City of Rochester
Comprehensive Access and Mobility Plan

Walkable City Report

NELSON
NYGAARD

Cover photo from patrickashley via wikimedia

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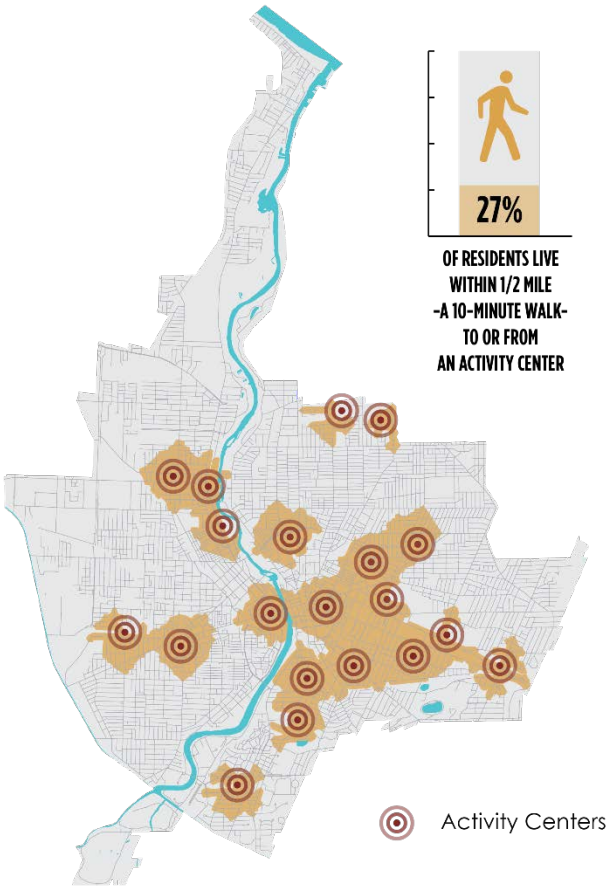
1 Walking in Rochester: A Snapshot

Approximately 7% of commuters in the City of Rochester travel to work by foot, and almost one-quarter of residents that live near Downtown or the University of Rochester Medical Campus walk to work. While sidewalks exist on almost all streets within the City, infrequent crossing opportunities and overly large or complicated interchanges, like those at I-490 or around the Inner Loop, present significant barriers to pedestrian mobility in the city. Sidewalks and ramps in poor condition, narrow buffers between the sidewalk and the roadway, curb cuts, and physical barriers such as highways and rail crossings are additional factors that affect the walking experience. These conditions are also present in neighborhoods that have land use characteristics that are conducive to increased walking as a part of daily mobility.

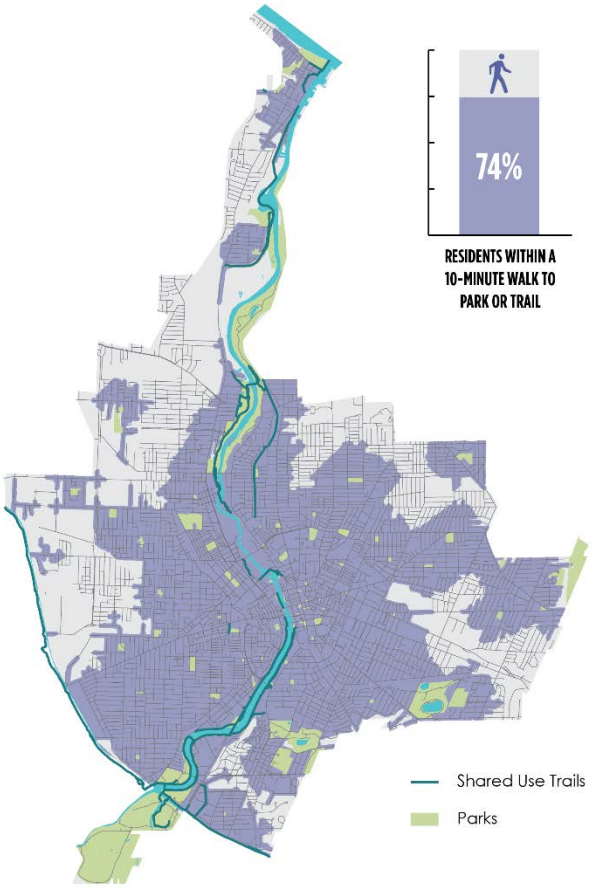
According to walkshed data displayed in the State of the City Transportation System Factbook, over one-quarter of Rochester residents live within a half mile, or a 10-minute walk, of a supermarket or other essential services. Two-thirds live within one mile, and are able to reach these activities in 20 minutes on foot.

Figure 1 Pedestrian Access to Services



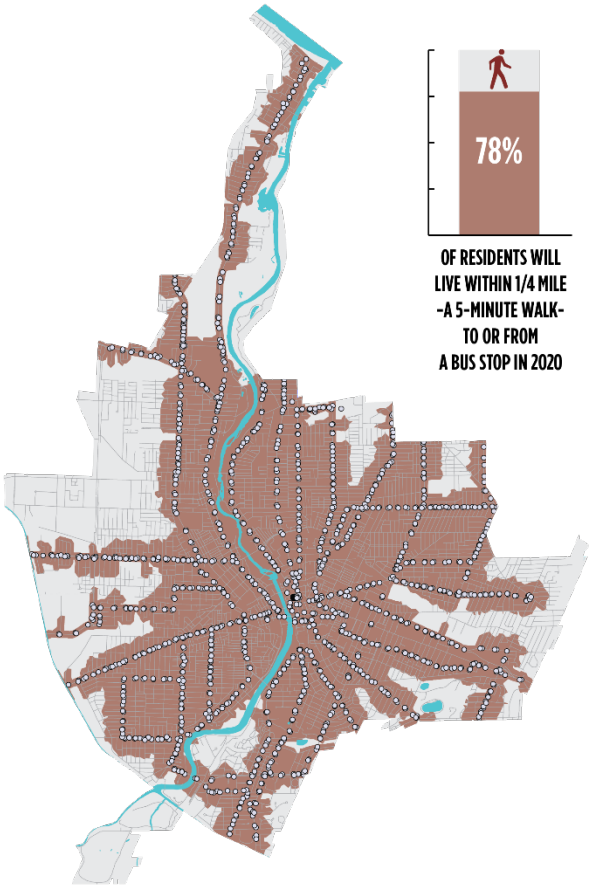
Almost three-quarters of residents live within a 10-minute walk to a park or trail, which provides recreational walking opportunities. Despite this proximity, conditions such as complicated expressway and multi-lane roadway crossings exist between residential areas and these greenspaces, precluding safe and comfortable pedestrian connections.

Figure 2 Pedestrian Access to Greenspace



Every transit trip begins with a walking trip and 87% of City residents currently live within ¼ mile of a bus stop. As the Reimagine RTS plan, which calls for a reduction in the number of fixed bus routes, is implemented in summer 2020, the number of Rochesterians who can walk to a bus stop within five minutes will drop to 78%. Therefore, high quality pedestrian infrastructure near transit stops (and other transit hubs) is essential to support transit ridership and provide safe mobility options for Rochester residents. This means ensuring that safe crossings exist near stops, especially on wide streets with long distances between signalized intersections.

Figure 3 Pedestrian Access to Transit – Reimagine RTS Realignment



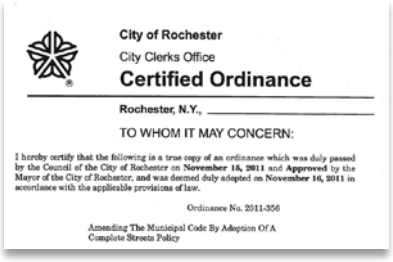
Similarly, since everyone who parks their vehicle or uses the bike-share system also walks at the beginning and end of their trip, quality pedestrian facilities improve the public realm experience for both residents and visitors, regardless of their primary means of transportation. The City has previously recognized the intersection of interesting architectural and natural resources with the promotion of physical activity in transportation with their *Rochester Walks!* Initiative. The program published suggested walking routes online that cover many corners of the city, lists health benefits, and provides safety tips to potential walkers. While the program is no longer active, its helpful materials remain an online resource.

Policy and Planning Context

Previous land use, transportation, and corridor planning efforts In Rochester help set the stage for the Walkable City Report. The report builds on past work to direct Rochester toward a more walkable future. The following excerpts provide brief descriptions of select city plans and policies, focused on the ways each addresses walking or connecting to the walking network.

Rochester 2010: The Renaissance Plan (2000)

- Outlines the City's goals, principles, and implementation actions related to subject areas including economic development, environmental management, infrastructure, land use/zoning, and mobility/transportation, among others
- Outlines a Vital Urban Village concept containing landscaped pedestrian "human scale" streetscapes where public sidewalk minimum widths of 5' in residential areas and 8' in mixed use cores are established


City of Rochester
City Clerks Office
Certified Ordinance

Rochester, N.Y., _____

TO WHOM IT MAY CONCERN:

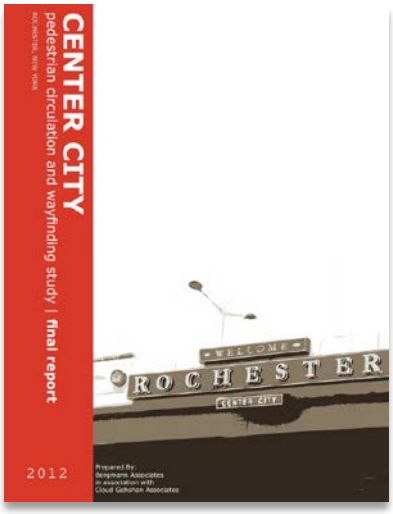
I hereby certify that the following is a true copy of an ordinance which was duly passed by the Council of the City of Rochester on November 16, 2011 and Approved by the Mayor of the City of Rochester, and was deemed duly adopted on November 16, 2011 in accordance with the applicable provisions of law.

Ordinance No. 2011-356

Amending The Municipal Code By Adoption Of A Complete Streets Policy

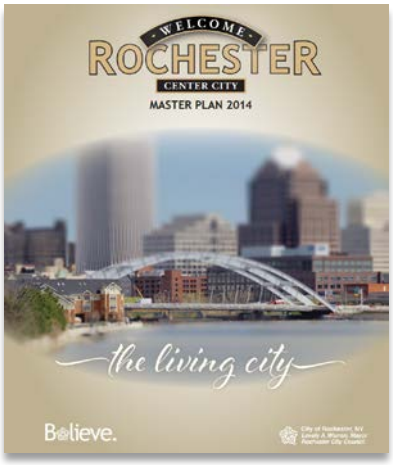
Complete Streets Policy (2011)

- Ensures that all future street design efforts will fully consider the needs of pedestrians, bicyclists, transit users and persons with disabilities by requiring Traffic Control Board review and an annual report from the City Engineer regarding consistency with the policy by all street construction, reconstruction, rehabilitation, and pavement maintenance projects
- Helps to improve public safety by installing and maintaining sidewalks, crosswalks, ADA-compliant ramps and bike lanes, as well as reducing crossing distances, lowering motor vehicle travel speeds and improving sight distances



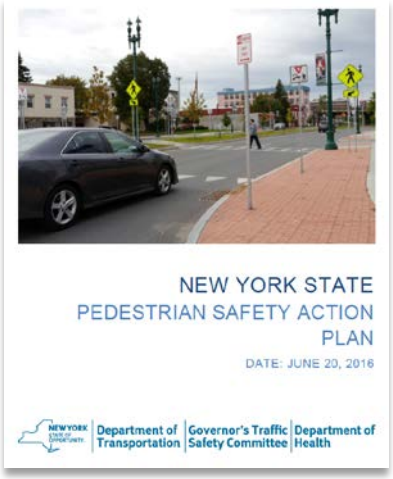
Center City Pedestrian Circulation and Wayfinding Study (2012)

- Attempts to improve the visitor wayfinding experience within Rochester's Center City by providing clear and direct orientation and connections, reducing the effort required to navigate Center City
- Recommends enhancement and connection of existing pedestrian wayfinding systems such as the Genesee Riverway Trail, High Falls Walking Tour, and Erie Canalway Heritage Trail sign systems
- Puts forth an organizing system and style recommendations for major kiosks, minor kiosks, and direction signs that builds off of the quadrant colors of the existing vehicular wayfinding system, but is modified for pedestrian focused wayfinding



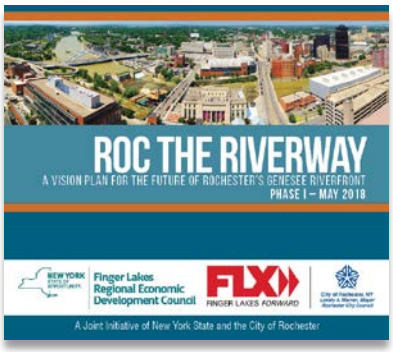
Center City Master Plan (2014)

- Identifies a fundamental vision of lively streets, highlights the importance of the Genesee River and Main Street, places downtown in the geographical context of the City and region, and identifies several key leverage points
- Draws a connection between active uses, attractive streetscape, and lively streets
- Recognizes obstacles to mobility in expressway/railroad corridors, superblocks, perception of safety, and walkway maintenance



New York State Pedestrian Safety Action Plan (2016)

- Recommends a distinct set of engineering, education, and enforcement countermeasures that can be accomplished over the next 5 years to improve pedestrian safety
- Names Monroe County a focus county and Rochester a focus community
- Creates systemic treatment packages for uncontrolled crossings on state roads in urban areas



Roc the Riverway (2018)

- Produces seamless and accessible pedestrian and bicycle connections along both sides of the river via the Genesee Riverway Trail and neighborhood linkages to the trail
- Will reinvest in pedestrian bridges, separate pedestrian traffic as a part of trail upgrades, and create improved streetscape experiences where streets bisect the river

2 Vision and Goals

In recent years, Rochester has built high-class pedestrian environments downtown, in many neighborhood centers, and along its trail system. These investments in walking infrastructure have made it possible for many residents to walk more and live more active lifestyles.

However, walking remains a small minority of transportation activity compared to private personal vehicles. To make Rochester a walkable city, all neighborhoods should be walkable. In reality, Rochester must prioritize limited funds and target pedestrian improvements in the places of greatest need. The Walkable City Report will set Rochester on a path to meet residents' most critical needs by presenting areas of improvement and assessment, identification, and implementation processes for those improvements.

Based on feedback from community outreach, stakeholder input, and conversations with city staff, the following vision and goals make an aspirational statement about the walkable city Rochester wants to become by 2034. Achieving these outcomes will require steadfast commitment from the city's leaders, staff, and residents as well as significant additional resources to support capital and program investments.

Comprehensive Access and Mobility Plan Vision

Rochester's transportation system improves quality of life for Rochesterians by enabling safe, convenient, and comfortable access to work, life, and play, and enabling connectivity between neighborhoods. The system works for users of all ages and abilities whether they walk, bike, drive or take public transportation, and supports Rochester businesses by enabling the movement of goods and personnel. The system activates transit and pedestrian oriented design to create a city of short distances, and is clear and user-friendly, with the highest standards of sustainability, design, and maintenance.

Goal 1: Create Connected and Complete Communities

- Complete the city-wide pedestrian network and enhance the walking environment
- Make connections to the places people need and want to go
- Provide seamless connections to transit and ensure access to community assets
- Enhance streetscapes to create vibrant public spaces
- Extend nature into the street network with trees and landscaping

Goal 2: Make the Experience Safe

- Reduce the number of motor vehicle crashes involving pedestrians, ultimately eliminating traffic-related injuries and fatalities
- Protect vulnerable populations and account for pedestrian needs first in planning and design
- Institute a culture of safety, educating walkers and drivers alike, to encourage more walking trips
- Teach and reinforce safe driving and walking behavior

Goal 3: Build Comfortable Walkable Places for All

- Prioritize improvement projects to aide residents on foot in meeting their regular transportation needs
- Make investments that promote equity in the transportation system for those unable to drive
- Assess and improve pedestrian environment quality citywide
- Design facilities for people of all ages and abilities
- Excite the public about walking through neighborhood activities and demonstration projects
- Make walking a part of everyday life in Rochester

Goal 4: Prioritize for Implementation

- Identify and prioritize a list of pedestrian facility improvement projects through the participation of key stakeholders in focus groups
- Note budgetary considerations, constraints, and outside funding opportunities

3 Needs Assessment

Connecting Demand to Destinations

While the pedestrian network in Rochester is nearly complete, the range of pedestrian demand generated by Rochester neighborhoods does not always conveniently reach destinations that serve residents' regular needs. Distance and convenience are reasons commonly cited for Rochester's lack of everyday practical walking activity, pointing to a need to improve the quality of the pedestrian environment such that either destinations are found in closer proximity to residences or that longer walks are considered a positive experience.

Pedestrian Demand Index

Using a combination of factors that generate or attract walking trips, the Pedestrian Demand Index highlights areas of Rochester that would be expected to have high levels of pedestrian activity. These factors include population density, employment density, density of households without a vehicle, household income, proximity to activity centers and frequency in bus stops.

The Pedestrian Demand Index weights normalized factors for each characteristic.

Figure 4 Weights of the Pedestrian Demand Factors

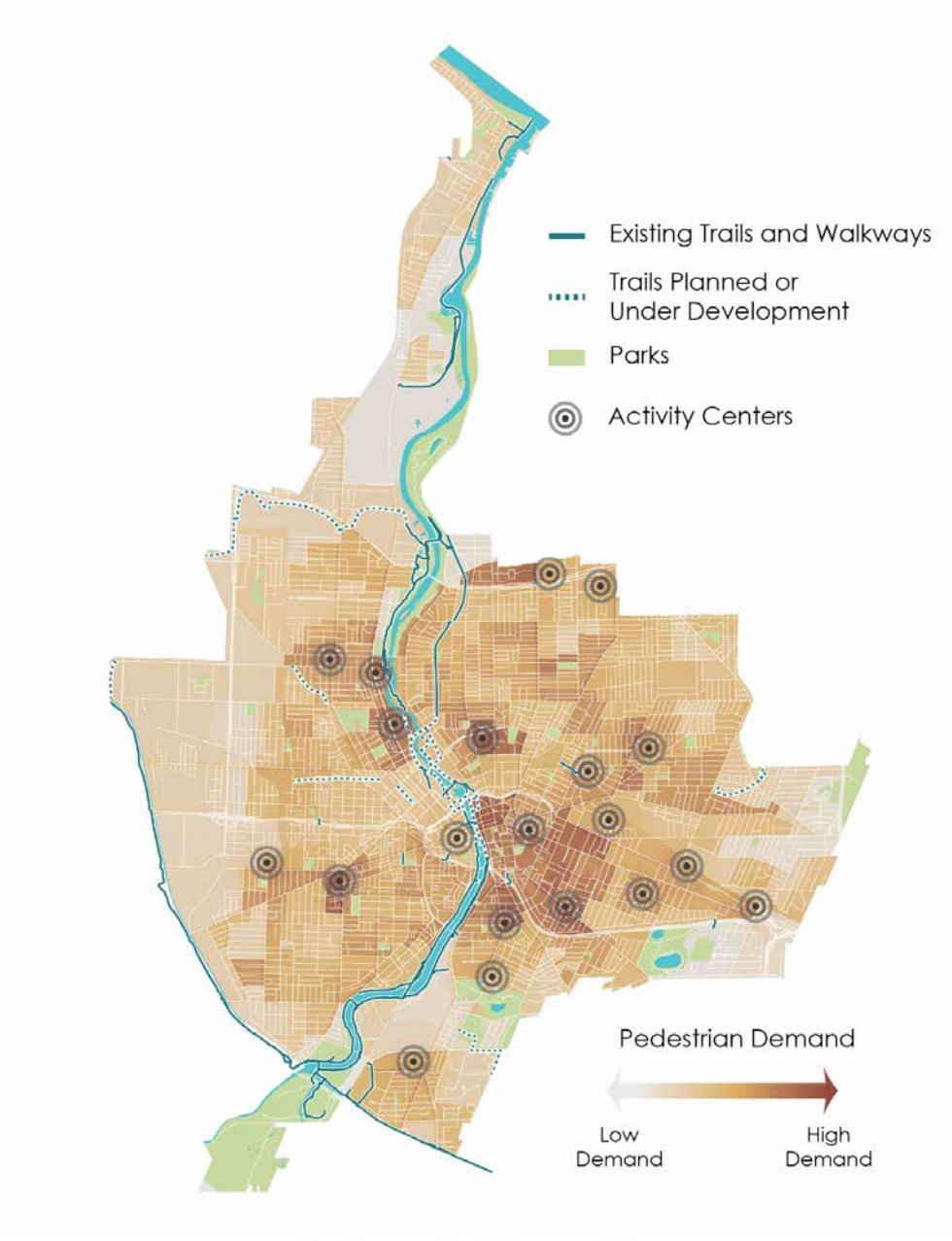
Factor	Weight
Population Density	2
Employment Density	2
Density of Households with Access to a Vehicle	1.5
Household Income	1.5
Activity Centers	1
Transit Frequency	1

Activity Centers were defined in the State of the City Transportation System Factbook through identification of the following use types that serve daily and weekly needs:

- Retail, including bicycle, book, clothing, furniture, hardware, and shoe stores
- Food Retail, including bakeries, restaurants, and supermarkets
- Services, including banks and laundromats
- Medical, including hospitals, pharmacies, and doctor/dentist offices
- Government, including courts and local offices
- Institutional, including libraries and churches
- Intercity Transportation

When mapped in Figure 3, the index shows that the "center of gravity" for expected pedestrian activity is located in downtown and downtown-adjacent neighborhoods to the south and east. Secondary pockets of high expected demand are found in the Bull's Head area, along Upper Falls Boulevard, along Lake Avenue between Driving Park and Lyell Avenues, near the intersection of Goodman Street and Webster Avenue, and at the northern end of Hudson Avenue.

Figure 5 Pedestrian Demand and Destinations



Sources: American Community Survey 2016, LEHD 2015, Google API, Genesee Transportation Council, City of Rochester

Factors Limiting Demand

Online survey and in-person public outreach participants were asked to indicate a transportation mode that they would prefer to use more often. Of the 26% of respondents who said they would like to walk more, the most frequently cited obstacle to doing so was distance, noted by 36% of respondents. The next most frequently cited obstacle, lack of destinations (14%), and another common reason, convenience (10%) are directly related to distance. These factors inhibiting walking align with the analysis in the State of the City Transportation System Factbook, which notes a smaller number of households are proximate to activity centers.

Key Conflict Areas

Even where pedestrian demand and destinations might be proximate, significant barriers exist that discourage walking. Expressway interchanges complicate and degrade the pedestrian environment along the edges of Downtown. General characteristics of these locations that confuse and dissuade people from walking through include:

- High vehicle speeds and multiple conflict points due to channelized turning movements
- One-way frontage roads creating multiple crossings, some without crosswalks
- Sidewalks routed through areas with many blind entryways or along high speed access ramps
- Termination of expressway operation or lane reductions
- Crossings that do not lead directly into continuing sidewalks
- An unclear sense of the direction of the pedestrian pathway versus diverging access ramps

Figure 6 Example Key Pedestrian Conflict Areas

West Broad Street at Allen Street, Joseph Avenue at Cumberland Street Source: Nelson\Nygaard

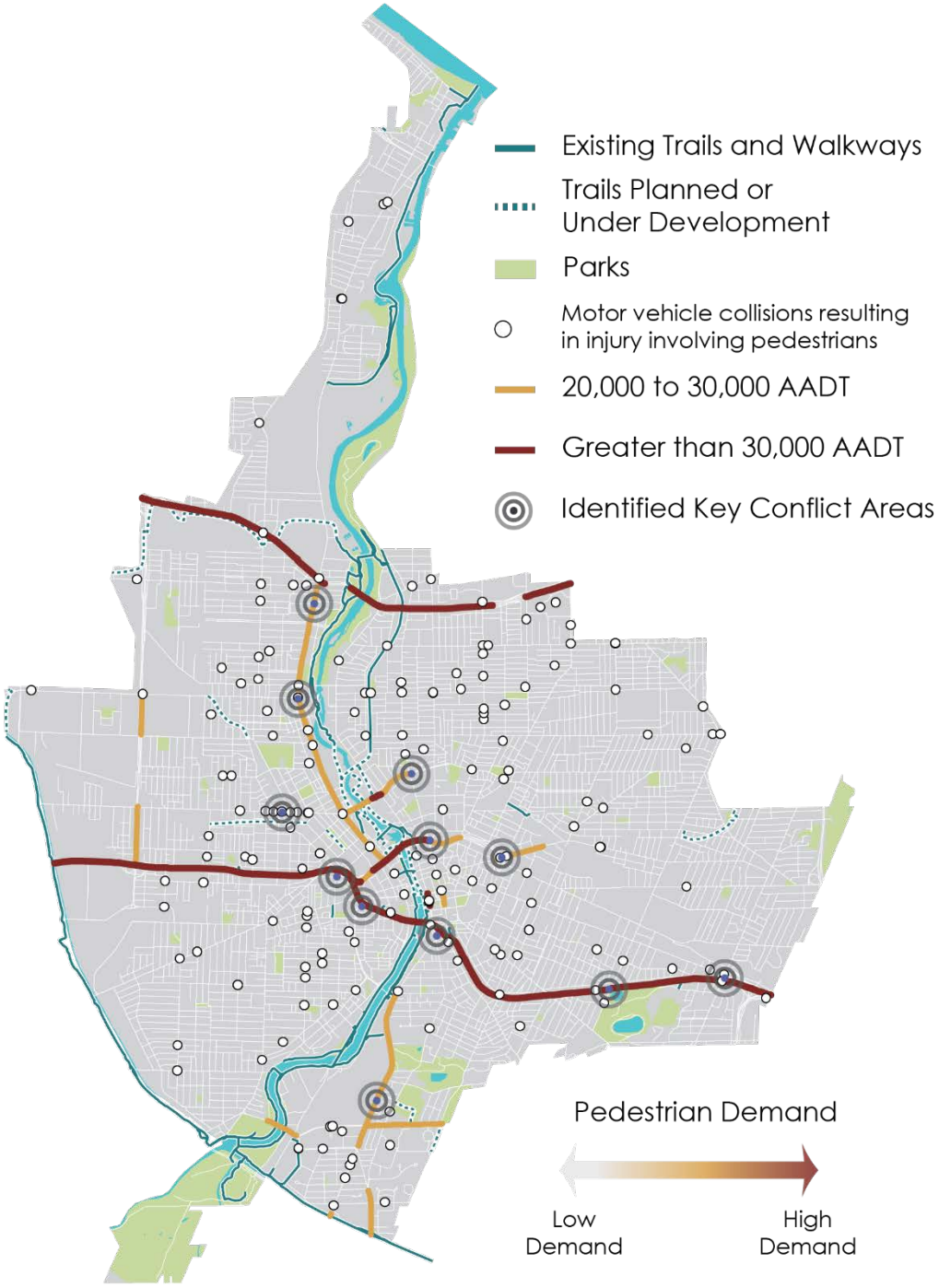
High-speed, and high volume urban arterials with multiple lanes, such as Lake Avenue, Upper Falls Boulevard, and Mt. Hope Avenue limit access to residents' regular needs. Pedestrian delay is long waiting to cross at intersections immediately bordering top destinations within activity centers such as supermarkets. These sites

are primarily oriented for vehicle access. Additionally, these high volume routes proceed for long distances between signalized intersections. Distances between traffic signals along Lake Avenue from Flower City Park to Driving Park Avenue range from 800 to 1,300 feet. The four-lane stretch of Upper Falls Boulevard from Joseph Avenue to Hudson Avenue measures 1,800 between signals. Mt. Hope Avenue, which carries over 20,000 vehicles per day between Elmwood and Highland Avenues is uninterrupted by traffic control devices on the entire 2,300 foot long stretch of roadway.

Figure 7 spatially displays key conflict areas. Highlighted areas were chosen that most closely correspond to the following conditions:

- Crossing safety compromised or complicated by high-volume expressway interchanges
- High traffic volume and/or large number of lanes on surface streets where the interval between signalized intersections exceeds 1,000 feet
- Low crossing level of service coupled with multiple collisions involving pedestrians in 2017
- Complex intersection geometry and dominant movements (Eg. Broad/Lyell/Dewey) coupled with multiple collisions involving pedestrians in 2017

Figure 7 Identified Key Conflict Areas



Sources: New York State Department of Transportation, NYSDOT Accident Location Information System

Network Quality

Pedestrian Level of Service

The quality of a transportation facility can be measured in a number of different ways depending of the point of view from which considerations are made. Transportation Research Board's Highway Capacity Manual 2010 (HCM2010) presents level of service concepts for multiple modes to describe facility performance from the traveler's perspective in a useful way to planners and decision makers as well as the users themselves.

HCM2010 defines pedestrian level of service (PLOS) as an approach to assess quality of operations of pedestrian facilities at intersections, as intersections generally experience the highest amount of modal conflict. At busy intersections, motorists, cyclists, and pedestrians often have to deal with complex situations and be aware of the position, movement, and intent of other users.

HCM2010 further defines PLOS at signalized intersections as a function of pedestrian time delay, which is calculated based on the contribution and proportion of 'walk' and 'don't walk' time within the overall signal cycle.

Analysis

Three intersections were chosen for an example PLOS calculation. Choices were made at activity centers or other areas of high pedestrian demand that demonstrated high levels of modal conflict due to high speeds, volumes, and/or turning movements. Figure 4 shows how these focus intersections relate to 2017 vehicle-pedestrian collisions resulting in injury as well as the Pedestrian Demand Index.

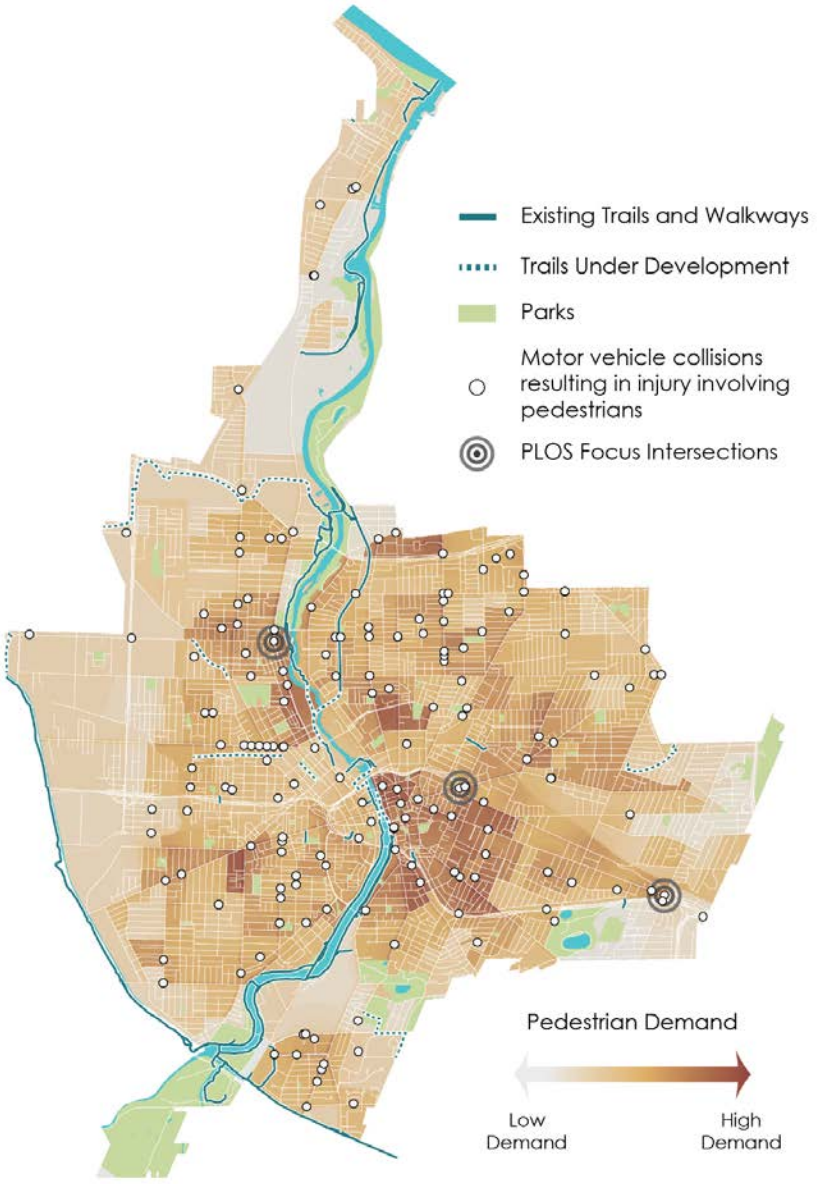
PLOS Grades as a function of expected travel delay are based on traveler perception research performed by the authors of HCM2010. While A represents the best quality of service, and F the worst, best and worst are undefined and subjectively based on traveling experience and perception of quality.

The grading table included in the Appendix uses a natural logarithmic scale linked to travel research that designates an 'A' grade to intersection legs whose expected pedestrian delay is 4 seconds or less. Note that this figure is an expected, rather than maximum value, which at any intersection is dependent on the signal cycle. For example, while the average person walking along Lake Avenue who attempts to cross Lexington Avenue will wait 10.4 seconds, someone who arrives just as the don't walk cycle begins will be forced to wait 54 seconds.

Conversely, an 'F' is assigned to crosswalks where expected pedestrian delay exceeds 81 seconds. A 'D' grade is assigned to crossings whose expected individual delay falls between 19 and 38 seconds. Behavioral studies have shown that delay exceeding 30 seconds leads to a dramatic decrease in pedestrian signal

compliance.[1] Further research links non-compliance to elevated relative risk of collision with a motor vehicle.[2] Even when actuated, the expected delay at major crossings of each intersection analyzed all exceed 30 seconds.

Figure 8 Motor Vehicle Collisions Involving Pedestrians and Resulting in Injury



Source: NYSDOT Accident Location Information System

[1] Zheng, Y. et al. *Pedestrian Traffic Operations in Urban Networks.* Transportation Research Procedia. Volume 15, 2016.

[2] King, M.J. et al. *Relative Risk of Illegal Pedestrian Behaviours.* 2008 Australasian Road Safety Research, Policing and Education Conference. 2008.

All signal cycle values included in Figure 7 represent PM peak cycle length and split times. Other times of day will have shorter cycle lengths and thus shorter walk interval times in the primary travel direction. The complex intersection at University Avenue and East Main Street is made of components of three intersections, allowing for analysis of North-South crossing of Main Street. It should be noted that the Western crossing requires the pedestrian to walk 300 feet west and make an extra crossing of Pitkin Street. This additional time is not included in the analysis.

Figure 9 Pedestrian Level of Service Selected Intersection Analysis

Intersection	Approach	Walk Cycle Length (s)	Full Cycle Length (s)	Pedestrian Delay (s)	Level of Service
East Avenue & Winton Road	North	44	120	21.6	D
	East	19	120	39.2	E
	West	19	120	39.2	E
	South	44	120	21.6	D
University Avenue & East Main Street @ Inner Loop	North	34	100	19.2	D
Union Street & East Main Street	West	32	125	31.7	D
University Avenue & East Main Street @ Pitkin Street	West	21	125	40.0	E
University Avenue & East Main Street @ Inner Loop	South	34	100	19.2	D
Lexington Avenue & Lake Avenue	North	29	120	31.5	D
	East	49	120	10.4	C
	West	49	120	10.4	C
	South	29	120	31.5	D

More advanced intersection PLOS calculations consider crosswalk crossing distance. Minimizing these distances minimizes pedestrian exposure to modal conflict and forms the basis of intersection reconfiguration best practices.

Safety and Perception

Safety concerns were cited by 12% of survey respondents who expressed a desire to walk more often. Respondents who provided specific reasons describe feeling unsafe walking due to roadways with heavy and/or fast vehicular traffic and feeling uncomfortable at intersections because they do not feel seen by drivers. Respondents were concerned about the quality of the pedestrian network, noting insufficient pedestrian infrastructure, narrow sidewalks, missing sidewalks, and sidewalks in disrepair.

Outreach participants were also asked to provide a Big Idea to make the Rochester Comprehensive Access and Mobility Plan's vision become reality. Many walkers Rochester simply want to be able to walk and bike comfortably. Some suggested the City focus more on people who walk during roadway development. Many suggestions focused on the right-of-way itself, suggesting widened sidewalks, reduced parking, added speed humps, and added traffic control devices such as stop signs. Additional suggestions requested the fixing and adding of pedestrian signals, further development of the trail network to promote low-stress pedestrian connectivity, and a wider implementation of road diets.

Street Design Preferences

Survey and outreach participants were asked whether they would prefer more landscaping, more seating, or more space to walk on a widened sidewalk along a neighborhood street where they spend time working, shopping, or meeting friends. A majority (50%) chose landscaping, followed by seating (30%), and finally more space to walk (20%).

Those who shared their Big Ideas were also concerned with the environment and sense of place, suggesting improved tree canopy along streets, more separation between the sidewalk and roadway, and landscaped public places with seating along pedestrian routes throughout the city. Noting significant gaps in the tree canopy in public rights-of-way, participants also suggested Investments in green pedestrian infrastructure in Downtown Rochester and in mixed-use neighborhoods, where interruptions related to automobile parking would be more dispersed throughout the district or neighborhood.

4 Challenges and Opportunities

Building on preliminary research, stakeholder input, and data analysis, there are four key challenge topics that impact walkability in Rochester (see Figure 8). These challenges influence pedestrian project delivery, pedestrian and driver behavior, walking comfort and safety, and access and mobility. Each challenge presents an opportunity for the City to build on what's working well and to learn from the efforts of others. The opportunities are further explored in the Recommendations and Best Practices sections, which present the types of solutions that can be applied to the challenges facing Rochester.

This section lays out problem statements and matches them with potential solutions that have been used effectively in cities across the nation. These leading practices are meant to inspire and expand the tools available to make Rochester more walkable.

Figure 10 Key Challenges and Opportunities for Rochester

Topic	Challenge	Opportunity
Pedestrian Environment, Distance, and Convenience	Only one-quarter of Rochester residents are able to walk to essential services in 10 minutes or less. Demand analysis shows expected areas of high pedestrian exist further from activity centers while public outreach indicates that factors related to distance are the most common obstacles to greater practical walking activity.	Fully two-thirds of residents live within a 20-minute walk of those same activity centers. Rochester can encourage walkers to go the literal 'extra mile' by improving the pedestrian environment, making walking a more rewarding experience and changing the perception of time spent in transit. Rochester can also help to coordinate future infill development to increase the percentage of residents who can reach destinations via shorter walks.
Connections and Modal Conflict	Connectivity is decreased through delay where large vehicle volumes intersect pedestrian movements. Intersections close to top destinations experience pedestrian delay and compromised pedestrian	Many Rochester intersections can be reconfigured to reduce crossing distances without disrupting traffic patterns. A reconsideration of signal timing could give pedestrians priority

Topic	Challenge	Opportunity
	safety due to wide crossing widths, long signal cycle times, and high vehicle speeds.	when they are most likely to be seen by drivers.
Safety and Maintenance	Even well-connected portions of the pedestrian network experience collisions resulting in injury. Citizens are confused by pedestrian routes and discouraged from walking where they feel unsafe or where facilities are too narrow or in disrepair.	Rochester can take advantage of new state crosswalk design standards and improvements delivered via the state Pedestrian Safety Action Plan (PSAP). Connecting sidewalks can be upgraded citywide to meet state standards. Introducing new pedestrian crossings to shorten the distance between controlled intersections and adding streetscape elements to better define the roadway edge can act to calm traffic on wide and high volume roadways.
Programmatic Approach	Rochester does not have a visible pedestrian program. Pedestrian supportive projects and programs like *Rochester Walks!* are implemented on an opportunistic basis, resulting in less impact than desired and a low level of recognition of available programs by the public.	Rochester can create an Active Transportation Program to house pedestrian projects and programs. Putting all existing and future work under a single recognizable umbrella demonstrates a commitment to a walkable Rochester. Using partnerships with stakeholders, and expanding best practice wayfinding initiatives, the City can further expand its education and encouragement programs.

5 Recommendations

Design for Safety and Connectivity

Reconfigure Key Crossings

In order to identify the worst pedestrian delays due to signalization, the City should perform a Pedestrian Level of Service analysis comparable to that in Section 3. Required inputs are walk signal duration, flashing don't walk signal duration, and the overall intersection cycle time in seconds. Formulae and the grading scale are included in the Appendix to this document.

Subsequently, the City should conduct pedestrian counts at intersections where PLOS is poor and compare to collision data to identify priority locations for reconfiguration of the surrounding pedestrian infrastructure. Fundamentally, reconfigurations should shorten and make crossings more direct while certain elements may bring with them additional traffic calming benefits.

The intersection of Lake and Lexington Avenues, a State DOT controlled intersection, sits immediately between a full-service supermarket and a low income neighborhood while where over one-third of households have no access to a vehicle. This intersection was identified by stakeholders and verified by analysis as a key conflict point where high demand and low PLOS coupled with high vehicle speeds creates an unsafe pedestrian environment.

Shown in Figure 9, the corner of Lake and Lexington presents a number of common opportunities to reduce crossing distance and conflict risk. A curb extension may be added without compromising the required length and function of bus turnout further south. The width of the eastbound lane on the eastern approach may be reduced by roughly half, not only reducing the eastern crossing distance, but also changing the interaction of the curb radius with the southern crossing. Medians already in place can be extended further into the intersection, slowing down left turn movements without violating the required turning radius for a DL-23 design vehicle. Larger vehicles such as a WB-50 tractor trailer should access the site via Glenwood Avenue to simplify back up movements and unloading.

As with all intersections examined, lane-to-lane outer turn radius and curb radii should be verified for the design vehicle and design context. In locations where on-street bicycle facilities are also present, to avoid bicycle queuing in the crosswalk and allow cyclists a safe place to queue, the advanced stop bar should be located at least 8 feet in advance of the crosswalk and a bike box utilized between the crosswalk and the advanced stop bar.

Figure 11 Example Crossing Improvements at Lake and Lexington Avenues

Crosswalk Design

Continental and bar pair crosswalks are more noticeable and visible crosswalk marking styles, improving roadway safety for both drivers and pedestrians. The crosswalks keep people visible while crossing the street and set clear limits to drivers. Studies have shown that continental and bar pair striping is safer than traditional pedestrian crossings marked by two parallel lines connecting the corners of an intersection. A Federal Highway Administration study completed in 2010 found that the continental and bar pair markings were detected at about twice the distance upstream as the transverse marking during daytime conditions.[3] This increase in distance reflects 8 seconds of increased awareness of the crossing for a 30 miles per hour operating speed. Cities such as San Diego and San Francisco are gradually replacing all traditional crosswalk markings with this style and codifying design standards.[4]

The study team has identified that bar pair striping is present in Downtown Rochester, though not consistently across all intersection approaches. New York State DOT Traffic Safety & Mobility Instruction 16-05 updates statewide policy on the use of high-

[3] Federal Highway Administration. Publication No.: FHWA-HRT-10-067

[4] City of San Diego. City Standard Drawing SDM-116

visibility crosswalk markings and will inform PSAP implemented improvements on state roads in the coming years. The PSAP also encourages local municipalities to implement systemic safety programs on locally owned roads. The City should prioritize the implementation of continental or bar pair striping (where special paving materials are not already in place) at:

- Intersections experiencing high levels of pedestrian volume
- Intersections and midblock crossings already slated to be painted
- Crosswalk locations near parks, libraries, and schools

Pay special attention to odd intersection geometries created by legacy shifts in the street grid. Lyell Avenue, which carries over 15,000 vehicles per day, and its many oblique intersections with Broad Street, Dewey Avenue, Saratoga Avenue and others, are the location of a series of vehicle-pedestrian collisions causing injury. Per state Engineering Instruction 18-008, the longitudinal lines of high visibility crosswalks should be drawn parallel to the direction of vehicle travel. The crosswalk itself should be no less than 10 feet in width, with limit lines installed no closer than 4 feet in advance of the transverse markings.

Leading Pedestrian Interval (LPI)

A Leading Pedestrian Interval (LPI) typically gives pedestrians a 3–7 second head start when entering an intersection with a corresponding green signal in the same direction of travel, enhancing the visibility of pedestrians in the intersection and reinforcing their right-of-way over turning vehicles, especially in locations with a history of conflict.

The City of Rochester should inventory existing LPI implementations, as well as those anticipated as part of the State PSAP, and compare to intersections where heavy turning traffic comes into conflict with crossing pedestrians, especially where pedestrian volumes are also high. This may require additional vehicular and pedestrian traffic counts. The City may then request additional LPI implementation from the Monroe County Department of Transportation to improve both safety and connectivity at a relatively low cost. The effectiveness of LPI further enhanced when paired with a curb extension.

Rectangular Rapid Flashing Beacon

Rectangular Rapid Flashing Beacons (RRFBs) are devices using LED flashing beacons in combination with pedestrian warning signs to provide a high-visibility strobe-like warning to drivers when pedestrians and bicyclists use a crosswalk. A push button is used to activate the beacon, or another activation method used by the person to signal the intent to cross. The push button and other components of the crosswalk must meet all other accessibility requirements. RRFBs can be used when a traffic signal is not warranted at an unsignalized crossing.

New York State will be installing additional RRFBs, such as one recently installed across Mt. Hope Avenue near Robinson Drive, as part of their PSAP. DOT guidelines in TSMI 18-02 cite the following criteria for the appropriateness of RRFB implementation while noting that not all criteria need to be met in order for an RRFB to be considered an appropriate solution at a previously uncontrolled location.

- Marked Crosswalk
- Minimum Vehicular Volumes: 1500 VPD or 150 VPH
- Minimum Pedestrian Volume Thresholds
  - 20 pedestrians or 10 school aged, elderly, or disabled pedestrians in any one hour
  - 18 pedestrians or 9 school aged, elderly, or disabled pedestrians per hour in any two hours
  - 15 pedestrians or 8 school aged, elderly, or disabled pedestrians per hour in any three hours
- Stopping Sight Distance (SSD) ≥ 8 times the Speed Limit
- Minimum 300 feet to the nearest protected crossing
  - 200 ft. in urban areas based on engineering judgment
- Posted Speed Limit of 30 to 45 MPH
- Maximum # of lanes crossed: 4 lanes
  - with a raised median: 5 lanes

RRFB installation should be considered for locations not on the State implementation list that experience with high vehicular volumes, greatly exceed established minimum distance to a controlled crossing guidance, and where pedestrian demand is likely to exceed minimum thresholds.

Provide a Quality Pedestrian Environment

At its core, a walkable city is one where transportation on foot is convenient, safe, and enjoyable. Quality pedestrian environments help to reduce the risk of motor vehicle collisions and increase physical activity and social cohesion with direct physical health benefits as well as stress reduction and mental health improvements that promote individual and community health.

Complementary Land Use

A quality pedestrian environment relies on land use diversity and density not just pedestrian design. The citation of distance as factor inhibiting walking activity includes some underlying context regarding useful locations for infill development. The City should develop criteria regarding the coordination of land use policy, development approval, and transportation infrastructure. This will require integration between city departments and key partners, including departments of

transportation, regional economic development councils, developers, lenders, local foundations, social service providers, healthcare agencies, and other key players.

Pedestrian Environmental Quality Assessment

Systems have been devised to aid in the qualitative assessment of pedestrian environmental quality. One such system is described in the case study below. Rochester has previously conducted a walkability audit in the Merchants-Culver neighborhood and should expand the scope of this type of assessment along all connecting corridors to further prioritize pedestrian environment improvements.

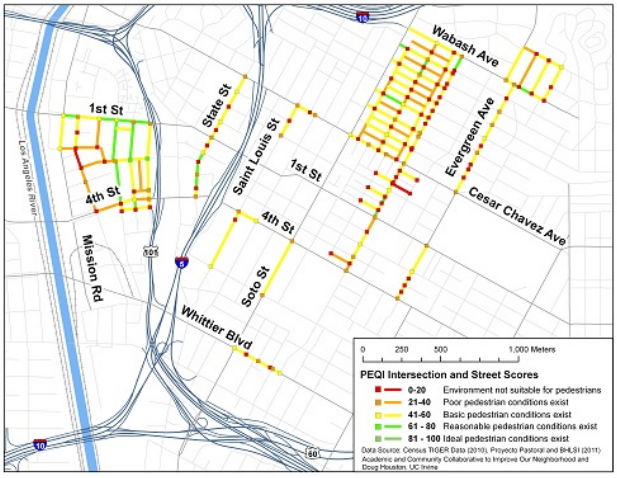
CASE STUDY

Pedestrian Environmental Quality Index

The Pedestrian Environmental Quality Index (PEQI) questionnaire was developed in 2008 by the San Francisco Department of Public Health Program on Health, Equity and Sustainability (SFPDH) to assess the quality and safety of the physical pedestrian environment and inform pedestrian planning needs. It evaluates the pedestrian environment in five categories:

- Intersection safety
- Traffic
- Street design
- Land use
- Perceptions of safety and walkability

Figure 12 Example PEQI Visual Representation



Source: UCLA Sustainable Technology and Policy Program

PEQI has since been adapted by the Sustainable Technology and Policy Program at UCLA,[5] translating the paper-survey form into a mobile phone application with automated scoring and web-based mapping.

Indicator scores for each indicator category were created based on a survey of national experts, including city and transportation planners and consultants, and pedestrian advocates, regarding their importance to pedestrian environmental quality. PEQI scores reflect the degree to which environmental factors supportive of walking and pedestrian safety have been incorporated into street segment and intersection design. PEQI differs from PLOS in that it relates more to a general

[5] University of California at Los Angeles. http://www.stpp.ucla.edu/node/496

perception of comfort level. With the exception of traffic volume, all indicative data is collected via an observational survey. PEQI is more comprehensive than PLOS as PEQI considers elements such as sidewalk impediments, presence of street trees and furniture, and even the presence of graffiti, litter, and abandoned buildings. PEQI can also act as a facility condition survey and a major component of a facility database that also includes PLOS and independent pedestrian counts.

The PEQI scores street segments and intersections separately, on a scale from 0 -100 where the following twenty point intervals represent:

- 100-81 = highest quality, many important pedestrian conditions present
- 80- 61 = high quality, some important pedestrian conditions present
- 60- 41 = average quality, pedestrian conditions present but room for improvement
- 40- 21 = low quality, minimal pedestrian conditions
- 20 and below = poor quality, pedestrian conditions absent

In addition to the score for a specific street or intersection, it is also informative to compare street and intersection scores across an area to see if there are notable areas with more or fewer physical environmental factors supportive of walking – and to see how the scores are spatially related to known pedestrian attractors such as schools, parks, or transit stops.

Design and Maintenance

When conducting walkability audits, facility quality and dimensions should also be inventoried with the intent of upgrading the entirety of the existing pedestrian network to meet minimum walkway and ramp standards set forth in Chapter 18 of the New York State Highway Design Manual. The city should work with volunteer organizations to develop an inventory of assets and develop a targeted upgrade program and maintenance cycle.

Rochester's significant average annual snowfall presents additional pedestrian network maintenance challenges. The effectiveness of the City's municipal sidewalk plowing program should be evaluated noting residual snow left below plow level or during snow events of less than four inches of accumulation and the impact of thaw and refreeze cycles on sidewalk walkability. If effectiveness is a function of snow storage capability, policies such as temporary no parking zones for snow storage, should also be evaluated.

Existing policies that place the onus on property owners to remove snow from the sidewalk immediately in front of their property should be presented on the City's website in an interactive manner that includes specific standards, fine information, violation reporting, and payment. Spot enforcement of existing policies should

augment reporting, not just intended to ensure cleared sidewalks, but also to educate property owners.

Streetscape Improvements

Noting challenges related to walking distances in Rochester, streetscape improvements can improve perception of the walking environment such that residents consider longer walks to be viable. Streetscape elements serve many important functions. The City's Main Street Strretscape and Wayfinding Project can be looked as an example of new streetscape designed to improve conditions for pedestrians and encourage multi-modal transportation.

Street Trees

Street trees provide many benefits to the street including identity, shade, visual narrowing, visual amenity, and street edge definition. Street trees should be planted within the sidewalk buffer or planting strip on every street, whenever possible. Plantings should be in compliance with Rochester's Urban Forest Policy, updated in 2012 by the Forestry Division of the Bureau of Operations and Parks. Larger trees are recommended to create greater canopy and to provide more variety along corridors.

Street Lighting

Lighting improves both safety and the sense of security. Lighting should be carefully designed to avoid light pollution and light cast into adjacent buildings. Lighting should be as energy efficient as possible, either utilizing LED technology or deriving their power from renewable energy sources. Lighting should illuminate the sidewalk as well as the roadway, crosswalks, and other conflict points. Lighting is appropriate and desirable on all street types other than alleys, which may or may not be lit.

Lighting should provide consistent lighting levels and avoid high contrasts of light and dark areas. Lighting spacing and design should accommodate growth of street trees and installation of other pedestrian infrastructure. Lighting fixture types should generally be limited to a small number of approved standards. This contributes to a cohesive public realm and more cost-effective maintenance.

Street Furniture

Public seating creates more accessible and inviting streetscapes for all users, especially those with mobility challenges, by providing places to rest and enjoy the street environment. They may include benches, chairs, seat-walls, and other fixed structures.

Public seating should be limited to areas with higher concentrations of pedestrian activity, public parks, plazas, transit stops, and places where there is other demonstrated need. Seating locations should be carefully evaluated to ensure that

they will be visible, regularly used, and maintain clearance with pedestrian movement, loading areas, fire hydrants, and/or other street fixtures.

Seating may be aligned parallel or perpendicular to the curb. Seating parallel to and along the curb should be oriented toward the sidewalk and away from vehicular traffic, except where provided at transit stops. Like light fixtures, street furnishings and public seating should be of a standard type that is consistent throughout the city or neighborhood and easily and reliably procured. Street furnishings should be constructed from long lasting and durable materials and finishes and should be regularly inspected for damage to ensure that it remains safe and comfortable for all users.

Supportive Zoning

Zoning policy can support the creation of aesthetically desirable and interesting places to walk through standards for infill development that include building setbacks, first floor fenestration and sidewalk entry access requirements, and parking lot location requirements. These measures reinforce the feeling of enclosure along a sidewalk and the perception of personal safety.

Railroad Underpasses

Streetscape improvement programs should consider the pedestrian environment within the large number of railroad underpasses in Rochester. These walkways should be well lit and kept clean. The City should coordinate with facility ownership, CSX Transportation, to achieve this goal.

Adopt an Effective Programmatic Approach

The implementation by the City of a recognizable Active Transportation Program would better equip Rochester to allocate funding to pedestrian projects as it becomes available and set clear parameters for the City to make improvements through creative partnerships. Any program should facilitate coordination among public and private stakeholders and develop new methods for involving communities in pedestrian projects.

An active transportation program may also choose to approach certain issues more specifically through planning efforts such as:

- Safe access to parks and trails plans promoting play and healthy living
- Transit supportive pedestrian improvement programs that provide safe routes to stops as well as location improvements through amenities, roadway geometry changes, and accessibility enhancements
- Creative public campaigns designed to draw attention to other pedestrian initiatives by encouraging active transportation over short vehicle trips

If any of these initiatives are currently being provided in some way by other city departments, Active Transportation Program management should lead internal coordination efforts to ensure that all pedestrian-oriented initiatives are well-publicized and information able to found in one convenient location.

Expand Pedestrian Focused Wayfinding

Good wayfinding simplifies navigation and efficiently relays important information, which adds to sense of place and makes a district more vibrant and enjoyable. The 2012 Center City Pedestrian Circulation and Wayfinding Study is an excellent plan for enhancing the pedestrian environment within Rochester's Center City. The City should continue implementation of the plan that began in 2017 as part of the Main Street Streetscape Project while developing a maintenance plan for wayfinding signage and structures that includes timely updates as new attractions are built or change names.

The fundamental wayfinding system within the plan should be expanded to neighborhoods outside of the Center City adding some longer distance non-motorized wayfinding principles to intra-neighborhood wayfinding. Distinct visual neighborhood identities should be a part of neighborhood wayfinding signage while maintaining a recognizable family of signs between neighborhoods and downtown.

Present Meaningful Information Using a Pedestrian Interface

Present destination-based, pedestrian-oriented information including walking times in minutes on directional signage and maps.

- Include 5- and 10-minute walk "rings" on "you are here" map installations.
- Install guidance plaques distance and direction of popular pedestrian destinations.
- Install all wayfinding signage and markings at a pedestrian level.

Emphasize Symbols over Text

Use internationally recognized symbols to convey information to the greatest number of people.

Emphasize Non-Motorized Routes in Maps

The City should ensure that official maps identify all pedestrian way-through options, including short pedestrian bridges over Interstate 490. The City should also engage partners who produce independent publications to further ensure that map standards involving non-motorized transportation modes are met in all publicly distributed literature.

Guide Users of Multiple Transportation Modes

As all residents and visitors become pedestrians at some part of their trip, use wayfinding signage to guide drivers to and from parking facilities, transit riders to bus routes and stations, and general visitors to riverfront access points and commercial/cultural/recreational destinations.

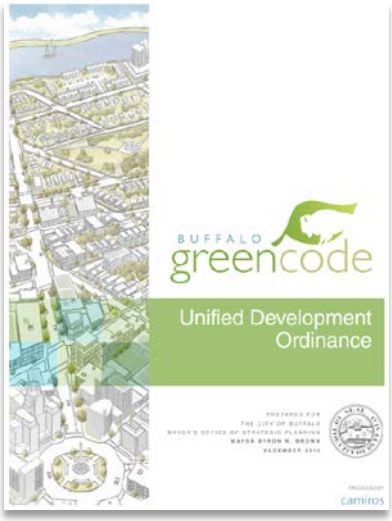
Ensure Consistency

Coordinate with all major generators of wayfinding signage to develop a seamless series of visual cues for pedestrian navigation.

Promote Walkability to Out-of-Town Visitors

Coordinate with hotels to promote area walkability and encourage the use of active transportation alternatives.

6 Best Practices

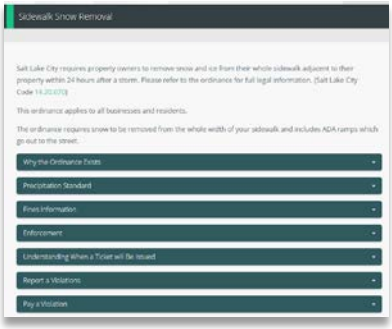


Crosswalk Design

Buffalo's recently adopted Unified Development Ordinance, or Green Code,[6] requires marked crosswalks where greater pedestrian visibility is desired, where two or more transit routes cross, where traffic volumes exceed 2,000 vehicles per day, and at crossings within certain zoning designations. High visibility striping, explicitly the continental pattern, is preferred. This has enabled neighborhood and other groups to install temporary high visibility crosswalks on non-state radoways.

Pedestrian Facility Quality Analysis

Over 2,300 miles of roadway corridors within the Richmond, VA Area MPO were analyzed for pedestrian level of service in order to identify nodes and corridors to guide regional pedestrian improvements. Additionally, individual facility and improvement selection criteria were created.[7]

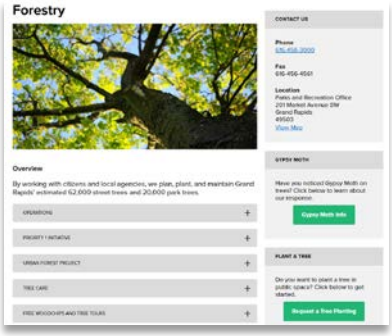


Snow Removal Policy

Salt Lake City describes their sidewalk snow removal ordinance on an interactive page within their city website. Citizens can clearly access precipitation standards and timing, fines information, report violations, and pay for received violations.

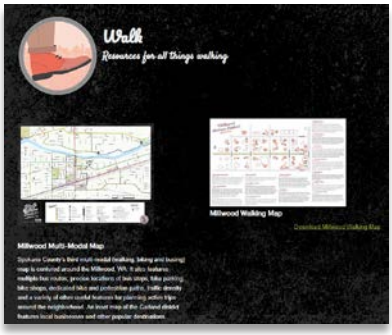
[6] City of Buffalo. Chapter 496, Unified Development Ordinance. Article 10 Section 2.4.B.3

[7] Virginia Department of Transportation. Richmond Regional Bicycle and Pedestrian Plan. Strategies A-2, B-3



Street Tree Canopy

The City of Grand Rapids has set a goal of a 40% tree canopy. By filling all available planting sites on City streets, they were able to raise canopy coverage to 34%. Grand Rapids is now endeavoring to plant on private property and in parks through their Urban Forest Project. This and other forestry initiatives, studies, and a tree planting request tool, are available on an easy-to-use web interface.



Active Transportation Program

The Spokane Region Health District, analogous to the Monroe County Health Department, encourages physical activity in everyday routines through its Walk Bike Bus Spokane program. The program offers residents individual support including information and products specific to walking, educational workshops and events, guidance from trained staff, incentives specific to program sign-on and tracking miles-traveled.

7 Priority Projects

- Create an active transportation program to streamline funding allocation to pedestrian projects.
- Conduct a pedestrian environmental quality and facility condition assessment as an initial input to a pedestrian network database.
- Conduct additional intersection PLOS analyses to identify worst pedestrian delays and highest likely exposure to collisions due to non-compliance.
  - Follow up with pedestrian counts to complete the pedestrian network database and to help identify specific improvement locations.
  - Work with MCDOT to implement LPI where not already implemented and where service level is Grade D or lower.
  - Reconfigure identified intersections to align crosswalks with state standards, reduce crossing distances, and reduce turning speeds by tightening curb radii.
- Install RRFBs to facilitate mid-block crossing along long intervals with no controlled intersections, and where appropriate criteria are met. Consider the following locations for appropriateness screening:
  - Mt. Hope Avenue between Highland and Elmwood Avenues
  - Lake Avenue between Flower City Park and Driving Park Avenue
  - Upper Falls Boulevard between Joseph and Hudson Avenues
  - Others as identified by Focus Group
- Expand the pedestrian wayfinding system to simplify navigation on foot within and between neighborhoods.

8 Appendix

Pedestrian LOS Calculation

The expected pedestrian delay while waiting to cross the street is computed with the equation below:

$$d_p = \frac{(C - g_{walk})^2}{2C}$$

Where d_p is pedestrian delay, g_{walk} is the sum of the duration of the walk and flashing don't walk signals, and C is the total signal cycle length.

The LOS Score for the crossing, given as I_p, is calculated as:

$$I_p = 0.5997 + \ln d_p$$

Figure 13 lists scores associated with each PLOS.

Figure 13 Pedestrian Level of Service Criteria

LOS	LOS Score
A	Less than or equal to 2.00
B	Greater than 2.00, less than or equal to 2.75
C	Greater than 2.75, less than or equal to 3.50
D	Greater than 3.50, less than or equal to 4.25
E	Greater than 4.25, less than or equal to 5.00
F	Greater than 5.00