap of 1.6 inches. With the VAA guidance disabled, maximum standard deviation reached 4.4 inches.

8.3.3 REGIONAL INITIATIVES

In their response to the FTA Request for Comments about Automated Transit Buses, the Chicago Transit Authority (CTA) noted they are currently reviewing supplemental bus technologies that are in various stages of development including an around vehicle monitoring system (i.e. Seon inView 360), adaptive cruise control (i.e. MAN Bus ACC), lane departure warning (i.e. MAN Bus lane guard system), Emergency Brake Assist (EBA), Driver fatigue / inattention alert (i.e. Guardian system), and pedestrian and cyclist detection (i.e. Mobileye Shield+).

CTA also stated that they are planning to undertake two demonstration projects:

- *Mobileye Shield* - This technology identifies the presence of pedestrians with ultrasonic sensors and cameras and can alert both the driver and pedestrians. A small screen would be positioned near the mirrors that would have a warning for operators that a pedestrian is in the blind spot. It does not automatically activate brakes but requires the driver to respond. The vendor has provided units to CTA to use for a demonstration.
- *Clever Turn Warning* - This includes both visual (strobe) and audible warning to pedestrians that a bus is going to turn but does not affect the driver. This feature would activate based on turn radius (i.e. not for a lane change).

All Pace buses placed in revenue service since 2013 are already equipped with turn warning system. The Protran Safe Turn Alert (STA) System is a passive warning system that plays an audible warning message external and/or internal to the vehicle when a Pace vehicle is making a right- or left-hand turn. The system also has flashing LED strobe lights that act as a visual warning to pedestrians as the vehicle is turning.

8.3.4 OPPORTUNITIES AND IMPEDIMENTS

Connected and Autonomous Vehicle (CAV) technologies have the potential to provide significant benefits but also pose some unique challenges. This section discusses the opportunities as well as some of the potential impediments.

8.3.4.1 Potential Opportunities

- *Improved Safety* - CAV may increase safety by reducing the severity and frequency of collisions of buses with both vehicles and pedestrians.
- *Reduced Casualty and Liability Costs* - Increasing safety potentially reduces liability and other collision costs. The average annual cost per transit bus for casualty and liability expenses is about $6,600.00. Data from a study conducted by the Washington State Transit Insurance Pool showed that 65 percent of $53 million in bus claims incurred over 13 years could have been prevented by using Autonomous Collision Avoidance and Autonomous Emergency Braking systems, resulting in significant reductions in collisions, fatalities, injuries, and insurance costs.
- *Reduced Operations and Maintenance Costs* - Decreased vehicle wear, and more efficient operations has the potential to provide operations and maintenance savings.
- *Reduced Environmental Impact*- Smoother acceleration and deceleration and improved routing may result in fuel savings, reducing the impact on the environment.
- *Improved Service Availability and Operational Efficiency* - New transit services, such as circulators or late-night service, or operations in low-density areas, may become cost effective, improving transit access.
- *Improved Customer Experience*: CAV may improve service reliability and delivery, enhancing rider experience.
- *Reduced Driver Stress* - Driver assistance systems may reduce driver stress and workload, resulting in safer systems and more satisfied drivers.

8.3.4.2 Potential Impediments

- *Customer Acceptance* - Public acceptance of a high level of transit bus automation remains uncertain. However, this is not likely to be a strong impediment to lower levels of automation such as driver assistance.
- *Agency Acceptance* - There may be reluctance to be "on the bleeding edge" when implementing new technologies.
- *Labor Impacts*: Automation technology may impact agency workforces, which may result in shifting duties away from vehicle operation.
- *Capital Investment* - Facilities and equipment may need to be purchased or retrofitted to support CAV which will require additional funding.
- *Research and Technology Availability* - Many CAV products are still being developed or tested.

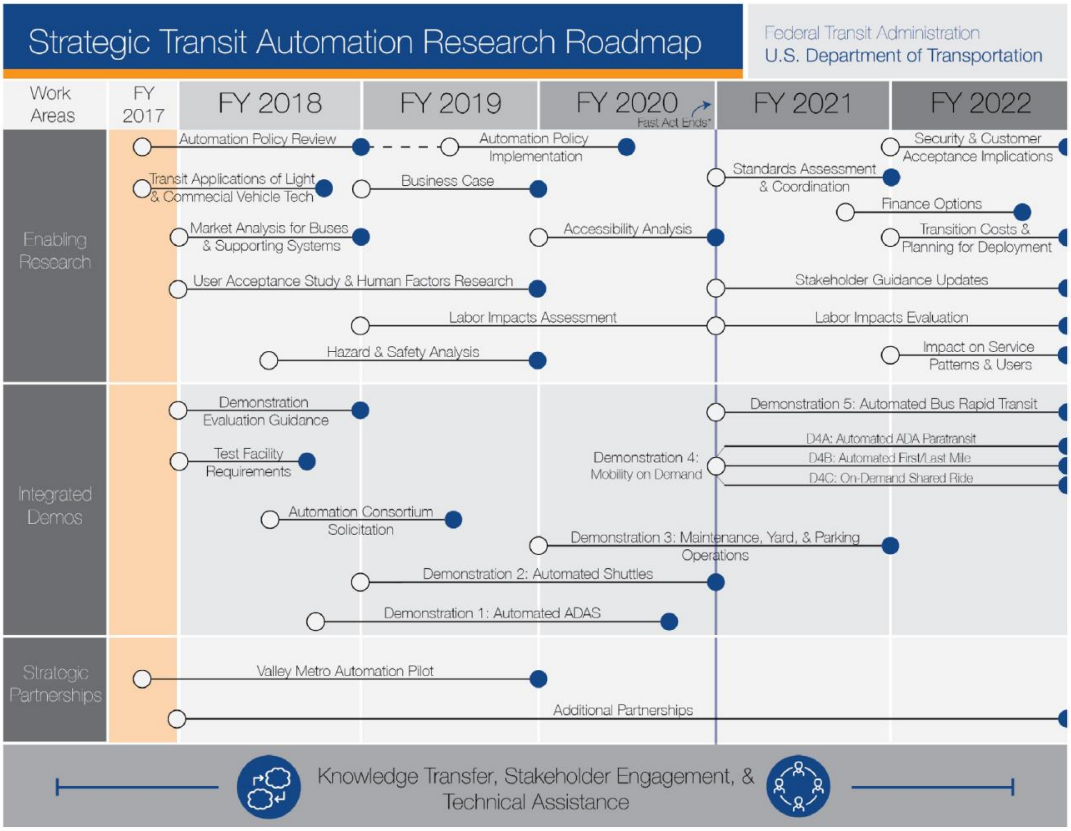
8.3.4.3 Anticipated Horizon for Technology Implementation

CAV technologies are advancing rapidly for light-duty vehicles, with large investments from the private sector. The USDOT, auto manufacturers, and ride sharing companies are actively planning, testing, and deploying CAV-related technologies. In addition, The National Highway Traffic Safety Administration (NHTSA) has proposed a requirement that DSRC devices be installed in all new passenger vehicles by 2023, which would allow most light-duty vehicles to take advantage of connected vehicle technology. Connected vehicle technology is estimated to add roughly $350 to the cost of a new car in 2020, and fall below $200 as mass production of vehicles with connected vehicle technology increases. As market penetration increases it is expected that public sector investment in infrastructure will also increase. Substantial numbers of personal vehicles with CV technologies in urban areas such as Chicago, together with infrastructure such as traffic signals able to communicate with them, will present the ideal conditions for Pace and other transit agencies to reap the benefits of the earlier investments made by the auto industry. Full automation is still in the research and design stage with test tracks throughout the US including one at the University of Wisconsin in Madison. Early automation technologies to provide driver assistance have already been offered in many personal vehicles on the market.

The domestic transit bus industry lags behind both light-duty vehicles and heavy-duty trucking, as well as international transit manufacturers and providers. According to the Strategic Transit Automation Research Plan "the U.S. transit industry often is conservative in adopting new technologies, services, and business models. Although funding and policy constraints may play a role, there is also a reasonable unwillingness to risk public funding or to undertake new operational models without a full understanding of the approach or

without federal leadership and guidance." The Federal Transit Administration (FTA) has developed the Strategic Plan to establish a research and demonstration framework that will move the transit industry forward. Figure 8.3 shows the planned timeline for this effort.

FIGURE 8.3 STRATEGIC TRANSIT AUTOMATION RESEARCH ROADMAP



Source: FTA

8.3.4.4 Resources

The USDOT's current ITS research program is focused on two key priorities: Realizing Connected Vehicle Implementation and Advancing Automation. As CV technology advances from research to implementation, there will be increased focus on pilots. This may represent an opportunity for Pace to receive funding for CV applications that address identified needs. The FTA Office of Research, Demonstration and Innovation also supports research and administers awards for activities funded through the Public Transportation Innovation Program.

8.3.4.5 Potential Regional Coordination

Cooperation and coordination between agencies in the Chicago metropolitan region will be key for successful implementation of CAV technologies. Pace has partnered in the past with the Illinois Tollway to compete to be one of the USDOT pilot Connected Vehicle deployments. The Illinois Tollway currently is involved in a small-scale pilot deployment of Connected Vehicle technologies on one of their facilities. The CTA also appears to be moving forward with CAV technologies by including Driver Assistance technologies into the most recent specifications for their buses, as well as undertaking demonstration projects for some of these technologies. Cooperation with CTA including the sharing of lessons learned, would be beneficial for Pace as it begins to incorporate these technologies into future Pulse vehicles.

8.3.4.6 Bus Specification Process

It takes between four to five years for Pace to develop a bus specification. Because of this timeline, as well as the lack of flexibility to change technology once it is ordered, it is critical to investigate all potential technologies well in advance. However, it should be noted that CAV technologies do not have to be factory installed. There is an important role in the aftermarket/retrofit systems in providing Pace with the ability to adapt as technology changes without waiting until new buses are purchased. CAV systems should not be expected to last for the life of the bus. Software and electronic components in the systems will be replaced by newer improved versions over time as the original versions will no longer be available. Many Driver Assistance technologies have already been developed as standalone systems and could be installed on a limited number of existing or future Pulse vehicles as a pilot before being fully deployed.

8.3.5 RECOMMENDATIONS

The following are some recommendations for ways to prepare for and incorporate CAV technologies for the 95th Street Line:

- Conduct further research and review of Driver Assistance technologies such as adaptive cruise control, around vehicle monitoring system, lane departure warning, Emergency Brake Assist (EBA), Driver fatigue / inattention alert and pedestrian and cyclist detection (i.e. Mobileye Shield+).
- Incorporate these technologies into the next bus specification.
- Consider developing a demonstration project using aftermarket versions of one or more of these technologies possibly in coordination with CTA.
- Consider piloting CV applications that increase bus and pedestrian safety as well as mobility applications such as Dynamic Ridesharing (D-RIDE) and Connection

Protection (T-CONNECT) possibly in coordination with other regional agencies. The CV technology could be provided through the use of aftermarket systems.

- Engage and coordinate with CTA, the Illinois Tollway and other regional stakeholders currently involved with CAV technologies.

9 Preliminary Operating Plan

This section discusses the estimated running times and draft proposed schedules for the Pulse 95th Street Line, as well as proposed modifications to the existing local Pace Route 381 ("Modified Local") to be implemented upon commencement of Pulse service in the project corridor. In addition, an estimate of the current and future operations and maintenance (O&M) costs for Pulse and modified local service is presented.

The proposed running times in the corridor are based on the existing Route 381 timetables and analyses of actual operating conditions along the corridor, as well as estimated changes resulting from increased service frequencies, increased ridership, limited stops, transit signal priority (TSP), and raised boarding platforms. The O&M cost estimate is based on unit operating costs provided by Pace and the estimated service levels in the corridor.

9.1 Corridor Overview

The running time estimate and associated O&M cost estimate provided in this document are based on the corridor station locations shown in Figure 9.1. The Pulse 95th Street Line will include 18 pairs of intermediate stations and two terminal stations at the CTA Red Line 95th/Dan Ryan Station and Moraine Valley Community College (MVCC). The Harlem station is identified as a potential future station and is not included in the operating plan at this time. Final routing has yet to be determined as of March 2019. Some station location decisions on the west end of the line are subject to this routing decision. For purposes of this analysis, the 76th Avenue routing variant is assumed, with Harlem Avenue as the alternative variant. The same number of Pulse stations will be served regardless of routing.

FIGURE 9.1 PULSE 95TH STREET LINE STATION LOCATIONS

Source: Pace, PMO

9.2 Service Planning Assumptions

9.2.1 Baseline Operating Plan

The policy framework for Pulse service planning on the 95th Street Line was established through Pace's development of the Pulse Milwaukee Line, planned to open for service in August 2019. During the Milwaukee Line Project Definition Study, Pace established that Pulse service should offer 10-minute headways during Peak hours and 15-minute headways during off-Peak hours and on weekends, following a span of service that is equal to or better than the existing local service on the corridor. Further, it was established during the Milwaukee Line study that local service modifications should include a reduction in the span of local service, particularly during evenings, during which time Pulse would be the only available service on the corridor. Pace is recommending that local service on Milwaukee Avenue operate at 60-minute headways at all times, with reduced evening hours.

The proposed Pulse 95th Street Line plan is similar to the proposed Pulse Milwaukee Line service, but was revised to better reflect the travel market in the 95th Street corridor. For example, existing ridership patterns show the afternoon Peak tends to be between 1 and 5 PM, so the PM Peak frequency was shifted earlier to accommodate these travelers. Another adjustment was the start of 30-minute frequency at 8 PM, which is because ridership drops in later hours on the 95th Street corridor. A final departure is assumed at

12:30 am in each direction, which would serve passengers traveling to/from the CTA Red Line 95th/Dan Ryan Station.

The 95th Street Line is assumed to operate from 5:00 am to 1:00 am on weekdays, which exceeds the current span of service provided by Route 381, which runs from approximately 5:15 am to midnight. Three hours in the morning and four hours in the afternoon will feature 10-minute service headways (approximately 6:00 am to 9:00 am and 1:00 PM to 5:00 PM), with 15- and 20-minute headways throughout the rest of the day and early evening, and 30-minute service during late night hours. The assumed spans and frequencies for Pulse 95th Street Line are summarized in Table 9.1 and Table 9.2.

TABLE 9.1 PULSE 95TH STREET LINE PROPOSED FREQUENCIES

Frequency						
	EARLY	**AM**	**MID**	**PM**	**EVENING**	**NIGHT**
Weekday	15 min	10 min	15 min	10 min	20 min	30 min
Saturday	30 min	15 min	15 min	15 min	30 min	30 min
Sunday/Holiday	-	15 min	15 min	15 min	30 min	30 min

TABLE 9.2 PULSE 95TH STREET LINE PROPOSED SERVICE SPAN

Operating Hours						
	EARLY	**AM**	**MID**	**PM**	**EVENING**	**NIGHT**
Weekday	5-6a	6-9a	9a-1p	1-5p	5-8p	8p-1a
Saturday	5-6a	6-9a	9a-1p	1-5p	5-8p	8p-12a
Sunday/Holiday	-	6-9a	9a-1p	1-5p	5-8p	8p-12a

Pace Route 381 would continue to operate on the corridor with the introduction of Pulse service, as it would provide local access to all bus stops in between the proposed Pulse station locations. The frequency on Route 381 is proposed to be reduced to every 60 minutes. The operating assumption used in the development of operating costs and ridership estimation is that Route 381 would continue to operate between the CTA Red Line 95th/Dan Ryan Station and Moraine Valley Community College, with all trips operating via 88th Avenue in Hickory Hills. The service would end at 10 PM on all days. Table 9.3 and Table 9.4 detail the proposed frequency and span for the revised Route 381. All operating assumptions, particularly the routing, will be subject to further discussion with Pace service planning staff prior to project implementation, and any significant changes to Route 381, as proposed in this plan, would also be subject to a public hearing before being finalized.

TABLE 9.3 MODIFIED ROUTE 381 PROPOSED FREQUENCIES

Frequency						
	EARLY	AM	MID	PM	EVENING	NIGHT
Weekday	60 min	60 min	60 min	60 min	60 min	60 min
Saturday	-	60 min	60 min	60 min	60 min	60 min
Sunday/Holiday	-	60 min	60 min	60 min	60 min	60 min

TABLE 9.4 MODIFIED ROUTE 381 PROPOSED SERVICE SPAN

Operating Hours						
	EARLY	AM	MID	PM	EVENING	NIGHT
Weekday	5-6a	6-9a	9a-1p	1-5p	5-8p	8-10p
Saturday	-	6-9a	9a-1p	1-5p	5-8p	8-10p
Sunday/Holiday	-	6-9a	9a-1p	1-5p	5-8p	8-10p

9.2.2 Operating Statistics

Operating statistics for both the Pulse 95th Street Line and the revised Route 381 were generated based on the travel times and the proposed service characteristics. Four main statistics were calculated:

- **Revenue hours** – the annual in-service hours required to operate the Pulse service and proposed Route 381 changes; does not include layover or deadhead time for each driver block.
- **Vehicle hours** – the annual total hours required to operate the Pulse service and proposed Route 381 changes, including layover and deadhead time. Revenue hours were converted to vehicle hours by using existing ratio of vehicle to revenue hours for Pulse 381 service. Calculated ratios include: weekday ratio of 1.25, Saturday ratio of 1.32, and Sunday ratio of 1.30.
- **Revenue miles** – the annual in-service miles required to operate the Pulse service and proposed Route 381 changes; does not include deadhead to/from the garage for each driver block.
- **Peak vehicles** – the number of vehicles required for Pulse and Route 381 service, based on the defined Peak headway and the cycle time. A 20% layover was

assumed for Pulse service and a 15% layover for local 381 service in order to ensure each route is reliably operated during all time periods and conditions.

Table 9.5 summarizes the operating statistics for the proposed service plan, including both Pulse 95th Street Line routing alternatives.

TABLE 9.5 OPERATING STATISTICS SUMMARY

Existing				
Route	**Annual Revenue Hours**	**Annual Vehicle Hours**	**Annual Revenue Miles**	**Peak Vehicles**
Pace 381	27,787	35,034	406,794	8
Total	***27,787***	***35,034***	***406,794***	***8***
Pulse 95th Street Line (via 76th Ave)				
Route	**Annual Revenue Hours**	**Annual Vehicle Hours**	**Annual Revenue Miles**	**Peak Vehicles**
Pulse 95th Street Line (via 76th Ave)	46,000	58,200	721,900	13
Modified Pace Route 381	10,536	13,341	156,032	3
Total	56,536	71,541	877,932	17
Increase over Existing	28,749	36,507	471,138	9
Pulse 95th Street Line (via Harlem Ave)				
Route	**Annual Revenue Hours**	**Annual Vehicle Hours**	**Annual Revenue Miles**	**Peak Vehicles**
Pulse 95th Street Line (via Harlem Ave)	46,900	59,300	705,600	14
Modified Pace Route 381	10,536	13,341	156,032	3
Total	57,436	72,641	861,632	18
Increase over Existing	29,649	37,607	454,838	10

9.3 Estimated Operating Cost

For the purposes of cost estimation, it was assumed that the Pulse 95th Street Line will be operated by Pace's Southwest Division, located in Bridgeview, which operates the existing Route 381.

Operating costs for the proposed Pulse 95th Street Line service were estimated based on two inputs:

- The annual vehicle hours for the proposed service plan; and
- The Pace-provided cost per vehicle hour

The cost per vehicle hour provided by Pace is $79.69/hour in 2019 dollars and $92.38/hour in 2024 dollars based on a 3% annual inflation rate.

Table 9.6 shows the cost estimate for each Pulse 95th Street Line alternative. The costs are presented in current year (2019) dollars, as well as opening year (2024 dollars). The results show that introduction of Pulse service adds between $2.9 and $3.0 million in 2019 dollars, and between $3.4 and $3.5 million in 2024 dollars, depending on alternative. The Harlem Avenue alternative adds 4% more vehicle hours and 4% more cost as a result. In addition, the extra travel time results in the need for one additional vehicle during the PM Peak period.

Note that the costs in Table 9.6 are for operating the service and maintaining vehicles but do not include additional costs associated with station infrastructure and amenities to be constructed in the Pulse 95th Street corridor.

TABLE 9.6 ESTIMATED OPERATING COSTS (IN 2019 AND 2024 DOLLARS)

Existing			
Route	**Annual Vehicle Hours**	**O&M Cost (FY19 $)**	**O&M Cost (FY24 $)**
Pace Route 381	35,034	$2,791,856	$3,236,526
Total	***35,034***	**$2,791,856**	**$3,236,526**
Pulse 95th Street Line (Via 76th Ave)			
Route	**Annual Vehicle Hours**	**O&M Cost (FY19 $)**	**O&M Cost (FY24 $)**
Pulse 95th Street Line (Via 76th Ave)	58,200	$4,637,958	$5,376,664
Modified Pace Route 381	13,341	$1,063,167	$1,232,502
Total	71,541	$5,701,125	$6,609,166
Increase Over Existing	36,507	$2,909,269	$3,372,640
Pulse 95th Street Corridor (Via Harlem Ave)			
Route	**Annual Vehicle Hours**	**O&M Cost (FY19 $)**	**O&M Cost (FY24 $)**
Pulse 95th Street Line (Via Harlem Ave)	59,300	$4,725,617	$5,478,285
Modified Pace Route 381	13,341	$1,063,167	$1,232,502
Total	72,641	$5,788,784	$6,710,787
Increase Over Existing	37,607	$2,996,928	$3,474,261

10 National Environmental Policy Act Documentation

Pace anticipates pursuing federal funding for the Pulse 95th Street Line and will therefore comply with the National Environmental Policy Act (NEPA). The Pulse 95th Street Line is likely to qualify for a documented Categorical Exclusion (CE) NEPA Class of Action under 23 CFR 771.118(d). The Pulse Milwaukee and Dempster Lines both qualified for a CE. This section reflects the Purpose and Need statement submitted to the FTA on March 20, 2019. It will be used as the basis for the environmental analysis conducted in the next phase of the Pulse 95th Street Line.

10.1 Purpose Statement

The purpose of the Pulse 95th Street Line is to provide an enhanced and cost-effective bus rapid transit service along 95th Street through the improved frequency, reliability and travel time of bus transit service, as well as improved bus transit facilities.

Definition: A Purpose and Need Statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.[20]

10.2 Need Elements

The purpose action must address the following needs:

- Improve the frequency of bus transit service;
- Improve the reliability of bus transit service;
- Improve travel time of bus transit service vehicles; and
- Improve the quality of bus transit facilities

The need to improve bus service and the quality of bus transit facilities in the 95th Street Corridor (Pace Bus Routes 381 and 395) dates back to 2001, when Pace published Vision

[20] https://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol34/pdf/CFR-2012-title40-vol34-sec1502-13.pdf

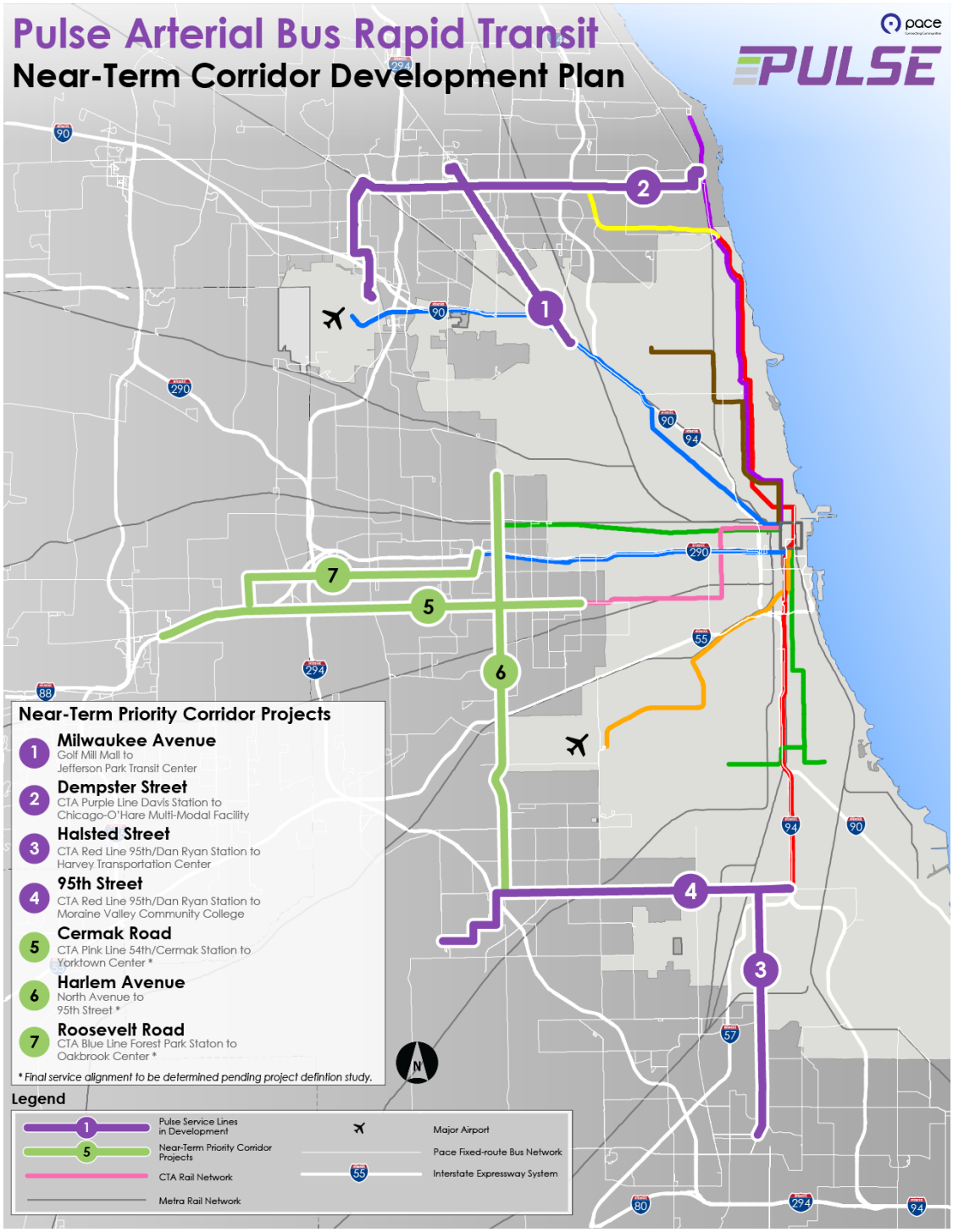
2020. The Pulse 95th Street project was identified in Vision 2020 as one of twenty-four corridors that would provide a regional network of premium transit services across Pace's six county service area.

In the years since Vision 2020, Pace completed additional planning studies to develop a specific action plan for implementation of Pulse corridors. The Pulse 95th Street corridor was identified as a priority for implementation due to several factors, including strength of existing transit service, benefits to local and regional transit connectivity, existing and projected ridership. In addition to corridor prioritization, the studies completed by Pace helped to better define the infrastructure improvements and design elements that would be feasible and would provide cost-effective transit investments throughout Pace's service area. Pace's priority Pulse corridors include:

- Milwaukee Avenue – Golf Mill Mall to Jefferson Park Transit Center
- Dempster Street – CTA Purple Line Davis Station to Chicago-O'Hare Multi-Modal Facility
- Halsted – CTA Red Line 95th/Dan Ryan Station to Pace Harvey Transportation Center
- 95th Street- CTA Red Line 95th/Dan Ryan Station to Moraine Valley Community College
- Cermak Road[21] – CTA Pink Line 54th/Cermak Station to Yorktown Center
- Harlem Avenue – North Avenue to 95th Street
- Roosevelt Road – CTA Blue Line Forest Park Station to Oakbrook Center

[21]Final service alignments for Cermak, Harlem and Roosevelt Lines to be determined pending project definition studies. The ART Implementation Plan (2009) identified the Oak Brook corridor, which has since been further refined into the Roosevelt and Cermak corridors.

FIGURE 10.1 PULSE CORRIDOR PROJECTS



10.3 Goals

The following goals were identified through a review of Pace's past transit planning efforts, discussions with local planning officials, as well as direct input provided by members of the Project's Corridor Advisory Group (CAG). The CAG serves an advisory role by reviewing transit improvements and design elements, service and station features, and environmental considerations. The CAG is composed of local, state, and federal government officials and staff, regional transportation and transit agencies, transit advocacy groups, and other key stakeholders in the study area. The first CAG meeting was held on December 19, 2018. Up to three additional CAG meetings are anticipated throughout the duration of the project, providing stakeholder input at key project milestones.

The goals identified below are not the core transportation needs for which the proposed action is intended to address. However, they were used to shape the project's purpose and need statement and will be used in conjunction with the identified needs to evaluate the proposed action.

The following goals have been identified for the Pulse 95th Street Line

- Encourage suburban transit usage through the establishment of a network of higher-quality line-haul routes;
- Improve the visibility and perception of suburban bus transit service;
- Improve access to and efficiency of bus passenger travel; and
- Connect communities and encourage transportation, land use, and economic development objectives identified in the study corridor.

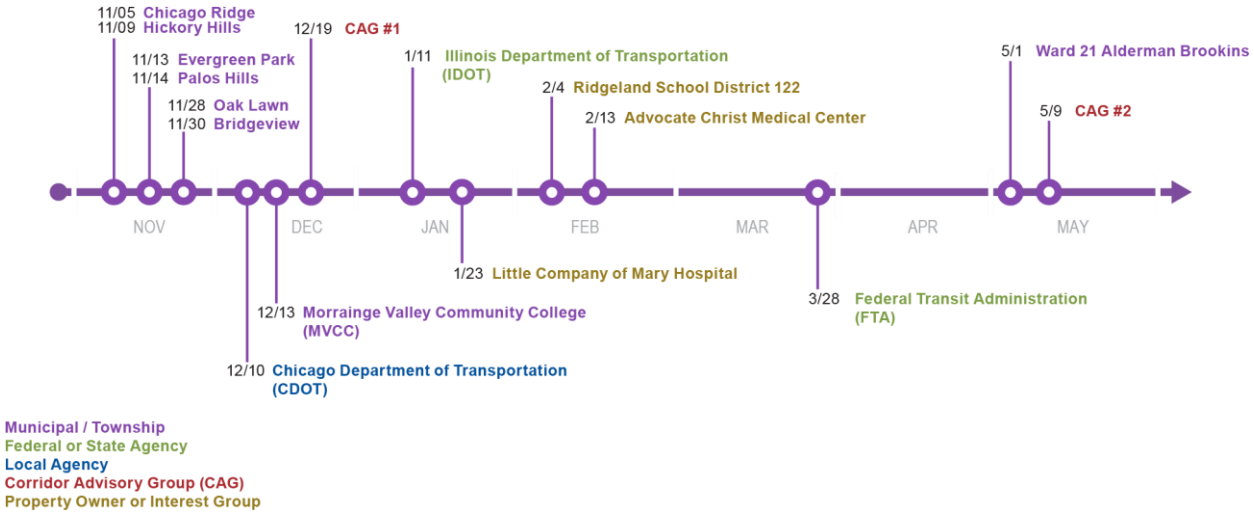
10.4 Logical Termini

Based on ridership and operational data, the eastern limit of this transit improvement project will be the CTA Red Line 95th/Dan Ryan Station. The CTA Red Line 95th/Dan Ryan Station is a logical endpoint since it serves as an existing transit hub with connections to Pace bus, CTA bus, and CTA rail. The western limit of the Pace 95th Street Line is Moraine Valley Community College. Moraine Valley Community College is a logical endpoint since it is a major trip generator/destination and the current terminus for Pace Route 381. The designated termini are sufficient to allow for appropriate consideration of related environmental matters – including potential impacts and benefits – and they will not restrict the consideration of alternatives for other reasonably foreseeable transportation improvements.

11 Stakeholder Involvement

Pace developed a 95th Street Line Stakeholder Involvement Plan (SIP) in December of 2018. The SIP outlines project goals and objectives, project activities, stakeholder groups, stakeholder involvement activities, and ongoing management of the SIP. During the Project Definition phase, Pace engaged stakeholders at the local, state and federal level. The meeting format ranged from large Corridor Advisory Group (CAG) meetings, which included a variety of stakeholders, to smaller, individual meetings with property owners, local government representatives, and agency representatives. The meetings fall within the following general categories: Corridor Advisory Group, Municipal/Township, Local Agencies, and Federal and State Agencies. Stakeholder coordination will continue through the environmental review phase and expand to include broader public participation. The following subsections describe activities within each of the categories. Figure 11.1 shows a timeline of stakeholder involvement activities.

FIGURE 11.1 STAKEHOLDER INVOLVEMENT TIMELINE



11.1 Corridor Advisory Group 1

CAG #1 was held on December 19th, 2018, at the Oak Lawn Public Library. The purpose of the meeting was to introduce the Pulse Program and the 95th Street Line project to communities and agencies throughout the corridor. The meeting included a presentation, which provided an overview of the Pulse Program and the 95th Street Line project; role of the Corridor Advisory Group; project schedule; preliminary station locations; current ridership statistics; transit needs discussion; station concepts; public involvement process; and next steps. The meeting concluded with a question and answer session. Twenty-eight

CAG members attended the meeting including representatives from local agencies, private and public properties, municipalities, and state agencies and offices.

11.2 Corridor Advisory Group 2

CAG #2 was held on May 9th, 2019, at the Oak Lawn Public Library. The CAG was attended by 20 stakeholders including representatives from local agencies, private and public properties, municipalities, and state agencies and offices. The team presented the refined station locations, sites and layouts, preliminary operating plan, and project capital costs. Stakeholders provided feedback on site selections and station layouts.

11.3 Agency Coordination and Community Outreach

In addition to the two CAG meetings, Pace engaged stakeholders through 14 meetings with representatives from local governments, local agencies, and federal and state agencies. These meetings were tailored to address specific topics or issues particular to specific station locations and sites.

11.3.1 Municipal/Township

Pace facilitated outreach meetings with each of the 7 municipalities along the corridor including: Chicago, Evergreen Park, Chicago Ridge, Oak Lawn, Bridgeview, Palos Hills, and Hickory Hills. The meetings focused on the specific proposed station sites within the community. TABLE 11.1 lists the meetings with the municipalities and the proposed station locations and sites discussed.

TABLE 11.1 MUNICIPALITIES AND TOWNSHIPS WITH CORRESPONDING PROPOSED STATION SITES

Municipality/Township	Proposed Station Sites
City of Chicago	CTA Red Line 95th/Dan Ryan Station WB (Alt 1) Halsted EB (Alt1) Halsted WB (Alt2) Vincennes (Longwood Metra) EB (Alt1) Vincennes (Longwood Metra) WB (Alt 1) Ashland EB (Alt 2) Ashland WB (Alt 1) Wood (Beverly Hills Metra) EB (Alt 2) Wood (Beverly Hills Metra) WB (Alt2) Western EB (Alt 1, Alt 3) Western WB (Alt 1)

Municipality/Township	Proposed Station Sites
Evergreen Park	California EB (Alt 1) California WB (Alt 2) Kedzie EB (Alt 1) Kedzie WB (Alt 1)
Oak Lawn	Pulaski EB (Alt 2) Pulaski WB (Alt 1) Kostner EB (Alt 1, Alt 2) Kostner WB (Alt 1) Cicero EB (Alt 2) Cicero WB (Alt 2) Oak Lawn Patriot Metra EB (Alt 1) Oak Lawn Patriot Metra WB (Alt 3) Central EB (Alt 3) Central WB (Alt 1) SW Highway EB (Alt 1) SW Highway WB (Alt 1) Ridgeland WB (Alt 1)
Chicago Ridge	Ridgeland EB (Alt 1) Harlem/103rd EB (Alt 3)
Hickory Hills	76th EB (Alt 2) 76th WB (Alt 1, Alt 2)
Bridgeview	Bridgeview Courthouse EB (Alt 2) Bridgeview Courthouse WB (Alt 2, Alt 3)
Palos Hills	Bridgeview Courthouse EB (Alt 4) Harlem/103rd WB (Alt 1) Roberts/104th EB (Alt 2) Roberts/104th WB (Alt 3) Moraine Valley Community College WB (Alt 2)

Source: Pace, PMO

11.3.2 Local Agencies

Pace met with CDOT on December 10th, 2018, as part of the outreach coordination efforts and led a discussion of the proposed station locations in the City of Chicago: Western, Beverly Hills Metra, Ashland, Vincennes (Longwood Metra), Halsted, and CTA Red Line

95th/Dan Ryan Station. This included an overview of the possibilities and constraints regarding east and west bound station alternatives per each station location. Additional discussion included the coordination between Pace and CDOT to roll out transit signal priority (TSP) along 95th street, updates on the opening of the Dempster and Halsted Lines, and updates from CDOT regarding a study for the CREATE GS21a railroad grade separation at 95th Street and Eggleston, and the potential for an expansion of the 95th Street streetscape from Damen to Wood.

11.3.3 Federal and State Agencies

Pace met with the FTA to discuss the Pulse program and provide updates on the 95th Street Line regarding the station corridor termini, station locations, and station designs and amenities. Pace also provided an overview of the South Halsted Corridor Enhancement Project, a joint CTA-Pace initiative that includes implementation of the Pulse Halsted Line, as well as improvements to CTA-operated portions of the corridor. Additional topics included project progress to date, the proposed NEPA Class of Action, and funding strategies.

Pace also held a meeting with IDOT to review the Pulse Program, the project process, and proposed/potential stations. Discussion items included the Interchange Design Study (IDS), provided by IDOT, for the reconstruction of the Harlem/95th interchange and the proposed reconfiguration of the interchange into a partial cloverleaf. IDOT noted that 95th Street would be resurfaced as part of that planned project. There was also a discussion regarding the feasibility and evaluation of the 12-inch raised platform as well as queue jumps.

11.4 Property Owners and Interest Groups

Pace met with several property owners and interest groups to discuss the proposed station locations near major employment and education centers. The first meeting was with Moraine Valley Community College (MVCC). Pace provided an overview of the project and ongoing work among the other Pulse Lines, and the potential station location for the MVCC campus as well as being the western terminus for the 95th Street Line.

A meeting was also held with the Little Company of Mary Hospital to discuss the potential station location at 95th Street and California and the hospitals expansion plans.

Pace also met with Ridgeland School District 122 to discuss the potential station location just west of the 95th Street and Ridgeland Avenue intersection. The school district shared their concerns regarding the westbound location and issues of people lingering near the school. However, the school district said it would be amenable to having the station located along the center drive island and noted that they are open to some site and signage reconfigurations.

Pace also held a meeting with the Advocate Christ Medical Center to discuss the potential station location at 95th Street and Kostner. The discussion focused primarily on the Kostner westbound station and its size, proximity to hospital services such as a potential daycare center, and southbound traffic patterns.

11.5 Future Stakeholder Involvement Activities

As the 95th Street Line project advances from the Project Definition phase to the environmental review phase, stakeholder involvement activities will expand to include broader participation. Pace will actively engage stakeholders including Pace customers, residents, affected property owners, business groups, and the general public. The project website will be updated and planned activities include fact sheets, project newsletters, public meetings, and one-on-one stakeholder meetings. Pace will continue to coordinate with local communities, government officials, and local, state, and federal agencies.

12 Capital Cost Estimate

The capital cost estimate for the 95th Street Line is based on the Conceptual Station Improvement Plans in Appendix E, as submitted to Pace on March 23, 2019 and dated March 22, 2019. For the purposes of developing the corridor cost estimate, it is assumed that of the three potential stations identified in Figure 1.1, only 76th would be constructed (see Table 12.1).

TABLE 12.1 STATION LOCATIONS

Station Location	Included in 95th Street Line Corridor-Level Estimate
CTA Red Line 95th/Dan Ryan Station	No, no improvements planned
Halsted	Yes
Vincennes (Longwood Metra)	Yes
Ashland	Yes
Wood (Beverly Hills Metra)	Yes
Western	Yes
California	Yes
Kedzie	Yes
Pulaski	Yes
Kostner	Yes
Cicero	Yes
Oak Lawn Patriot Metra	Yes
Central	Yes
SW Highway	Yes
Ridgeland	Yes
Harlem	No Station is a potential future station dependent on routing and Illinois Tollway plans
76th	Yes
Harlem/103rd	No (Station location is dependent on routing and Illinois Tollway plans)
Bridgeview Courthouse	Yes
Roberts/104th	Yes
Moraine Valley Community College	Yes

Several of these station locations have one or more individual sites that will be considered and evaluated during the environmental review phase[22]. At this time, Pace has identified 39 station sites to be carried forward and analyzed during the environmental review phase for the 95th Street Line, in addition to the eastern terminal at the CTA Red Line Dan Ryan/95th station. A station layout has been developed for each of these station sites and is documented in the March 22, 2019 station drawings in Appendix E. Note that the station drawings do not include layouts for station sites at Harlem, as this station location is identified as a potential future station to be coordinated with the Illinois Tollway's improvement plans for the Central Tri-State (I-294). Individual station-level capital costs have been estimated for all 39 station sites that are being carried forward. Table 12.2 identifies the station sites being carried forward. It also indicates the 35 sites that are rolled up into the corridor-level estimate, which has been developed to present the total project cost for the 95th Street Line.

TABLE 12.2 PULSE 95TH STREET LINE PROPOSED STATION SITES CARRIED FORWARD

Station Site	Alternate #	Included in Corridor-Level Estimate
CTA Red Line 95th/Dan Ryan Station	NA	No Cost
Halsted (EB)	Alt #1	Yes
Halsted (WB)	Alt #1	Yes
Vincennes (Longwood Metra) (EB)	Alt #1	Yes
Vincennes (Longwood Metra) (WB)	Alt #1	Yes
Ashland (EB)	Alt #2	Yes
Ashland (WB)	Alt #1	Yes
Wood (Beverly Hills Metra) (EB)	Alt #2	Yes
Wood (Beverly Hills Metra) (WB)	Alt #2	Yes
Western (EB)	Alt #1	No
Western (EB)	Alt #3	Yes
Western (WB)	Alt #1	Yes
California (EB)	Alt #1	Yes
California (WB)	Alt #2	Yes
Kedzie (EB)	Alt #1	Yes

[22] Station "locations" refer to the general bi-directional location of a Pulse station proximate to an intersection. Station "sites" refer to the specific eastbound and westbound sites where a station platform may be constructed at a particular station location.

Station Site	Alternate #	Included in Corridor-Level Estimate
Kedzie (WB)	Alt #1	Yes
Pulaski (EB)	Alt #2	Yes
Pulaski (WB)	Alt #1	Yes
Kostner (EB)	Alt #1	Yes
Kostner (EB)	Alt #2	No
Kostner (WB)	Alt #1	Yes
Cicero (EB)	Alt #2	Yes
Cicero (WB)	Alt #2	Yes
Oak Lawn Patriot Metra (EB)	Alt #1	Yes
Oak Lawn Patriot Metra (WB)	Alt #3	Yes
Central (EB)	Alt #3	Yes
Central (WB)	Alt #1	Yes
SW Highway (EB)	Alt #1	Yes
SW Highway (WB)	Alt #1	Yes
Ridgeland (EB)	Alt #1	Yes
Ridgeland (WB)	Alt #1	Yes
76th (EB)	Alt #2	Yes
76th (WB)	Alt #1	Yes
Bridgeview Courthouse (EB)	Alt #4	Yes
Bridgeview Courthouse (EB)	Alt #2	No
Bridgeview Courthouse (WB)	Alt #2	No
Bridgeview Courthouse (WB)	Alt #3	Yes
Roberts/104th (EB)	Alt #2	Yes
Roberts/104th (WB)	Alt #3	Yes
Moraine Valley Community College	Alt #2	Yes

12.1 Methodology

The capital cost estimate is based on Pulse 95th Street Line Conceptual Station Improvement Plans dated March 22, 2019, which depict potential station locations and typical sections. The 100% design files for the Milwaukee Line were used as a reference to provide additional station details, as was Milwaukee Line construction pricing information from Pace's Rapid Transit Office. These documents form the basis for the identification of

the various composite cost elements that were used in the development of the station and corridor cost estimate.

12.1.1 Station Level Estimate

The estimate for station sites includes station elements and amenities, access features, related infrastructure requirements, and other miscellaneous items. 95th Street Line Pulse stations will include features currently being used on the Milwaukee Line, which have been selected by Pace to enhance passenger comfort, address safety and operations concerns, and reflect the Pulse brand. Pulse stations will apply station features consistently while accommodating individual site requirements. A selection of Pulse station features and their unit costs are provided in Table 12.3.

TABLE 12.3 TYPICAL PULSE STATION FEATURES

Station Feature	Unit Cost (in 2019 $)
Pulse Shelter	$42,000/each
Vertical Marker	$60,000/each
Real-Time Sign	$31,100 ($15,550 x 2 per marker)
Shelter Heater	$4,030 ($2,015 x 2 per shelter)
Bench	$3,085/each
Trash Receptacle	$890/each
Bike Rack	$1,200/each
Tactile Strip	$45/square foot
Bus Curb	$45/linear foot
Pavement Snowmelt	$25/square foot
Electrical Cabinet	$28,000/each
Railing	$300/linear foot

Source: Pace, PMO

Station facility quantities are based on a conceptual scope of work by station type (Compact, Ultra Compact, Standard and Double Standard). Unit bid costs for project elements such as pavement, concrete flatwork, steel railing and pavement markings that are common to local department of transportation markets were applied to quantity takeoffs to develop station costs in 2019 dollars. The costs for new shelters, removal of existing shelters, vertical markers, heaters, pavement snowmelt systems, site improvements and real time signs were based on cost allowances established during the development of the Pulse Milwaukee Line. This estimate also applies an order of magnitude cost to ComEd service drops, utility relocations, and the purchase of temporary or permanent easements. All items included in the station-level estimate were categorized according to

the Federal Transit Administration's (FTA) standard cost categories (SCC) to facilitate the documentation of the estimate in the SCC Small Starts workbook.

A separate station site cost was developed for each of the 39 station sites in Table 12.2 except for the CTA Red Line 95th/Dan Ryan Station. These station costs include distributed costs for labor, materials, equipment and other related construction costs. Capital costs for each of the station sites are summarized in Table 12.4, with an assumed proposed conceptual station type noted. Detailed cost information for each individual location being considered for these sites is provided in Appendix I.

TABLE 12.4 CAPITAL COSTS - ALL STATION SITES

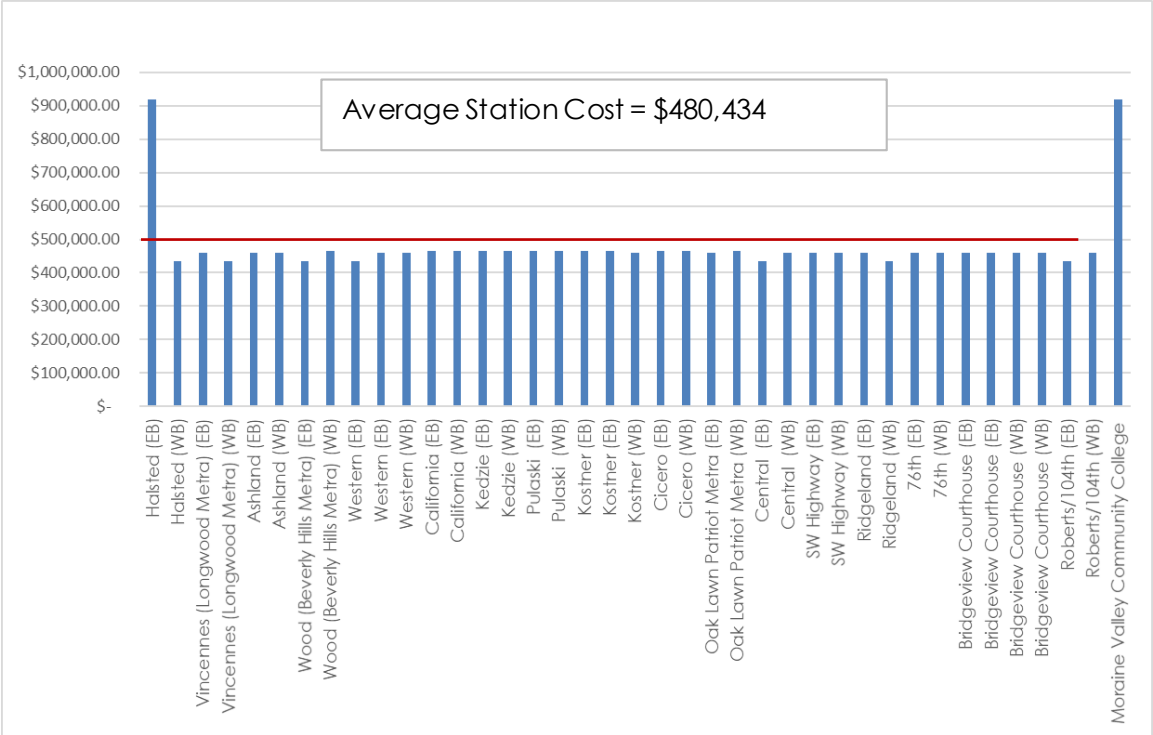
Station Sites	Station Type	Amount (2019 $)
CTA Red Line 95th/Dan Ryan Station	N/A	$0
Halsted (EB), Alt #1	Double Standard	$919,765.00
Halsted (WB), Alt #1	Compact	$433,565.00
Vincennes (Longwood Metra) (EB), Alt #1	Standard	$460,035.00
Vincennes (Longwood Metra) (WB), Alt #1	Compact	$433,565.00
Ashland (EB), Alt #2	Standard	$460,035.00
Ashland (WB), Alt #1	Standard	$460,035.00
Wood (Beverly Hills Metra) (EB), Alt #2	Compact	$433,565.00
Wood (Beverly Hills Metra) (WB), Alt #2	Ultra Compact	$465,148.75
Western (EB), Alt #1	Compact	$433,565.00
Western (EB), Alt #3	Standard	$460,035.00
Western (WB), Alt #1	Standard	$460,035.00
California (EB), Alt #1	Ultra Compact	$465,148.75
California (WB), Alt #1	Ultra Compact	$465,148.75
Kedzie (EB), Alt #1	Ultra Compact	$465,148.75
Kedzie (WB), Alt #1	Ultra Compact	$465,148.75
Pulaski (EB), Alt #2	Ultra Compact	$465,148.75
Pulaski (WB), Alt #1	Ultra Compact	$465,148.75
Kostner (EB), Alt #1	Ultra Compact	$465,148.75
Kostner (EB), Alt #2	Ultra Compact	$465,148.75

Station Sites	Station Type	Amount (2019 $)
Kostner (WB), Alt #1	Standard	$460,035.00
Cicero (EB), Alt #2	Ultra Compact	$465,148.75
Cicero (WB), Alt #2	Ultra Compact	$465,148.75
Oak Lawn Patriot Metra (EB), Alt #2	Standard	$460,035.00
Oak Lawn Patriot Metra (WB), Alt #4	Ultra Compact	$465,148.75
Central (EB), Alt #3	Compact	$433,565.00
Central (WB), Alt #1	Standard	$460,035.00
SW Highway (EB), Alt #1	Standard	$460,035.00
SW Highway (WB), Alt #1	Standard	$460,035.00
Ridgeland (EB), Alt #1	Standard	$460,035.00
Ridgeland (WB), Alt #1	Compact	$433,565.00
76th (EB), Alt #1	Standard	$460,035.00
76th (WB), Alt #1	Standard	$460,035.00
Bridgeview Courthouse (EB), Alt #4	Standard	$460,035.00
Bridgeview Courthouse (EB), Alt #2	Standard	$460,035.00
Bridgeview Courthouse (WB), Alt #1	Standard	$460,035.00
Bridgeview Courthouse (WB), Alt #3	Standard	$460,035.00
Roberts/104th (EB), Alt #2	Compact	$919,765.00
Roberts/104th (WB), Alt #3	Standard	$460,035.00
Moraine Valley Community College	Double Standard	$919,765.00

Figure 12.1 depicts the capital costs of each of the station layouts as well as the average cost. The average capital cost of a station site is $480,434. The terminal station at CTA Red Line 95th/Dan Ryan is not included in the average as no capital improvements are planned.

When comparing the costs of all station sites, the majority are relatively comparable to one another. The exceptions are at Halsted and Moraine Valley Community College, which are double standard stations with elongated platforms meant to accommodate more than one Pulse or fixed route service.

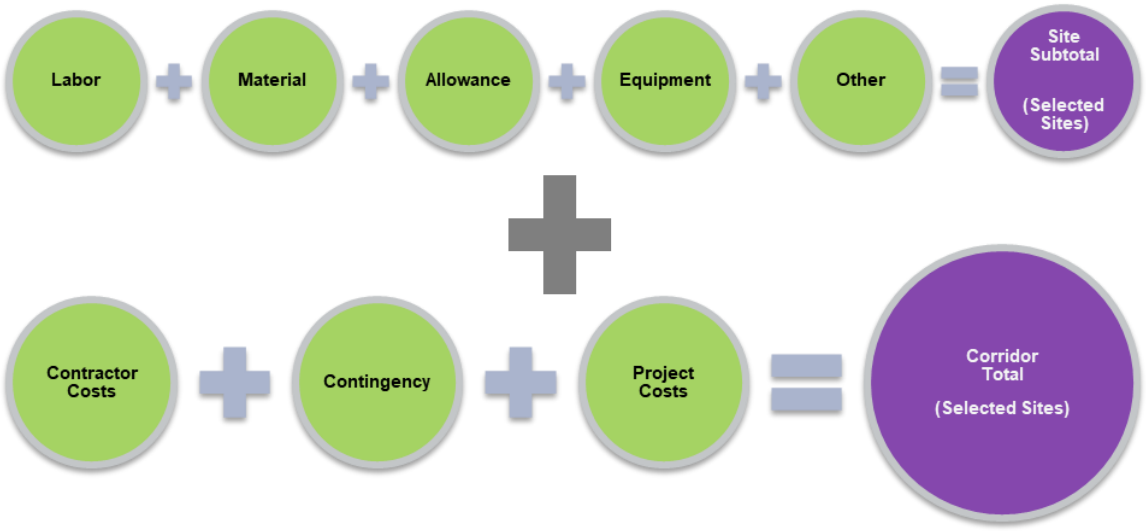
FIGURE 12.1 STATION SITE SUBTOTAL COSTS



12.1.2 Corridor-Level Estimate

The corridor-level estimate was built upon the station-level estimate with a subtotal for the 35 station sites identified in Table 12.2 as being included in the corridor-level estimate. The costs are based an assumed station type for each station and then adding global project-level costs were added. The identified station types are generally representative of improvements needed for the station location. While only a representative sample of station sites are included in the corridor-level estimate, all station sites and layout options will be evaluated during the environmental review phase and a preferred alternative will be developed that identifies one station site in each direction to be developed with detailed design drawings during the design phase. Figure 12.2 illustrates the process of building the corridor-level estimate.

FIGURE 12.2 CORRIDOR-LEVEL COST ESTIMATE FORMULA



12.1.2.1 STATION TYPE SUBTOTAL

Appendix K includes a detailed accounting of costs for each station site included in the corridor-level estimate as well as a summary sheet for the total capital cost for Pulse 95th Street Line stations. As noted above, station sites selected for the corridor-level cost estimate were chosen to provide a representative sample of all station sites considered for each location, with one station site in each direction chosen for the intermediate station locations and the terminal station at Moraine Valley Community College. A breakdown of the elements included in the site subtotal is shown in Table 12.5. The subtotal for the selected station sites represents 60% of the total 95th Street Line station capital costs at $16,918,116.

TABLE 12.5 BREAKDOWN OF COSTS INCLUDED IN THE SITE SUBTOTAL

Description	Amount (2019 $)	Percent of Total Project Cost
Labor	$ 4,485,014	26.5%
Materials	$ 3,445,153	20.4%
Equipment	$ 1,754,163	10.4%
Other	$ 130,776	0.7%
Allowances	$ 7,103,010	41.9%
SITE SUBTOTAL	$16,918,116	

The site subtotal, contractor costs, project costs, and contingency were combined to develop an estimate for the total corridor-level capital construction cost for the Pulse 95th Street Line.

12.1.2.2 CONTRACTOR COSTS

Contractor costs and fees include contractor's general condition, overhead and profit, an adjustment for labor and payroll burden, direct costs for tools and equipment, bonds, and other insurance, sales tax and utility relocation costs. The rates applied are based on historical data and estimator experience and are applied to the site subtotal. The rates and costs are identified in Table 12.6. Contractor costs represent 11% of total project costs.

TABLE 12.6 CONTRACTOR COSTS

Description	Amount (2019 $$)	Rate	Percent of Total Project Cost
General Conditions[23]	$1,015,087	6.0%	5.3%
Overhead & Profit	$1,075,992	8.0%	5.7%
TOTAL CONTRACTOR COSTS	**$2,091,079**	**11.0%**	

12.1.2.3 CONTINGENCY

A contingency allowance of 25% of the site subtotal is included in the corridor-level estimate. The 25% rate is appropriate for the project's current level of design. The contingency cost of the project is $4,752,299 and represents 15.2% of the total project cost.

12.1.2.4 PROJECT COSTS

Project costs are costs included for the corridor-level estimate only and are applied as either a lump sum or percentage of the site subtotal and represent engineering, project management, land acquisition, permits and other associated costs, including an estimated cost of both Pace staff time (force account) and consultant costs. The rates applied are based on historical data and estimator experience. The project costs represent 23.6% of the total corridor-level capital costs for the 95th Street Line. A breakdown of project costs is detailed in Table 12.7.

[23] General conditions include construction management personnel (e.g. superintendents, project manager, safety manager, time clerk), site facilities (e.g. trailers, sanitation units), and miscellaneous personal protective equipment and tools provided to the employees to meet the minimum safety standards.

TABLE 12.7 PROJECT COSTS

Project Cost Categories	Amount (2019 $$)	Rate	Percent of Total Project Cost
Advanced Conceptual Design	$ 950,460	5.0%	3.0%
Final Design	$1,900,920	5.0%	6.1%
Project Management, Agency/PM Consulting	$1,338,000	5.0%	4.3%
Construction Administration & Management	$1,425,690	7.5%	4.6%
Insurance	$190,092	1.0%	0.6%
Legal, Permits, Review Fees	$475,230	2.5%	1.5%
Right-of-Way Acquisition	$950,460	5.0%	3.0%
Survey, Testing, Inspection	$190,092	1.0%	0.6%
TOTAL PROJECT COSTS	**$7,420,943**		**23.8%**

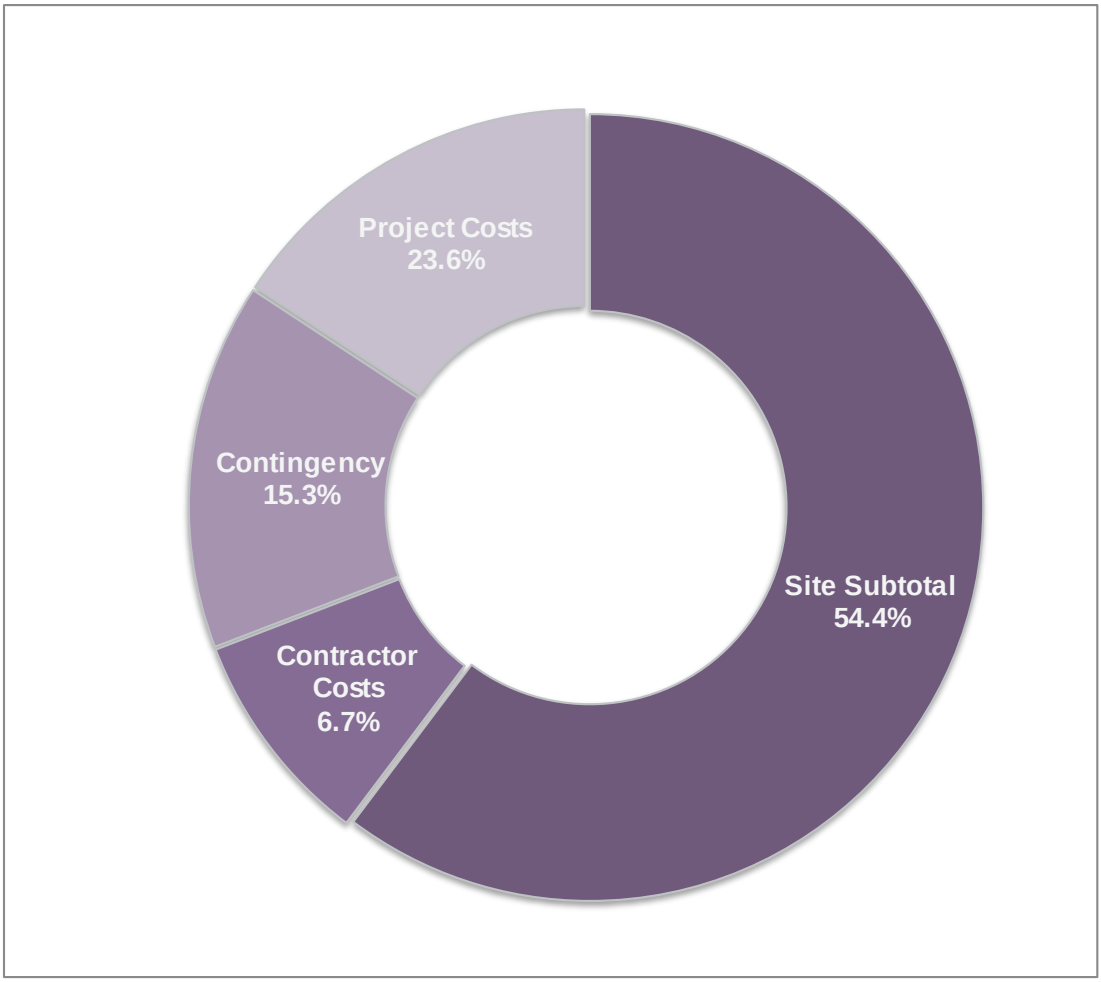
12.1.2.5 CORRIDOR-LEVEL TOTAL CAPITAL COSTS

Total corridor-level capital costs are $31,182,437 as shown in Table 12.8. A breakdown of all corridor-level cost components as a percentage of the total corridor-level cost is shown in Figure 12.3.

TABLE 12.8 CORRIDOR-LEVEL CAPITAL COST CATEGORY TOTALS

Project Cost Categories	Amount (2019 $)
Station Site Subtotal	$16,918,116
Contractor Costs	$ 2,091,079
Contingency	$ 4,752,299
Project Costs	$7,420,293
TOTAL 95th STREET LINE CORRIDOR-LEVEL CAPITAL COSTS	**$31,182,437**

FIGURE 12.3 SHARE OF CORRIDOR-LEVEL CAPITAL COST BY CATEGORY



12.1.2.6 COST ESCALATION

All capital costs have been presented in 2019 dollars. To escalate the estimated costs to the start of revenue service – currently anticipated to be 2024, pending funding – a variable escalation rate for each year was developed based on the monthly and historic Consumer Price Index (CPI) as well as forecast data obtained from the Congressional Budget Office (CBO) Baseline Economic Projections for August 2018. Based on these escalation rates, the corridor-level capital cost estimate of $31.182 million in 2019 dollars would increase to $35.108 million in 2024. Table 12.9 illustrates the escalation of capital costs for the stations to 2024.

TABLE 12.9 ESCALATED CORRIDOR-LEVEL CAPITAL COSTS[24]

	2019	2020	2021	2022	2023	2024
Corridor Capital Cost (Stations)	$31,182,437	$31,868,451	$32,665,162	$33,481,791	$34,285,354	$35,108,202
Escalation Rate		2.2%	2.5%	2.5%	2.4%	2.4%

12.1.3 Vehicles

Pulse vehicles will be procured as part of Pace's regular vehicle replacement program. Based on the preliminary operating plan for the 95th Street Line, there is an assumed need for 13 vehicles with 3 spares for a total of 16 new Pulse vehicles at a cost of $600,000 per vehicle[25]. Like the corridor-level cost estimate, a variable escalation rate for each year was used to escalate the vehicle costs to 2024. Vehicle costs of $9.6 million in 2019 dollars would increase to $10.8 million in 2024, the anticipated year of purchase and revenue service. Table 12.10 illustrates the escalation of vehicle costs.

TABLE 12.10 ESCALATED VEHICLE COSTS

	2019	2020	2021	2022	2023	2024
Pulse Vehicles (16=13 + 3 spares)	$9,600,000	$9,811,200	$10,056,480	$10,307,892	$10,555,281	$10,808,608
Escalation Rate		2.2%	2.5%	2.5%	2.4%	2.4%

[24] Monthly and historic CPI (http://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-Current/) and CBO Baseline Economic Projections, August 2018 (https://www.cbo.gov/system/files?file=2018-08/54318-EconomicOutlook-Aug2018-update.pdf)

[25] Vehicle costs were established during the Pulse Milwaukee Line capital cost estimate and may vary based on the current vehicle specifications. A 2018 cost of $480,000 was used as the basis for the vehicle cost and a 25% contingency is reflect in the 2019 cost. This contingency allows for changes in vehicle technologies and requirements.

12.1.4 Total Cost for the 95TH Street Line

As shown Table 12.11, the total cost for the Pulse 95th Street Line including the station capital costs and Pulse vehicles is $40.8 million in 2019 dollars and $45.6 million in 2024 dollars. Project costs are escalated to 2024 to show how the costs may increase with the start of revenue service.

TABLE 12.11 TOTAL PROJECT COSTS

	2019	2020	2021	2022	2023	2024
Station Capital Cost	$31,182,437	$31,868,451	$32,665,162	$33,481,791	$34,285,354	$35,108,202
Pulse Vehicles	$9,600,000	$9,811,200	$10,056,480	$10,307,892	$10,555,281	$10,808,609
Total Project Capital Cost	$40,782,437	$41,679,651	$42,721,642	$43,789,683	$44,840,635	$45,916,811
Escalation Rate		2.20%	2.50%	2.50%	2.50%	2.40%

12.1.5 FTA Standard Cost Categories

Pace Pulse investments that are pursuing federal funding through the Federal Transit Administration (FTA) grant programs, including the Congestion Mitigation and Air Quality (CMAQ) program, must organize project costs according to the FTA's Standard Cost Categories (SCC) structure. The Station Capital Cost estimate presented and detailed in Appendix J and Appendix K was transferred to a SCC Capital Cost Estimate workbook that follows FTA guidance and requirements for estimating and annualizing capital construction costs and other project costs and funding sources. While the cost of vehicles is not included in Appendix J and Appendix K, they are included in the summary cost table, which is presented in Appendix L.

Following FTA methodology recommendations, the SCC Capital Cost Estimate is broken down into ten (10) major components including five (5) cost categories for station construction and five (5) cost categories for supporting project elements, needs and administration / finance. These include the following:

- Category 10: Guideway and Track Elements
- Category 20: Stations, Stops, Terminals and Intermodal
- Category 30: Support Facilities: Yards, Shops, and Administrative Buildings
- Category 40: Sitework and Special Conditions

- Category 50: Systems
- Category 60: Right of Way, Land, and Existing Improvements
- Category 70: Vehicles
- Category 80: Professional Services
- Category 90: Unallocated Contingency
- Category 100: Finance Charges

A key difference between the SCC format and the capital cost estimate presented is that the costs in the SCC workbook have variable years of expenditure to reflect when work is expected to occur. For example, in order for the Pulse 95th Street Line to begin revenue service in 2024, the engineering design services must begin in 2021 and conclude in 2022. Because the schedule and years of expenditure are defined in more detail, the project costs are escalated to different years. The result is a total project cost of $45,916 million in year of expenditure dollars, with the largest share of expenses anticipated in 2024.

13 Ridership Forecast

The ridership estimate for the Pulse 95th Street Line, as well as proposed changes to the existing local Route 381 to be implemented upon commencement of Pulse service in the corridor were evaluated in this forecast. The forecast was built upon previous detailed ridership analysis for the corridor and was developed using Simplified Trips-on-Project Software (STOPS) ridership forecasting model, which was first released in 2013 by the Federal Transit Administration (FTA). The most recent Chicago application of the STOPS model was released by the Regional Transportation Authority (RTA) in July 2018. Additional modifications, calibration, and project coding were completed for specific application to this project. The modified STOPS model developed for this ridership forecast has not been calibrated to the full Chicago region and is not necessarily suitable for use on other projects.

The ridership forecast documented is based on the corridor stations shown in Figure 1.1. The Pulse 95th Street Line will consist of two terminal stations (CTA Red Line 95th/Dan Ryan Station and Moraine Valley Community College) and 18 intermediate stations. One station (Harlem) was excluded from the ridership forecast as the location and function of this station is dependent on substantial and as-yet undefined changes to the existing built environment. For modeling purposes, the western routing via 76th Avenue was treated as the default project routing. The other proposed routing, which operates via Harlem Avenue with a station at Harlem/103rd replacing the station at 95th/76th, was evaluated as a sensitivity test.

The running time, span, and frequency of service used in the ridership forecast are documented in the Operating Plan and O&M Cost Estimate technical memorandum submitted March 8, 2019.

13.1 Stops Model

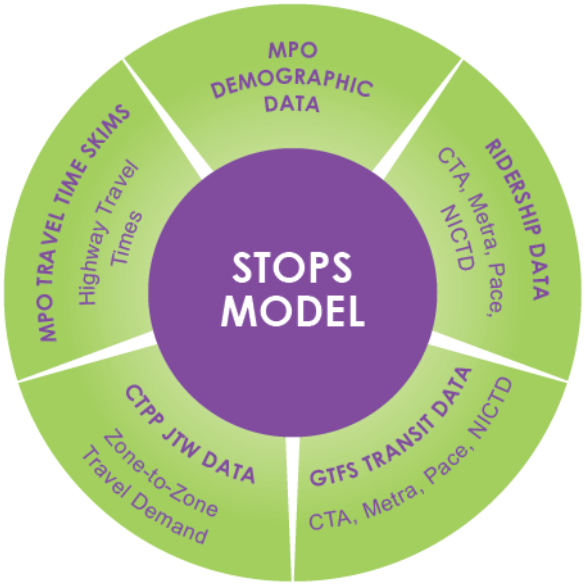
STOPS was developed by the FTA in 2013 as an alternative to using a conventional four-step regional travel demand model for transit ridership forecasting. Through several subsequent software releases and real-world experience running the software, the FTA has expanded the types of recommended applications for STOPS and has updated several important recommended procedures for model implementation.

The latest version of STOPS currently available is Version 2.5, which became available in 2018. Version 2.5 has been released to users on request, but has not yet been fully documented. The most current documentation available is from the previous release, Version 1.5, and can be accessed on the FTA's STOPS website. Version 2.5 includes several new features and updates which will be further discussed in the following sections.

13.1.1 Overview of the STOPS Model

The FTA's STOPS Model documentation contains an exhaustive discussion of how the model operates, key data inputs, etc., which this section will not attempt to replicate. This section presents a high-level discussion of the main features and data inputs in STOPS. For a detailed technical discussion, the model documentation should be consulted.

FIGURE 13.1 PULSE 95TH STREET LINE STATION LOCATIONS



STOPS emulates the workflow of a traditional four-step travel demand model, with a greater focus on accurate representation of the transit network and detailed calibration to actual transit demand in the study area. Figure 13.1 summarizes the key data inputs used by STOPS, which include the following:

- **MPO Demographic Data**: While STOPS is intended to function as an alternative to using a regional travel demand model, a region must still have a conventional model available, as STOPS uses several items from these models. The first is the regional zone-based data set for base year and future year population and employment. For the 95th Street Corridor model, the 1,944-zone demographic forecast prepared by the Chicago Metropolitan Agency for Planning (CMAP) was used. The demographic forecast is used to take existing base year journey-to-work data (described below) and grow it to current and future years.
- **MPO Travel Time Skims**: The second MPO model data set used by STOPS is the highway travel-time "skim" matrix, which is a database containing the estimated

travel time and travel distance between any two pairs of MPO zones. Models typically contain skims for various time periods and forecast years. In accordance with STOPS Model recommended procedures, the AM Peak time period is used. The CMAP travel time skims contained separate distance and time tabulations for all forecast years (2015, 2020, 2030, and 2040). Travel time skims are used by STOPS to compare highway driving times to transit travel times (the latter of which are computed within the model), and thereby establish the highway/transit mode share of a given zone-to-zone travel movement.

- **Journey to Work (JTW) Data**: The FTA packages and provides JTW data sets specifically for use in STOPS. The data comes from the Census Transportation Planning Package (CTPP), a modeling package produced using Census data to describe origin-destination patterns of travel demand specifically for work trips. The data contains a table of trip productions and trip attractions for every zone in a given region. Because the CTPP JTW data only describes work trips, STOPS uses internal factors within the model to expand the work trip table to include non-work trips. The zone system used in the JTW data is not necessarily the same zone system used in the previously described MPO demographic and travel time data; STOPS automatically reconciles the two zone systems.

- **GTFS Schedule Data**: One area where STOPS differs from conventional travel demand models is in the manner in which it represents existing and future transit service. While conventional models typically represent transit service in terms of a travel time between zones which includes an assumed waiting time (based on the frequency of service), STOPS uses detailed schedule data to develop a precise and far more accurate representation of the true transit travel time between any two zones at any given departure or arrival time. To do this, STOPS reads GTFS data. GTFS is the open-source standard for publishing transit schedule data, used in applications such as Google Maps and various other third-party trip planning tools. There are many GTFS reader and editor tools available, and the files are easily modified to represent future changes to the transit network. Additionally, many transit agencies use internal scheduling and run-cutting software that automatically generates GTFS files for both existing and proposed conditions. In addition to the standard GTFS file set, STOPS uses several "add-on" files that are not part of the standard GTFS file sets, which are used to represent the existence of park and ride (PnR) facilities, and to facilitate quick edits to the transit network, such as turning off routes or rerouting service, without the need for extensive GTFS schedule coding.

  The 95th Street Corridor STOPS model contains a complete GTFS representation of CTA, Pace, Metra, and NICTD (South Shore Line) transit service.

- **Ridership Data**: STOPS uses ridership data at both the stop level and the system level as a tool for model calibration. Stop-level ridership data is entered as a Geographic Information System (GIS) Shapefile, while system-level ridership (linked and/or unlinked transit trips) is entered in a model parameter file as a control total. For the 95th Street Corridor model, several sources of ridership data were combined.

  In comparison to a traditional four-step travel demand model, STOPS differs primarily in the final two steps, Mode Choice and Trip Assignment. For the first two steps, Trip Generation and Trip Distribution, STOPS depends on external data sources (MPO data, CTPP JTW data) and on model calibration constants to develop an understanding of existing travel demand in the study area.

13.1.2 Regional Transportation Authority STOPS Model

In July 2018, Chicago's RTA publicly released the second edition of its regional STOPS model calibration for the Chicago region, for use by the various transit service providers and planning agencies in the region. This regionally calibrated model was used as the starting point for development of the 95th Street Corridor model, with several significant modifications. This section briefly describes key inputs and assumptions that were used in the RTA's model. The following section then describes the modifications that were made in preparing the 95th Street Corridor model.

The following is a summary of key elements of the RTA STOPS model. Additional technical detail can be found in that model's User Guide.

- The RTA model was developed using Version 2.50 of STOPS, which was the latest version available at the time of the model's development. Accordingly, the RTA model used JTW data derived from the 2008-2012 American Community Survey (ACS), the latest JTW data set available for use in Version 2.50 of STOPS.
- For station-level calibration, the RTA model included station-level boarding data for all Metra, NICTD, CTA, and Pace bus and rail stations.
    - CTA boardings data represents October 2017 average weekday boardings, with cross-platform boardings added to station totals from CTA's monthly ridership reports.
    - Metra boardings data represents average weekday boardings from Metra's fall 2016 boarding/alighting count.
    - NICTD boardings data represents October 2017 average weekday boardings, provided to the RTA by NICTD.

- Pace boardings data represents October 2017 average weekday boardings.

These stations were aggregated by the RTA into 105 Station Groups based on operator, mode, line, and distance to Downtown Chicago, as well as special station groups for major downtown termini as well as other major transfer stations.

- MPO zones are aggregated into 12 Districts based on areas of similar transit mode share and land use characteristics.
- GTFS files were assembled from the four existing transit agencies representing October 2017 service levels for Pace, CTA, and NICTD, and October 2018 for Metra (to capture the new Romeoville station). Only existing conditions were represented; a future no-build was not developed.
- Various transfer penalties were imposed at the station and agency level to improve calibration results. For example, inter-agency transfer penalties were imposed at some Metra stations to suppress the number of transfers between Metra and other transit services, especially to CTA service at non-downtown locations in Chicago.

13.1.3 95th Street Corridor Model

The RTA model covers a very large area including Chicago, its surrounding suburbs, and beyond (including portions of Indiana and Wisconsin), and was intended by its developers to be modified and supplemented for corridor-specific applications such as the 95th Street Corridor. Additionally, non-downtown-oriented corridors such as 95th Street are particularly challenging for a regional, largely downtown-oriented model such as the RTA STOPS model and require additional refinement and data to achieve a suitable level of local calibration.

This section describes the adjustments and additional data used to update and enhance the RTA model for application to this project.

13.1.3.1 Stations Shapefile

To improve calibration results in the study area, the following modifications were made to the RTA-provided Stations shapefile:

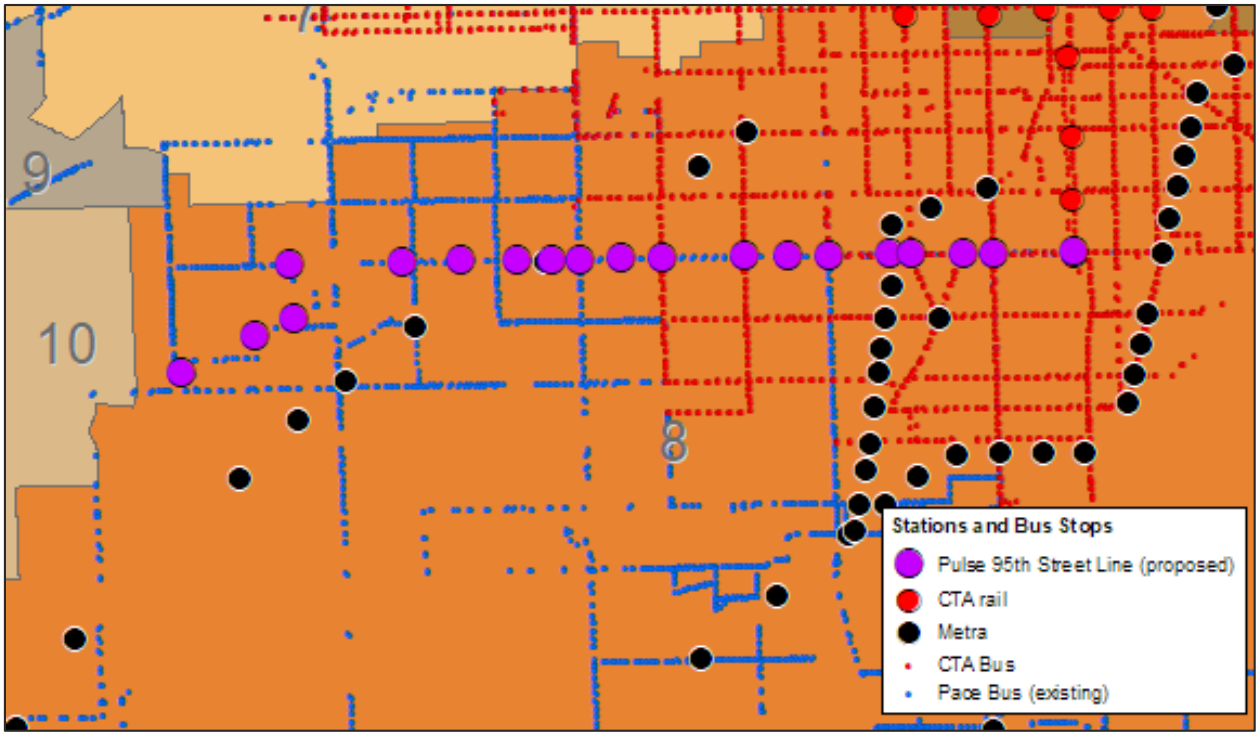
- Access time penalties were standardized at all Metra stations to represent the differential between Metra's zone-based fares and the baseline local transit fares charged by CTA and Pace. The time penalty was applied based on an assumed value-of-time of $10/hour, divided by the difference between the Metra fare to downtown from each station, and CTA rail fare of $2.50.

- Access time penalties were applied for transfers at the CTA Red Line 95th/Dan Ryan station to better represent walking times among the two bus terminal areas and the rail station below.
- Park and ride access penalties were applied at Pace stations adjacent to Metra park and ride lots along 95th Street to suppress park and ride access to Pace bus service, which is not an expected or observed mode of access for most Pace local service.
- Pulse 95th Street Line stations were added as new stations, assigned to the station groups of their corresponding nearby local bus stops.
- Station groups were modified as described in the next section.

13.1.3.2 Districts

The RTA's default districts were very large, encompassing substantial portions of the region within each district. These districts were designed to encompass concentric tiers radiating from downtown Chicago, with areas aggregated based on similar levels of transit availability, as well as geography (north, west, and south of downtown Chicago). As shown in Figure 13.2, under the default RTA-defined district system the entire Pulse 95th Street Line corridor was contained within a single district (District 8, representing medium transit availability south of Downtown). This district also encompasses much of Chicago's Far South Side and surrounding southwestern inner suburbs.

FIGURE 13.2 RTA DEFAULT MODEL DISTRICTS

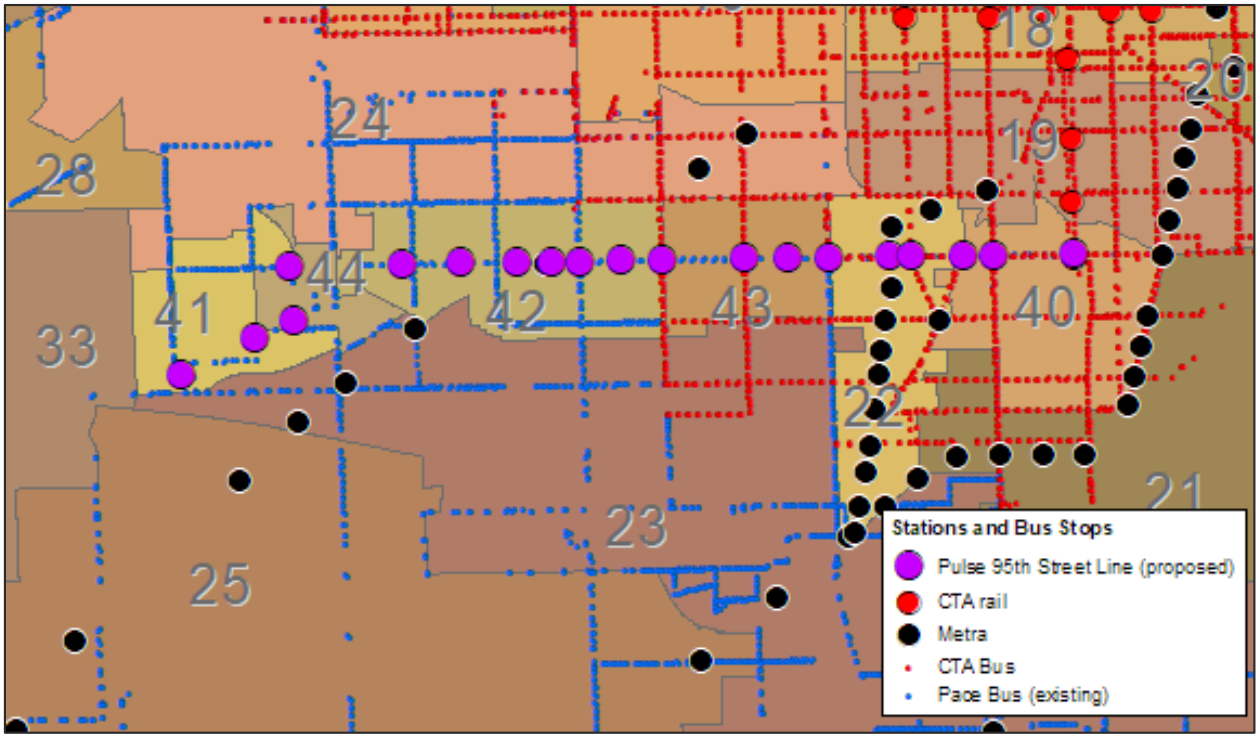


Note: the colored polygons represent the default RTA districts.

These districts were intended to be subdivided into smaller districts for application of the model to specific corridor studies. The PMO subdivided districts throughout the region, with a particular focus on the study area, resulting in 44 districts, including six along the project corridor, as shown in Figure 13.3.

In creating new districts, boundaries between existing RTA-defined districts were generally preserved, with new districts created by subdividing existing ones. New districts were defined based on areas of similar socioeconomics, land use, transit access, and existing ridership.

FIGURE 13.3 PULSE 95TH STREET LINE CORRIDOR MODEL DISTRICTS



Note: The colored polygons represent the districts used in the 95th Street Corridor Model.

New districts in the study area include the following:

- District 40: 95th/Dan Ryan station and Roseland area
- District 22: Beverly neighborhood, including the entire Beverly Branch of the Metra Rock Island District
- District 43: Pulse 95th Street Line, Evergreen Park
- District 42: Pulse 95th Street Line, Oak Lawn and Chicago Ridge
- District 44: Pulse 95th Street Line, Bridgeview
- District 41: Pulse 95th Street Line, Hickory Hills and Palos Hills

In addition, the remainder of the larger district from which most of the aforementioned districts were drawn was subdivided into portions north, northwest, south, and southwest of the project corridor (new districts 10, 24, 23, and 25), respectively.

13.1.3.3 Station Groups

As previously noted, the RTA STOPS model generally assigned station groups to align with the districts in which the stations are located, creating separate station groups for each operator and mode (CTA bus, CTA rail, Pace, Metra, and NICTD). Additional station groups were assigned to key transfer locations and downtown termini.

The PMO updated station groups as needed to align with newly created districts as well as for key ridership and transfer locations along the corridor. In total, the number of station groups increased from 105 in the RTA model to 194 station groups in the 95th Street Corridor Model.

The following changes were made to station groups:

- Where new districts were created, corresponding new station groups were created for stations located in within those new districts.
- Pace and CTA bus stops along the project corridor were moved from separate station groups by agency to combined station groups encompassing both agencies' bus stops within a given district, to better calibrate overall transit ridership along segments where both agencies operate.
- Where district boundaries ran along the centerlines of streets with bus stops, stations groups on both sides of the street were assigned the same group, rather than having pairs of bus stops assigned two separate groups.
- All Pace and CTA bus stops serving the CTA Red Line 95th/Dan Ryan station were assigned to a single newly-created station group specific to that location.
- Moraine Valley Community College was assigned its own station group.
- Branch line Metra stations (for example, Rock Island Beverly Branch and Metra Electric Blue Island Branch) were assigned separate station groups from their main line counterparts.

13.1.3.4 GTFS Files

The following GTFS file sets were included in the 95th Street Corridor STOPS model:

- **CTA:** The GTFS files developed by the RTA were used, with no further modifications for the 95th Street Corridor model.
- **Metra**: The GTFS files developed by the RTA were used, with no further modifications for the 95th Street Corridor model.

- **NICTD:** The GTFS files developed by the RTA were used, modified to reflect NICTD's ban on picking up inbound passengers and dropping off outbound passengers north of Hegewisch.
- **Pace**: The GTFS files developed by the RTA were used, with no further modifications for the 95th Street Corridor model.

  In addition, a second Pace GTFS file set was created, modified from the default file set to add proposed Pulse 95th Street Line stations, and corresponding Pulse 95th Street Line service and adjusted local service. This file set was used for the Build condition.

For all four transit agencies, the PnR.txt file that was developed by the RTA, which represents park and ride facilities, was added to the GTFS data set. For some PnR facilities, the catchment areas and access penalties defined by the RTA were adjusted to improve localized calibration results. No new park and ride facilities were defined as part of the Pulse 95th Street Line project.

13.1.4 STOPS Parameter File

The STOPS parameter file was unchanged from the RTA's default settings. The following are several key parameters from the STOPS model parameter file:

- **CTPP Calibration Approach**: Attractions District Only
- **Station Group Calibration Approach**: Type 12: OD Matrix Adjustment (Route and Stop)
- **Fraction of Transfer Penalty to Apply**: 1.3
- **Fixed Guideway Visibility:** 1.0
- **Linked Trip Factors**: All default values were used as contained in the RTA model.
- **Weekday Unlinked Trip Control Total**: 2,048,605.
- **Weekday Regional Linked Transit Trips by trip type and auto ownership**: All default values were used as contained in the RTA model.

13.2 Ridership Forecast Results

Prior to producing the Pulse 95th Street Line ridership forecast, the model was calibrated with a particular focus on the study area, including Route 381 ridership, total bus and rail boardings at the CTA Red Line 95th/Dan Ryan station, Metra boardings at stations along

the corridor, and ridership on other connecting bus routes. In total, 14 rounds of calibration adjustments and preliminary model runs were completed prior to producing a forecast. The final results of the Existing Conditions calibration as well as the Build Condition forecast are shown in Table 13.1. As shown, the model forecast indicates that ridership on the corridor will increase by 34% over existing boardings. This compares to a near-doubling of revenue-hours and revenue-miles of service on the corridor.

The forecast indicates that between the Existing and Build conditions, average weekday 95th Street Corridor ridership grows by 1,086 passengers (3,202 to 4,288), while Pace systemwide ridership grows by 1,255 boardings. This suggests that nearly all new boardings on the 95th Street corridor are entirely new Pace trips, as opposed to trips drawn from other routes; and in addition, approximately 20% of the new boardings along 95th Street also include transfers to other Pace routes.

TABLE 13.1 SUMMARY OF CALIBRATION RESULTS AND BASELINE RIDERSHIP FORECAST

	Pace Systemwide Boardings	Pace Route 381	Pulse 95th Street Line	95th Street Corridor Total
Existing Ridership (Actual)	**113,971**	3,513	N/A	**3,513**
Existing Ridership (Modeled)	**117,619**	3,202	N/A	**3,202**
Difference vs. Actual Existing	*3,648*			*-311*
Percent Difference vs. Actual Existing	*+3%*			*-9%*
Build Condition Ridership	**118,874**	408	3,880	**4,288**
Growth vs. Modeled Existing	*+1,255*			*+1,086*
Percent Growth vs. Modeled Existing	*+1%*			*+34%*

Note: The existing boardings number is based on October 2017 ridership, and corresponds with the GTFS files used in the STOPS model as compiled by RTA.

13.2.1 Sensitivity Tests

Sensitivity tests were conducted to examine the impacts of certain assumptions as well as to ascertain how changes to the project might affect ridership. Two sensitivity tests have

been developed as part of the ridership forecast development, and are described in this section and summarized in Table 13.2.

13.2.1.1 Harlem Avenue Routing

To address the yet-to-be-determined western routing of the Pulse 95th Street Line, an alternative operating plan was developed in which service proceeds via Harlem Avenue and 103rd Street, reconnecting with the default routing on the 103rd Street side of the Bridgeview Courthouse. Under this operating plan, the 76th Avenue station would be eliminated, and replaced with a station at Harlem Avenue and 103rd Street. This station could also potentially connect with enhanced Pulse Harlem Line service, or proposed express service on I-294, but these future improvements were not included in the forecast.

The STOPS model does not consider the exact route, but rather generates results based on station locations and the travel times. As discussed in Operating Plan and O&M Cost Estimate technical memorandum submitted on March 8, 2019, running times are estimated to be approximately one minute longer on the Harlem Avenue routing as compared with the default routing via 76th Avenue. All other operating assumptions, including the Pulse 95th Street Line span and headway, and proposed changes to local Route 381 service, were unchanged from the baseline scenario.

The resulting forecast was not substantially different from the baseline forecast, with total corridor ridership less than 3% higher than the baseline scenario. This highlights the speculative nature of the proposed Harlem/103rd station location, the benefits of which are primarily associated with future redevelopments and/or complementary service changes on other Pace corridors. Likewise, the proposed station at 95th Street and 76th Avenue, omitted under this alternate scenario, generated relatively low ridership under the baseline scenario.

13.2.1.2 Speed Improvements Only

To better understand the nature of the model's predictions about ridership growth on the 95th Street corridor, a sensitivity test was performed in which the anticipated Pulse 95th Street Line running time improvements were retained, but the frequency/headway improvements were removed. Under this scenario, the 95th Street Line would operate at the same approximate spans and headways as the existing Route 381, and the reduced local Route 381 under the Build condition was eliminated.

Under this sensitivity test, the resulting forecast indicates 3,169 average weekday boardings in the corridor, which is more nearly identical to the modeled existing conditions on 95th Street. Systemwide ridership is similarly unchanged versus existing conditions. This suggests that the ridership growth predicted under the baseline scenario is almost entirely a function

of increased frequency and span of service, rather than of speed improvements on the corridor.

TABLE 13.2 SUMMARY OF SENSITIVITY TESTS

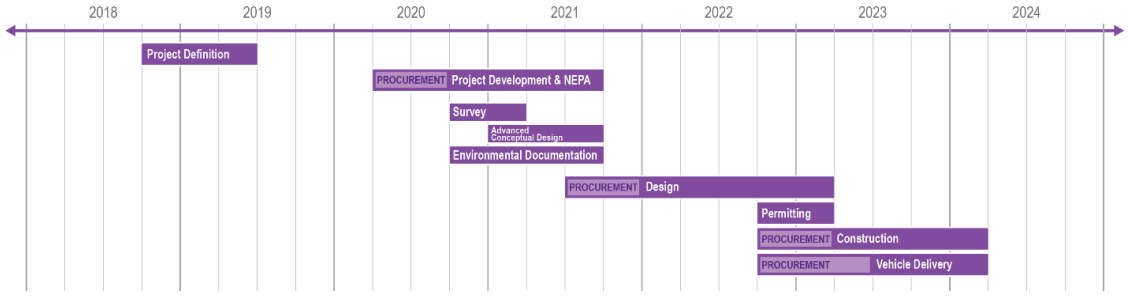
	Pace Systemwide Boardings	Pace Route 381	Pulse 95th Street Line	95th Street Corridor Total
Existing Ridership (Modeled)	**117,619**	3,202	N/A	**3,202**
Baseline (Build) Ridership	**118,874**	408	3,880	**4,288**
Growth vs. Existing	*+1,255*			*+1,086*
Percent Growth vs. Existing	*+1%*			*+34%*
Harlem Routing	**119,123**	503	3,899	**4,402**
Percent Growth vs. Existing	*+1%*			*+37%*
Percent Growth vs. Baseline	*+0%*			*+3%*
Speed Improvements Only	**117,756**	N/A	3,169	**3,169**
Percent Growth vs. Existing	*+0%*			*-1%*
Percent Growth vs. Baseline	*-1%*			*-26%*

14 Project Delivery

14.1 Project Delivery Approach

It is anticipated that the implementation of the Pulse 95th Street Line will utilize a design-bid-build delivery method. While the timing of all project phases are subject to funding availability, Pace intends to proceed with the required environmental documentation in 2020. At the conclusion of the environmental documentation phase and pending funding, Pace will procure a designer to complete project engineering, which would then be followed by the procurement of a construction contractor. Pace has a goal of implementing the 95th Line and beginning revenue service in 2024, pending the receipt of project funding. A preliminary implementation schedule required to achieve this goal is shown in Figure 14.1.

FIGURE 14.1 95TH STREET LINE IMPLEMENTATION SCHEDULE



14.1.1 Conceptual Design, National Environmental Policy Act (NEPA) Clearance, and Public Involvement

Conceptual design of the 95th Line is complete and is being documented and finalized in this Project Definition report. To continue to advance the project through the environmental documentation phase to comply with NEPA and to support the 2024 implementation timeline, a survey and advanced conceptual design will commence in 2020. During this time, the conceptual station layouts will be updated to reflect the conditions documented in the survey to a preliminary level of detail to support the environmental analysis. During the NEPA phase, Pace will undertake a public involvement and stakeholder outreach effort that will include public meetings, Corridor Advisory Group meetings and one-on-one stakeholder meetings to facilitate stakeholder input on impacts, particularly related to affected properties.

14.1.2 Engineering

As Pace anticipates using federal CMAQ dollars to fund the capital construction of the 95th Line, a qualifications-based solicitation will be used to procure a project designer. Similar to the process used for the Milwaukee and Dempster Lines, it is expected that Pace will solicit a qualified professional design firm using a Letters of Interest and Qualifications (LIQ) procurement. A scope of work for the designer will be developed during the NEPA phase and will be based on the scope for the design of the Dempster Line capital facilities. During the engineering phase, the designer will also coordinate with Pace to obtain the necessary project permits.

Throughout the engineering phase, Pace's External Relations department will support the Long Range and Capital Planning department and Rapid Transit Program Supervisor by coordinating community outreach and stakeholder involvement efforts appropriate to the engineering phase, including the development of intergovernmental agreements and coordination with property owners, businesses and other stakeholders.

14.1.3 Construction

As the engineering phase draws to a close, Pace will procure a general engineering contractor (GEC) to construct the 95th Line capital facilities. The GEC will need to team will qualified subcontractors, fabricators and vendors capable of ensuring the fit and proper function of all station elements, including the real time information signs.

As with the engineering phase work, Pace's External Relations will support the Long Range and Capital Planning department and Rapid Transit Program Supervisor by coordinating community outreach and stakeholder involvement efforts appropriate to the construction phase.

14.1.4 Operations

At the close of project construction, Pace will conduct testing of the capital facilities associated with the 95th Line and will train staff on Pulse operations. Revenue service is planned to begin in 2024, pending funding. From that point forward, Pace will focus on launching and evaluating the performance of the service and making any necessary adjustments.

14.2 Intergovernmental Coordination

During the development of the Milwaukee Line, Pace coordinated with municipal and agency representatives as well as the appropriate roadway authorities on roadway design modifications, right-of-way improvements, and the construction of station facilities and

developed intergovernmental agreements (IGAs) with these partnering entities to facilitate project implementation. These IGAs will set precedents for the implementation of future Pulse projects, including the 95th Street Line, and help establish a consistent strategy for negotiating and administering community partnerships.

For the 95th Line service, Pulse vehicles will operate on roadways that are primarily under the jurisdiction of IDOT and at off-street facilities controlled by local municipalities or other partners such as Moraine Valley Community College.

Roadway design modifications, right-of-way improvements, and the construction of station facilities will require IGAs with partner entities in advance of construction. During this Project Definition phase, Pace has initiated involvement and coordination with these partners including municipal and agency representatives and the appropriate roadway authorities. These efforts will continue into the NEPA, engineering, and construction phases of the 95th Street Line project and IGAs will be finalized during the engineering phase. Each of the partners will have a unique perspective on the 95th Street Line project and ability to facilitate the service and Pace will need to develop, negotiate, and execute IGAs with these parties as appropriate. Generally, coordination and support in the following areas will be critical to ensure maximum mutual benefit from Pace's investments:

- Facilitating efficient transfers between Pulse and connecting transit service at the CTA Red Line 95th/Dan Ryan Station and Moraine Valley Community College.
- IDOT investments in providing and maintaining appropriate roadway access and conditions, including coordination of right-of-way acquisition or easements with local jurisdictions in advance of construction.
- IDOT support for innovative transit facilities that support the program goals and project needs.
- Support for Pulse station improvements including construction within the public right-of-way and on publicly or privately owned property outside of the right-of-way limits.
- Permission for Pace to access and maintain station facilities within the public right-of-way as needed.
- Proactive coordination of agency activities that could impact access to or use of Pulse station facilities to ensure minimal service impacts.
- Local community investments in "last mile" mobility, ensuring adequate sidewalk and crosswalk access to Pulse stations.

- A coordinated strategy to mutually publicize and reinforce the Pace Pulse brand, while also providing opportunities for local branding, advertising, and community expression.

14.2.1 Pace Responsibilities

As the lead agency responsible for implementing the Pulse program and the Pulse 95th Street Line project, Pace's responsibilities will include (but not be limited to) the following:

- Station area construction that complies with state and local codes/standards and permitting requirements.
- Timely and reasonable requests for variances, if needed.
- Coordination with local and other authorities, as appropriate, regarding the following:
    - Utility service to the station/shelter during and after construction, and any needed relocation of existing utility infrastructure.
    - Demolition, clearing and earthwork at the station site.
    - Connection to the existing sidewalk network in an ADA-compliant manner adjacent to the station site.
    - Containment, mitigation, or removal and appropriate disposal of any hazardous materials disturbed during station site construction.
    - Maintenance of traffic during station construction.
    - Installation and removal of any required temporary facilities associated with station site construction.
- Minimization of disruptions to nearby property owners and the existing transportation network as a result of Pulse construction activities.
- Construction of the station shelter, platform, vertical marker and other associated amenities, which may or may not include the following:
    - Bicycle racks.
    - Trash receptacles.
    - Real-time information signage (on the vertical marker).
    - Other information signage including local area and transit information on the vertical marker.
- Maintenance of the vertical marker and periodic updates to associated information signage.

- Regular cleaning and sweeping of Pulse shelter structure and station platform (e.g. loose trash, landscape debris), if not provided for in a service agreement with IC&SC, Titan or other advertising shelter contractor.
- Regular trash collection (frequency to be determined by Pace).
- Guarantee of a minimum number of years of Pulse service in response to local infrastructure investments (pending discussion between Pace and local agencies).
- Release of Pulse operations-related liability for local governments and DOTs (pending discussion between Pace and local agencies).

14.2.2 Local Municipality Responsibilities

In order to facilitate Pulse implementation, Pace will need to form partnerships with local communities and coordinate on the provision of mutually beneficial improvements. While construction of the station improvements will be Pace's primary responsibility, local municipalities may be relied upon to deliver, facilitate or support some or all of the following:

- Commitment to implement Pulse improvements at on-street stations and transit centers such as the CTA Red Line 95th/Dan Ryan Station.
- Timely reviews and a streamlined permitting process, and approval of reasonable variances when needed (for example, to accommodate the height of the vertical marker, if needed, and Pulse-related electronic signage).
- Location and marking of any existing underground utilities in the station area prior to commencement of construction (Pace will bear no responsibility for impacts to existing utilities not accurately marked in advance by others).
- Provision and maintenance of sufficient street lighting near the station platform area for visibility of and for Pulse passengers.
- Facilitation of agreements with IC&SC and other advertising shelter contractors for station and shelter maintenance, if appropriate.
- Timely snow and ice removal when needed, including salting/sanding for slip resistance. (The station snow melt system planned for the stations will melt snow falling at a moderate rate, but significant snow events will require manual clearing of snow and ice.)
- Any locally desired security measures, potentially to include: security cameras, emergency call boxes, and emergency response (Pace will provide supporting

conduit runs in the standard shelters to enable local installation and maintenance of security related equipment. Upon request, Pace will be provided "read only" access to video feed from security cameras stored or hosted by others and will bear no responsibility for responding to calls for emergency assistance).

- Installation and maintenance of public art, if desired.
- Maintenance of community expression elements desired by the local community as established in the *Community Expression Features: Cost Sharing Strategy and Coordination Guidelines* document.
- Installation and maintenance of local advertising (on panels affixed to the shelter structure, in coordination with Pace).
- Provision of ADA-accessible sidewalk access routes to the station.
- Provision of at least one fully marked and signalized pedestrian crossing across an arterial roadway within 200 feet of a station platform with crossing locations to be mutually agreed upon by Pace and the local municipality.
- Installation of missing segments, or upgrades to existing segments, of the broader pedestrian and bicycle access network within a one-quarter (1/4) mile area surrounding each station location.
- Coordination with local plans and programmed roadway improvements:
- TSP
- Turn lane and other roadway configuration coordination.
- Facilitation of use agreements with adjacent private property owners where temporary and/or permanent off-street station access is needed.
- Facilitation of right-of-way acquisition or easement negotiations as needed (and potentially acquiring right-of-way or easements on Pace's behalf, as appropriate).
- Development of transit-supportive land uses along the 95th Streetcorridor and TOD-friendly zoning amendments.

14.2.3 Transportation Department Responsibilities

Departments of Transportation, in this case IDOT, CDOT and Cook County Department of Transportation and Highways, have a critical role to play in facilitating the development of the Pulse 95th Street Line, which may include, but not be limited to, the following;

- Timely reviews and permitting.
- Allowing reasonable use of and access to the right-of-way:
    - Allowing installation and use/maintenance of structures within the right-of-way.
    - Coordinating with Pace with regards to any changes to the station improvements or access and ensuring that Pace will have continued access to and use of such improvements.
    - Facilitating transit signal priority, raised platforms, bus pads, curb bump outs, and other roadway treatments as appropriate.
- Allowing innovative transit facilities (e.g. raised platforms and bus curbs) that support the program goals and project needs.
- Supporting the right-of-way acquisition process.

14.2.4 Transit Agency Responsibilities

Other transit agencies, specifically Metra, the CTA, and the RTA, also have a role to play in facilitating Pulse, including (but not limited to) the following:

- Commitment by the CTA through an IGA to implement effective Pulse transfers at the CTA Red Line 95th/Dan Ryan Station, which may involve:
    - Allocation of bus bays or stop locations to Pulse service.
    - Allocation of space for a vertical marker and/or other Pulse signage.
- Commitment by Metra to work cooperatively to facilitate effective Pulse transfer opportunities at the Metra Rock Island District Main Line Vincennes Avenue and Longwood Stations, and the Metra Southwest Service Line Oak Lawn Patriot Station.
- Commitment by the RTA to support Pulse throughout the suburban market where demand has been identified:
    - Provide general support and funding for Bus Rapid Transit projects throughout the region.
    - Provide support and leadership on interagency signage, including real time information signs where two or more transit services meet
    - Facilitating IGAs when needed (e.g. CTA and Pace, Metra and Pace).

14.2.5 Intergovernmental Agreements (IGAs)

Pulse implementation will require more complex and varied IGAs than have been needed for Pace service and facilities in the past, with a new emphasis on the construction and maintenance of physical infrastructure located primarily within the public right-of-way.

IGAs are have been developed for the Pulse Milwaukee Line and should serve as templates for the implementation of the 95th Street Line and other future Pulse projects. The IGAs will serve to clarify the respective roles and responsibilities of the various parties involved in Pulse implementation, both during the construction phase and during ongoing operations. This includes the customization of community expression features and the ongoing maintenance responsibilities for these elements as documented in the guidelines Pace developed in February 2016, entitled Community Expression Features: Cost Sharing Strategy and Coordination Guidelines 2016. IGAs with local and agency stakeholders needed to support Pulse-related improvements may address (but are not limited to) the items listed below. IGAs should be executed prior to the commencement of station construction in each municipality.

14.2.5.1 Potential IGA Elements

- Utility locating, relocation and/or extension.
- Hazardous material testing, and mitigation or removal as needed.
- Temporary or permanent easements.
- Temporary construction facilities and/or detours.
- Installation of TSP.
- Roadway construction and maintenance (e.g. curb bulb-outs, bus pads, etc.).
- Local provision of pedestrian crossings and sidewalk connections.
- Upgrades from basic station amenities (e.g. custom platform paving, additional bicycle racks, custom railing-mounted panels, etc.), with local municipalities funding (or securing funding for) the incremental increase in cost.
- Public art installation, if desired.

15 Next Steps

Pace has applied for CMAQ funding as well as Surface Transportation Program (STP) funding to support the implementation of the Pulse 95th Street Line. CMAQ funds are federal funds administered by the FTA when used for transit projects. STP funding supports projects of significant cost as well as multijurisdictional projects that address federal performance measures and priorities of the Chicago region's adopted regional plan: *ON TO 2050*, which include bus speed improvements. Use of CMAQ and STP funds requires compliance with federal aid procedures, including compliance with the NEPA. The Pulse 95th Street Line must receive environmental clearance in order to advance into the engineering phase, making the environmental analysis the next step to be completed to advance the project.

Additional key steps to continue the implementation process beyond this Project Definition Report include (but are not limited to) the following:

1. Prepare a land survey to delineate the right-of-way and identify parcel boundaries.
2. Identify any easements, land acquisitions, and driveway closures and/or consolidations needed to support the construction of the stations and shelters.
3. Solicit feedback from the public and project stakeholders on the location and configuration of each stations as well as the proposed operating plan.
4. Update conceptual station layouts, capital cost estimates and station design criteria to incorporate and respond to survey information.
5. Complete the NEPA documentation process and receive FTA approval.
6. Engage a design contractor to design the station improvements and prepare construction bid documents as part of the engineering phase.
7. Develop IGAs with local communities, IDOT, Moraine Valley Community College and other agencies to address the varied aspects of Pulse, as described in previous sections.
8. Acquire any easements, right-of-way and complete any driveway closures or consolidations needed to support the construction of the stations and shelters.
9. Complete the engineering for the station improvements.
10. Secure the necessary project permits.
11. Procure a general engineering contractor to construct the station improvements.
12. Secure permits for utilities and/or permanent structures in the right-of-way.
13. Construct the station improvements.
14. Train Pulse operators on the use of the near level boarding and bus curbs.
15. Complete operational test of facilities.

By employing these steps in a timely and coordinated manner, Pace will be well positioned for CMAQ funding for the 95th Street Line and future Pulse projects. Further, Pace will lay the groundwork for efficient implementation of Pulse projects and the rapid establishment of the Pulse network.