  
**Minneapolis**  
City of Lakes

# PEDESTRIAN AND BICYCLE WINTER MAINTENANCE STUDY



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# ACKNOWLEDGEMENTS

**Technical Advisory Committee (TAC)** members from the City of Minneapolis' Public Works and Regulatory Services Departments participated in meetings and interviews and provided guidance and feedback throughout the project:

- Andrew Carlson
- Kathleen Mayell
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- Larry Matsumoto
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**Interviewees from other municipalities** shared bikeway maintenance policies, practices, and programs from their communities in Minnesota, other States, and Canada:

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- Brett Jenkinson, City of Rochester, Minnesota
- Jarrod Brunelle, City of Plymouth, Minnesota
- Jeff Stevens, City of Saint Louis Park, Minnesota
- Jeremy Klotz, City of Bloomington, Minnesota
- Joe Keding, City of Shoreview, Minnesota
- John Nardone, City of Cambridge, Massachusetts
- Karen St. Aubin, City of Rochester, New York
- Kyle Bunnaw, City of Madison, Wisconsin
- Marshall Beugen, City of Golden Valley, Minnesota
- Matthew Morreim, City of Saint Paul, Minnesota
- Rich Thibault, City of Burlington, Vermont
- Rick Diluca, City of Vaughan, Ontario, Canada

The City of Minneapolis **Pedestrian Advisory Committee (PAC)**, **Bicycle Advisory Committee (BAC)**, **Minneapolis Advisory Committee on Aging (MACA)**, and **Minneapolis Advisory Committee on People with Disabilities (MACOPD)** provided guidance and feedback throughout the project.

Consultant:



# STUDY OVERVIEW

The City of Minneapolis (City), while experienced with winter maintenance, has completed this report in an effort to identify opportunities for continued improvement via self-evaluation, innovation, further learning and/or changes to existing processes and policies. The City has approximately 1,910 miles of sidewalks, over 220 miles of trails and bikeways, over 1,000 miles of street, almost 400 miles of alleys, over 2,800 bus stops and light rail stations, and a variety of pedestrian, bicycle and vehicular bridges citywide. City staff, property owners, and several partner agencies maintain these facilities throughout the winter season during which Minneapolis receives an average of 52” of snow per year resulting from 20 to 25 precipitation events. From freezing rain to blizzards, these precipitation events, in addition to countless freeze-thaw cycles, can create icy and hazardous conditions on sidewalks, paths, and streets if not properly managed.

Minneapolis is committed to year-round walking and bicycling as safe, accessible and convenient options for its residents and visitors. The purpose of the Minneapolis Pedestrian and Bicycle Winter Maintenance Study is to gather and present information, data, and implementation cost ranges of winter maintenance practices such that the City can determine opportunities for continued improvement. This study does not answer all questions or make recommendations; however it provides a framework for continued conversation with the community, interested stakeholders and policy makers.

This report is divided into three primary sections:

- [Section 1: Existing Minneapolis Pedestrian and Bicycle Winter Maintenance Practices](#)
- [Section 2: City and Agency Review](#)
- [Section 3: Alternative Winter Maintenance Options](#)

## Project Framework

A framework was developed to guide the examination of existing policies, practices, and programs pertaining to winter maintenance.

	PEDESTRIAN WINTER MAINTENANCE	BICYCLE WINTER MAINTENANCE
PRACTICES	<ul style="list-style-type: none"><li>• Sidewalk snow and ice clearing, removal, and enforcement</li><li>• Pre- and post-treatment (salt, brine, sand)</li><li>• Costs and funding</li><li>• Transit stops</li></ul>	<ul style="list-style-type: none"><li>• Snow and ice clearing and removal</li><li>• Pre- and post-treatment (salt, brine, sand)</li><li>• Costs and funding</li></ul>
POLICIES AND LEGISLATION	<ul style="list-style-type: none"><li>• Agency agreements</li><li>• Minneapolis planning documents</li><li>• Performance measures</li><li>• Priority winter maintenance network</li><li>• Special Service Districts/Business Improvement Districts</li><li>• ADA</li></ul>	<ul style="list-style-type: none"><li>• Agency agreements</li><li>• Minneapolis planning documents</li><li>• Performance measures</li><li>• Priority winter maintenance network</li><li>• Special Service Districts/Business Improvement Districts</li></ul>
PROGRAMS	<ul style="list-style-type: none"><li>• Public education, communication, and reporting</li><li>• Volunteer programs</li></ul>	<ul style="list-style-type: none"><li>• Public education, communication, and reporting</li></ul>

## Winter Maintenance Definitions

The terms ‘snow and ice control,’ ‘snow clearing,’ ‘snow removal,’ and ‘snow windrows’ are referenced throughout this report when describing snow and ice maintenance. For the purpose of this report, they are defined as:

**Snow and ice control** – includes plowing snow to the side of a street, trail, or sidewalk, where it is typically left to accumulate until it eventually melts. Ice can be controlled with chemicals to prevent bonding or promote melting, or with abrasives like sand to provide traction. These activities can be accomplished with a truck, tractor, utility vehicle, or hand shoveling. This is the broadest definition that typically covers all types of activities.

**Snow clearing** – pushing, plowing or removing snow in much the same manner as above, but generally used to describe activities like clearing street corners or other facilities.

**Snow removal** – involves physically removing snow from a street, trail, or sidewalk and hauling it to another location to eventually melt. Snow is typically cleared to the side of a facility first and later collected with special procedures and equipment, and hauled away.

**Snow windrows** – rows of snow piles that are left behind by snow plows after plowing operations.

**Snow Emergency** – snow emergencies are declared when there is significant snowfall. When a Snow Emergency is declared, parking restrictions go into effect along defined snow emergency routes so plows can clear the streets.

# SECTION 1: EXISTING POLICIES, PRACTICES AND GUIDANCE

This section of the study describes what the City of Minneapolis, as a northern climate city, currently does in order to maintain pedestrian and bicycle facilities during the winter. Property owners are responsible for clearing snow and ice from sidewalks adjacent to their properties. Bikeway winter maintenance responsibilities are less obvious as they are the responsibilities of the respective jurisdictional owners such as the City, the MPRB, the Minnesota Department of Transportation (MnDOT), Hennepin County, Three Rivers Park District, and the University of Minnesota (U of M).

The data collected and reviewed for this study does have limitations. Minneapolis sidewalk winter maintenance data includes sidewalk snow and ice complaints received, managed, and processed through the City's 311 system. This data only represents complaints and violations, which may not accurately portray the state of winter sidewalk conditions citywide as it is unlikely all violations are reported through the system

City of Minneapolis: By the Numbers	
Miles of sidewalks	1,910
Miles of bikeways	220+
Individual land parcels	129,370
Average annual snowfall	52 inches

The City has processes in place for Public Works maintenance staff to coordinate and collaborate with project planners and design engineers on winter and other maintenance needs as capital projects are planned and designed. [Access Minneapolis](#), the City's Transportation Action Plan, also provides detailed guidance about designing for snow and ice clearance in the winter. Specifically, [Chapter 10](#) of the [Street and Sidewalk Design Guidelines](#) describes desired sidewalk widths to accommodate maintenance vehicles, curb ramp design, and other pedestrian facility design recommendations for adequate winter maintenance.

The City's draft [ADA Transition Plans for Public Works Programs](#) details enhanced snow enforcement guidelines. Many of the proposed elements have been implemented, including shortening the length of time for the enforcement process, issuing sidewalk snow removal work orders to private contractors, increasing sidewalk snow inspection activities with additional existing City staff, and coordinating with other City Departments to accomplish increased sidewalk snow inspections.



Figure 1: A man walks along the sidewalk on 6th St SE.

## Winter Maintenance of Pedestrian Facilities

### ➤ **Minneapolis Planning Guidance**

The [Minneapolis Pedestrian Master Plan](#) establishes a goal of a well-maintained pedestrian system, including Objective 5.1 on page 62: “Ensure effective snow and ice clearing for pedestrians”. The plan describes several implementation options to achieve that objective including establishing priorities for sidewalk snow clearing, improving enforcement and monitoring of private property owner responsibilities for snow clearing, and supporting property owners with snow and ice clearing assistance options. Since the Minneapolis Pedestrian Master Plan was completed in 2009, the City has implemented measures to resolve 311 sidewalk shoveling complaints, refine the corner clearing program, address transit stops along with corner clearing, and increase communication around the importance of sidewalk snow clearing.

### ➤ **Clearing Snow and Ice from Sidewalks**

Throughout the city, property owners are responsible for clearing snow and ice from sidewalks that are adjacent to the properties they own. Single family homes and duplexes are given 24 hours after a snowfall has ended to clear snow and ice, while all other properties have four hours after a snowfall has ended to clear snow and ice. [City ordinance 445](#) establishes this time frame.

### ➤ **Agency Agreements**

There are many MnDOT or Hennepin County roads that are maintained by the City of Minneapolis through respective interagency agreements. Agreements are the tool for assigning responsibility for work completion from one agency to another, which often includes some amount of compensation. In cases where sidewalks along these roads are adjacent to private properties, City ordinance 445 still pertains and the private property owners are responsible for clearing the sidewalk. The City clears all sidewalks on bridges and overpasses as part of these agreements.

### ➤ **Corner Clearing Program**

The City started a deliberate sidewalk corner clearing program in 1995. The budget at the time provided for some funding to cover the expenses. Over the years, the program was operationally refined by reprioritizing resources, without any additional funding to address the growing desire for more aggressive corner clearing. In 2015, Public Works proposed and was granted funding to enhance the corner clearing program, focusing on a network of pre-defined, high priority pedestrian corners. Corner clearing is prioritized based on the Pedestrian Street Lighting Corridor (PLSC), formerly known as Pedestrian Priority Corridors (PPC). There are two circumstances that will trigger the initiation of corner clearing activities: an accumulation of 4” or more of snow or a declared Snow Emergency. Corner clearing commences at the completion of the Snow Emergency; this allows the City to remove the windrows left in place after street plowing is completed. If another Snow Emergency is declared before all the corners are cleared, the City resumes corner clearing at the end of the new Snow Emergency, starting with the pre-defined high pedestrian corridors, as defined by the PLSC. Once the priority corners are cleared, crews continue operations until another snow event or until all corners are cleared.

➤ **Special Service Districts**

A Special Service District is one way for commercial property owners to fulfill their responsibility for sidewalk snow and ice control. In 2017, six of the sixteen Special Service Districts (SSDs) in the City chose to pay contractors for sidewalk snow and ice control, which sometimes includes the removal of snow windrows along the curb, as part of their SSD operating plans. These districts must meet City ordinance requirements. Public Works contracts for, and directs the work. The costs of these services are recovered by Public Works through special assessments to the affected SSD property owners.

➤ **Transit Stop Facilities**

There are approximately 2,860 transit facilities in Minneapolis, including bus stops whether they have shelters or not, transit centers and rail platforms. Clearing snow from bus stops and any adjacent facilities is a shared responsibility of Metro Transit, US Bench Corporation, and adjacent property owners.

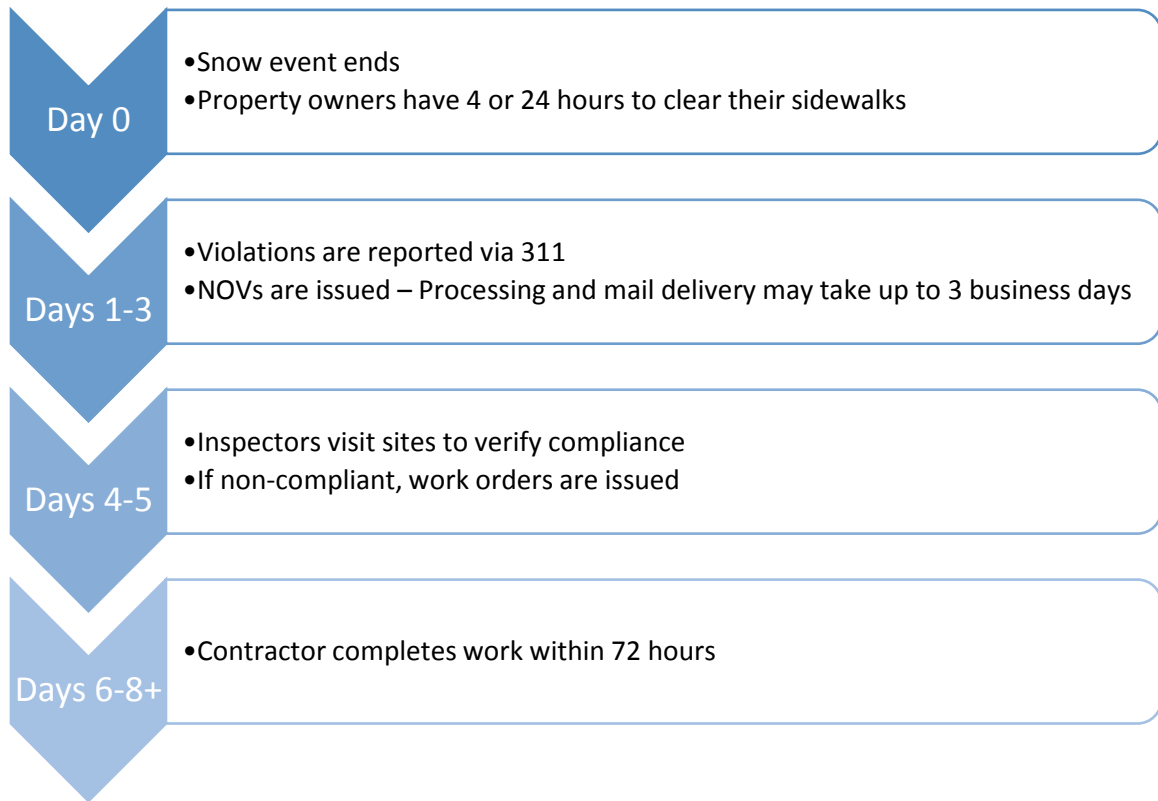
- Metro Transit prioritizes snow removal based on ridership numbers, route locations, and travel routes of people who are disabled. They strive to clear of snow and ice within the first 24 hours after a snow event with accumulation of 1" or more. They perform overnight snow removal activities at light rail stations in downtown only.
- Adjacent property owners and the City of Minneapolis are responsible to clear bus stops that do not have a shelter or a bench, which is approximately 58% of all bus facilities. Property owners clear sidewalks adjacent to their property, and later the City of Minneapolis will create an opening in the snow windrow during its corner clearing program to provide access to the bus stop area.
- The benches at bus stops without a shelter are owned and maintained by US Bench Corporation. They have their own crew of maintenance workers that clear snow and ice from 700 benches across the city per [City ordinance '283.210 – Maintenance of benches'](#) which states "ice and snow shall be removed from the benches and vicinity thereof in such a manner that each bench shall be accessible at all times".

➤ **Sidewalk Snow and Ice Clearing Non-Compliance**

If sidewalks are not shoveled within the timeframe defined in City ordinance 445, the process for enforcing the snow and ice clearing ordinance may commence. Currently, while the City does proactively conduct some inspections, the enforcement process is primarily complaint driven and relies on the public to report issues through 311. In rare circumstances, when temperatures remain extremely cold for extended periods of time and ice is tightly bonded to pavements, it becomes impossible to remove and inspectors will issue an order to sand the sidewalk in order to provide temporary traction rather than issue a NOV.



The complaint driven process can be summarized as:



When a contractor completes a work order, the property owner is billed for the work and unpaid bills are added to the property tax bill as a special assessment. Property owners are allowed to appeal their bills through an Administrative Hearing or Public Hearing process, and ultimately to District Court.

There are occasions that a property owner will clear their sidewalk after a work order is issued but prior to the contractor completing the work order. In this case, the City will compensate the contractor at a rate of 10% of the contractor's bid price; the private property owner is not billed for this cost.

In total, the complaint driven process can take anywhere from 6 to 8 or more working days. The timeline resets if another snow event occurs during this timeline.

This process was streamlined in 2016 to eliminate an initial physical inspection that would have occurred prior to an NOV being issued. The streamlining has reduced the amount of time between receipt of a 311 complaint and a contractor clearing the sidewalk by two to three working days. Public Works is currently evaluating the benefits of this process, including identifying challenges to foregoing the initial inspection.

➤ **Freeze-Thaw Cycles**

When temperatures rise above freezing, snow and ice on or adjacent to sidewalks will melt and often flows onto or across the sidewalk. When temperatures drop back below freezing, the remaining water on the sidewalk refreezes and results in icy sidewalk conditions. Similar conditions will result after a freezing rain event. It is estimated that during the winter of 2016-2017, approximately 60-70% of the contractor work orders were due to ice, not snow. Therefore, even without a precipitation event, property owners need to address their sidewalks.

## Winter Maintenance of Bicycle Facilities

➤ **Minneapolis Planning Guidance**

The City's [Bicycle Master Plan](#) and subsequent [Protected Bikeway Update](#) describe the importance of winter maintenance for year-round facility use and guide future planning, design, and implementation of the bikeway network. However, these documents provide little guidance or policy recommendations for maintaining bicycle facilities in the winter.

➤ **Agency Agreements**

Bikeway winter maintenance responsibilities are the responsibilities of the respective jurisdictional owners such as the City, the MPRB, MnDOT, Hennepin County, Three Rivers Park District, and the U of M. There are many roads and/or bikeways that are maintained by the City of Minneapolis through respective interagency agreements. Agreements are the tool for assigning responsibility for work completion from one agency to another, which often includes some amount of compensation. Because protected bike lanes are a relatively new initiative, there is not yet a complete understanding or agreement of mutual responsibilities or the added costs of maintaining these facilities. The County has completed a Bikeway Maintenance Study to aid in their internal discussions regarding cost participation, but has yet to state any conclusions as a result of the study. At the time that this report was finalized, the City is not being reimbursed for services provided on protected bike lanes along County roads.

➤ **Shared Use Paths and Off-Street Trails**

Maintenance of paths and trails throughout the city is the shared responsibility of the jurisdictional owners such as the City, the MPRB, MnDOT, Hennepin County, Three Rivers Park District, and the U of M. Each maintain their facilities within their respective jurisdictions, but agencies provide the same level of service goal of having plowed and treated off-street paths and trails within 24 hours after a snowfall has ended. Off-street trails typically have plenty of buffer space for snow storage and snow removal is rarely necessary.

➤ **Protected bike lanes**

Protected bike lanes are bicycle facilities that are physically separated from vehicular traffic. Public Works provides the same winter maintenance level of service goals for protected bike lanes as the off-street path and trail system, or plowed and treated within 24 hours after a snowfall has ended. In the event that snow removal is required, where snow windrows encroach on protected bike lanes, removal operations will extend beyond the 24-hour snow clearing standard. Because of the design of protected bike lanes, City crews often use special equipment, have dedicated crews, and often make several return trips for snow clearing and/or removal.

➤ **Standard On-street Bike Lanes**

One of the most challenging bicycle facilities to maintain in the winter is on-street bike lanes where they are adjacent to parked motor vehicles. Bike lanes are generally plowed at the same time as the parking and travel lanes. However, if vehicles are not moved during plowing operations then snow windrows will accumulate adjacent to the parked vehicles and encroach into the bike lanes. Additionally, snow and slush is often splashed into the bike lanes from moving motor vehicle traffic resulting in slushy and slippery conditions. If vehicles are moved during plowing operations, then snow windrows are created along the curbs throughout the season and motorists are forced to park farther and farther away from the curbs which results in the parked vehicles encroaching into the bike lane.

➤ **Bicycle Boulevards**

Bicycle boulevards in the city are plowed at the same time, and to the same level of service, as the streets on which they are located. By definition and design, bicycle boulevards are typically located on residential, non-Snow Emergency route, streets. If a bicycle boulevard is on a Snow Emergency route, it will be cleared as the Snow Emergency route is cleared; if it is not a Snow Emergency route, it will be cleared with the Non-Snow Emergency plowing routine.

Consequently, if part of a bicycle boulevard is located on a Snow Emergency route and part of it is not, it is possible that different segments of that bicycle boulevard will receive different levels of service.

## SECTION 2: CITY AND AGENCY REVIEW

Cities in northern climates across North America experience snowy and icy conditions annually and often have very different approaches to winter maintenance services, including clearing or removing snow and ice from pedestrian and bicycle facilities. This section contains a summary of policies, practices, and programs from select agencies and municipalities in Minnesota and across North America. Information on pedestrian and bicycle winter maintenance was gathered from interviews with staff and web-based research. The information presented in this section does not cover every aspect of winter maintenance but highlights the main topics that emerged from the interviews and research.

### Cities and Agencies Reviewed

The project team selected five North American municipalities and seven Minnesota communities, in addition to Minneapolis, to review. The chosen cities have similar climates to Minneapolis but vary in their size, population, infrastructure mileage, and approach to winter maintenance of pedestrian or bicycle facilities.

#### Minnesota Cities:

- Minneapolis, Minnesota
- Bloomington, Minnesota
- Golden Valley, Minnesota
- Plymouth, Minnesota
- Rochester, Minnesota
- Saint Louis Park, Minnesota
- Saint Paul, Minnesota
- Shoreview, Minnesota

#### North American Cities:

- Burlington, Vermont
- Cambridge, Massachusetts
- Madison, Wisconsin
- Rochester, New York
- Vaughan, Ontario, Canada

The research included reviewing policy and planning documents and other materials available online, conducting phone interviews with staff from Saint Paul, Rochester (MN), Rochester (NY), Madison, Burlington, and Vaughan, and in-person interviews with Bloomington, Saint Louis Park, Shoreview, Golden Valley, and Plymouth. The thirteen municipalities reviewed for this study have different pedestrian and bicycle facilities and varying approaches to winter maintenance programs and policies, which are outlined in Table 1 and Table 2.

The research also includes bicycle-related winter maintenance best practices documented in the Hennepin County Bikeway Maintenance Study, completed by Toole Design Group on behalf of Hennepin County in 2016. Guidance documents from national agencies were also reviewed, including the Federal Highway Administration (FHWA) guidance documents and the U.S. Access Board's Draft Public Rights-of-Way Accessibility Guidelines (PROWAG).



Table 1: A comparison of policies and programs in five North American cities. Average annual snowfall data was collected from the National Oceanic and Atmospheric Administration (NOAA).

At a Glance: North American Cities Sidewalk Summary							
Municipality Background Information				Policies			
City, State	Population	Estimated Miles of Sidewalks	Average Annual Snowfall (NOAA)	Winter Priority Network(s)	Sidewalk Snow and Ice Clearing Responsibility	Time to clear all sidewalks with City staff or contractors	Time allowed to property owners to clear sidewalks
Burlington, VT	42,452*	127	81"	Sidewalk priority network (for citywide clearing)	City	6-9 (Performed by City staff)	Not applicable
Rochester, NY	209,802*	878	100"		City when snowfall exceeds 4"; property owners below 4"	4-5 (Performed by private contractors)	
Vaughan, ON, Canada	306,233**	621	76"	Sidewalk priority network (for citywide clearing)	City when snowfall exceeds 2"; property owners below 2"	12 (Performed by City staff)	
Cambridge, MA	110,402*	260	44"	Sidewalk priority network (for inspection purposes)	Property owners	Not applicable	12 hours after snow stops falling during the day; before 1pm if it snowed during night
Madison, WI	248,951*	1,255	51"	Shared use path priority network (for clearing); Sidewalk priority network (for inspection); Priority crosswalk network	Property owners		By noon of the day after the snow stopped

\*2015 U.S. Census estimates.

\*\*2016 Canada Census estimates.

Table 2: A comparison of winter maintenance policies and programs from Minneapolis and seven other Minnesota cities. Average annual snowfall data was collected from the National Oceanic and Atmospheric Administration (NOAA).

\*2015 U.S. Census estimates.

At a Glance: Minnesota Cities Sidewalk Summary							
Municipality Background Information				Policies			
City, State	Population*	Estimated Miles of Sidewalks	Average Annual Snowfall (NOAA)	Winter Priority Network(s)	Sidewalk Snow and Ice Clearing Responsibility	Time to clear all sidewalks with City staff or contractors	Time allowed to property owners to clear sidewalks
Minneapolis, MN	410,939	1,910	52"	Pedestrian Street Lighting Corridor establishes priorities for corner clearing program	Property owners	Not applicable	24 hours after snowfall for single family homes and duplexes; Four daytime hours (after 8 am) for all other properties
Bloomington, MN	85,826	270	52"	Sidewalks without buffer zones; school routes	City	24 for primary routes- 48 for secondary	Not applicable
Saint Louis Park, MN	47,043	113	53"	School routes, higher volume streets	Partial City/partial property owners	24	Same day if six hours of sunlight left or by noon next day
Shoreview, MN	25,951	<20	52"	Schools first, all sidewalks in one day	City	24	Not applicable
Golden Valley, MN	20,866	50	53"	Priority 1: Schools, County roads, bus routes	City	24	Not applicable
Plymouth, MN	73,896	58	52"	Sidewalks without buffer zones; connections to shared use paths	Partial City/partial property owners	24	24 hours after a snowfall
Saint Paul, MN	300,840	1,026	51"	Not applicable	Property owners	Not applicable	24 hours after a snowfall
Rochester, MN	110,275	534	52"	Not applicable	Property owners	Not applicable	24 hours after a snowfall

## Summary of City and Agency Review

### Winter Maintenance of Pedestrian Facilities

#### ➤ **ADA Requirements**

The American with Disabilities Act (ADA) calls for communities to maintain pedestrian facilities to ensure accessibility. The Federal Highway Administration has clarified the law to apply “maintenance” to include reasonable snow clearing. The U.S. cities researched were generally aware of this responsibility.

#### ➤ **Increased Public Communication and Reporting Methods**

Almost all the cities researched were found to have at least one means of soliciting reports of inaccessible sidewalks due to snow and ice, such as calling by phone, text messaging, emailing, online reporting, or via a smartphone application. Many also used public service announcements to encourage property owners to comply with snow clearing requirements. More and more cities are using social media to give snow clearing updates, but most of these are focused on street conditions rather than conditions related to walking and bicycling.

#### ➤ **Citations for Non-Compliance**

Communities have varying inspection and enforcement processes when property owners do not clear snow and ice from sidewalks. In many communities, a soft approach is taken where more education is conducted, warnings are issued, and 1-2 days is given to property owners to clear snow and ice from sidewalks after warnings. Other cities do not issue warnings and require same day snow and ice clearing, or they will issue a citation. Each city is governed by different city ordinances and state statutes, providing a different legal framework which may guide their approach on citations for non-compliance.

#### ➤ **Assistance Programs for Seniors or People with Disabilities**

Some cities manage programs to assist seniors and people with disabilities with clearing snow and ice from their sidewalks if adjacent property owners are responsible for winter maintenance.

#### ➤ **Priority Sidewalk Network**

Several communities defined priority routes for sidewalk winter maintenance. Priority routes are typically identified using criteria such as expected pedestrian usage and presence of high demand destinations such as schools, hospitals, universities, and commercial areas. How routes are prioritized may define the order in which they are cleared and/or inspected for enforcement.

#### ➤ **Bus Facility Snow and Ice Clearing**

In most cities, clearing snow and ice around bus facilities is the responsibility of the transit agency or adjacent property owners. The City of Madison takes responsibility for clearing snow and ice from bus facilities and has four dedicated employees that clear facilities throughout the winter. In other seasons, these employees work in different City departments and conduct other seasonal work, such as park maintenance.

#### ➤ **Citywide Sidewalk Clearing**

Six of 13 cities that were reviewed were selected because they take responsibility for sidewalk snow clearing citywide. These cities vary significantly in population, land use, size of sidewalk network, and governing structure. In some of these cities, City staff performs the work with City-owned equipment and resources. In others, private contractors are hired to clear sidewalks. Some clear sidewalks and paths along major arterial streets only, while property owners on other streets are responsible for clearing sidewalks along their properties.

## Winter Maintenance of Bicycle Facilities

### ➤ **Evolving Technology and Communication Methods**

Technology and communication methods are rapidly changing, and cities are embracing these technologies to communicate with the public in new ways. Social media channels are increasingly utilized by municipalities to communicate important messages and updates.

### ➤ **Maintenance of Shared Use Paths**

Almost all the cities researched prioritized clearing snow and ice from shared use paths to ensure that select paths are reliably cleared of snow and ice for bicycle commuters. Due to increased winter maintenance operations, shared use paths are gaining recognition for providing year-round non-motorized transportation options and recreational opportunities.

### ➤ **Standard On-Street Bike Lanes**

Standard on-street bike lanes, whether adjacent to the curb or adjacent to a parking lane, will often experience encroachment of snow and ice and/or parked vehicles. Once the snow and ice builds along the curb line, it often becomes frozen and removing it is difficult or impossible until weather conditions allow, special operations can be conducted, or the season ends.

### ➤ **Bikeway Design Impacts Winter Maintenance**

Bikeway design can have a significant impact on maintenance operations. Research found that the two design characteristics that have the biggest impact on winter bikeway maintenance operations for protected bike lanes are bikeway width and buffer design. Wider bikeways can accommodate pick-up trucks with standard snow plows, while narrower bikeways require specialty equipment to navigate the constrained areas, which may not be as readily available as pickup trucks. Buffer zones on the sides of curb-level protected bike lanes and shared use paths provide space for snow storage in winter and help reduce the need for snow removal operations, as well as providing a visual and physical buffer between the bike lane and motor vehicle lane.

### ➤ **Flexible Delineators**

One of the most common forms of separation between motor vehicles and on-street protected bike lanes are flexible delineators. Flexible delineators are secured to the pavement and provide vertical separation between motor vehicle travel lanes and bike lanes. They are a relatively cost-effective, easy, and quick tool for implementing on-street protected bikeways. However, they also present an extra challenge for winter maintenance, particularly with plowing equipment. Flexible delineators are easily displaced when struck by a snow plow, dislodged when heavy snows are plowed against them, and some become brittle in cold weather and are prone to cracking. They also require budgetary consideration for replacement of lost or damaged delineators. They require additional operations and expense to clear around and between the delineators to avoid run-off from melting windrows to create icing conditions in the bike lanes.

### ➤ **Pre-treatment with Salt Brine**

More cities, including Minneapolis, are experimenting with salt brine applied before snowfalls, known as anti-icing, on shared use paths and curb level separated bikeways that may reduce the amount of salt usage after snow events, or provide for the ability to meet service level goals more quickly.

### ➤ **Prioritized Winter Maintenance Networks**

Priority winter maintenance networks are used to define the order in which routes are cleared of snow and ice after a snowstorm, for prioritizing sidewalk compliance inspection, and to communicate to pedestrians and bicyclists when they can expect those routes to be cleared. Of the 13 cities reviewed for this study, nine of them have some form of a priority winter maintenance network.



## SECTION 3: ALTERNATIVE WINTER MAINTENANCE OPTIONS

### Introduction and Background

The purpose of the alternative winter maintenance options is to enhance the quality and consistency of clearing snow and ice from sidewalks and bikeways, which would improve safety, accessibility and mobility for those who rely on walking, biking or taking transit, and could encourage more people to walk and bike in the winter.

The identified options could replace or augment existing winter maintenance practices for pedestrian and bicycle facilities. The options are based on the research, knowledge of City of Minneapolis existing practices and policies, feedback from the Minneapolis Pedestrian Advisory Committee (PAC), the Minneapolis Bicycle Advisory Committee (BAC), the Minneapolis Advisory Committee on Aging (MACA), the Minneapolis Advisory Committee on People with Disabilities (MACOPD), and suggestions from the project Technical Advisory Committee (TAC). The options are divided into four sections based on mode (pedestrian options and bicycle options) and approximate time to implement (short-term and long-term). Short-term and long-term options are described as:

- **Short-term** ≤2 years
- **Long-term** 2+ years

This study does not recommend or prioritize one option over another, or make recommendations. The study provides information and options for staff and policy makers to consider. Some of the options could be used in conjunction with each other, and some are mutually exclusive. Some of the options are also contingent upon the development of preceding options; these relationships are described in this section when applicable.

### Implementation Cost Estimates

Cost estimates are categorized as low, medium, or high cost as defined below. Although low cost options may be performed with existing City staff and resources, implementing those options will reduce the time those employees and resources could be dedicated to other duties and therefore would result in trade-offs with other priorities.

**Low cost** – Anticipated to be performed with existing City staff, equipment, and resources

**Medium cost** – May require the purchase of new or additional equipment, and/or hiring private contractors or additional City employees to perform work

**High cost** – Likely to require the purchase of new or additional equipment, and/or hiring private contractors or additional City employees to perform work

## Pedestrian Winter Maintenance Options

Table 3: A list of alternative pedestrian maintenance options, along with their relationship to other options.

Category	Option	Option Title	Use in Conjunction with Option(s)
Short-term	P1	Designate a Winter Pedestrian Priority Network	P2, P7
	P2	Implement Sidewalk Clearing Inspection & Enforcement Process Improvements	P4
	P3	Implement Snow and Ice Clearing Assistance Programs for Select Populations	P4
	P4	Develop an Expanded Sidewalk Winter Maintenance Awareness Campaign	P1, P2, P3
	P5	Update and Improve the City's Winter Maintenance Webpage	P7
	P6	Enhance Winter Maintenance Data Collection	P2, P4
Long-term	P7a/P7b	Implement a Partial City-led Sidewalk Clearing Program	P1
	P8a/P8b	Implement a Citywide City-led Sidewalk Clearing Program	P1; replaces P2 – P3, P7

## Short-term Pedestrian Winter Maintenance Options

### P1: Designate a Winter Pedestrian Priority Network

#### *Possible Benefits:*

- Prioritize and target investments for enhanced winter maintenance options such as proactive compliance inspections and City-led sidewalk snow and ice clearing

#### *Possible Challenges:*

- Identifying a winter pedestrian priority network that differs from the pedestrian street light corridors network, the snow emergency routes, or other existing networks, could prove challenging to communicate and understand

*Implementation Cost Estimate:* Low

*Cost Assumptions:* City staff lead a prioritization study

#### **Summary**

The City of Minneapolis currently uses the Pedestrian Street Lighting Corridor (PSLC), formerly known as Pedestrian Priority Corridors (PPC), to establish priorities for its winter corner clearing program. The [pedestrian street lighting corridors map](#) was developed as part of the Minneapolis Street Lighting Policy and was most recently updated in 2015. The City could evaluate the PSLC map to determine if it adequately establishes priorities related to pedestrian winter maintenance. After evaluating the PSLC, the City may choose to continue the designation of those routes as a pedestrian winter maintenance priority network, or recommend a distinct winter pedestrian priority network based on specific pedestrian winter maintenance needs. Once established, the winter pedestrian priority network could be used in conjunction with other winter maintenance options described in this study. The total mileage of a winter pedestrian priority network directly informs the estimated costs of other winter maintenance options that are used in conjunction with the winter pedestrian priority network.

Input and feedback from the PAC identified the following potential criteria for designating a winter pedestrian priority network:

- High usage bus corridors
- Senior housing properties
- Low car ownership areas/neighborhoods
- Areas around schools (coordinated with the [Minneapolis Walking Routes for Youth map](#))
- Major commercial destinations and corridors
- Estimated pedestrian volumes
- Areas or neighborhoods of low income
- Streets without boulevards/buffer space
- Major barrier crossings (i.e. highways, rivers, railways)
- Areas around hospitals

## P2: Implement Sidewalk Clearing Inspection & Enforcement Process Improvements



### *Possible Benefits:*

- Higher rate of property owner compliance for snow and ice clearing
- Quicker response time for contractors to clear non-compliant properties

City staff to pursue immediately

### *Possible Challenges:*

- Additional analysis recommended, based on deficiencies in current data set, in order to fully evaluate the current process for improvements
- Implementing shorter contractor response times would likely result in higher costs, which are passed along to property owners
- Process improvements may require modifications to existing computer software which have been custom designed
- Eliminating initial inspections, while saving time, eliminates an opportunity to verify the existence and address of a complaint and/or non-compliance

*Implementation Cost Estimate:* Low to Medium

*Cost Assumptions:* TBD whether staff capacity exists or would require additional staff resources

### **Summary**

The City generally enforces sidewalk snow and ice clearing non-compliance in response to public complaints reported through 311, as well as some internal reporting. When non-compliance is reported, a case is created and the City mails a Notice of Violation (NOV) to the property owner allowing for up to three working days for processing and mail delivery. City inspectors then examine the sidewalk for compliance. If the sidewalk remains non-compliant, the City issues a work order to a contractor to clear the sidewalk. The contractor is allowed up to 72 hours to respond to the work order.

The enforcement process was streamlined in 2016 by eliminating an initial inspection to verify non-compliance before an NOV was sent. Currently, this process, in full, takes between 6-8 days or longer. The timeline resets if another snow event occurs during this timeline. Public Works is currently evaluating the impacts of eliminating the initial inspection which, while saving time in the process, was an opportunity to verify the existence and location of a complaint and/or non-compliance. The risk of NOVs being mailed to incorrect addresses is the resulting concern.

The City could explore ways to further reduce this timeline, including:

- Keep moving through the process even if there is a new snow event
- Reduce the contractor response time
- Introduce fines on top of the clearing charge
- Identify a second process for repeat or chronic properties with noncompliant sidewalks

In addition to further improving upon the reactive, complaint driven process, the City could evaluate implementing citywide proactive sidewalk inspections.



### P3: Implement Snow and Ice Clearing Assistance Programs for Select Populations

#### *Possible Benefits:*

- Higher rate of sidewalk clearing compliance for select populations
- Consistent and equitable offering of services City-wide

#### *Possible Challenges:*

- A City-led program would compete with existing neighborhood-led programs
- Difficult to estimate cost to administer such a program

*Implementation Cost Estimate:* Low to Medium

*Cost Assumptions:* City staff perform administrative tasks and program management  
TBD whether staff capacity exists or would require additional staff resources

#### **Summary**

Clearing snow and ice from sidewalks can be challenging for certain populations, including older adults and people with disabilities. There are several organizations in Minneapolis that provide snow clearing services to seniors, including neighborhood-level programs like the [Longfellow Snow Shoveling Network](#). Some organizations match people in need of assistance with volunteers, while other organizations simply provide information to seniors about affordable snow shoveling services, such as the [Northeast Senior Services](#). The City could seek to partner with these existing organizations in an effort to increase participation by raising awareness and promoting the services provided by these organizations. The cost to the City in forming a partnership is anticipated to be low however there could be increased administrative costs to the organizations as a result of increased participation and how these costs are handled would require additional conversation.

Another option is for the City to create and manage a citywide program to assist with clearing snow and ice from sidewalks for select populations. While older adults or those with physical disabilities are often identified for assistance programs, the City could collect and evaluate additional data to determine if these are the populations most in need of assistance based on compliance rates or if there are other criteria that should be considered.

The program could be structured such that those who meet low-income requirements could receive free or reduced rate assistance from the City, while those who do not meet the low-income requirements may be directed to private contracting companies or local volunteers. Creating and managing a citywide program would require City staff for administrative and program management work, further evaluation is needed to determine if existing staff capacity is adequate to take on this effort or if additional staff resources would be required.

## P4: Develop an Expanded Sidewalk Winter Maintenance Awareness Campaign



### Possible Benefits:

City staff to pursue immediately

- Create a more visible message
- Opportunity to further promote use of 311 for reporting complaints and/or non-compliance
- Identify new technology for reporting complaints and/or non-compliance
- Increase knowledge of winter maintenance responsibilities including sidewalks, corners, and bus stops
- Higher rate of sidewalk clearing compliance

### Possible Challenges:

- Will be difficult to measure effectiveness
- High reliance on digital and social media will miss certain populations entirely
- Hard copy materials are high cost

Implementation Cost Estimate: Low

Cost Assumptions: May require assistance from specialized consultant

### Summary

The City has made an effort in recent years to encourage residents to shovel their sidewalks and provide more sidewalk snow clearing information to the public via their website and social media accounts. However, there is an opportunity to create greater awareness on the importance of sidewalk snow and ice clearing and the City's enforcement policies.

The awareness campaign could focus on:

- Educational messaging regarding property owner responsibilities for snow and ice clearing, including;
  - Clearing sidewalks at bus stops
  - Clearing windrows left at bus stops, driveways and alley entrances
- Clear messaging regarding **why** snow and ice clearing is so important
  - Use the perspective of those most negatively impacted when sidewalks are not accessible
  - Use the perspective of Safe Routes to School and possibly partner with the Minneapolis Public Schools
  - Encouraging all residents to help be part of the solution
- Engage with the community to ensure that the best communication tools to reach community members are identified and implemented
  - Neighborhood organizations know their communities best and often have great suggestions for ways to get the word out
- Reinforce the use of 311 to report complaints and/or non-compliance
  - The City's current system generally relies on voluntary reporting
  - Communicate how the system currently works and **why** reporting complaints and/or non-compliance is critical to its success
  - The City could pursue a process improvement to ensure reporting can be done anonymously
- Educational messaging regarding where to clear snow
  - Ensuring that snow is not cleared into on-street bike lanes

## P5: Update and Improve the City's Winter Maintenance Webpage



### Possible Benefits:

City staff to pursue immediately

- Increase awareness of City policies and practices
- Opportunity to further promote use of 311 for reporting complaints and/or non-compliance
- Increase knowledge of winter maintenance responsibilities including sidewalks, corners, and bus stops
- Opportunity to report progress toward improved winter maintenance performance
- Higher rate of sidewalk clearing compliance

### Possible Challenges:

- Will be difficult to measure effectiveness
- High reliance on digital media will miss certain populations entirely

Implementation Cost Estimate: Low

Cost Assumptions: City staff perform work

### Summary

The [City of Minneapolis' existing 'Snow Shoveling' webpage](#) includes information on:

- The City's sidewalk snow and ice ordinance
- When, what and how to shovel
- The free sand program
- Tips for snow and ice clearing
- How to report a complaint and/or non-compliance

Currently, the webpage does a poor job of describing **why** snow and ice clearing is so important. The webpage should provide this information, and should use the perspective of those most negatively impacted when sidewalks are not accessible and also encourage all residents to help be part of the solution.

Additionally, the current webpage asks visitors if they “want to go the extra mile” with a link and information to report complaints and/or non-compliance provided. However, given the City's current system generally relies on voluntary reporting, this could be a much more direct request of visitors of the webpage rather than a suggestion that implies doing so is beyond what is expected. As previously indicated, the ability to report anonymously should also be investigated.

The City could also expand the content and include additional key resources and information specific to pedestrian and bicycle winter maintenance, such as:

- A sidewalk snow removal FAQs
- Winter walking and bicycling tips and resources
- Information regarding the environmental dangers of high salt usage on sidewalks including tips on how to reduce the application of salt on sidewalks

## P6: Enhance Winter Maintenance Data Collection

### *Possible Benefits:*

- Comprehensive understanding of snow and ice clearing compliance and non-compliance
- New data could be used for a variety of purposes, including identifying best practices, prioritizing inspections or focus education and outreach campaigns, and identifying systemic issues that may merit policy or practice modifications
- Help track winter maintenance performance over time and analyze results of implementing new policies or practices

### *Possible Challenges:*

- Scheduling data collection efforts around weather events which are unpredictable

*Implementation Cost Estimate:* Low to medium

*Cost Assumptions:* TBD whether staff capacity exists or would require additional staff resources

### **Summary**

The City has been collecting sidewalk snow and ice complaint data from 311 for several years. This data contains information pertaining to non-compliance, including the location of reported issues. The quantity of calls tends to rise during winters with more snow, and it drops during winters with less snow.

It is recognized that the 311 data is incomplete because not all complaints and/or non-compliance are reported. Therefore, the City does not know the magnitude of unreported violations. To gain a more comprehensive understanding of snow and ice sidewalk compliance and non-compliance, the City could increase its efforts to encourage residents to report non-compliant sidewalks through 311. More 311 data may provide a more accurate reflection of the state of sidewalk winter maintenance in the City.

Another option would be to initiate comprehensive winter maintenance data collection in addition to the 311 data. The data collection program could have a very different model for collecting data that does not rely on the public to report complaints and/or non-compliance. If citywide proactive sidewalk inspections are pursued, data collection could be part of the inspection process.

A more complete data set is expected to help better understand the magnitude of non-compliance with respect to winter maintenance such that proposed solutions are right-sized to the problem they are intended to solve.



## Long-term Pedestrian Winter Maintenance Options

### P7a/P7b: Implement a Partial City-led Sidewalk Clearing Program

#### *Possible Benefits:*

- Improve consistency of sidewalk clearing along winter pedestrian priority network
- Predictable level of service along winter pedestrian priority network

#### *Possible Challenges:*

- City-led clearing may not happen as quickly as would be possible if property owners were clearing
- May be confusion regarding when City-led services would be initiated versus when property owner-led efforts would be required
- Snowfall amounts less than the threshold for City-led services may be ignored, resulting in compacted snow and icy conditions
- Relief for some property owners may raise questions regarding equity

*Implementation Cost Estimate:* High

*Cost Assumptions:* Uses winter pedestrian priority network to define where City-led services would be provided

Winter pedestrian priority network is assumed to be 20% of the city's total sidewalk mileage

TBD whether staff capacity exists or would require additional staff resources

TBD whether equipment capacity exists or would require additional equipment resources

### Summary

The City could take on responsibility for clearing snow and ice from sidewalks on a winter pedestrian priority network. There are two options to implement this, P7a and P7b, which differ in the snow thresholds that trigger City-led snow clearing services.

In option P7a, City-led services would be deployed to clear winter pedestrian priority network sidewalks anytime a snowfall has reached a defined minimum depth. It is assumed that any snowfall less than a certain depth would remain the responsibility of the adjacent property owner, including treating or clearing ice on sidewalks. The depth threshold may be adjusted based on public expectations and available resources. Based on snowfall data collected since the winter of 2009-2010, Minneapolis annually receives snowfalls with:

- 0.1" or greater 21 times on average
- 1" or greater 10 times on average
- 2" or greater 8 times on average, and
- 4" or greater 3 times on average

In option P7b, the City would clear sidewalks along a winter pedestrian priority network after every snowfall, regardless of snowfall depth.

## P8a/P8b: Implement a Citywide City-led Sidewalk Clearing Program

### *Possible Benefits:*

- Improve consistency of sidewalk clearing citywide
- Predictable level of service citywide
- Relieve property owners of the physical responsibility of snow clearing for some or all snow events

### *Possible Challenges:*

- City-led clearing may not happen as quickly as would be possible if property owners were clearing
- Unknown whether the region has contractor capacity to meet expectations, which may impact feasibility and/or drive up costs
- May be confusion regarding when City-led services would be initiated versus when property owner-led efforts would be required
- Snowfall amounts less than the threshold for City-led services may be ignored, resulting in compacted snow and icy conditions

*Implementation Cost Estimate:* High

*Cost Assumptions:* Clearing performed by contractor(s)

Total citywide sidewalk mileage approximately 1,910 miles

City staff oversight of contractor(s)

## Summary

This option would develop a citywide sidewalk snow clearing program performed by private contractor(s). There are two options, P8a and P8b, which differ in the snow thresholds needed to trigger snow clearing services.

In option P8a, contractors would be deployed to clear snow after a snowfall reaches a certain threshold. In this scenario, snowfall amounts less than the threshold would remain the responsibility of the adjacent property owner, including treating or clearing ice on sidewalks. The depth threshold may be adjusted based on public expectations and available resources. Based on snowfall data collected since the winter of 2009-2010, Minneapolis annually receives snowfalls with:

- 0.1" or greater 21 times on average
- 1" or greater 10 times on average
- 2" or greater 8 times on average, and
- 4" or greater 3 times on average

In option P8b, contractors would be responsible for clearing snow from sidewalks regardless of snowfall depth. Since contractor crews would be deployed far more times in option P8b, this option would cost significantly more than P8a.

## Bicycle Winter Maintenance Options

Table 4: Bicycle maintenance options, along with their relationship to other options.

Category	Option	Option Title	Use in Conjunction with Option(s) ...
Short-term	B1	Designate a Winter Bicycle Priority Network	B3, B4
	B2	Develop a Bikeway Winter Maintenance Awareness Campaign	
Long-term	B3	Define Standard Level of Service for Clearing Winter Bicycle Priority Network	B1
	B4	Develop a Regional Winter Bicycle Priority Network	B1, B3

## Short-term Bicycle Winter Maintenance Options

### B1: Designate a Winter Bicycle Priority Network

#### *Possible Benefits:*

- Prioritize and target investments for bicycle winter maintenance
- An understanding of what can be reasonably expected in terms of snow and ice clearing along the priority network

#### *Possible Challenges:*

- Identifying a winter bicycle priority network that differs from the snow emergency routes, or other existing networks, could prove challenging to communicate and understand

*Implementation Cost Estimate:* Low

*Cost Assumptions:* City staff lead a prioritization study

#### **Summary**

The City currently has crews dedicated to clearing protected bike lanes, shared use paths and off-street trails with a stated goal of clearing snow within 24 hours after a snowfall has ended. Snow clearing of standard, on-street bicycle facilities follows the timeline for the street on which the facility is located.

Designating a winter bicycle priority network would allow bicyclists to have reasonable expectations of the bicycle routes that will be cleared of snow and ice after a snow storm and how quickly the work would be completed. The bicycle network in Minneapolis is dense and connections between on-street and off-street facilities are common. Combining both types of facilities in a bicycle priority network is expected to be complex given the different approaches to snow and ice clearing between these different types of facilities and in particular the ongoing interaction between cleared bicycle lanes on-street and the plowing of adjacent travel and/or parking lanes.

The BAC identified the following potential criteria for developing a winter bicycle priority network:

- Connectivity with other priority routes
- Spacing between priority routes
- Estimated existing bicycle volumes
- Facility type (e.g., buffered bicycle lane, bicycle boulevard, standards bike lanes)
- Connectivity to destinations and commercial corridors

## B2: Develop a Bikeway Winter Maintenance Awareness Campaign



### *Possible Benefits:*

- Reduce snow clearing into bikeways
- Increase knowledge of recommended winter maintenance practices near bikeways

City staff to pursue immediately

### *Possible Challenges:*

- Will be difficult to measure effectiveness
- High reliance on digital and social media will miss certain populations entirely
- Hard copy materials are high cost

*Implementation Cost Estimate:* Low

*Cost Assumptions:* May require assistance from specialized consultant

The City has made an effort in recent years to increase communication when it comes to snow events. However, there is an opportunity to create greater awareness especially as it relates to both pedestrian and bicycle winter maintenance. These efforts can work together.

The awareness campaign could focus on:

- Educational messaging regarding property owner responsibilities for snow and ice clearing, including;
  - Ensuring that snow is not cleared into on-street bike lanes
  - Use the perspective of Safe Routes to School and possibly partner with the Minneapolis Public Schools
  - Encouraging all residents to help be part of the solution
- Engage with the community to ensure that the best communication tools to reach community members are identified and implemented
  - Neighborhood organizations know their communities best and often have great suggestions for ways to get the word out

## Long-term Bicycle Winter Maintenance Options

### B3: Define Standard Level of Service for Clearing Winter Bicycle Priority Network

#### *Possible Benefits:*

- Improve reliability of having cleared and/or treated bicycling routes
- Improve on-street bike lane conditions on the winter bicycle priority network
- Remove gaps in the bikeway system caused by encroached upon on-street bike lanes
- An understanding of what can be reasonably expected in terms of snow and ice clearing along the priority network

#### *Possible Challenges:*

- Increased need for parking enforcement, signage, and towing
- Possibility for competing information and confusion if different than standard timeframes for snow emergencies

#### *Implementation Cost Estimate:*

Medium to High

#### *Cost Assumptions:*

Uses winter bicycle priority network

TBD whether staff capacity exists or would require additional staff resources

TBD whether equipment capacity exists or would require additional equipment resources

### Summary

If a winter bicycle priority network is established, the City could define a standard level of service related to these routes. The standard level of service could include:

- Timeframes for clearing and/or treating snow and ice
  - As previously stated, a 24 hour goal already exists for protected bike lanes and off-street paths and trails, all other routes follow the timeline associated with the street they are located on
- Frequency of snow and ice clearing and/or treatment
  - This could help combat the ongoing challenge of snow and ice clearing between different types of facilities and in particular the ongoing interaction between cleared bicycle lanes on-street and the adjacent travel and/or parking lanes
- Quality of clearing
  - Is the goal bare pavement or not, what is reasonable and feasible
  - What types of treatments are used

Standard bike lanes are typically cleared of snow at the same time as the streets they are located on. However, the challenge with many on-street bike lanes is that they are adjacent to parked cars, which can create on-going issues in the winter time with snow, ice, and slush that is splashed into the bike lane, which often freezes and can become dangerous for bicyclists. To help mitigate this issue, the City could temporarily restrict parking on portions of the



winter bicycle priority network that have on-street bike lanes adjacent to parked cars. Temporarily restricting parking on these streets would allow the City's snow plows to periodically clear all snow and ice from the on-street bike lanes and adjacent parking lanes. However, there could be significant challenges in communicating and enforcing temporary parking restrictions especially along routes that are also snow emergency routes.

## **B4: Develop a Regional Winter Bicycle Priority Network**

### *Possible Benefits:*

- Prioritize and target investments for bicycle winter maintenance
- An understanding of what can be reasonably expected in terms of snow and ice clearing along the priority network

### *Possible Challenges:*

- Identifying a winter bicycle priority network that differs from the snow emergency routes, or other existing networks, could prove challenging to communicate and understand

*Implementation Cost Estimate:* Low

*Cost Assumptions:* City staff lead a prioritization study, in partnership with other agencies

### **Summary**

Building off a Minneapolis winter bikeway priority network, the City could coordinate with the Metropolitan Council and surrounding counties, municipalities, and agencies to develop a regional winter bikeway priority network. A prioritized network conveys to bicyclists the routes they can expect to be cleared and the time to expect routes to be cleared after a snowfall.

## STUDY SUMMARY

The alternatives described in this report are the result of research, interviews with staff from Minneapolis and other cities, guidance from the project's Technical Advisory Committee (TAC), and feedback from several Minneapolis advisory committees. The project team would like to thank the TAC, Minneapolis Pedestrian Advisory Committee (PAC), Minneapolis Bicycle Advisory Committee (BAC), Minneapolis Advisory Committee on Aging (MACA), and Minneapolis Advisory Committee on People with Disabilities (MACOPD) for their support and feedback during the study. The project team would also like to thank the volunteers who took part in the Winter Facilities Trial Evaluation during the winter of 2015-2016. The results of that effort were evaluated as part of this study.

## NEXT STEPS

Following the completion of the study, the City will continue to engage with the PAC, BAC, and other groups to present and discuss the alternatives from this report. The City also plans to host a public open house to present the study, gather community feedback, and generally discuss how winter maintenance of pedestrian and bicycle facilities can continue to be improved. The final report will be made available to the public and posted on the City's website.

Beginning in 2018, the City plans to update [Access Minneapolis](#), the transportation action plan that addresses a full range of transportation options and issues, including pedestrians, bicycles, transit, automobiles, and freight. The City recently assessed several components of the plan and identified areas of focus for the transportation action plan update. Assessments were completed for the Pedestrian Master Plan, Bicycle Master Plan, Citywide Action Plan, and Design Guidelines for Streets and Sidewalks. When these components of *Access Minneapolis* are updated, there may be opportunities for the City to provide further direction and guidance on winter maintenance of pedestrian and bicycle facilities.

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# APPENDIX A: WINTER FACILITIES TRIAL EVALUATION (WFTE)

## Introduction and Background

The purpose of this section is to summarize the goals, results, and effectiveness of the City of Minneapolis' 2016 Winter Facilities Trial Evaluation (WFTE). On July 10<sup>th</sup>, 2015, the Minneapolis City Council took action to direct Public Works staff to conduct a bicycle and pedestrian facility winter maintenance evaluation to be piloted in the winter of 2015-2016.

City council members voted unanimously in favor of the following action:

*“Approval of a staff direction that Public Works staff conduct a bicycle and pedestrian facility winter maintenance evaluation to be piloted in the winter of 2015-2016. The evaluation should include examples of all bicycle facility types including off-street trails, protected bikeways, on-street bike lanes, and bicycle boulevards, and also include sidewalk snow clearing on pedestrian priority corridors. The results of this evaluation will help better define budget needs and practices for bicycle and pedestrian facilities.”*

The purpose of the evaluation was to determine the effectiveness of winter maintenance practices for bicycle and pedestrian facilities, and subsequently define budget needs. The evaluation included sidewalks, off-street shared use paths, protected bikeways, on-street bike lanes, and bicycle boulevards.

In partnership with over 80 volunteers, City staff piloted the evaluation process from early January to late March of 2016. There were 87 observation locations which included pedestrian-specific locations (sidewalks at street intersections), combined pedestrian and bicycle locations (non-motorized bridges), and bicycle-specific corridors (bicycle boulevards, on-street protected bikeways, on-street standard bikeways, off-street shared use paths). Although shared use paths are used by both pedestrians and bicyclists, the evaluation of shared use paths were categorized as bicycle locations for the purposes of this study.

The bicycle evaluation corridors were often several blocks long, so the winter maintenance analysis on those corridors was based on an approximate average for the entire length of the corridor. All the sites were selected by staff in response to recommendations from the Pedestrian Advisory Committee and the Bicycle Advisory Committee. In total, over 1,160 observations were collected at these 87 locations over approximately 3 months.



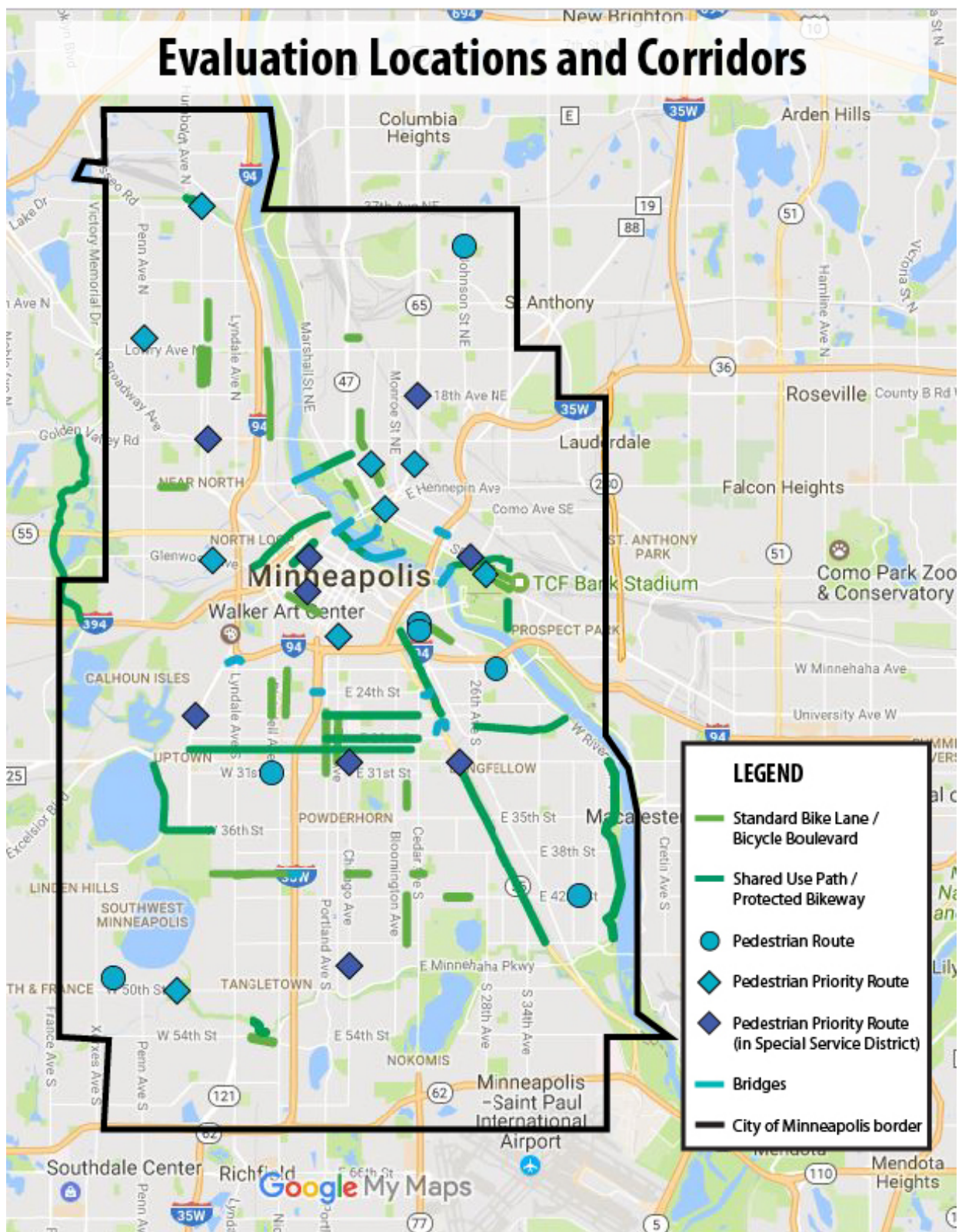


Figure 1: This map shows sites where winter maintenance data was collected within the city. Teal blue lines indicate bridges, light green lines show standard bike lanes or bicycle boulevards, darker green lines show shared-use paths or protected bikeways, dots show pedestrian routes, and diamonds illustrate pedestrian priority routes.

The characteristics used for selecting sites were as follows:

- Pedestrian:
  - Geographic representation across the city
  - A variety of [Pedestrian Priority Corridor \(PPC\)](#) and non-Pedestrian Priority Corridor locations (locations on a PPC may be prioritized by agency forces, particularly intersection corners that are part of the corner clearing program)
  - Areas within a Special Service District (SSD) and areas outside of a SSD (snow clearing within an SSD is generally performed by a contractor, paid for collectively by the businesses in the district, with clearing typically being quicker and more uniform than outside an SSD)
  - Near schools, senior public housing facilities, and in quieter neighborhood areas
- Bicycle:
  - Geographic representation across the city
  - Different facility types: on-street vs. off-street; protected vs. non-protected vs. bike boulevard; parking versus curbside running bike lane; City, County or MPRB maintained
  - Higher usage facilities
- Bicycle and Pedestrian Bridges
  - Geographic representation across the city

## Summary of Key Findings

The key findings from the pilot evaluation tool are summarized below. The winter of 2015-2016 was relatively mild and only had one major snow event (February 2<sup>nd</sup>, 2016) during the evaluation period that triggered a snow emergency. The lack of major snow events, along with the points below, resulted in findings for the pilot WFTE that are somewhat limited.

- The pedestrian and bicycle network was relatively clear for most of the study evaluation period, but because of limited winter precipitation events, the results cannot be extrapolated to average Minneapolis winters.
- There are several limitations of the WFTE that exist regardless of a mild winter, including the survey structure, the inconsistent time period for reporting data, and the required level of effort. These are summarized in the [Study Limitations](#) section.
- The study assessed data at limited points (87 points across entire city).
- During the observation period, snow depth and ice coverage were minimal on all facilities.
- During the week after the snow emergency was declared, snow depth and ice coverage increased on all segments (especially on bridge facilities with protected bicycle lanes).
- Bridge facilities had a higher percentage of observations that were not clear of ice and snow compared to other facilities.
- There were no clear performance targets set for each facility or the overall bicycle and pedestrian facility network before the WFTE was developed and deployed, so it is difficult to draw significant conclusions of the data results or overall bicycle and pedestrian facility network performance.

## Evaluation Methodology

At each pedestrian location and along each bicycle corridor, volunteers were instructed to observe and document the presence of:

- Snow coverage
- Ice coverage
- Impassible barriers

For both snow and ice observations, there was an open response field for volunteers to describe areas with impassible obstructions. Each observation was recorded using an online form, and included the location, date, and time of inspection. Volunteers made observations on a biweekly basis (six observations total over 12 weeks), and between 24 and 48 hours after a snowfall of two inches or more. Volunteers documented snow depth in three levels:

- None
- < 1 inch
- 1-3 inches
- 3 > inches

Volunteers also documented ice coverage of the areas they observed and documented the results within four categories:

- None
- <20 percent
- 20-50 percent
- > 50 percent



Figure 2: At the pedestrian locations, such as the intersection example above at Cedar Ave and Riverside Ave, sidewalks were evaluated (green areas) as well as corners outside of the curb ramps (orange areas).

Each pedestrian observation location included a separate evaluation of the facility outside of a crossing area or intersection, and within a crossing or intersection area. For example, sidewalk conditions were evaluated separately from the curb ramps and crosswalks. The pedestrian observation locations included green areas and orange areas (see Figure 2); the green areas included “the entire width of the sidewalk from the adjacent property line to the curb or boulevard”. The orange areas “extend three feet into the street from the bottom of each pedestrian ramp”. An example is shown in Figure 2 at Cedar Ave S and Riverside Ave.

Bicycle facility corridors also included observations for two different areas (see Figure 3): green areas (travel zones) which included “the portion of the bikeway between intersections, along blocks”; and orange areas, (intersection zones) which included “the logical continuation of the bikeway through intersections, including through crosswalks.”



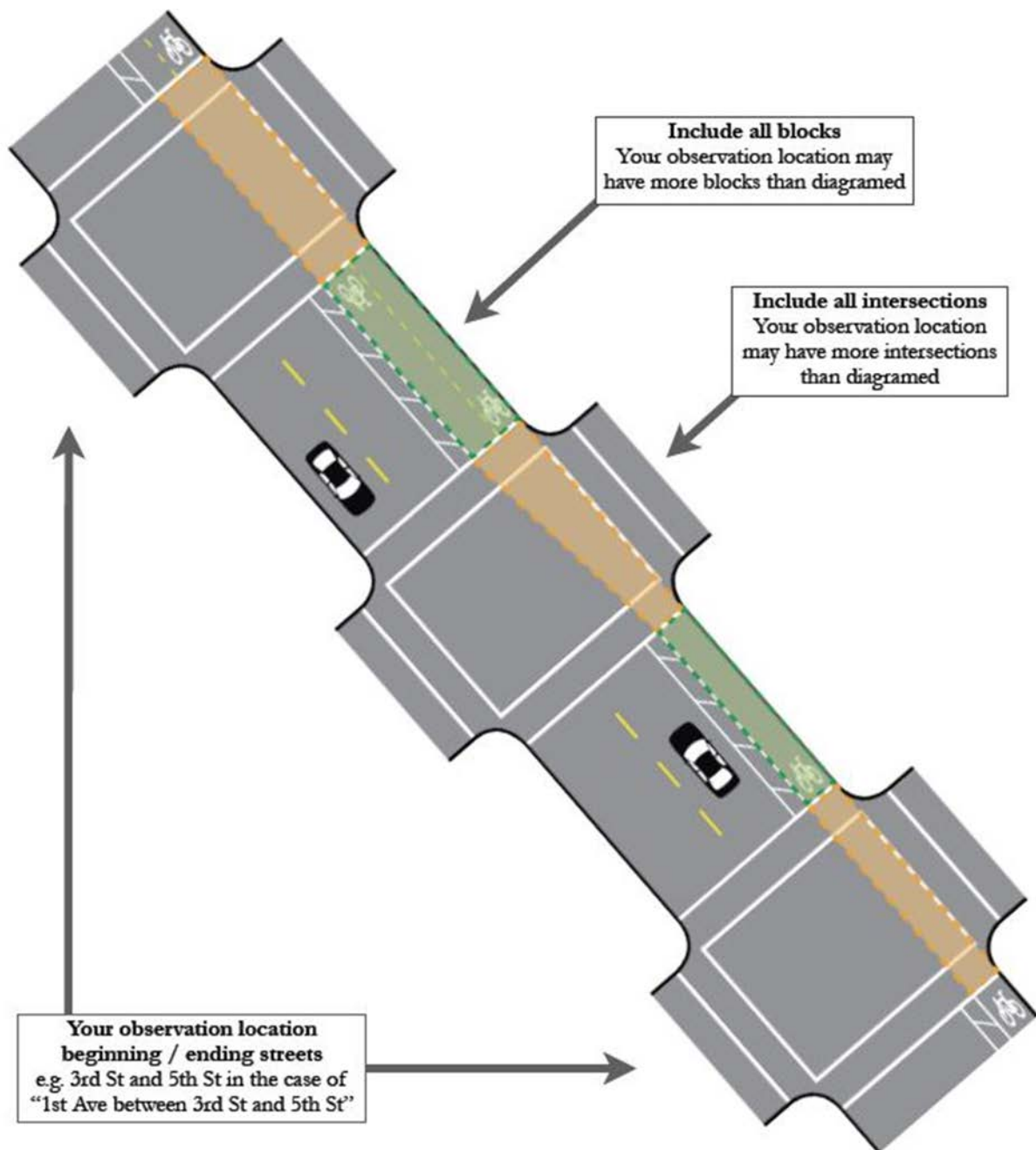


Figure 3: A typical example of a bicycle observation location, which included green areas (the portion of the bikeway between blocks) and orange areas (the logical continuation of the bikeway through the intersection).

Over 80 volunteers collected information on multiple occasions at 87 sites, totaling over 1,160 observations over the three-month data collection period. The volunteers were instructed to spend about 5 minutes for each observation, plus their travel time to and from the locations and time afterwards to input the data. Assuming a total of 30 minutes per observation, an estimated 580 volunteer-hours were used to collect data.

The WFTE data was evaluated and summarized in different categories to assess the results and determine the value of the tool. The data was evaluated by bridge facilities and non-bridge facilities, snow depth and ice coverage, travel zone and intersection zone, and snow emergency verses non-snow emergency. The purpose of the evaluation was to present all data in an organized and methodical manner to help determine the usefulness of the WFTE and whether it should be used in the future.

## Study Limitations

The evaluation tool has several limitations that reduce the value and usefulness of the study results. Some of the limitations of the WFTE are outlined below.

### Limited Evaluation Timeframe

There was only one significant snowfall during the timeframe the WFTE was piloted. Due to the limited weather events and the fact that the pilot only took place during one winter season, conclusions from the data is not necessarily reflective of typical maintenance practices.

### Lack of Performance Targets

There were no performance targets set before the WFTE was developed, deployed, or analyzed, so it was challenging to assess the results and therefore the value of the evaluation tool. For example, the time period that data was collected after the snow emergency on February 2<sup>nd</sup> was very inconsistent. If the City had a performance target of clearing all curb ramps within 48 hours of a snow event, volunteers could have been instructed to focus their keen attention to those specific areas between 48-72 after a snow event. The observations do not indicate if maintenance of the bicycle and pedestrian facility network met City standards.

### Ambitious Study Scope and Too Many Variables in Observation Data

The pilot study was ambitious in that it attempted to collect and analyze five different facility types and four different observation categories across the entire city. Too many variables were attempted to be measured citywide, which resulted in small sample sizes for each category that are not as meaningful and difficult to draw conclusions. Moreover, different facility types are very difficult to compare to each other because of variations on how to measure data on each.

### Observation Data Based on Volunteers' Interpretation and Judgement

Much of the data collected was based on how the volunteers interpret each of the data collection categories, which means that there are inconsistencies across volunteer data. For example, volunteers' interpretation of what 20% or 50% ice coverage looks like may be very different. Other variables in volunteer data collection include the date and time observations were made and the frequency of observations. The study was intended to be flexible for volunteers so that it was easier on them, but the flexibility in the data collection methodology results in inconsistent data.

### Weaknesses in Data Collection Methodology

It was not possible to evaluate pedestrian facilities separately from bicycle facilities in locations such as non-motorized bridges and shared use paths because many observation locations were listed as both bicycle and

pedestrian facilities (aggregated). There may be cases where a facility is clear for pedestrians, but not clear for bicyclists (or vice versa), so a single data point to represent the conditions for both does not provide enough information to assess both modes accurately. In the WFTE pilot, there were several observation locations that combined the condition evaluation (10 non-motorized bridges and 22 shared use paths). This not only means these sites can't be disaggregated for analysis, but that city-wide snapshots of conditions are compromised. This could be mitigated by presenting the performance of pedestrian facilities separately from bicycle facilities even where a facility serves both functions (such as a non-motorized bridge or a shared use path).

Furthermore, the volunteer observations describing impassible obstructions were not analyzed. Analysis was not possible because the question was framed as an open response instead of a binary question. Answers ranged from "no obstructions" to full paragraph descriptions. The information cannot be summarized without coding individual responses. Framing the question in a multiple-choice format would make observations easy to summarize.

## Summary of WFTE

- Due to study limitations, the Winter Facilities Trial Evaluation produced no significant results that will impact City processes related to winter maintenance.
- The number of volunteer hours for this effort illustrates the high level of effort of such a task; and given the results of the pilot, there is not a strong rationale to pursue a similar effort in the future.