Valley OnBoard

2023 Addendum

Safety and Access to PVTA Bus Stops

A HOPE Project

Prepared by Tatum Thomas, UMass Master's of Regional Planning 2023

PVTA

LA&RP Landscape Architecture & Regional Planning

VOB Valley OnBoard

"Many do not take the needs of disabled pedestrians into account when they are just going about their daily business."

Gus Alexiou on Accessibility, Inclusion, and Social Justice

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Acknowledgements

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Valley On Board Project Summary

The Pioneer Valley Transit Authority (PVTA), Massachusetts' largest regional transit authority (RTA), has partnered with the University of Massachusetts at Amherst (UMass) on a two-year project. The goal of this project is to analyze and
redesign the current transit network and service offerings to enhance equity and economic vitality throughout its service area in Hampshire and Hampden counties. The UMass
planning project, Valley On Board (VOB), is part of a larger Pioneer Valley Transit Review and Improvement Planning Study (PV-TRIPS project).

Funded by the Federal Transit Administration (FTA) and the US Department of Transportation through a Helping Obtain Prosperity for Everyone (HOPE) grant, the Valley On Board project advances the goal of the Federal HOPE Program, which is to improve public transit in areas of persistent poverty in the U.S. The Fall 2022 UMass Regional Planning Studio proposes an adaptable 20 year vision that includes network, operational, and capital improvements that will increase efficiency,
accessibility, and equity of public transit for riders throughout the Pioneer Valley, with a specific focus on those living in areas that meet the Commonwealth's criteria for Environmental
Justice Communities (EJCs).

This report summarizes Phase III of the two-year Valley On Board planning project. This process consists of five components:

1. An analysis of the drivers of change in the region and review of the scenario planning conducted in Fall 2021.
2. Development and implementation of an accessible, flexible, and interactive public engagement strategy
3. An analysis of data gathered from engagement events.
4. Route and recommendation development that is consistent with the analysis of the drivers of change and public feedback.
5. Evaluation of recommendations using the metrics of access, equity and efficiency to evaluate priorities of implementation.

The drivers of change, public feedback, and transit design and public engagement best practices were used to develop an adaptable 20 year vision for the PVTA.

Safety and Access Executive Summary

This addendum focuses on safety of walking infrastructure and access to the PVTA. The study was conducted in three small study areas in South Hadley, West Springfield, and Springfield. Each study area is a Census block group and is classified as an environmental justice community by the Commonwealth of Massachusetts.

The purpose of the study was to develop a methodology for evaluation of walking infrastructure condition, characterize accessibility, and identify any barriers to accessing PVTA bus stops. A characteristics and condition scoring matrix was developed from existing accessibility literature. Field work was conducted using ESRI Field Maps to create inventory maps of infrastructure and store attribute data from the study areas. The infrastructure scores were then summarized to characterize each study area's safety and accessibility.

An important note on the following report is each study area was selected for its unique characteristics. Because of this, the results of the study ***cannot*** be generalized to the larger community.

This report is supplementary to the Valley On Board reports and can be used in partnership between PVTA and member communities to improve safety and access to the PVTA.

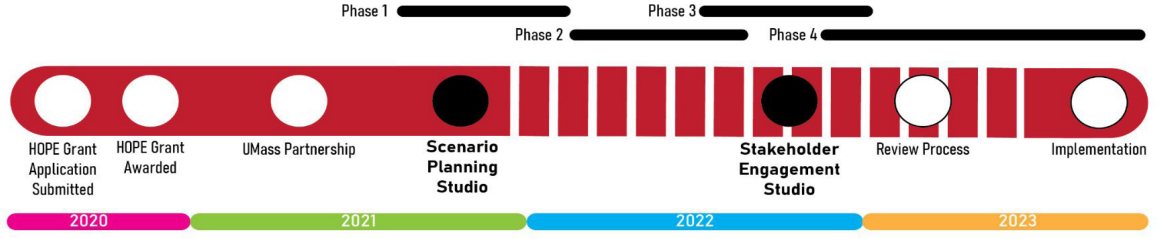


Figure 1: Valley On Board Project Timeline

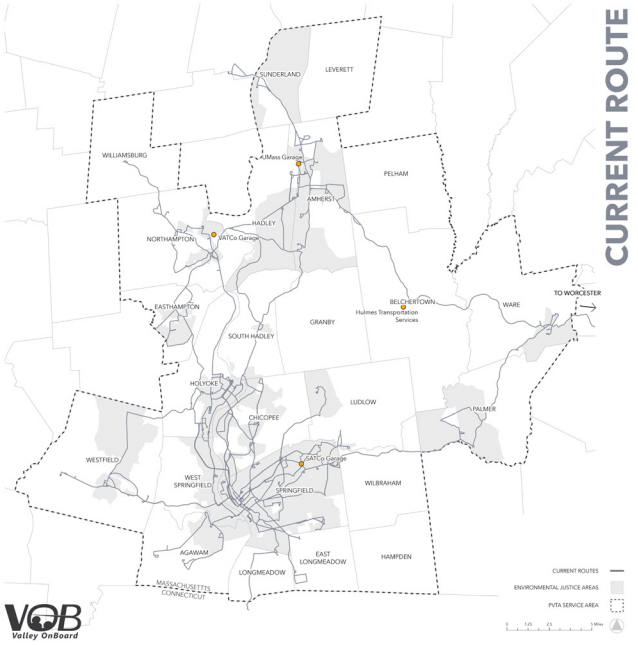


Figure 2: Map of PVTA service area and current routes

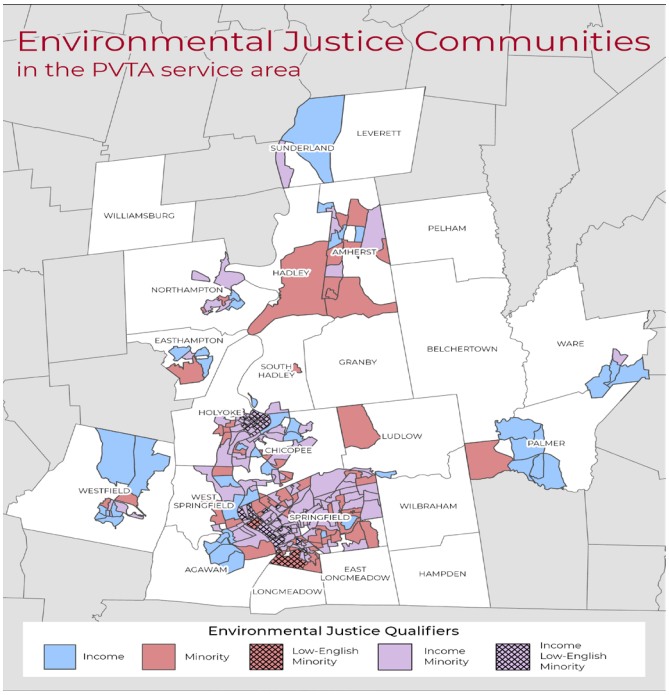


Figure 3: Environmental justice communities in the PVTA service area by classification

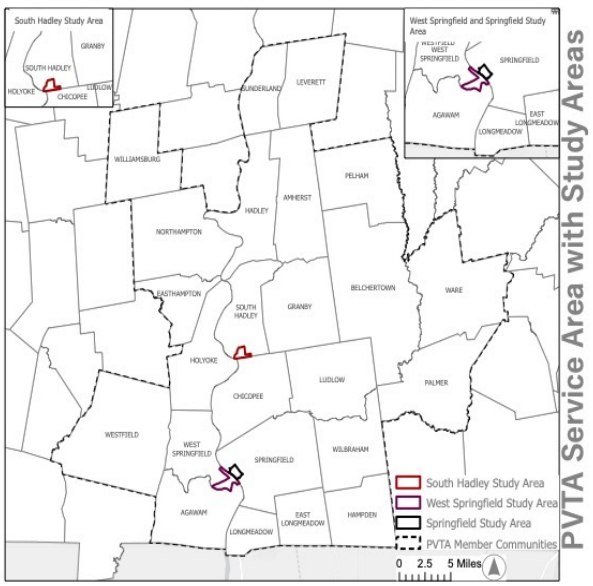


Figure 4: Safety and access study areas

Study Areas

This report focuses on safety and access specifically in environmental justice communities. Environmental justice communities are defined by Massachusetts as a block group where one or more of the following criteria are met:

1."the annual median household income is 65 percent or less of the statewide annual median household income

2. minorities make up 40 percent or more of the population

3. 25 percent or more of households identify as speaking English less than "very well"

4. minorities make up 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income."

("Environmental Justice Populations in Massachusetts | Mass.Gov" n.d.)

Selection of the study areas began with the selection of the larger communities. South Hadley was chosen as the most rural study area. While other more rural communities exist in the service area, they have fewer bus routes and stops, making them less feasible for this study. West Springfield was chosen due to its smaller urban character and its location in the southern portion of the service area. Last, Springfield was chosen as the most urban study area, as it is the largest city in the service area and the core of the southern service area.

After the communities were chosen, the environmental justice block group in each community with the highest number of bus stops was chosen as the study area. To ensure consistency, the block groups chosen share two environmental justice classifications—low median household income and high percentage of minority populations.

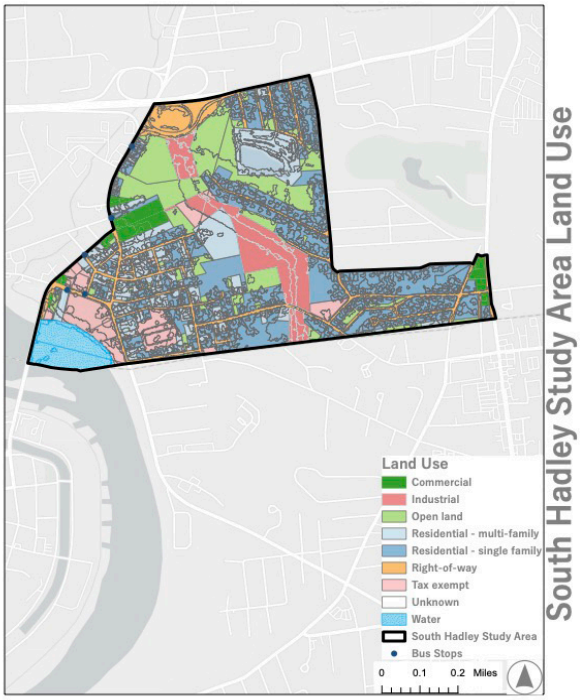


Figure 5: Map of South Hadley study area bus stops and land use

South Hadley Demographics	
Population	17,494[1]
Total Households	6,983[1]
Percent Minority	9.6%[1]
Percent Limited English	0.6%[1]
Town Median HH Income	$62,236[1]
Massachusetts Median HH Income	$89,026[2]

Table 2: Demographic summary of Town of South Hadley [1]Data from ACS 2010, 5-year estimates [2]Data from ACS 2021, 5-year estimate

South Hadley Study Area Demographics	
GeoID	250158211002
Population	1,486
Total Households	667
Percent Minority	26.92%
Percent Limited English	0%
Percent of MA Median HH Income	58.61%
Block Group Median HH Income	$50,313
Environmental Justice Classification	M*, I**
Number of Bus Stops	9

Table 3: Demographic summary of South Hadley Study area

South Hadley

South Hadley was selected as the most rural study area. South Hadley has a population of 17,494 and 6,983 total households. South Hadley is in the northern part of the PVTA service area in Hampshire county. The town is served by the R29 and routes 38 and 39.

The South Hadley study area is found in the southern part of the town of South Hadley. The block group is bounded by Lamb Street, Bridge Street, and Granby Road as well as neighborhood streets on the eastern section. The area has a population of 1486 and contains 667 households (Census 2010). The study area contains about one tenth of the town's total population and households. 26.92 percent of the population in the study area are minorities, in contrast with 9.6 percent of the town's population. The study area's median household income is 58.61 percent of the state median household income, at $50,313. For a full demographic summary of the Town of South Hadley, see Table 2. For a full demographic summary of the study area, see Table 3.

This study area was chosen because it has the most bus stops (9 stops) in any one block group in the Town of South Hadley and two matching environmental justice classifications with the other two study areas (percent minority population and low median household income). The primary land use of the study area is residential, with some industrial and commercial uses (Figure 5).

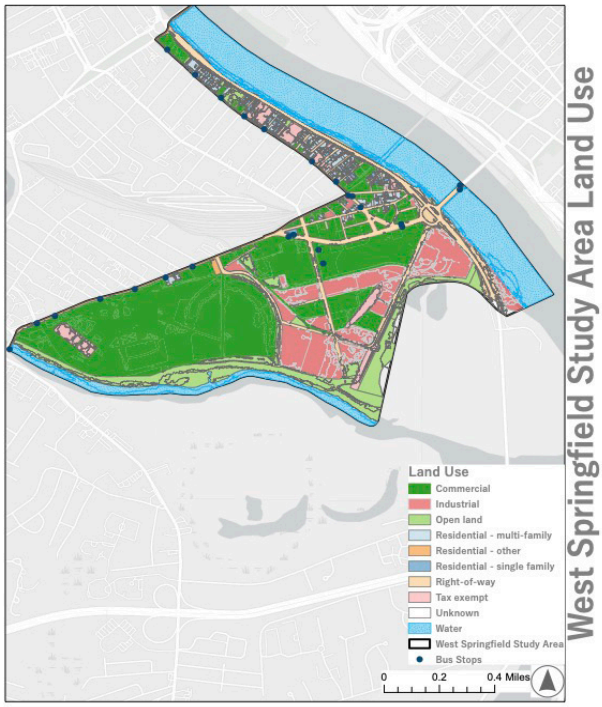


Figure 6: Map of West Springfield study area bus stops and land use

West Springfield Demographics	
Population	28,287[1]
Total Households	11,761[1]
Percent Minority	14.6%[1]
Percent Limited English	12.3%[1]
Town Median HH Income	$51,358[1]
Massachusetts Median HH Income	$89,026[2]

Table 3: Demographic summary of City of West Springfield [1]Data from ACS 2010, 5-year estimates [2]Data from ACS 2021, 5-year estimate

West Springfield Study Area Demographics	
GeoID	250138123001
Population	655
Total Households	206
Percent Minority	25.19%
Percent Limited English	0%
Percent of MA Median HH Income	50.54%
Block Group Median HH Income	$43,382
Environmental Justice Classification	M*, I**
Number of Bus Stops	24

Table 4: Demographic summary of West Springfield study area

West Springfield

West Springfield is the mid-sized city of the three study areas with a population of 28,287 and 11,761 total households. The city has higher percentages of minority populations (14.6 percent) and populations with limited-English proficiency (12.3 percent) than South Hadley, but lower percentages of these populations than Springfield. West Springfield is part of the southern portion of the PVTA service area and is in Hampden county.

The study area in West Springfield is on the western edge of West Springfield, abutting the Connecticut River. The block group is bounded by the river, Memorial Avenue, small neighborhood roads on the north section, and the town boundary on the bottom of the study area. The population of the area is 655 with 206 households, or about 2 percent of the city's population and households. 25.19 percent of residents are minorities, and the block group median income is 50.54 percent of the median household income for Massachusetts. See Table 3 for a demographic summary of the City of West Springfield and Table 4 for a demographic summary of the study area.

There are 24 bus stops within the study area. This area was chosen based on the high number of PVTA stops, its shared environmental justice characteristics, and its neighborhood character in the northern section. The primary land uses of this study area are commercial, with most of the residential land use in the northern section of the study area (Figure 6). The bus stops in the area are mostly within the residential area, with one route following along the periphery of the commercial area. The routes that serve this study area are the R10, R14, and P20.

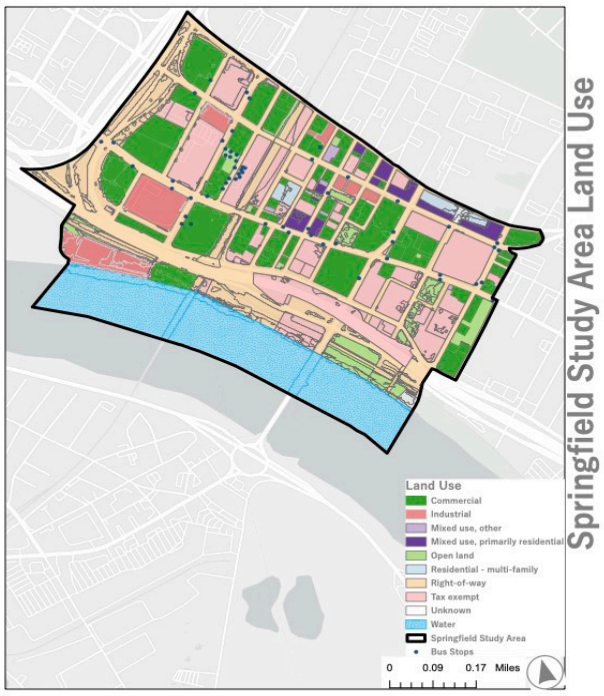


Figure 7: Map of Springfield study area bus stops and land use

Springfield Demographics	
Population	152,906[1]
Total Households	56,229[1]
Percent Minority	60.7%[1]
Percent Limited English	14.5%[1]
Town Median HH Income	$34,628[1]
Massachusetts Median HH Income	$89,026[2]

Table 5: Demographic summary of City of Springfield [1]Data from ACS 2010, 5-year estimates [2]Data from ACS 2021, 5-year estimate

Springfield Study Area Demographics	
GeoID	250138011011
Population	1710
Total Households	1079
Percent Minority	88.25%
Percent Limited English	32.16%
Percent of MA Median HH Income	20.21%
Block Group Median HH Income	$17,346
Environmental Justice Classification	M*, I**, E***
Number of Bus Stops	44

Table 6: Demographic summary of Springfield study area

Springfield

Springfield is the most populous city of the three study area communities with a population of 152,906 and 56,229 total households. The City of Springfield has the highest minority population and population of people with limited-English proficiency (60.7 and 14.5 percent respectively) of the three communities. Springfield also has the lowest municipal median income at $34,628. Springfield is in Hampden county and is the hub of PVTA transit in the southern part of the service area.

The Springfield study area was selected as the mixed-use, high-density study area for this research. The area is on the western side of Springfield, across the river from the West Springfield study area. It is bound by the River and Interstate 91 on the west, Interstate 291 on the north, Chestnut street on the east, and small streets on the south. The population of the study area is 1710 and 1079 households, or about 1.5 percent of the city's population and households. The study area has 44 bus stops. The study area contains Union Station, which is a major transit hub. 88.5 percent of residents in the study area are minorities and 32.16 percent of people have limited English proficiency. The block group median income is 20.21 percent of the median income of Massachusetts. See Tables 5 and 6 for a summary of the demographics of the City of Springfield and the study area demographics.

This area was chosen due to its high volume of bus stops in the block group and the environmental justice characteristics of high minority population and low-income, which are shared with the other two study areas. The study area also has the additional classification as a limited-English proficiency block group. The primary land use of the study area is commercial with a few pockets of residential land use (Figure 7). Since Union Station is the transit hub of the southern service area, most routes serve this block group including the P20, G1, G2, B4, and B12.

Methodology

The two main components of this study are safety and accessibility of the PVTA transit system in three study areas. This was measured through the condition and connectivity matrix on page 13. I developed the matrix based on systematic literature review of sidewalk condition standards and accessibility requirements. The matrix assigns scores ranging from one (unacceptable) to seven (exceptional) to each of the seven components of sidewalk condition, connectivity, and safety. Based on existing literature, the seven components used to measure sidewalk accessibility are: sidewalk characteristics, crosswalk characteristics, sidewalk condition, curb ramp presence and condition, sidewalk lighting presence, amenities at stop, connectivity to stop, and overall safety. Data was collected using ESRI Field Maps, which was used to create a GIS layer mapping sidewalk connectivity, hazards and discontinuities, and bus stop location, as well as the scores associated with each attribute. The scores associated with the condition of walking infrastructure and bus stops based on the matrix were were assigned while walking through the study area and input directly into the layer's attribute table.

All the literature reviewed focused on sidewalks in the United States and included information on federal requirements from the Federal Highway Administration (FHWA) as well as the Proposed Right of Way (PROW) Accessibility Guidelines from the Americans with Disabilities Act. The condition and connectivity matrix focuses on seven primary measures of condition, connectivity, and safety, as well as a final measure of overall safety which is calculated from all other metric's scores. The measures are: 1) Sidewalk characteristics, which focuses on the general presence and specifications of the sidewalk including width; 2) Crosswalk characteristics, which examines the presence and condition of crosswalks including visibility, signal lighting, and reflectivity; 3) Sidewalk condition, which is a measure of the true condition of the present sidewalk, evaluating potholes, cracks, and obstructions as well as the impact of these disruptions on accessibility; 4) Curb ramp presence and condition, which aims to measure the availability of curb ramps and their true accessibility based on condition; 5) Sidewalk lighting presence, which evaluates the presence of lighting on the sidewalk and its overall effectiveness; 6) Amenities at stop, which provides a measure of the general amicability and safety of a stop based on the presence of shelters, lighting, benches, and signage; 7) Connectivity to stop, which measures the sidewalks direct connection to the bus stop and how well pedestrians and passengers have safe access to boarding and exiting.; and, 8) Overall safety, the final measure, which is measured by evaluating all the scores, calculating a score for general safety of the sidewalk and stop based on individual safety measures. This matrix allowed for the evaluation of sidewalks within the study areas but has wider applicability as a tool for municipalities to evaluate sidewalks on a regular basis and prioritize improvements.

The scoring process for this research includes multiple steps. First, sidewalks, crosswalks, and bus stops were scored in the field from 1 to 7 based on the sidewalk condition and connectivity matrix for their respective characteristics. These scores were input into the shapefile attribute table using Field Maps. Sidewalks, crosswalks, absent sidewalks and crosswalks, and bus stops were all stored as distinct and separate layers. It should be noted that, per the matrix, absent sidewalks and crosswalks were labeled as such and given an automatic score of 1 on their attributes. Next, the attribute table for each component was exported and analyzed in Excel. The attributes for each study area were analyzed individually. Analysis consisted of calculating an average score for each characteristic, except safety. Due to the separate nature of the infrastructure layers, analysis was done compartmentally, with scores for sidewalks and absent sidewalks and crosswalks combined into one table, crosswalks as another, and bus stops as a third table.

After scores were calculated for each individual characteristic, the characteristics associated with each component of infrastructure (sidewalks and absent sidewalks and crosswalks, crosswalks, and bus stops) were coded in a binary, with scores greater than or equal to 4 receiving a value of 1, and scores less than 4 receiving a value of 0. The combined safety score for each separate component was then calculated by summing the number of characteristics with a score greater than or equal to 4 using the weighting in Tables 7 and 8. Following the calculation of individual safety scores, an average safety score was calculated for each of the three infrastructural components. When calculating the network safety score, each component's (sidewalk, crosswalk, bus stops) safety score was averaged.

Example of Safety Score Calculation: Sidewalk segments are scored on the components: sidewalk characteristics, lighting, and sidewalk condition. For each segment, a binary coding system was used in which a score of 4 or higher elicited a 1, and a score below 4 was marked as a 0. The sum of the binary code was used to assign the safety score based off Tables 7 and 8. For example, a sidewalk segment with the following scores:

Characteristics: 4

Lighting: 2

Condition: 3

Would be coded 1, 0, 0. The sum of the binary codes is 1 and therefore the segment would receive a weighted safety score of 3.

Sidewalk and Absent Sidewalk/Crosswalk Weighting	
Sum of characteristics with scores greater than 4	Weighted Safety Score
0	1
1	3
2	5
3	7

Table 7: Weighting for the calculation of safety scores from the three scored characteristics of sidewalks and absent sidewalks and crosswalks (presence/characteristics, lighting, and condition) based on sum of characteristics with a score greater than 4.

Crosswalk and Bus Stop Weighting	
Sum of characteristics with scores greater than 4	Weighted Safety Score
0	1
1	3
2	7

Table 8: Weighting for the calculation of safety scores from the two scored characteristics of crosswalks (curb ramps and condition) and bus stops (stop amenities and sidewalk connectivity) based on sum of characteristics with a score greater than 4.

Condition Matrix

Table 9: Matrix developed from accessibility literature for evaluation of walking infrastructure characteristics and condition

Characteristic	1- Unacceptable	2	3	4- Sufficient	5	6	7- Exceptional
Sidewalk Characteristics (width, presence)	Sidewalk not present	Sidewalk present in sections (one side of street), disconnected, inadequate width [1,2]	Sidewalk present in sections (one side of street), disconnected, adequate width	Sidewalk present in sections (both sides of street), disconnected, inadequate width	Sidewalk present in sections (both sides of street), disconnected, adequate width	Sidewalk present and connected, inadequate width	Sidewalk present and connected, adequate width
Crosswalk Characterstics (Presence, condition)	Crosswalk not present	Crosswalk present, low visibility, low reflectivity, non-functioning signal lights or button, insufficient night lighting [3]	Crosswalk present, 3 of 4 components inadequate (visibility, reflectivity, signal light, night lighting)	Crosswalk present, 2 of 4 components inadequate (visibility, reflectivity, signal light, night lighting)	Crosswalk present, visible, reflective, functioning signal lights and button, insufficient night lighting	Crosswalk present, visible, reflective, functioning signal lights and button, sufficient night lighting	Crosswalk present, visible, reflective, functioning signal lights and button, sufficient night lighting, median refuge (if applicable)
Sidewalk Condition (wheelchair accessible? Large cracks, potholes, etc?)	Poor condition with large surface discontinuities that limit all types of access.	Poor condition with small and large surface discontinuities that limit most types of access.	Fair condition with small and large surface discontinuities that impact accessibility but do not impact all access.	Fair condition with mostly small surface discontinuities that impact accessibility but do not impact all access.	Fair condition with mostly small surface discontinuities and few larger discontinuities that may impact accessibility.	Good condition with small surface discontinuities that do not affect accessibility.	Sidewalk in good, accessible condition with no surface discontinuties.
Curb Ramp Presence/Condition (where applicable)	Curb ramp not present	Curb ramp not accessible for individuals using mobility devices, no visibility aid/visibility aid poses trip risk, inaccessible signal button	Curb ramp in disrepair but functional, other accessibility measures(visibility aid, signal button) not functional	Curb ramp in good, accessible condition, both other accessibility measures (visibility/ signal button) not functional	Curb ramp and one accessibility measure in good, accessible condition, one other accessibility measures (visibility/ signal button) not functional	Curb ramp or other accessibility features (visibility aid, signal button) all functional but in some disrepair	Curb ramp in accessible condition, including visibility aid and accessible signal button
Sidewalk Lighting Presence	No lighting present	Present lighting, discontinuous and sporadic illumination not at standard [4]	Present lighting, discontinuous and sporadic illumination at standard	Present lighting, discontinous but frequent illumination not at standard	Present lighting, discontinous but frequent illumination at standard	Present lighting, continuous illumination, not at standard	Adequate lighting, providing continuous illumination at standard
Amenities at Stop (shelter, lighting, etc.)	No bus stop sigange	Bus stop sign, no other amenities	Bus stop sign, present but inadequate lighting	Bus stop sign, present and adequate lighting	Bus stop sign, present and adequate lighting, bench (poor condition)	Full amenities (sign, lighting, bench, shelter) in need of repair	Full amenities (sign, lighting, bench, shelter) in good condition
Connectivity to Actual Stop	Sidewalk is not connected to bus stop	Sidewalk is connected to bus stop, but no crosswalk is connected [6]	Sidewalk present and connected to bus stop, distant crosswalk, both inaccessible or in disrepair	Sidewalk present and connected to bus stop, distant crosswalk, one inaccessible or in disrepair	Sidewalk present and connected to bus stop on both sides of road, closely connected crosswalk, one in disrepair	Sidewalk present and connected to bus stop on both sides of road, distant connected crosswalk, all in good condition	Sidewalk present and connected to bus stop on both sides of road, closely connected crosswalk, all in good condition
Safety	7 safety concerns (scores lower than 4 in each category)	6 safety concerns (scores lower than 4 in each category)	5 safety concerns (scores lower than 4 in each category)	4 safety concerns (scores lower than 4 in each category)	3 safety concerns (scores lower than 4 in each category)	2 safety concerns (scores lower than 4 in each category)	1 or less safety concerns (scores lower than 4 in each category)

Footnotes: [1] Adequate width of sidewalks according to FHWA is 4 feet minimum with 5 feet required for passing areas ("FHWA Walkways, Sidewalks, and Public Spaces" n.d.) [2] Safe Routes to School recommends 6 feet minimum and 8-10 feet where no buffer from street is present ("SRTS Guide: Sidewalks" n.d. http://guide.saferoutesinfo.org/engineering/sidewalks.cfm) [3]"A Guide for Maintaining Pedestrian Facilities for Enhanced Safety." https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa13037/fhwasa13037.pdf [4] Hennesey and Ai, "A Spatial Comparison of Roadway Lighting and Nonmotorist Crashes in Cambridge, MA." [5]"NACTO Curbside Pull-Out Stop." https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-configurations/curbside-pull-stop/ [6]"U.S. Department of Transportation Pedestrian and Bicyclist Road Safety Assessments." https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/assessments/assessments.pdf

Key Findings

The study found some key trends in safety and access to PVTA bus stops. The first trend was that safety and access declined as population declined. This can be seen in the average and raw scores of the three study areas. South Hadley had the lowest scores across all characteristics and conditions (except for curb ramps, in which West Springfield scored the lowest). Springfield had the highest raw and average scores of each of the study areas.

Another trend found in the study was there are reoccurring safety and accessibility barriers across all three study areas. Commonalities included discontinuities and obstructions to sidewalks, poor sidewalk width which was too narrow to be accessible, lack of lighting especially at stops, lack of crossings near stops, and inaccessible curbs.

Figure 8: Obstructed sidewalk in Springfield study area.

South Hadley

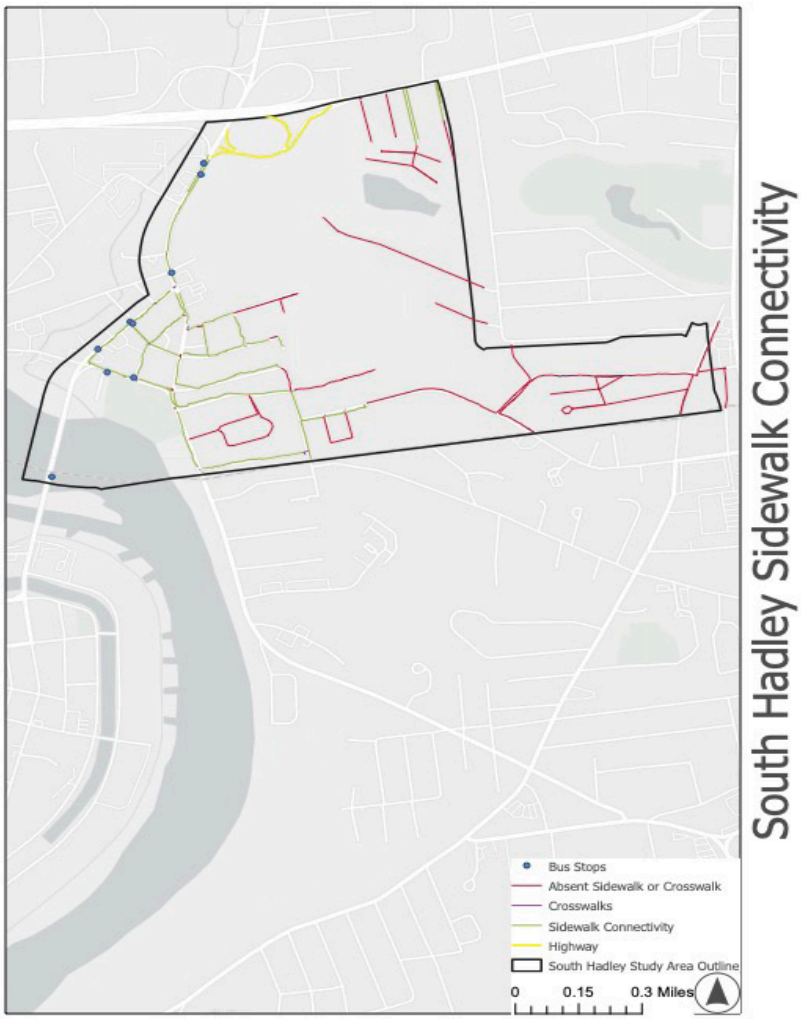


Figure 9: Field map of South Hadley study area including bus stops, sidewalks, crosswalks, and missing infrastructure.

South Hadley Network Summary	
Lighting	2.40
Sidewalk Condition	3.24
Sidewalk Characteristics	2.86
Curb Ramps	4.44
% Intersections with Curb Ramp	0.75
Crosswalk Condition	3.88
Stop Amenities	1.78
Connectivity to Stop	7.00
Safety	3.86

Table 10: Average scores for network components in South Hadley study area

South Hadley had the most absent sidewalk infrastructure of the three study areas. It also had the lowest scores across most attributes of safety and access. All average scores were below the benchmark score of 4 except for the curb ramp score and connectivity to stop score. The lowest score for South Hadley was the stop amenities score, which was 1.78. This reflects that no stops had amenities in South Hadley, and several had no signage. Most crosswalks were poorly visible or otherwise in disrepair as can be seen in Figure 10, resulting in a score of 3.88. Sidewalk characteristics also had a low score of 2.86, reflecting the inadequate width and absence of many sidewalks in the study area. Sidewalk condition was only slightly better at an average score of 3.24. This score was due to many sidewalks containing discontinuities which may impact accessibility, as seen in Figure 11.

The network average safety score was 3.56, close to the benchmark score of sufficiency. This score indicates that on average there were between four and five safety concerns (or components with a score of less than 4) per network feature. Despite the low scores for most attributes, South Hadley had a higher percentage of curb ramps at intersections and higher curb ramp score than West Springfield, with 75 percent of intersections having curb ramps and the ramps scoring a 4.44.

Figure 10: Poorly visible crosswalk in South Hadley study area.

Figure 11: Sidewalk discontinuity in South Hadley study area.

West Springfield

West Springfield Network Summary	
Lighting	2.73
Sidewalk Condition	3.78
Sidewalk Characteristics	3.45
Curb Ramps	4.00
% Intersections with Curb Ramp	0.62
Crosswalk Condition	4.74
Stop Amenities	3.54
Connectivity to Stop	7.00
Safety	4.55

Table 11: Average scores for network components in West Springfield study area

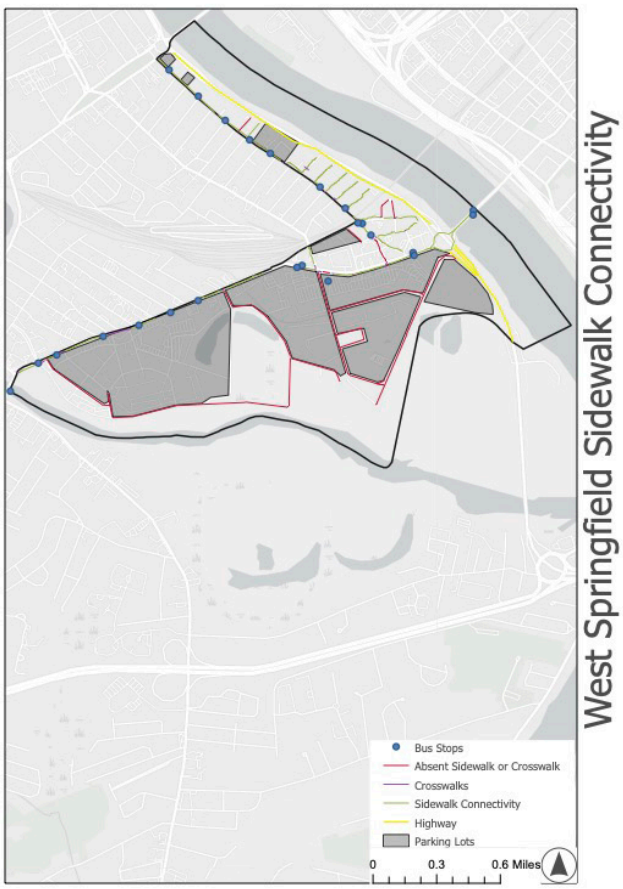


Figure 12: Field map of West Springfield study area including bus stops, sidewalks, crosswalks, and missing infrastructure.

On average, West Springfield sidewalks scored below 4 for all components, however the average scores for each component were closer to sufficient than South Hadley. The lighting score was the lowest of all average scores for the study area's sidewalk segments, at an average score of 2.73, with 13 of 49 (26.5 percent) segments scoring a 4 or higher. However, for both sidewalk condition and sidewalk characteristics, more than half (57 percent and 55 percent respectively) scored a 4 or better in the study area. The average safety score was a 3.78 for the study area, which is reflective of the high percentage of segments with sufficient scores for sidewalk condition and characteristics, as well as the low prevalence of adequate lighting which lowered the overall safety score.

The West Springfield study area sidewalk network scored in between South Hadley and Springfield for most components. Curb ramp condition, crosswalk condition, and overall network safety were all greater than the score of 4 for sufficiency. The safety score of 4.55 represents between 3 and 4 network characteristics were sufficient on average. Despite having average scores between South Hadley and Springfield, the percentage of intersections with curb ramps and the curb ramp average score was the lowest of the three study areas in West Springfield. This represents the high percentage of crossings (38 percent) that did not have adequate curb ramps and the low score corresponds with the prevalance of curb ramps in disrepair as seen in Figure 13.

Figure 13: Image of curb ramp in West Springfield in disrepair and without accessible features.

Springfield

Springfield Network Summary	
Lighting	4.35
Sidewalk Condition	4.86
Sidewalk Characteristics	4.46
Curb Ramps	6.11
% Intersections with Curb Ramp	0.93
Crosswalk Condition	5.30
Stop Amenities	2.75
Connectivity to Stop	7.00
Safety	5.56

Table 12: Average scores for network components in Springfield study area

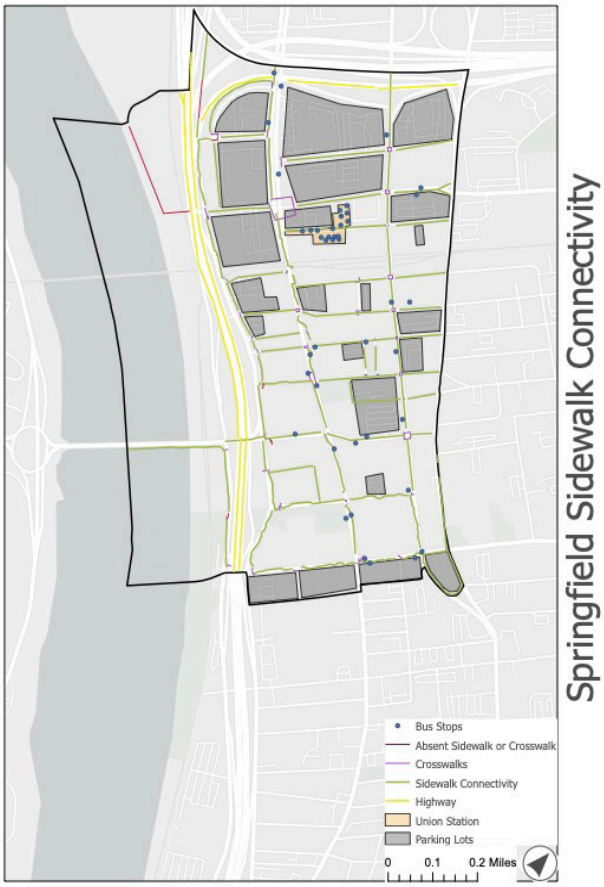


Figure 14: Field map of West Springfield study area including bus stops, sidewalks, crosswalks, and missing infrastructure.

Springfield had the highest average score of all three study areas for sidewalk components and characteristics. All the components' average scores were above the benchmark of 4 for sufficient. The average overall safety score for sidewalks in Springfield was a 5.54, which demonstrates good condition and accessibility overall. Sidewalks were present throughout all of the study area to varying degrees and this helped the average score. On average, sidewalk segments had sufficient lighting, condition, and characteristics.

Springfield also had the highest average scores for crosswalk characteristics and condition. The average curb ramp score was a 6.11, representing excellent average curb ramp condition. The percentage of intersections with curb ramps was 93 percent, indicating that nearly all crossings had curb ramps present. The crosswalk average score was a 5.30, which represents, on average, more than sufficient crosswalk condition. The average overall safety score of crosswalks in the Springfield study area was a 6.33, which represents near perfect safety on average at crossings.

Springfields overall network averages were the highest of the three study areas, with the exception of stop amenities. All components of walking infrastructure scored above the benchmark of 4, on average, except for stop amenities, which scored a 2.75. The average stop amenity score is not entirely representative of the actual stop amenities due to the large number of bus stops, which meant that stops with amenities did not have as strong of an influence on the average score as in other study areas. Overall, the sidewalk network in Springfield was in the best condition of the three study areas.

Figures 15 and 16 show the condition of Springfield walking infrastructure, which was the most safe and accessible of the three study areas.

Figure 15: Crosswalk, bus shelter, and sidewalk in good condition in Springfield.

Figure 16: Bus shelter and sidewalk in good condition in Springfield.

Implications for Future Planning

This report provides an understanding and insight into the real conditions and characteristics affecting access and safety in the Pioneer Valley. There are several key implications this report has for future planning. First, it should be noted that the sidewalks, crosswalks, and bus stop amenities are out of the control of the PVTA and fall upon the member communities to implement and maintain. This means that coordination and collaboration between PVTA and member communities is critical to improving access and safety.

Knowing that responsibility falls on member communities and their coordination with PVTA, there are several things which can be done to improve safety and access to bus stops. First, this study shows the need for better inventory of walking infrastructure and conditions. An updated inventory is the first step to improving safety and access of the system. Next, it is important to prioritize and schedule maintenance of facilities. Priority should be given to areas most affected by accessibility barriers, particularly in environmental justice communities, which tend to be more transit dependent.

Following the prioritization of regularly scheduled maintenance, prioritization of implementing new safe, accessible infrastructure should be done from the inventory. Areas with absent sidewalks, crosswalks, lighting, curb ramps, and stop amenities should be ranked and prioritized to identify areas which would most benefit from new infrastructure. Due to the limited availability of funding, special priority should be given to environmental justice communities with high transit ridership, first, followed by other areas of interest as determined by ridership and pedestrian traffic.

This study emphasizes the real need for improved walking infrastructure to improve safety and access to transit. It also provides data for municipalities to use to identify barriers to accessibility. It provides a methodology for evaluating access in member communities and allows them to quantify the needs of the community. This data can be used to apply for funding to help improve safety and access within the community.

Another future direction following this report is the potential for this methodology to be used to examine a community in a more broad way, on a larger scale. This would allow planners to better understand the conditions in their community since the results of such a specific study cannot be generalized to the larger community.

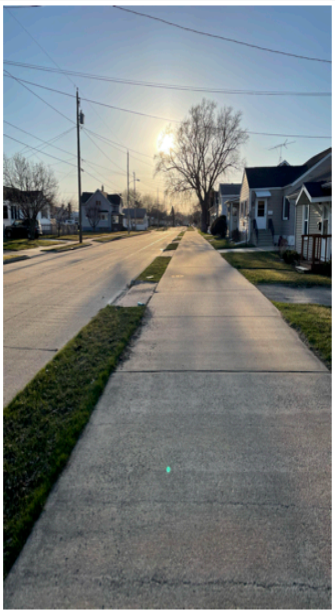
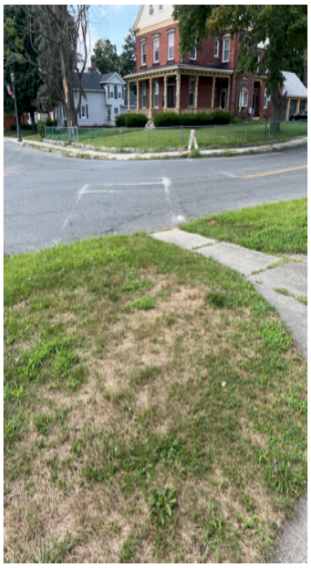
Conclusion

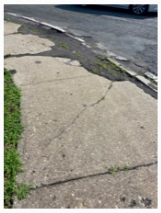
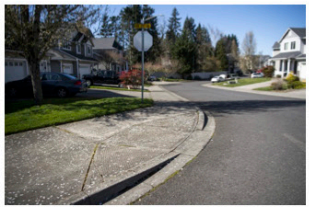
This report explored the safety and accessibility to PVTA bus stops in three study areas in the PVTA service area. The study found that safety and accessibility are limited, especially in more rural areas. Major barriers to safety and access include poor condition and absent sidewalks, poor and absent curb ramps, and absent crosswalks. Often sidewalks were obstructed by discontinuities and other barriers, making them inaccessible. Bus stops lack amenities, with many in rural areas lacking signage, and most stops throughout the three study areas lacking lighting and amenities.

This information can be used to inform priorities for PVTA and member communities to collaborate on and improve safety and access to transit in the Pioneer Valley. Coordination between PVTA and member communities is critical to the improvement of these conditions. Additionally, the developed methodology can be used by stakeholders to identify safety and accessibility barriers throughout the service area and prioritize areas in need of maintenance and improvement. Areas that should be prioritized are areas with the lowest scores, particularly in high transit ridership and transit dependent areas such as environmental justice communities. Improving safety and access to PVTA is crucial to the experience and safety of riders of the PVTA and the access to critical destinations for transit dependent community members.

Appendix A:

Scoring Reference Images

Characteristic	1	4	7
Sidewalk Characteristics			
Crosswalk Characteristics			

Characteristic	1	4	7
Sidewalk Condition			
Curb Ramp Presence/Condition	 		

Characteristic	1	4	7
Sidewalk Lighting			
Amenities at Stop			

Characteristic	1	4	7
Connectivity to Stop			

Appendix B:

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Thank You!