

Nantucket Accessibility Survey



by
LilyAnne Lewis
Connor McGuirk
Paige Tencati

Nantucket Accessibility Survey

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by
LilyAnne Lewis
Connor McGuirk
Paige Tencati

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Mike Burns
Nantucket Planning Office

Professors Dominic Golding and Reinhold Ludwig
Worcester Polytechnic Institute

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Abstract

The goal of our project was to provide recommendations to the Nantucket Planning Office (NPO) on ways to improve the accessibility of the sidewalks in Downtown Nantucket and the bus stops along four main bus routes, while preserving its historic character. We surveyed the sidewalks, crosswalks, and curb ramps in Downtown Nantucket as well as the bus stops and added our collected data into GIS. We recommend that the NPO and Nantucket Regional Transit Authority (NRTA) create guidelines for the planning, design, construction, and maintenance of future bus stops and sidewalks. We also recommend that a map or list is created of the best accessible routes in and around Downtown Nantucket and the four main bus routes.

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Executive Summary

In every US community, accessibility has been a major focus since the implementation of the Americans with Disabilities Act (ADA) in 1990. The ADA put a major emphasis on improving the accessibility of public passageways such as sidewalks and bus stops. To provide accessibility, many communities have been required to allocate time, effort, and money into constructing features to comply with ADA standards. This poses many problems especially in historic communities due to the cost of preserving and accommodating historical features. One community that struggles to comply with these standards is Nantucket, MA.

The overall goal of this project was to provide recommendations to the Nantucket Planning Office (NPO) on ways to improve the accessibility of the sidewalks and bus stops of Nantucket while still preserving its historic and aesthetic character. To accomplish this goal we established five project objectives:

- **Objective 1:** A review of the current and best standards in the design of sidewalks and bus stops in historic areas.
- **Objective 2:** An inventory and assessment of the sidewalks of the Core Parking District of the Old Historic District of Nantucket.
- **Objective 3:** An inventory and assessment of the bus stops along the Madaket, Miacomet, Mid Island, and Sconset (via Old South) bus routes.
- **Objective 4:** Interviews to gauge the opinions of key stakeholders and decisions makers about the current conditions and future plans of the sidewalks.
- **Objective 5:** An Evaluation of design options to make recommendations to the Nantucket Planning Office.

To accomplish the project goal, we began by researching other historic communities that have updated the accessibility of their sidewalks and bus stops to meet current federal and state standards. We then created checklists for assessing the sidewalks and bus stops by creating, pretesting, and implementing a survey and protocols to gather consistent data. We also attempted to traverse our study area using a wheelchair.

We conducted one-on-one interviews with selected stakeholders and attended pertinent committee meetings to collect opinions on the current accessibility of the sidewalks and bus stops. We also asked for opinions on design recommendations for future construction. We then uploaded all of our findings into a database compatible with the GIS software used by the Town of

Nantucket. Based on our findings, we developed short and long term recommendations to the Nantucket Planning Office for future construction in the Old Historic District and along the bus routes.

Sidewalk and Crosswalk Findings:

After analyzing 101 sections of sidewalk and 37 intersections, our results showed that most sidewalks and crosswalks do not comply with ADA regulations. During our investigation, we rated each section of the surveyed sidewalks on a scale of 1 – 5, where a rating of 1 describes a section that is in very good condition and compliant with ADA standards, a rating of 4 describes a section that is in poor condition and in need of improvement to meet ADA regulations; a rating of 5 refers to a section that does not contain a sidewalk.

We found that 74% of the sidewalks sections surveyed in our study area were either in very good ('1') or good ('2') condition, while 11% were either in poor ('4') or very poor ('5') condition. The average rating of all sidewalk sections was 2.21. In our wheelchair investigation we found that it is easy to travel on a sidewalk with a rating of 1. However, any sidewalk with a rating of 2 or higher would require outside assistance to traverse.

One ADA required feature, which is absent from every curb ramp in our study area, is a detectable warning panel, such as the typical *truncated dome pad* seen in many other urban areas. The color and texture of these panels contrasts with the sidewalk and is used to signal the beginning or end of an intersection to those who are visually impaired. Using a set of photographs, we solicited the opinions of key stakeholders regarding the appropriateness of different panel designs for downtown Nantucket.

Bus Stop Findings:

We found that the majority of bus stops (123/144 or 85.4%) lack crucial requirements for accessibility required by the ADA. We rated these bus stops on a scale of 1 – 5. The best rating of 1 meant that the bus stop contained a blue marker, an ADA approved boarding area, and is accessible from a sidewalk or pedestrian passageway. The worst rating of 5 describes a bus stop that is not accessible, contains no boarding area, and is neither accessible by sidewalks nor features a pedestrian passageway. We found that 52 (or 36.1%) of the bus stops in the study area were in

very good ('1') or good condition ('2') while 34 (or 23.6%) of the bus stops in the study area were in poor ('4') or very poor ('5') condition. The average rating of all the bus stops was 2.76.

Conclusion 1: Maintenance of Sidewalks and Crosswalks

The majority of the sidewalks in the Core Parking District are in reasonable condition, but many still require substantial improvement to bring them into compliance with ADA and Massachusetts standards. Many crosswalks and curbs are missing, and many do not meet ADA guidelines, making it difficult for the disabled and mobility impaired to navigate safely. According to ADA guidelines, there must be an accessible path to all main buildings in any location, even historic communities. However, bringing them up to standard will be difficult given the cost and need to maintain aesthetic and historic character.

Recommendation 1.1: We recommend that the NPO develop a strategic plan for the Old Historic District that lays out priorities, a budget, and milestones for upgrading existing sidewalks, crosswalks, and curb ramps to meet ADA regulations each year.

Recommendation 1.2: We recommend that the NPO develop a similar strategic plan for the Old Historic District that lays out priorities, a budget, and milestones for adding *new* sidewalks, crosswalks, and curb ramps to meet ADA regulations each year.

Recommendation 1.3: We recommend that the NPO, the Historic District Commission (HDC), and the Commission on Disability (COD) develop design, construction, and maintenance guidelines for handicap infrastructure in the Old Historic District and elsewhere on the island, including crosswalks and curb ramps, to maintain aesthetic character.

Recommendation 1.4: As a short term solution, we recommend that the NPO develop materials/guidebooks regarding the current accessible buildings, features, and routes, and update the Nantucket Island Guide.

Conclusion 2: Maintenance of Bus Stops

The majority of the bus stops along the Madaket, Mid Island, Miacomet, and Sconset (via Old South) are in reasonable condition, but many still require considerable improvement to bring them into compliance with ADA and Massachusetts standards. Many do not contain proper

boarding areas, and many do not meet ADA guidelines, making it difficult for the disabled and mobility impaired to safely board the bus.

Recommendation 2.1: We recommend that the NRTA also develop a strategic plan for the bus stops and bus routes that lays out a budget and milestones for upgrading existing bus stops to meet ADA regulations, prioritizing stops that are used most frequently. We recognize that bringing these up to standard will be difficult given the costs, since the service is seasonal, many stops are infrequently used, and the ADA requirement for large paved pads seems inappropriate in the rural and aesthetic landscape of Nantucket. This is why we recommend a phased approach.

Recommendation 2.2: We recommend that the NRTA, the HDC, and the COD develop design, construction, and maintenance guidelines for accessible features located at each bus stop, including boarding areas, sitting areas, and pull offs.

Recommendation 2.3: We recommend that the NRTA, in the short term, develop informational material and a web page regarding current accessible bus stops and bus routes, and update the Nantucket Island Guide.

Authorship

Section	Primary Author	Secondary Author	Editors
1.0 Introduction	LL	CM, PT	ALL
2.0 Background	LL	CM, PT	ALL
2.1 United States Sidewalk Federal Accessibility Laws and Regulations	PT	LL, CM	ALL
2.2 Massachusetts Guidelines on Accessibility	PT	LL, CM	ALL
2.3 Historical Towns with Major Accessibility Issues	CM	LL, PT	ALL
2.4 Nantucket's History and Accessibility	LL	CM, PT	ALL
2.5 Summary	LL	CM, PT	ALL
3.0 Methodology	LL	CM, PT	ALL
3.1 Objective 1: Review the Current Standards and Best Practices	CM	LL, PT	ALL
3.2 Objective 2: Assess Sidewalks and Crosswalk Accessibility	CM	LL, PT	ALL
3.3 Objective 3: Assess Bus Stop Accessibility	PT	LL, CM	ALL
3.4 Objective 4: Gauge the opinions of key stakeholders	LL	CM, PT	ALL
3.5 Objective 5: Evaluate design options and make recommendations	LL	CM, PT	ALL
4.0 Findings and Analysis	LL	CM, PT	ALL
4.1 Sidewalk and Intersection Findings	CM	LL, PT	ALL
4.2 Bus Stop Findings	CM	LL, PT	ALL
4.3 Stakeholder's Opinions	PT	LL, CM	ALL
5.0 Conclusion and Recommendations	LL	CM, PT	ALL
Future Work	PT	LL, CM	ALL
Appendices	CM	LL, PT	ALL

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1.0 Introduction

Universal accessibility to all pedestrians has been a desired goal in the US since the passage of the Americans with Disabilities Act (ADA) in 1990. In 2012, it was reported that one in every five people have a disability in the United States, with more than half of them saying their disability was severe (Bernstein, 2012). Currently, mobility impairment is the largest segment of disabled individuals, and this segment is continuing to grow, especially as the population ages. Without properly maintained walkways and bus stops, accessibility to public transportation is difficult. Also, modifying buildings and urban infrastructure poses substantial challenges, especially in retrofitting older historic buildings and towns to make them meet ADA standards. One location facing this challenge is Nantucket.

Currently on Nantucket, about 12.5% of the population is comprised of seniors and 8.3% are individuals with disabilities (Coordinated Human Services Public Transportation Plan for the Nantucket Region 2015, Nantucket Planning and Economic Development Commission). Without safe walkways and accessible bus stops, this portion of Nantucket's population will have difficulties traveling between locations. As Nantucket is a popular tourist attraction in the warmer months, it would be ideal if the sidewalks on Nantucket met the standards listed on the ADA, while still preserving the historic feel of the island. Despite efforts of the local committees, most walkways currently do not meet ADA standards, walkability for the elderly and disabled is limited, and many sidewalks may pose a safety hazard for all, not just the disabled. Which of the walkways are missing curb ramps? Instead of yellow truncated dome pads, what would be a more viable option to match the aesthetics of the historic district? Are all of the sidewalks the correct width to meet ADA standards? Are there any obstructions that limit passing and how might they be addressed? These are the kinds of questions this project tries to answer.

The purpose of this project is to assist the Nantucket Planning Office, or NPO, in improving the accessibility of the sidewalks and bus stops in Nantucket. To understand this problem more thoroughly, we looked at other historic towns that faced similar problems, and observed how they attempted to fix these issues. Some examples of those towns include Beacon Hill, Cambridge, Newton, and Watertown, all located in Massachusetts. We also looked at the building guidelines established for Nantucket by the Historic District Commission, or HDC. This project catalogs all of the walkways downtown in the Old Historic District, as well as bus stops along four main routes (Mid Island, Miacomet, Madaket, and Sconset), and identifies all of the accessibility issues we

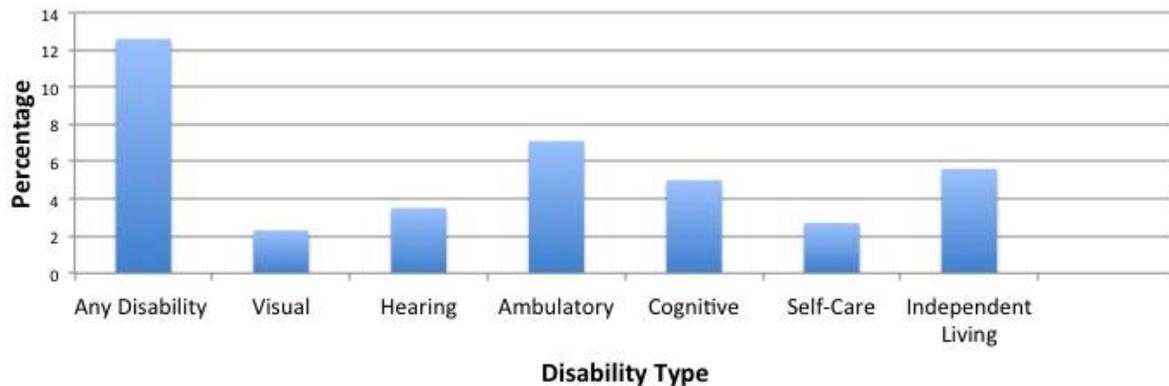
encountered. We also gathered the opinions of key stakeholders and committees regarding the current conditions of the walkways. Using our catalog, we created recommendations for updating and maintaining the sidewalks and bus stops for the NPO, which they can choose to implement to make Old Historic District more universally accessible, and make traversing on foot much easier for all, including the disabled and elderly.

2.0 Background

In this section we describe the laws and regulations in place concerning pedestrian mobility, as well as challenges faced when improving accessibility. We examine steps other locations have taken to update their walkways with consideration to their historical character, and the current condition of Nantucket's sidewalks, and possible ways to update them.

2.1 United States Sidewalk Federal Accessibility Laws and Regulations

The Census Bureau's 2013 American Community Survey found that almost 40 million people in the United States (or 12.6% of the population) have some kind of disability (Figure 2.1). Ambulatory disabilities are the most common type of disability, affecting more than 20 million people, or 7.1% of the population, in the United States. The proportion of ambulatory impaired individuals' climbs to 15.8% among those aged 64-79 and the overall numbers are expected to grow in the future as the population ages.



Disability Type	%	Number
Any Disability	12.6	39,187,600
Visual	2.3	7,327,800
Hearing	3.5	11,081,300
Ambulatory	7.1	20,639,200
Cognitive	5	14,637,400
Self-Care	2.7	7,775,300
Independent Living	5.6	14,005,400

*Note: Children under the age of five were only asked about Vision and Hearing disabilities. The Independent Living disability question was only asked of persons aged 16 years old and older.

Figure 2.1 Prevalence of disability among non-institutionalized people of all ages in the United States in 2013
(2013 Disability Status Report: United States, 2013)

People with disabilities need special accommodations to travel and get around in public places, but it is difficult for communities to fund these accessibility projects. To address these issues, in the past few decades the United States has developed laws and guidelines to help improve the accessibility of communities and towns. The Americans with Disabilities Act (ADA) and the Public Right-of-Way Accessibility Guidelines (PROWAG) are supplemented by other laws and guidelines at the state and local levels.

2.1.1 Americans with Disabilities Act (ADA)

The ADA is a federal civil rights law that prohibits discrimination against individuals with disabilities (United States Access Board, 2011). Under the Americans with Disabilities Act, any “newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals

with disabilities (United States Access Board, 2011).” All public facilities must abide by the 2010 ADA Standards. These standards are in place for any construction that was commenced after January 26, 1992. The ADA sidewalk regulations specify minimum sidewalk widths, the removal of obstructions, and ramps of appropriate grades to allow easy passage for wheelchairs. These regulations are often supplemented by additional guidelines and regulations at the state level; those for Massachusetts are discussed below. The ADA also sets regulations for bus stop boarding areas. These regulations are in place to ensure that the bus stops are safe and accessible to all. (See Appendix A for a summary of the basic standards for the design of accessible sidewalks and for bus stops.)

2.1.2 Public Rights-of-Way Accessibility Guidelines (PROWAG)

The most recent Public Right-of-Way Accessibility Guidelines (PROWAG) were updated on July 26, 2011 by the Architectural and Transportation Barriers Compliance Board (which is an independent federal agency also known as the United States Access Board). These guidelines were developed specifically for pedestrian facilities in the public right-of-way. The PROWAGs were originally introduced in 1992 (shortly after the ADA was enacted in 1990) and applied initially to state and local government facilities (United States Access Board, 2011). The current PROWAGs have not been fully implemented as a final rule yet but are accepted as a ‘best practice.’ Building on the ADA requirements, the Access Board has said:

“The Department of Justice regulations further state that a “path of travel” includes a continuous, unobstructed way of pedestrian passage by means of which the altered area may be approached, entered, and exited, and which connects the altered area with an exterior approach (including sidewalks, streets, and parking areas), an entrance to the facility, and other parts of the facility. An accessible “path of travel” may consist of walks and sidewalks; curb ramps and other interior or exterior pedestrian ramps; clear floor paths through lobbies, corridors, rooms, and other improved areas; parking access aisles; elevators and lifts; or a combination of these elements; and also includes the restrooms, telephones, and drinking fountains serving the altered area (United States Access Board, 2011).”

The guidelines are intended to ensure that facilities for pedestrian use that are located in the public right-of-way are readily accessible and usable by pedestrians with disabilities. Pedestrian access routes that are described in PROWAG must be provided with:

- “Sidewalks and other pedestrian circulation paths located in the public right-of-way;
- Pedestrian street crossings and at-grade rail crossings, including medians and pedestrian refuge islands; and
- Overpasses, underpasses, bridges, and similar structures that contain pedestrian circulation paths. (United States Access Board, 2011)”

The PROWAG also supplements the ADA’s bus stop boarding area guidelines. A full list of these guidelines concerning sidewalks and bus stops can be found in Appendix B.

2.2 Massachusetts Guidelines on Accessibility

The Massachusetts guidelines for accessibility supplement the accessibility guidelines that are presented by the United States. The Massachusetts Department of Transportation (MassDOT) and the Massachusetts Architectural Access Board (MAAB) are responsible for setting standards and ensuring compliance in order to improve accessibility in Massachusetts.

2.2.1 Massachusetts Department of Transportation (MassDOT) and Massachusetts Architectural Access Board (MAAB)

The Commonwealth of Massachusetts requires that all state-owned facilities follow two sets of accessibility laws when repairing, maintaining, and operating facilities. These accessibility laws are the ADA and the rules and regulations of the Massachusetts Architectural Access Board, or MAAB.

The Massachusetts Architectural Access Board develops and enforces regulations that are designed to provide interior and exterior accessibility in public locations to people with disabilities. The MAAB has its own guidelines to supplement the ADA called the 521 CMR. The 521 CMR has very specific regulations regarding curb ramps on sidewalks. Some of the regulations include the following:

- A curb ramp must be placed on sidewalks or walkways whenever an accessible route crosses the curb.
- The slope of the sidewalk must be the least possible and should not exceed a 1:50 ratio.
- The width of the curb ramps must be a minimum of 36” wide.
- Crossing controls must be located in the most practical location possible (Commonwealth of Massachusetts, 2015).

A picture of a slope on the curb ramp is shown in Figure 2.2

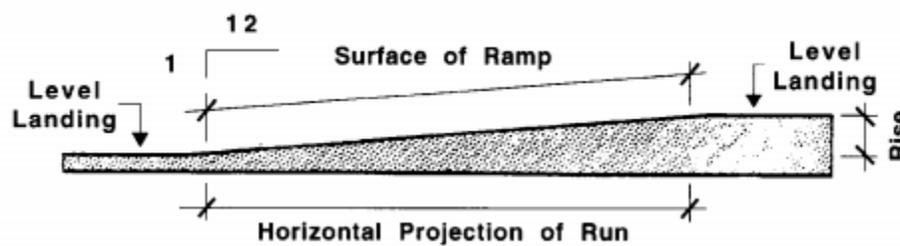


Figure 2.2 Example of a Curb Ramp Slope
(Architectural Access Board: 521CMR, 2006)

The Massachusetts Architectural Access Board (MAAB) has also put in regulations regarding drainage to make sure sidewalks do not accumulate puddles or ice. All surfaces of sidewalks also must be stable, firm and in a continuous plane that has minimum surface warping (Commonwealth of Massachusetts, 2015).

The Massachusetts Department of Transportation (MassDOT) is a state office that performs large-scale projects regarding transportation, which includes sidewalks. MassDOT strictly follows the ADA/MAAB guidelines when building and recently they used action points from the ADA and Section 504 of the Rehabilitation Act of 1973 to create the ADA/Section 504 Transition Plan Scope of Work (SCOPE). This plan was created to determine the complete list of limitations that people with disabilities have in access to their activities and services (Commonwealth of Massachusetts, 2015).

Variations from the MAAB and ADA laws are allowed under special circumstances. Many communities in Massachusetts have construction limitation laws to preserve historical sites and unique city services. After the ADA and 521 CMR were created, most historical communities faced difficulties meeting those accessibility regulations. As a result, most do not abide by Title

II of the ADA to provide access to people with disabilities for every city service and program, and often revert to their own created limitation laws.

The ADA is flexible and does not require any construction that would alter historically significant facilities or cause major financial burdens to city service, but handicap access must be provided, even if it is not specific to the ADA guidelines. When a new sidewalk or road is constructed, a city must adhere to the ADA standards by building curb ramps and crosswalks. This rule also applies when a sidewalk or road is resurfaced. If a town decides to leave a sidewalk unaltered, then it is not necessarily required to put in curb ramps and crosswalks. For cities to not have built these features, they must create alternate and accessible routes to buildings. In these situations, cities also must create milestones for curb ramp compliance. These milestones serve as progress dates for cities to meet the curb ramp compliancy of the ADA (US Department of Justice, 2008).

2.2.2 WalkBoston

“WalkBoston is a non-profit pedestrian advocacy organization dedicated to improving walking conditions across Massachusetts. (WalkBoston, 2015)” WalkBoston conducts assessments in cities and towns to determine if their streets, sidewalks, intersections, and crosswalks are safe for all pedestrians (i.e., not specifically those with disabilities). When WalkBoston visits a city or town to complete an assessment, the members determine the conditions of the streets, sidewalks, intersections, and crosswalks. Observations can be, but are not limited to, street descriptions, speed and driver behavior (of the street), neighborhood features, a sketch of the street or intersection, descriptions of the intersections and crossings, and the attractiveness of the walking route. These conditions are then compiled into a spreadsheet including location, observation, recommendation, time-frame, and cost, and are given to the DPW, Town Manager, Selectmen, or persons responsible for the maintenance. (The WalkBoston walk audit form can be found in Appendix C.)

WalkBoston has conducted walkability assessments in Watertown, Newton, and Cambridge between 2014 and 2015. The goals of these assessments were to foster an awareness of the infrastructure elements, which contribute to the walking environment, evaluate the safety and quality of the walking environment along route, and to recommend infrastructure improvements. Solutions were accepted by all three locations for all observed issues. The sections

of the towns that were assessed did not require any variations from ADA standards as they did not contain any historical sites or unique city services.

2.3 Historical Towns with Major Accessibility Issues

Many of the older towns in the United States have historic districts that are characterized by narrow, tree-lined streets with sidewalks of traditional materials such as brick or stone. These streetscapes pose special difficulties for those with impaired mobility. Modifying the streets and sidewalks to meet the current ADA and other accessibility guidelines can be expensive and difficult to achieve without disturbing the historic and aesthetic integrity of these locations. In the following sections we review efforts in three communities. These communities include Beacon Hill of Boston, MA, Charleston, SC, and the French Quarter of New Orleans, LA.

2.3.1 Beacon Hill

Beacon Hill is one of the oldest communities in Boston, MA, and is named after a beacon that was once atop the hill to warn of invasions from foreigners (City of Boston, 2014). The architecture of the area is that of colonial Boston, so it has many old and unique features. Although Beacon Hill is a beautiful and historic community, it has limited accessibility, and the costs to improve the access are high.

Currently the community, which covers only a small area of approximately a sixth of a square mile, needs to put in 238 ramps on sidewalks to meet the standards of the ADA. Furthermore, a recent survey found that 90% of Beacon Hill's existing pedestrian ramps did not comply with the MAAB guidelines either (Irons, 2015). These problems pose major obstacles to pedestrians and especially the mobility impaired.

In 1955, the Beacon Hill Architectural Commission (BHAC) was established to preserve and protect the historical integrity of the community (Mead, Johnson, & Ludden, 1975). Recently the city of Boston has attempted to install sidewalk ramps in order to make the sidewalks more accessible to the disabled. However, a Suffolk superior court judge ordered the mayor to cease construction on these sidewalks. Many residents objected that the project did not fit the character of the neighborhood and evidently the judge agreed (Irons, 2015). Making sidewalks more

accessible while maintaining historical character is not an easy task because it is hard to find materials and designs that match the old colonial architecture of Boston and the width and design of sidewalks cannot easily be modified given the placement of buildings and narrowness of the roadways.

Like Massachusetts, other states and towns created guidelines of their own to supplement the requirements of the ADA. Two of these communities are Charleston, SC and the French Quarter in New Orleans, LA.

2.3.2 Charleston, SC

Charleston, SC is one of the best historically preserved cities in all of the United States. Like Beacon Hill, it contains many aspects of colonial America. The sidewalks are made of materials such as bricks, bluestone, granite blocks, sandstone, and even marble squares. The history of this city is so important to its people that it was the first place in the U.S. to create an historic district in 1931 in a community called the Battery (Lang & Stout, 1995). Such movements inspired other cities to take similar actions to preserve their own historic districts. It is these aspects of Charleston that make it a major tourist attraction, and with numerous tourists as pedestrians, accessibility is always a concern.

The sidewalks of Charleston have been described as uneven with tree roots bulging through the surface. People have even been known to trip and fall when walking along the sidewalks (Behre, 2011). The streets and sidewalks division of the South Carolina Department of Transportation employs 17 staff dedicated to repairing the sidewalks and making them more accessible since the promulgation of the ADA. Unfortunately, the Department of Transportation regularly receives complaints that the modifications will alter the color and look of the sidewalks and the town (Behre, 2011). This is so because the original materials used were unique and the ADA requires yellow truncated dome pads, which would alter the original colors. This city shows again how difficult it is to make changes in an historic area, no matter how crucial they may be.

2.3.3 French Quarter, LA

The French Quarter is the cultural center of New Orleans. A large number of tourists are attracted to the mix of Spanish, French, Creole, and American architectural styles that dates back to the early 1700's (New Orleans Tourism Marketing Corporation, 2015).

Recently, the French Quarter has been active about improving pedestrian accessibility (Egglar, 2013.) The improvements have been a part of a program called Paths to Progress. The improvements include fixing curbs, removing and replacing sidewalks, putting in ramps that are ADA compliant, and making bike lanes. The community was able to improve eight of its streets in the seventy-eight square block area, which is a significant step towards making the overall accessibility of the area acceptable. All of this work was done partly to improve accessibility in advance of the 2013 Super Bowl, when a large increase in pedestrian traffic was expected (Egglar, 2013).

2.4 Nantucket's History and Accessibility

As with many other towns in Massachusetts and around the country, Nantucket struggles to find the resources to improve pedestrian access in its buildings and sidewalks. Given the large number of historic buildings, the narrow brick sidewalks, and limited budgets in Nantucket, the problem is likely to remain unresolved for a long time.

2.4.1 Architectural History

Nantucket is proud of its history and architectural heritage and preserves it carefully. In the historic core of downtown Nantucket, more than 800 buildings were constructed before the civil war, and the brick sidewalks with granite curbs are reminiscent of a bygone era (Lang & Stout, 1995). It is precisely the architecture and quaint streetscapes that make Nantucket so charming and unique, and that draw tourists from all over the world. Recognizing the uniqueness of their town, the islanders formed an historic district in 1955 and created the Nantucket Historic District Commission to ensure its historic character was preserved (Lang & Stout, 1995).

2.4.2 Nantucket Historic District Commission

Nantucket is one of the earliest historic districts in the country and the Nantucket Historic District Commission (HDC) has played a central role in the island's preservation since its creation. The purpose of the HDC is "to promote the general welfare of the Town of Nantucket through the preservation and protection of historic buildings, places and districts of historic interest through the development of an appropriate setting for these buildings, places and districts and through the benefits resulting to the economy of Nantucket in developing and maintaining its vacation-travel industry through the promotion of these historic associations (Nantucket Historical Association, 1996)."

The HDC reviews all exterior structural changes and new construction on the island. The commission has established numerous standards to maintain the historic and architectural integrity of all construction on the island. Especially stringent guidelines apply in the historic core to preserve those structures built before the middle of the nineteenth century. Measures are taken to preserve the historic pattern, street-side buildings, and the pedestrian detail. Out of town, the guidelines may be less restrictive but are nevertheless designed to protect the character of the historic settlements such as Siasconset, Wauwinet, Quidnet, Surfside, and Madaket. When new buildings are constructed, the commission tries to foster a common character to preserve and protect the spacious character of the natural landscape (Nantucket Historical Association, 1996).

2.4.3 Accessibility in Nantucket

On Nantucket, most locations are reachable by foot or bicycle. As most walkways are made of brick or granite slabs, it is difficult to maintain them and keep them at peak condition. Most walkways on Nantucket pose varying degrees of accessibility problems for pedestrians, as seen in Figures 2.3 and 2.4.



Figure 2.3 Example of Tree Roots Damaging the Brick Sidewalk
(SeeClickFix, 2015)



Figure 2.4 Example of Uneven Footing
(Island Oracle, 2015)

Figure 2.3 shows the kind of damage from tree roots that is common on many of Nantucket's sidewalks. Not only do the uneven bricks present a tripping hazard for all, but they present special difficulties for those with limited mobility and especially those in wheelchairs. As is evident in the photograph, the uneven surface prevents effective snow removal, which only exacerbates the problems of access. Figure 2.4 also illustrates the kinds of problems the disabled face in navigating Nantucket's sidewalks, including uneven surfaces and narrow clearances for the passage of wheelchairs or walkers.

The Nantucket Roads and Rights of Way Committee conducted a survey to evaluate the accessibility of all the walkways in the Residential Old Historic District, ROH, and the Downtown, CDT, which it surrounds (see Appendix D for an excerpt from this survey). This survey lists the street name and the location of the street, as well as who surveyed the street. It also states what the walkways are made out of (granite, brick, concrete, etc.).

Each sidewalk was then given a condition rating of 1-5, with 1 being in the best condition and 5 being in the worst condition. This condition rating was given based on overall accessibility and current conditions. However, some issues, such as lack of curb ramps, were not addressed in the survey. Streets with a rating of 1 are ADA compliant and do not require any work. Streets with a rating of 2 to 3 have curbs in poor condition, broken pavement, narrow passages, and are not ADA compliant. Streets with a rating of 5 do not have a sidewalk at all. As sidewalks were split up into sections for this survey, one street can have multiple condition ratings. This survey also contains extra comments regarding the condition of the streets/sidewalks. Some of these comments include "no sidewalk", "uneven", "curb higher than sidewalk", and more (Nantucket Roads and Rights of Way Committee, 2015).

The committee found that sections of sidewalk were missing on 24 streets and assigned these sections a rating of 5. These sidewalks included Broad, Candle, Center, Federal, and others. The committee considered any sidewalk on which parking was permitted was not accessible, since it would require pedestrians to walk on the street. After the creation of this survey, they managed to identify problem locations but proposed no solution (Nantucket Roads and Rights of Way Committee, 2015).

The Roads and Rights of Way Committee's main goal for this survey was for the Town officials, through the Department of Public Works, to use it give certain streets priority to repair or replace sidewalks.

Upgrading the Sidewalks

According to the Federal Highway Administration (FHWA), existing conditions of sidewalks should be evaluated to find possible improvements. These improvements can then be used to maintain/increase mobility for all pedestrians. Regular maintenance of sidewalks is needed to reduce damage done by weather and regular use. Individuals in wheelchairs may find it hazardous to travel on cracked and uneven walkways. Individuals who are visually impaired may find it difficult to follow the sidewalk when there are many settles areas with trapped water, and uneven walkways can also be a tripping hazard. Currently, most of the sidewalks on Nantucket do not meet ADA standards set by the FHWA (ADA, 2010). While making the sidewalks more accessible, the Town of Nantucket will need to preserve the historical character and aesthetics in line with HDC guidelines. For example, it is likely that many citizens and the HDC would object to the installation of bright yellow, truncated-dome pads on the edges of the walkways, since this would detract from the historical and aesthetic integrity of the town. Any designs proposed to improve accessibility must make the walkways more traversable for all pedestrians, while not compromising the visual aesthetic of the island.

Currently in the Core Parking District, a subsection of the Old Historic District where we will be focusing on for the duration of our project, there are 20 roads, each with varying levels of accessibility. There are no specific guidelines in place for the maintenance of the sidewalks on these streets, and repairs are often paid for by the nearby shop owners. Funding from the federal and state government for sidewalk repairs is also available, although not every town can benefit from this funding as only a few towns are selected for these funds.

Upgrading the Bus Stops

In addition to accessible sidewalks, the Nantucket Planning Office and the Nantucket Regional Transit Authority are concerned about access to public transport. Currently, NPO does

not know which bus stops for the regular bus have a pad, let alone which ones are accessible. In 2010, the Wave carried nearly 240,000 passengers, using a total of 22 vehicles (Nantucket Planning and Economic Development Commission, 2015). A map of all bus routes can be found in Figure 2.5.

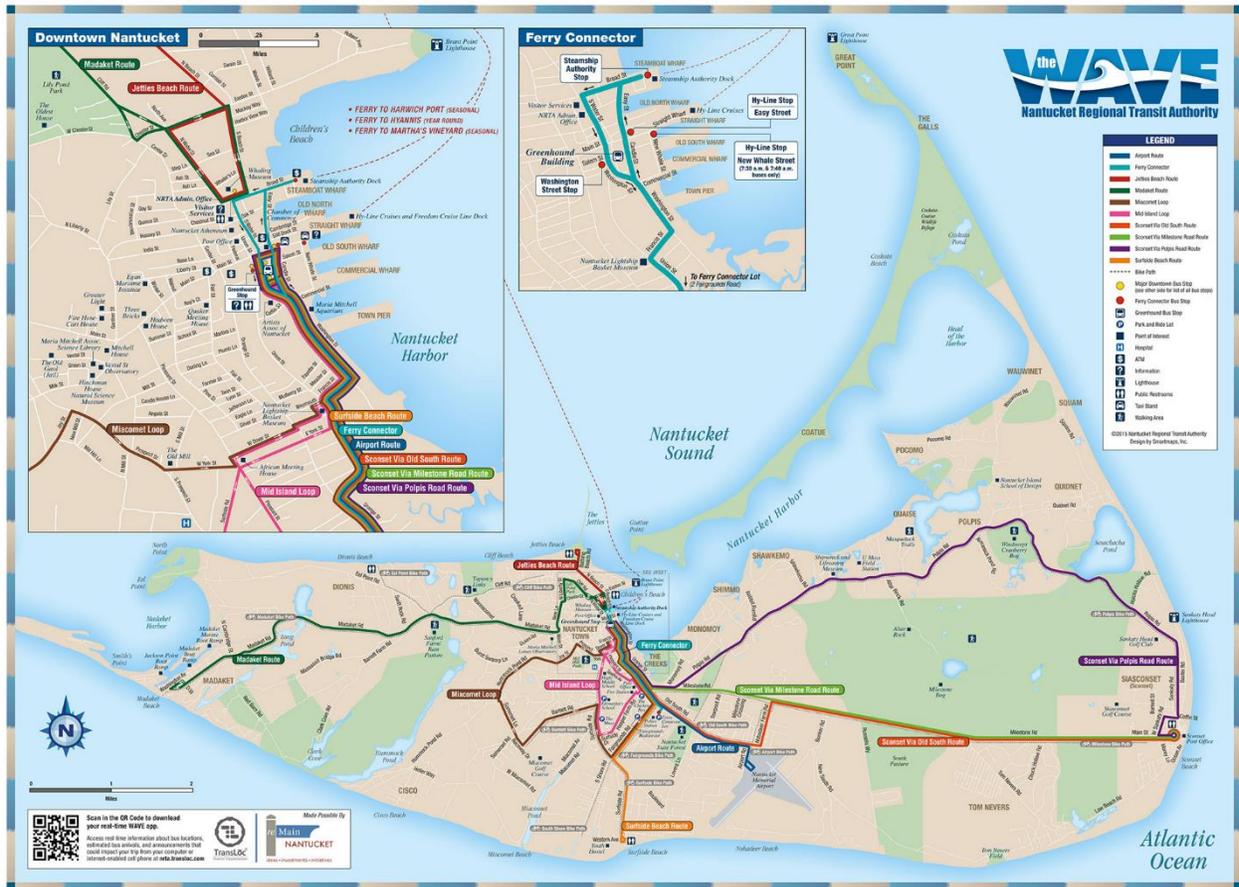


Figure 2.5 Map of Nantucket Bus Routes
(The WAVE: Nantucket Regional Transit Authority, 2015)

There are currently 10 bus routes, with 14 buses and over 200 bus stops. Each bus is equipped with a ramp for wheelchair access, and all mobility devices are secured in a designated area on the bus. Each bus is also equipped with an overhead speaker for the visually impaired, which will announce the arrival at each bus stop. Currently, the buses do not operate year-round, and are only seasonal. However, the NRTA is looking for funding to operate year-round.

2.5 Summary

In the past few years, the United States has passed new laws and guidelines concerning the safety and accessibility of sidewalks. However, many historical locations are unable to fully meet these guidelines, including Nantucket. The Nantucket Planning Office is attempting to make the walkways and bus stops more accessible for tourists as well as current and future residents. Our team was assigned to assist the Nantucket Planning Office work on a proposal to update the walkways while preserving its' historical character. The next section describes in detail the methods we used to accomplish our goals.

3.0 Methodology

The purpose of this project was to provide recommendations to the Nantucket Planning Office on ways to improve the accessibility of the sidewalks of Downtown Nantucket while still preserving its historic and aesthetic character.

To accomplish this goal, we identified five objectives. We:

- Reviewed the current standards and best practices in the design of accessible sidewalks for historic areas;
- Conducted an inventory and assessment of sidewalk and crosswalk accessibility in the historic district of downtown Nantucket;
- Conducted an inventory and assessment of the current conditions and possibilities for improving accessibility of the bus stops of Nantucket;
- Gauged the opinions of key stakeholders and decision makers concerning the current conditions and future plans for improving accessibility and;
- Evaluated design options and made recommendations for improvements.

In this chapter, we describe the methods we used to reach our objectives. Figure 3.1 presents the goal, objectives, and associated tasks.

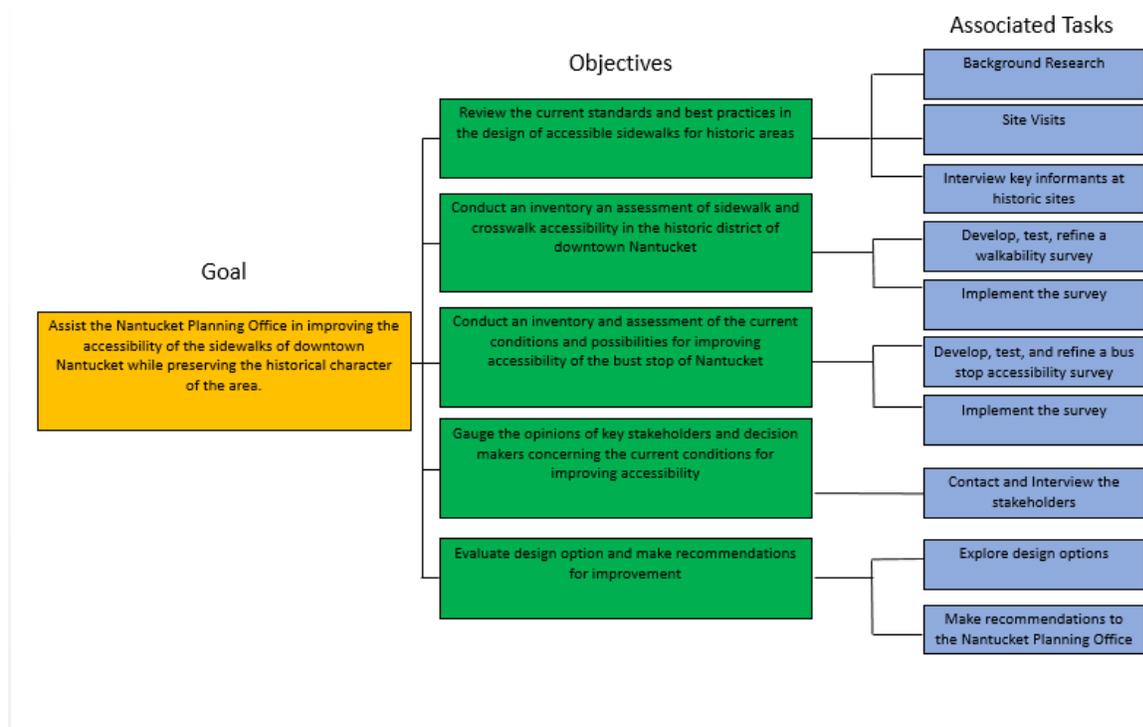


Figure 3.1 Project Goals, Objectives, and Tasks

3.1 Objective 1: Review the Current Standards and Best Practices

In the background chapter, we summarize the key federal and state laws that shape the design and implementation of accessible sidewalks in Nantucket and other towns in Massachusetts. We also summarize some of the practices taken to improve accessibility in historic districts similar to the historic core of Nantucket. We built on these background assessments by conducting interviews with experts in the field and site visits to selected towns in Massachusetts.

We identified several towns that have endeavored to improve accessibility in ways that are consistent with local aesthetic and historic sensibilities. The communities that we reviewed are Beacon Hill in Boston, MA, Charleston, SC, Watertown, MA, and Newton, MA. We identified pertinent officials and other key informants in these towns and attempted to contact them for interviews to supplement the information we gathered. The key informants included representatives of groups such as WalkBoston and employees at the MAAB, and MassDOT. We contacted them through email. However, we were unsuccessful with scheduling interviews with any of these informants. The only group to respond was WalkBoston, and we were unable to interview them at the time.

We also visited Beacon Hill in Massachusetts. We observed the accessibility of the sidewalks in this area, taking pictures of the ramps and detectable warning panels located there. We compared Beacon Hill's sidewalks to the federal and state accessibility standards. We took pictures of the important features of each sidewalk to keep a record.

Our sponsor, Mike Burns, also provided us photographic examples of detectable warning panels from Wales and other locations in Europe. We used these examples in an online survey, which we describe later in our report.

3.2 Objective 2: Assess Sidewalks and Crosswalk Accessibility

We conducted an inventory and assessment of the current sidewalk and crosswalk accessibility in downtown Nantucket. We focused on the sidewalks and crosswalks in the Core Parking District, which forms the core of downtown Nantucket. This area of Nantucket was officially designated as the "Old Historic District" by the Historic District Commission. The Old Historic District is outlined in blue, with the Core Parking District circled in green, in Figure 3.2 below.

Our inventory assessment of the sidewalks and crosswalks involved three tasks; (1) developing a preliminary walkability survey and implementation protocols; (2) pretesting and revising the survey and protocols; and (3) implementing the survey.

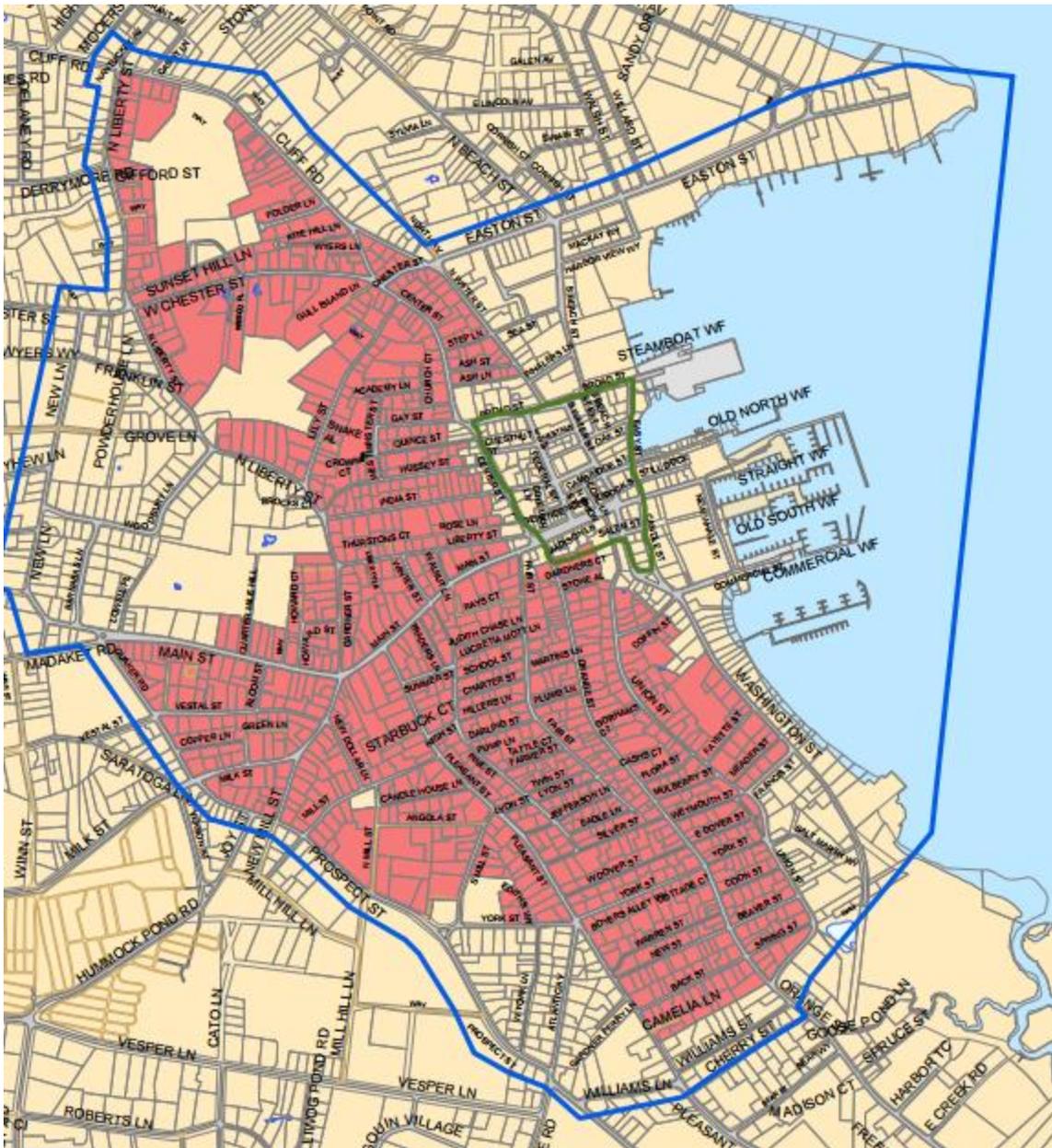


Figure 3.2 Map of Downtown Nantucket
(Town of Nantucket GIS Coordinator, 2014)

Developing the survey and protocols:

Building upon what we learned from our background research, the Roads and Rights of Way Committee’s sidewalk survey, and working in close consultation with our sponsor and advisors, we developed a checklist or walkability survey instrument that we used to determine the

current condition and accessibility of each sidewalk. We include a checklist in Appendix E and Appendix F, which we used to record the location of curb ramps, crosswalks, and basic attributes, such as width, slopes, materials used, and condition. The checklist was in digital format, and the information was gathered into an online database. We have also created protocols for conducting the survey. These protocols are attached to the checklist, and include precise details on how to perform the survey. The protocols are necessary to gather consistent and accurate data.

Pretest Survey and Protocols

As a group, we pretested the survey instrument and protocols by using them to evaluate a small sample of accessibility features, such as curb ramps, slopes, and sections of sidewalks, on Centre and Main Street. We investigated 5 curb ramps, 5 running and cross slopes and 4 sections of sidewalk. After pretesting the survey instrument and protocols, we consulted with our sponsor to ensure that the nature and quality of the data we collected were adequate. We discussed any difficulties we had in collecting the data, such as elements that were not included in the survey instrument, or protocols that did not work effectively in the field. We then revised the instrument and protocols as necessary.

Implement Final Survey

Once the protocols and survey instrument were finalized, we implemented it on the sidewalks in the historic district. We also took pictures during the survey to better represent the data. To achieve accurate results, we performed the survey as a team to reduce error, survey a total of 37 intersections and 101 sections of sidewalk along 20 streets. This was done over the course of a week, all sunny days. We entered the data into a database that is compatible with the Town's GIS. This enabled us to use a GIS data layer to make a map of particular features and retrieve and analyze information associated with each feature.

In addition to surveying the sidewalks, we assessed the condition of the sidewalks, curb ramps, and crosswalks by maneuvering in a wheelchair ourselves. This allowed us to experience directly the difficulties a disabled person might encounter in navigating the sidewalks. We documented this experience through photographs and video.

3.3 Objective 3: Assess Bus Stop Accessibility

We conducted inventory and assessment of the accessibility of 144 bus stops along four main bus routes of Nantucket. The routes we focused on included Mid Island, Miacomet, Madaket, and Sconset (via Old South Road). Some bus stops belong to multiple routes. Out of the 10 bus routes located on Nantucket, we were asked to focus on these four routes, as they are the most frequently used bus routes. The Mid Island route has 24 listed stops, the Miacomet route has 32 listed stops, the Madaket route has 27 listed stops, and the Sconset (via Old South) route has 31 listed stops. Some of these bus stops were surveyed twice, as they had two boarding locations on either side of the street, and a few were not listed. The routes and approximate locations of stops are displayed in Figure 3.3.

Our inventory and assessment of the bus stops involved three tasks (1) developing a preliminary survey and implementation protocols; (2) pretesting and revising the survey and protocols; and (3) implementing the survey.

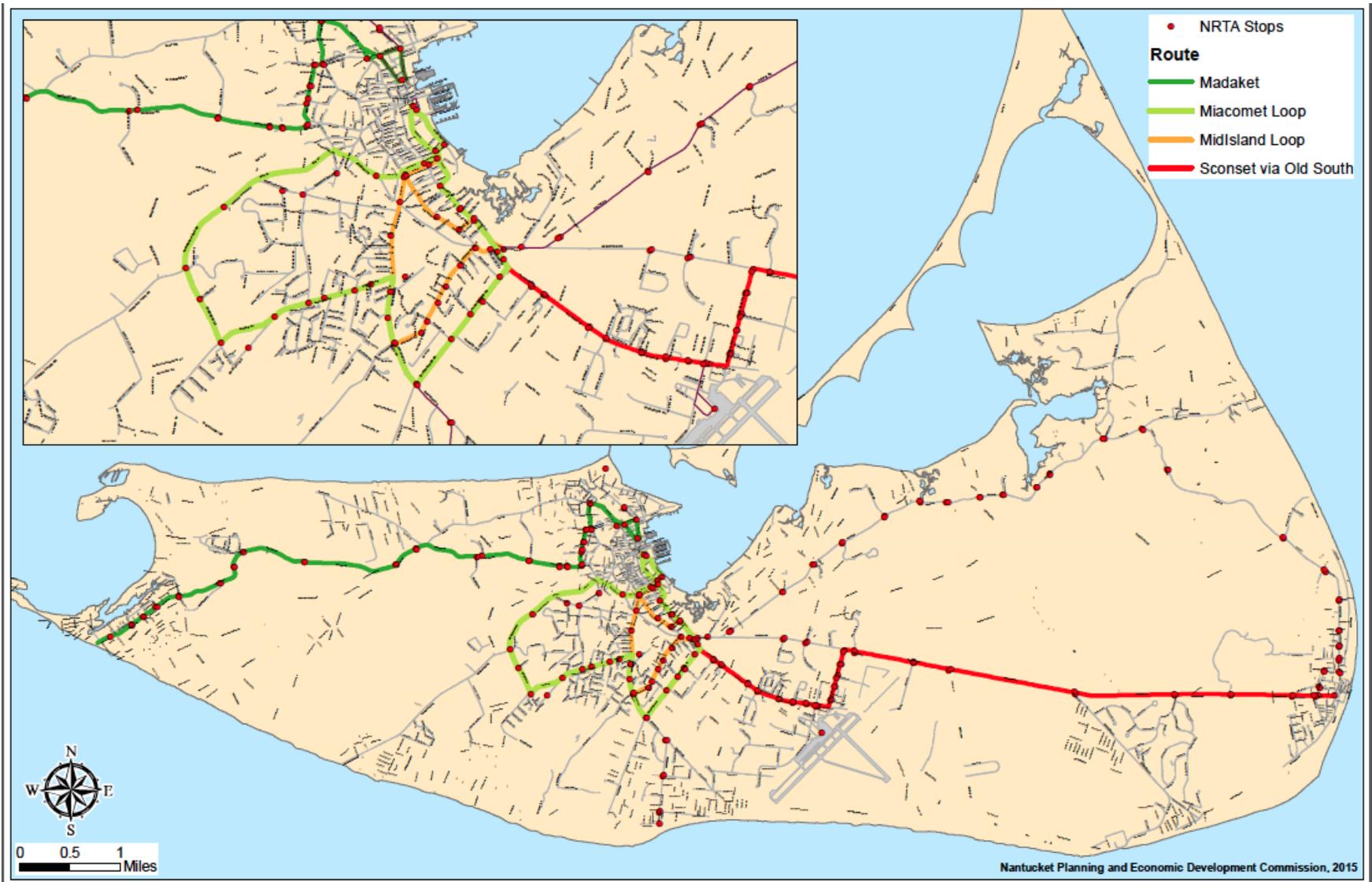


Figure 3.3 Map of the Four Specified Bus Routes
 (Nantucket Planning and Economic Development Commission, 2015)

Developing the survey and protocols:

Building upon what we learned from our research and working with our sponsor, we developed a checklist or survey instrument, which can be seen in Appendix G. We used this to determine the current condition and accessibility of the bus stops along four of the bus routes on the island. We used our survey instrument to record the stop location, presence or absence of key features, such as a paved pad, curb ramps, crosswalks, covered shelter, and the basic attributes of these features (such as width, slopes, materials used, and condition). We took pictures of key stops to document current conditions. The checklist is in digital format, and the information was gathered into a database after the field observations. We also created protocols, or precise methods to gather necessary data, for conducting the survey. These protocols are attached to the checklist, and include precise details on how to perform the survey. For example, our protocols state that all measurements gathered must be in inches. The protocols were necessary to gather consistent, reliable, and accurate data regardless of which member of the team was making the assessment.

Pretest Survey and Protocols

We pretested the survey instrument and protocols by using them to evaluate a small sample of accessibility features, such as curb ramps (if any), covered shelter, and condition. After we implemented our methods for 5 bus stops along Fairgrounds Road, and 3 stops on Hooper Farm Road, the group met to discuss if our methods need any modification. We consulted with our sponsor to ensure that the nature and quality of the data we collected was adequate. We discussed any difficulties we had in collecting the data. We revised the instrument and protocols to ensure all important elements were included.

Implement Final Survey

Once the protocols and survey instrument were finalized, we implemented it on 144 bus stops along the Mid Island, Miacomet, Madaket, and Sconset bus routes. This was done over the course of a week, with each bus route taking a single day. To achieve accurate results, we performed the survey as in at least a group of two. For the Mid Island, Miacomet, and Madaket routes, the weather conditions were sunny. For the Sconset route, it was lightly raining. We also entered this data into a database compatible with the Town's GIS.

After conducting our survey, we discovered that the Department of Public Works had removed many of the benches located at the bus stops prior to our investigation. After consulting with our sponsor, we removed our data gathered about the presence of a sitting area at each stop, as a sitting area is not specifically required following ADA guidelines.

3.4 Objective 4: Gauge the opinions of key stakeholders

We conducted a series of interviews with a variety of stakeholders, including Nantucket Council on Aging (COA), Nantucket Commission on Disability (COD), and the Historical District Commission (HDC). We also interviewed employees in the Nantucket Regional Transit Authority (NRTA). We consulted with our sponsor to identify appropriate individuals to interview and asked our interviewees to suggest other potential contacts. Interviews were conducted in person. One group member took notes. Before each interview, we told the interviewee that the interview was confidential, and obtained their verbal permission to use the gathered data in our final report. They were also told that they have the right to review our written work. This was all presented in a preamble (see Appendix H for the preamble and sample set of questions).

During our interviews, the participants were asked about the current conditions of the sidewalks, and if there had been any problems maintaining them, as well as if there had been any known injuries. We also asked about the condition of the bus stops. Some questions were tailored to different groups. For example, the DPW may have concerns about maintaining the sidewalks, while the Selectboard may want to know more about the total cost. All ideas that the participant had to make the sidewalks more accessible were welcome.

Independent of our interviews, we created an online survey to gather the opinions of different committees on Nantucket about the installation of detectable warning panels in the core historic district. Stakeholders that took the survey were from the following committees; HDC (Historic District Commission), BPAC (Bicycle and Pedestrian Advisory Committee), NHC (Nantucket Historic Commission), Planning Staff, HSAB (Historical Structures Advisory Board), Town Employees, and the general public. In the survey, we asked respondents to “rate the detectable warning panel in the picture below on a scale of 1 to 5, where 1 is ‘very appropriate’ and 5 is ‘not at all appropriate’ for Nantucket.” This survey was sent to each committee through email. The link to this survey was also tweeted by a member of BPAC.

We received a total of 30 responses. Unfortunately, since Worcester Polytechnic Institute's servers were inaccessible for half of a day, our survey was unavailable for that amount of time, and we may have missed some possible responses.

3.5 Objective 5: Evaluate design options and make recommendations

Once we determined the conditions of the sidewalks and bus stops, we evaluated different design options and made recommendations to the Nantucket Planning Office (NPO) and the Nantucket Regional Transit Authority (NRTA). Our findings will also be included in the Town's GIS software for future use. Looking at other historic tourist districts and seeing what they had done to improve their pedestrian access aided us in helping Nantucket decide how to improve their pedestrian access. We asked them about the current conditions of their bus stops, how they maintained them, if there are any problems, and what they did to make improvements (if they have made any). Determining the areas that are high priority for improvement was one of our goals. We made suggestions on where curb ramps and crosswalks should be discontinued and new ones installed, and where truncated dome pads need to be implemented. These design recommendations can be used in an attempt to meet ADA and PROWAG regulations. We helped the NPO and the NRTA identify designs that they can implement to improve the pedestrian access while maintaining the historic integrity and architectural aesthetics of the downtown area.

4.0 Findings and Analysis

The following section details the results of the research that we conducted for the Nantucket Planning Office. We discuss the results of our surveys conducted on the conditions of the sidewalks, crosswalks, and bus stops. We also summarize the opinions various stakeholders expressed during interviews and public meetings we attended.

4.1 Sidewalk and Intersection Findings

After extensive data collection, we found that most of the sidewalks of the Core Parking District of downtown Nantucket do not comply with ADA, PROWAG, and MAAB guidelines for accessibility. We collected the data according to the protocols described in the previous section and entered the data in two spreadsheets. One spreadsheet contains the information pertaining to small sections of sidewalk such as slope, width, and obstructions. A sample of this spreadsheet can be seen in Appendix I. The second spreadsheet includes data on the curb ramps and crosswalks at each intersection in our area of study. A sample of this spreadsheet can be seen in Appendix J.

We surveyed 101 sections of sidewalk¹ and found:

- 92 (or 91.1%) met the ADA minimum width requirements of 36”.
- Only 21 (or 20.8%) met the maximum ADA cross slope requirement of 2%.
- 72 (or 71.3%) met the maximum ADA running slope requirement of 5%.
- 73 (or 72.3%) met the ADA requirement of containing a 5’ X 5’ passing zone at a minimum of 200’ of sidewalk.
- 4 (or 4.0%) of the areas that should have sidewalks did not.

There are 12 (or 11.9%) contained obstructions that did not meet the ADA requirement of having 32” of passing room. Common obstructions include poles, trees, trash cans, and cars.

Figure 4.1 is an example of a tree presenting a sidewalk obstruction.

¹ A section of sidewalk includes the portion of sidewalk on one side of the street between intersecting streets. These sidewalk sections vary in size due to different lengths between intersections.



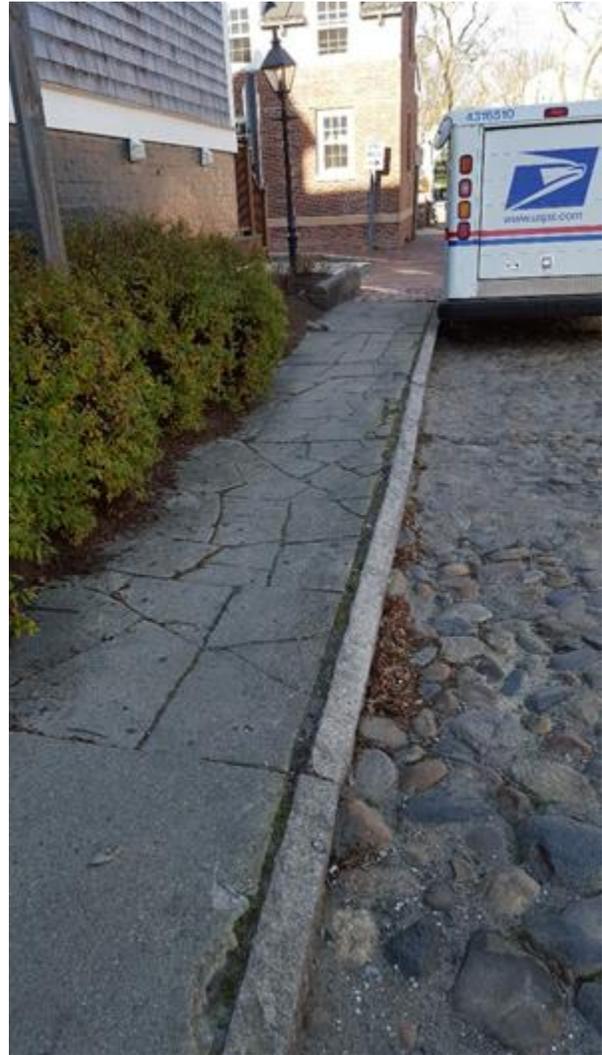
Figure 4.1 Example of a tree obstructing the sidewalk on Main St.

In the inventory of the sidewalks, we rated each sidewalk on a scale of 1-5, with 1 being the best and 5 being the worst based on the criteria described in Section 2. For example, a sidewalk section with a rating of 1 would meet all the ADA standards, and have good surface conditions. A sidewalk section with a rating of 5 would describe a section that is missing a sidewalk. A sample of our sidewalks survey results can be found in Appendix I.

An example of a sidewalk we rated a 1 versus a sidewalk we rated a 4 is shown in Figure 4.2.



a) Federal St.



b) North Union St.

Figure 4.2 Example of a sidewalk given a) a rating of 1 versus a sidewalk given b) a rating of 4

The pictures in Figure 4.2 are examples of the best and worst sidewalks found in the Core Parking District. Figure 4.3 shows that 74 (73.4%) of sidewalk sections in the study area were in very good ('1') or good condition ('2') while 11 (10.9%) were in poor ('4') or very poor ('5') condition. The average rating of all sidewalk sections was 2.21.

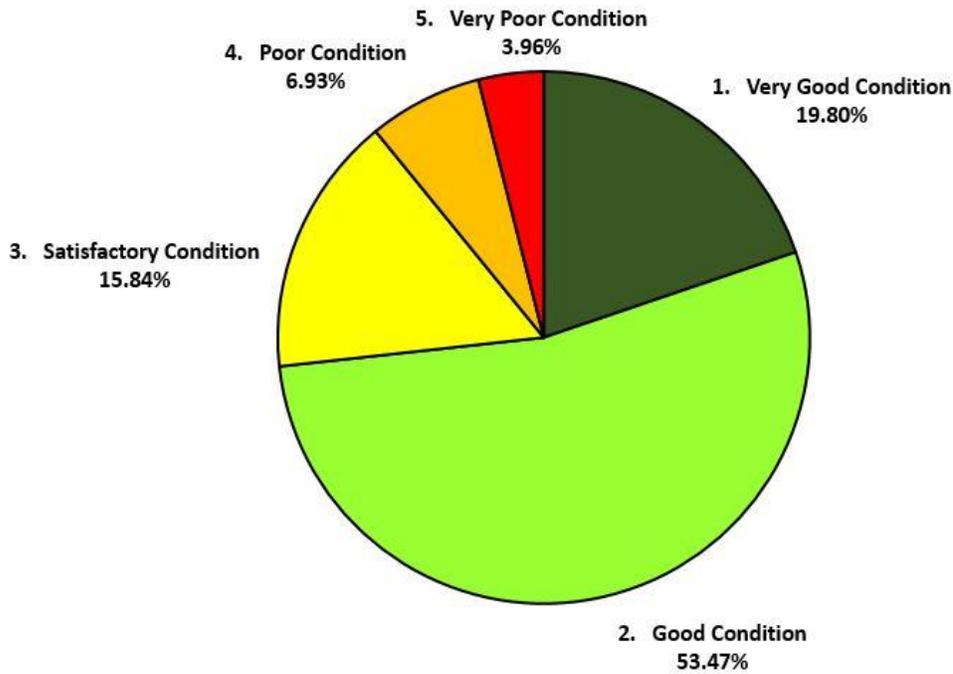


Figure 4.3 Sidewalk Conditions of the Nantucket Core Parking District

Figure 4.4 shows the sidewalk ratings throughout the study area. The dark green displays a rating of 1, the yellow-green displays a rating of 2, the orange displays a rating of 3, and the red displays a rating of 4. A red circle displays a section that received a rating of 5, indicating the absence of a sidewalk.

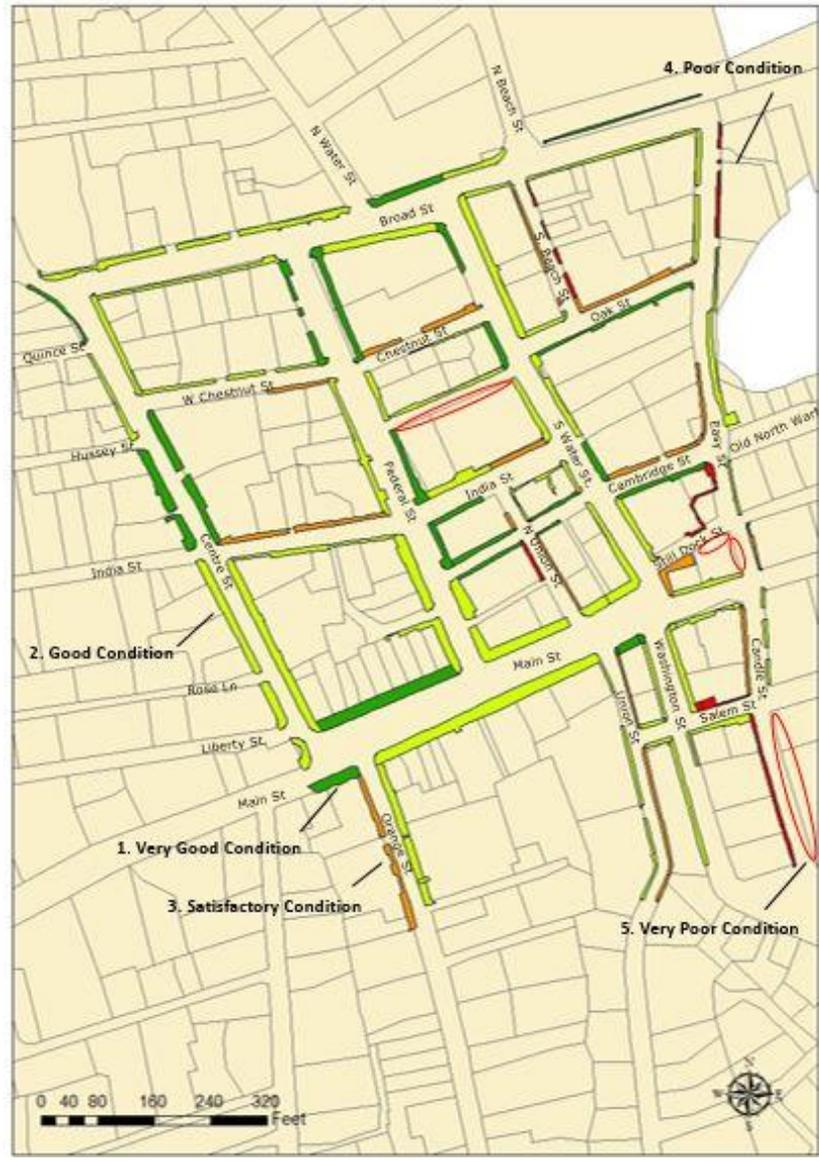


Figure 4.4 Nantucket Historic District Sidewalk Accessibility Map

4.1.1 Crosswalk Findings

We evaluated the crosswalks and curb ramps at 37 intersections in the study area, including 14 four-way intersections and 23 T-intersections. To comply with ADA standards a T-Intersection should have 3 crosswalks, and a 4-way intersection should have 4 crosswalks. Thus, our study area should include 125 crosswalks to meet ADA standards, but only 67 were present. Figure 4.5 shows the location of existing crosswalks (brown).

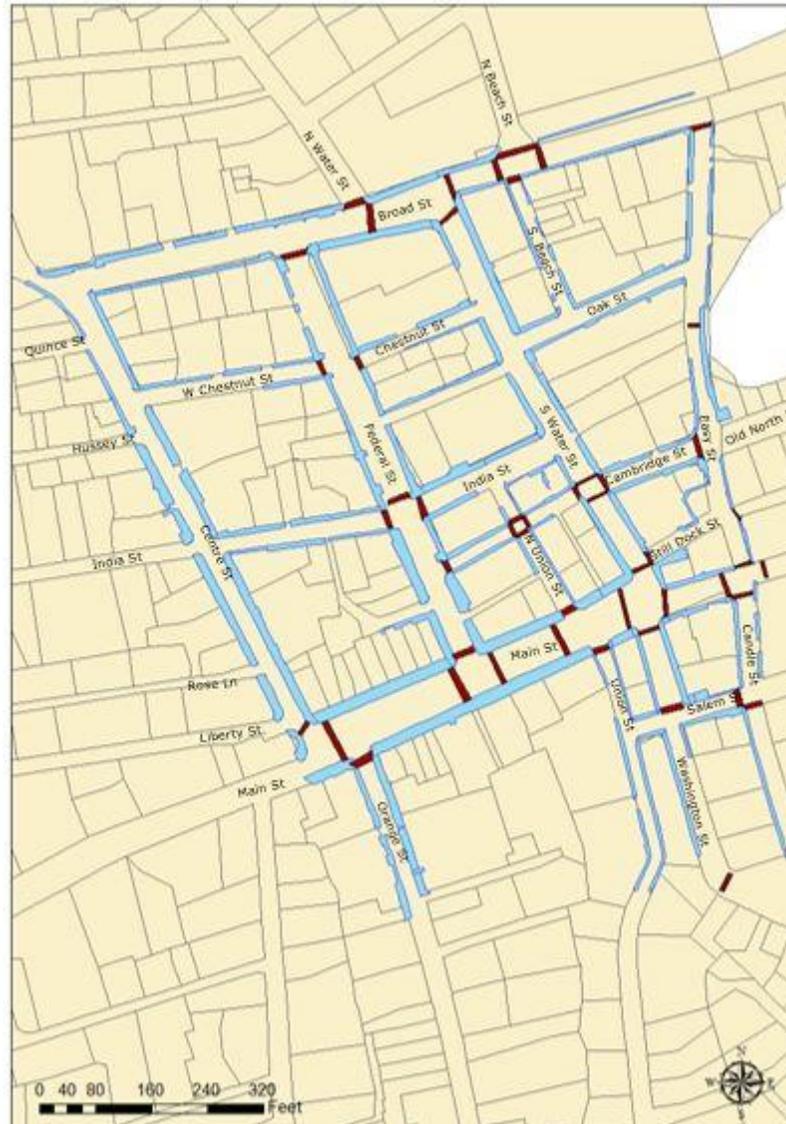


Figure 4.5 Nantucket Historic District Crosswalk Accessibility Map

Only 9 (24.3%) of the intersections contained all of the crosswalks needed to comply with ADA standards. An example of one of these intersections is shown in Figure 4.6.



Figure 4.6 Example of a 4-way intersection that meets ADA standards (North Union St. and Cambridge St.)

After evaluating the 67 crosswalks that are in place we found:

- 32 (or 47.8%) meet the ADA minimum width requirement of 72”.
- 12 (or 17.9%) were painted on concrete
- 55 (or 82.1%) were constructed of brick and granite
- 4 (or 6.0%) of the crosswalks contravene ADA standards by ending in another crosswalk (as shown by the example at the intersection of South Water St. and Cambridge St. in Figure 4.7).

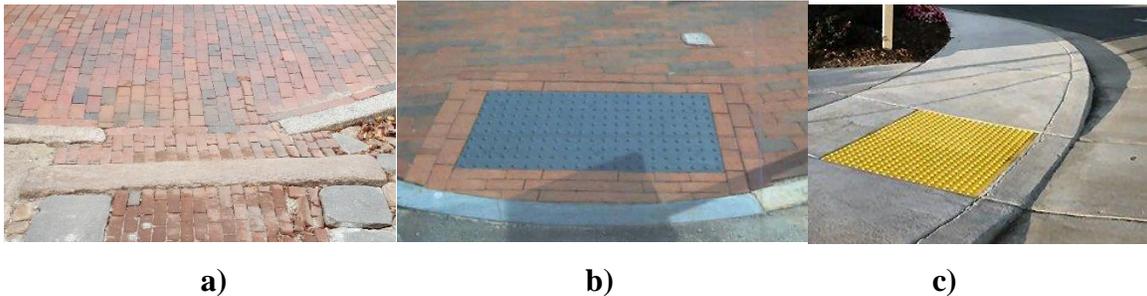


Figure 4.7 Example of a crosswalk ending in another crosswalk (South Water St. and Cambridge St.)

4.1.2 Curb Ramp Findings

Given the number of four-way (14) and T-intersections (23) in the study area, the ADA guidelines would require 250 curb ramps. Presently, there are only 167 curb ramps or 66.8% of the required number. Figure 4.8 displays a typical curb ramp on a historic Nantucket sidewalk. After evaluating the 167 present curb ramps we found:

- 165 (or 98.8%) met the ADA minimum width requirement of 36.”
- 93 (or 55.7%) are below the maximum ramp slope requirement of 8.33%



Figures 4.8 Examples of ramps
a) a ramp on Nantucket b) a Detectable Warning Panel in another historic community
c) an ADA approved Detectable Warning Panel
(McGuirk, 2015), (Portland Press Herald, 2011), (California ADA Compliance, 2013)

4.1.3 Traversing the Core Historic District in a Wheelchair

After collecting data on all of the sidewalks, curb ramps, and crosswalks, we thought it would be instructive for us to experience first-hand the difficulties of traversing the Core Historic District in a wheelchair. We plotted out a route designed to encompass a variety of sidewalk conditions. If the wheelchair got stuck or we were unable to navigate a particular section, another team member would lend assistance. We took multiple pictures and video recordings during the experiment.

After reviewing our footage, we made the following observations:

- Sidewalks we rated a 1 (i.e., very good condition) were the easiest to traverse, and require no outside help.

- Sidewalks given a rating of 2 (good condition) were much more difficult to traverse. Outside assistance was sometimes required for certain uneven sections of sidewalk.
- Sidewalks with a rating of 3 or higher were impossible to traverse in the wheelchair without assistance, and even then it was difficult to navigate.

4.2 Bus Stop Findings

We collected data on the condition of bus stops along four of the bus routes on Nantucket following the protocols outlined in Section 2. We recorded information on boarding area size, material, and accessibility at 144 bus stops along the Madaket, Miacomet, Mid-Island, and Sconset (via Old South) bus routes (Figure 2.5). A sample of the spreadsheet in which we recorded this information in can be found in Appendix K. We compared the data with the standards set by the ADA and PROWAG for bus stops.

We found:

- 106 (or 73.6%) of the 144 bus stops had a boarding area.
- Of the 106 bus stops that have boarding areas:
 - 87 (or 82.1%) are the minimum required size of 60” X 96”.
 - 56 (or 64.6%) of these have the same slope as the adjacent street.
- Of the 144 bus stops surveyed:
 - 29 (or 20.1%) have space for the bus to pull over.
 - 47 (or 32.6%) are accessible by pedestrian path (bike or dirt path).
 - 36 (or 25%) are accessible by sidewalk.
 - 61 (or 42.4%) are accessible by the street.
 - 139 (or 96.5%) of the bus stop are marked by blue tape to designate a bus stop (Figure 4.9).



Figure 4.9 Blue tape markers used to mark the locations of bus stops

After assessing each bus stop, we rated each on a scale of 1 – 5 with 1 as the best and 5 as the worst. A bus stop with a rating of 1 would include an appropriate sized boarding area that has the same slope as the adjacent road and access from a sidewalk or pedestrian passageway. A rating of 5 would be an unmarked or potentially dangerous bus stop with no boarding area. Examples of a bus stop that we rated a 1 versus a bus stop that we rated a 5 are depicted in Figure 4.10.



a) Surfside Road



b) North Dover St.

Figure 4.10 Bus stop given a) a rating of 1 versus a bus stop given b) a rating of 5

Figures 4.11 shows the distribution of the bus stop ratings for all 144 bus stops taken together, as well as the ratings for each individual bus route. Clearly the majority of the bus stops overall and on any given route are rated at 3 or higher. Typically, this means that many of the bus stops are marked but do not have an adequate boarding area. The Miacomet route has the largest number of stops (48.4%) that are rated at 1 or 2, although it also has the largest on number (6.1%) rated at 5.

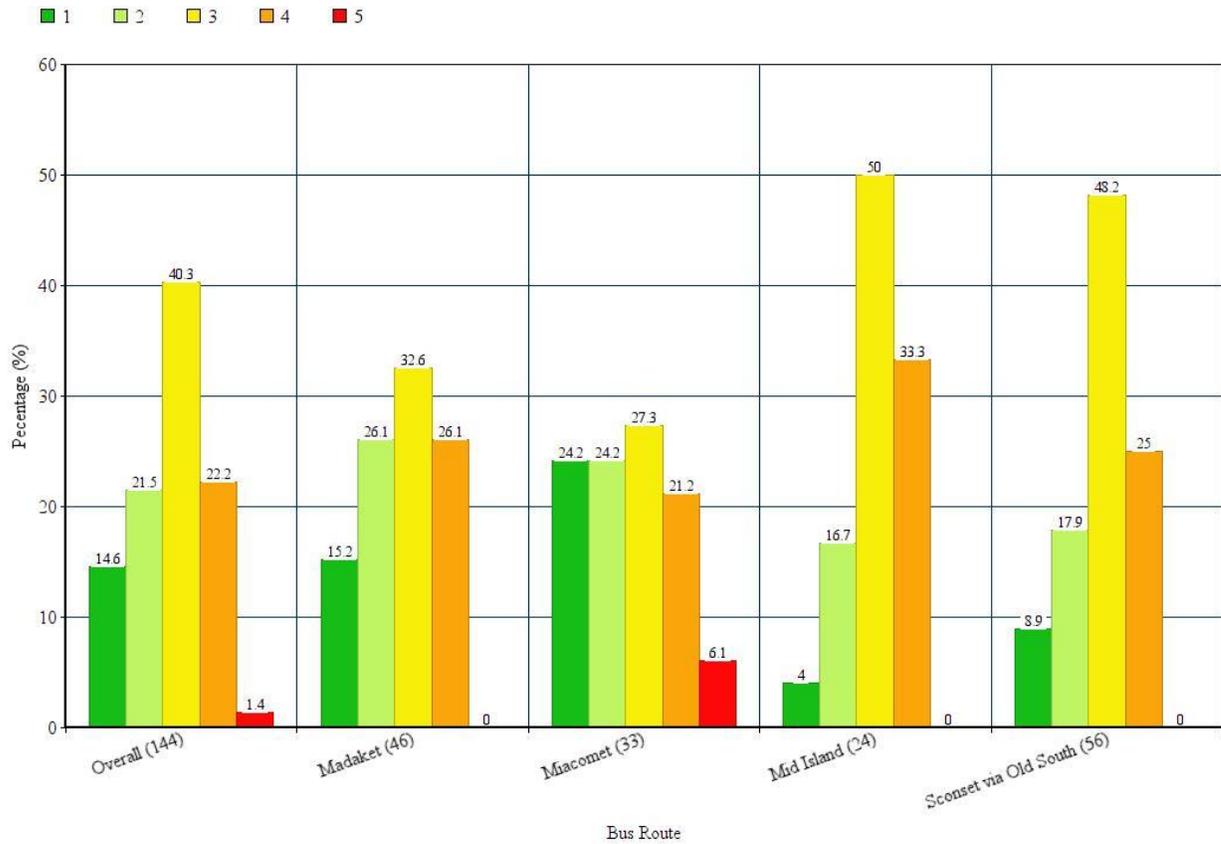


Figure 4.11 Bus Stop Conditions of Nantucket

The average rating for all routes is a 2.67, and ranges from 2.57 for Miacomet to 3.0 for Mid-Island routes.

This collection of ratings indicates that Miacomet route has the best bus stops and the Mid-Island route has the worst. Although there were a few bus stops that complied with ADA standards, most did not. This indicates improvements are needed. The NRTA is currently concerned with improving the most popular bus stops. Figure 4.12 shows a map of the 51 most popular bus stops, and it indicates if the bus stop has an appropriately sized boarding area of 60” x 96”. The green color depicts a bus stop with an appropriate boarding area, and the red color depicts a bus stop where the boarding area is missing or inadequate.



Figure 4.12 Map of Bus Stops with Appropriate Boarding Areas

4.3 Stakeholder Opinions

We attended committee meetings and/or had one-on-one interviews with representatives of the Bicycle and Pedestrian and Advisory Committee (BPAC), Council on Aging (COA), Commission on Disability (COD), Historic District Commission (HDC), and the Nantucket Regional Transit Authority (NRTA). We also sent out an online survey to these committees to gauge their opinions on types of detectable warning panels.

4.3.1 BPAC (Bicycle and Pedestrian Advisory Committee)

Dave Fredericks, a member of the Bicycle & Pedestrian Advisory Committee provided our team with useful information concerning the construction of sidewalks in the Old Historic District. Mr. Fredericks is also a member of the Roads and Rights of Way Committee. He explained that there currently are no durability standards in place for the planning, construction, and maintenance of sidewalks, which is the main reason why many sidewalks in the Core Parking District fell into disrepair after a few years of use. He compared these standards to the construction of the foundation of a building. In a foundation for a building, there are all types of design standards to ensure that the building is stable and, if properly maintained, will last for decades. He claimed that if sidewalks were built and maintained in a similar manner, then they would last longer without deforming into an inaccessible condition. Mr. Fredericks said his committee has divided the Old Historic District into eight different zones for repair (Figure 4.13). However, this idea has not been universally accepted yet, so no progress has been made.

We asked Mr. Fredericks if BPAC had ever received any complaints about any injuries due to the condition of the sidewalks downtown. He stated that BPAC had not receive any complaints and he did not know how many incidents of injury have occurred, although he had witnessed one incidence.

We were able to later able to attend a BPAC meeting, where we introduced ourselves and answered questions about our project. Some members at the meeting include the chairman Jason Bridges, Dave Fredericks, our sponsor Mike Burns, and others. Most questions we answered involved our opinion on the current condition of the sidewalks, how much work we had done so far, and if we had any primary findings at the time.

certain areas of concern along the sidewalks. Currently, SeeClickFix is being discontinued in lieu of a new application on a different platform, which will serve the same purpose.

Tom McGlenn was also able to describe improvements of sidewalks in the past few decades and the politics behind making these improvements. These improvements were mostly funded by shop owners and small groups, and didn't gain much momentum. In addition, he provided us with a wheelchair to analyze the sidewalks from a mobility impaired point of view.

We were also able to attend two of the Council on Aging meetings on November 4th and December 2nd. During the first meeting we introduced ourselves and described the purpose of our project. During the second meeting we presented our initial findings and answered questions from the committee members. Some of these questions included how we gathered our data, and how our findings would be used in the near future in regards to accessibility in the Core Parking District.

4.3.3 COD (Commission on Disability)

Brenda McDonough and Mickey Rowland from the Commission on Disability (COD) explained that their committee is personally involved in repairs made on many of the crosswalks in the Old Historic District. The COD has also received complaints of people falling and getting injured because of the condition of the sidewalks.

Like Dave Fredericks, they explained that there were no durability guidelines for the construction and maintenance of sidewalks, and the COD strongly believes that all of the sidewalks on Nantucket should meet the standards set in place by the Americans with Disabilities Act (ADA) and the Public Right Of Way Accessibility Guidelines (PROWAG). Ms. McDonough and Mr. Rowland believe that the installation of detectable warning panels would enhance accessibility not just for the disabled, but also for everyone on the island. They indicated, however, that many in the community would be opposed to such panels for aesthetic reasons.

Ms. McDonough also mentioned that parking on the sidewalks is becoming a major problem inhibiting access in the Core Historic District, especially in the summer. Also, delivery trucks tend to park on the sidewalks so they are not blocking the narrow streets when making deliveries. Ms. McDonough and Mr. Rowland emphasized that they and the members of the commission strongly feel that all of the sidewalks should be made accessible for everyone.

4.3.4 HDC (Historic District Commission)

While we did not conduct a one-on-one interview, our team attended two of its weekly meetings on November 3rd and December 8th, and we were in contact with Linda Williams through email.

During the first meeting, we introduced ourselves and explained the goal of our project. The only questions that were asked involved the location we would be focusing on (the Core Parking District) and that the HDC be kept in the loop for the duration of our project.

During the second meeting, we shared the results of an online survey we sent out to various committees, which will be explained in more detail later. All members were present, and they were open to all of our suggestions. After looking through each of the eight detectable warning panels that were on the survey, members of the HDC asked a few questions concerning the material of each panel, as well as discussing the advantages and disadvantages of each option, the HDC decided to conduct a trial run with option #2, the detectable warning panel surrounded by granite, shown in Figure 4.14. This option will be placed in the curb ramp located at the intersection of Main and Federal, near The Hub. After placement, various stakeholders will be consulted to determine if the design is suitable for the Old Historic District of Nantucket.

4.3.5 NRTA (Nantucket Regional Transit Authority)

We met with Paula Leary, Administrator of the Nantucket Regional Transit Authority to discuss the accessibility of the Nantucket bus stops. She provided us with a list of the most utilized stops.

Ms. Leary also described how people with disabilities are able to board the bus along a 5' ramp that extends from the bus. All NRTA vehicles are lift-equipped and handicap accessible.

Ms. Leary explained that the bus stops are usually updated when a new bike path is constructed. This statement was confirmed by our sponsor as well as our findings as the higher rated bus stops were along bike paths.

4.3.6 Detectable Warning Panel Survey Results

We created an online survey to gauge the opinions of different committees on Nantucket about detectable warning panels in the core historic district. Stakeholders that took the survey were from the following committees; HDC (Historic District Commission), BPAC (Bicycle and Pedestrian Advisory Committee), NHC (Nantucket Historic Commission), Planning Staff, HSAB (Historical Structures Advisory Board), Town Employees, and the general public.

In our survey, we asked the following question for eight different examples of detectable warning panels: “Please rate the detectable warning panel in the picture below on a scale of 1 to 5, where 1 is ‘very appropriate’ and 5 is ‘not at all appropriate’ for Nantucket.” We also asked what committees (if any) the stakeholders belonged to.

Our results showed that none of the options presented were particularly popular among representatives of the committees, see Figure 4.14. Respondents commented that they wanted to make the sidewalks of downtown Nantucket more accessible for everyone, but would rather not change any of the current sidewalks. The granite cobbles (top right in Figure 4.14) was the option that appeared to be least objectionable to the respondents. Curiously this is not the option the HDC had chosen to test on Main and Federal Streets.



Rating	Percentage (30 Responses)
1	16.67%
2	16.67%
3	16.67%
4	10%
5	40%



Rating	Percentage (27 Responses)
1	14.81%
2	18.52%
3	25.93%
4	22.22%
5	18.52%



Rating	Percentage (29 Responses)
1	13.79%
2	10.34%
3	24.14%
4	17.24%
5	34.48%



Rating	Percentage (29 Responses)
1	27.59%
2	17.24%
3	13.79%
4	20.69%
5	20.69%



Rating	Percentage (30 Responses)
1	10%
2	16.67%
3	13.33%
4	20%
5	40%



Rating	Percentage (30 Responses)
1	10%
2	16.67%
3	6.67%
4	26.67%
5	40%



Rating	Percentage (29 Responses)
1	17.24%
2	10.34%
3	17.24%
4	6.90%
5	48.28%



Rating	Percentage (30 Responses)
1	20%
2	6.67%
3	23.33%
4	20%
5	30%

Figure 4.14 Results from our Detectable Warning Panel Survey

5.0 Conclusions and Recommendations

Through our work with the Nantucket Planning Office, the responses from our interviews and the users of our survey, and the rest of our research and findings shown above, we have come to several conclusions and make a number of recommendations regarding the maintenance of existing infrastructure, design guidelines for the future, and information on accessibility on Nantucket.

Conclusion 1: Maintenance of Sidewalks and Crosswalks

The majority of the sidewalks in the Core Parking District are in reasonable condition, but many still require substantial improvement to bring them into compliance with ADA and Massachusetts standards. Many crosswalks and curbs are missing, and many do not meet ADA guidelines, making it difficult for the disabled and mobility impaired to navigate safely. According to ADA guidelines, there must be an accessible path to all main buildings in any location, even historic communities. However, bringing them up to standard will be difficult given the cost and need to maintain aesthetic and historic character.

Recommendation 1.1: We recommend that the NPO develop a strategic plan for the Old Historic District that lays out priorities, a budget, and milestones for upgrading existing sidewalks, crosswalks, and curb ramps to meet ADA regulations each year.

Recommendation 1.2: We recommend that the NPO develop a similar strategic plan for the Old Historic District that lays out priorities, a budget, and milestones for adding *new* sidewalks, crosswalks, and curb ramps to meet ADA regulations each year.

Recommendation 1.3: We recommend that the NPO, Historic District Commission (HDC), and Commission on Disability (COD) develop design, construction, and maintenance guidelines for handicap infrastructure in the Old Historic District and elsewhere on the island, including crosswalks and curb ramps, to maintain aesthetic character.

Recommendation 1.4: As a short term solution, we recommend that the NPO develop materials/guidebooks regarding the current accessible buildings, features, and routes, and update the Nantucket Island Guide.

Conclusion 2: Maintenance of Bus Stops

The majority of the bus stops along the Madaket, Mid Island, Miacomet, and Sconset (via Old South) are in reasonable condition, but many still require considerable improvement to bring them into compliance with ADA and Massachusetts standards. Many do not contain proper boarding areas, and many do not meet ADA guidelines, making it difficult for the disabled and mobility impaired to safely board the bus.

Recommendation 2.1: We recommend that the NRTA also develop a strategic plan for the bus stops and bus routes that lays out a budget and milestones for upgrading existing bus stops to meet ADA regulations, prioritizing stops that are used most frequently. We recognize that bringing these up to standard will be difficult given the costs, since the service is seasonal, many stops are infrequently used, and the ADA requirement for large paved pads seems inappropriate in the rural and aesthetic landscape of Nantucket. This is why we recommend a phased approach.

Recommendation 2.2: We recommend that the NRTA, HDC, and COD develop design, construction, and maintenance guidelines for accessible features located at each bus stop, including boarding areas, sitting areas, and pull offs.

Recommendation 2.3: We recommend that the NRTA, in the short term, develop materials and a web page regarding current accessible bus stops and bus routes, and update the Nantucket Island Guide.

Future Work:

In the future, another Interactive Qualifying Project team should continue to collect data on 1) stakeholders opinions, 2) most used bus stops, and 3) most accessible route of downtown.

Continuing to establish relationships with the stakeholders would be beneficial for the long-term reliability of our research because opinions may change. Different committees will also have their own ideas for the improvement of the accessibility of the Core Parking District.

Collecting data on the most frequented bus stops will help determine which bus stops need to be higher on the priority list to improve the accessibility. If there are bus stops that are not used, then the town would not have to spend money on improving them and redirect resources toward improving the bus stops that are more frequented.

Exploring options for the most accessible route of downtown would be useful for the town to have during the peak tourist months. The town should determine accessible routes that lead to all main public town buildings (Town Hall, Athenaeum, Public Meeting Space, the Whaling Museum, etc.). Future teams could also continue our work and determine which sidewalks, crosswalks, curb ramps, and bus stops should be updated and improved for each milestone.

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Appendices

Appendix A: Federal Standards for Sidewalks and Bus Stops under the Americans with Disabilities Act

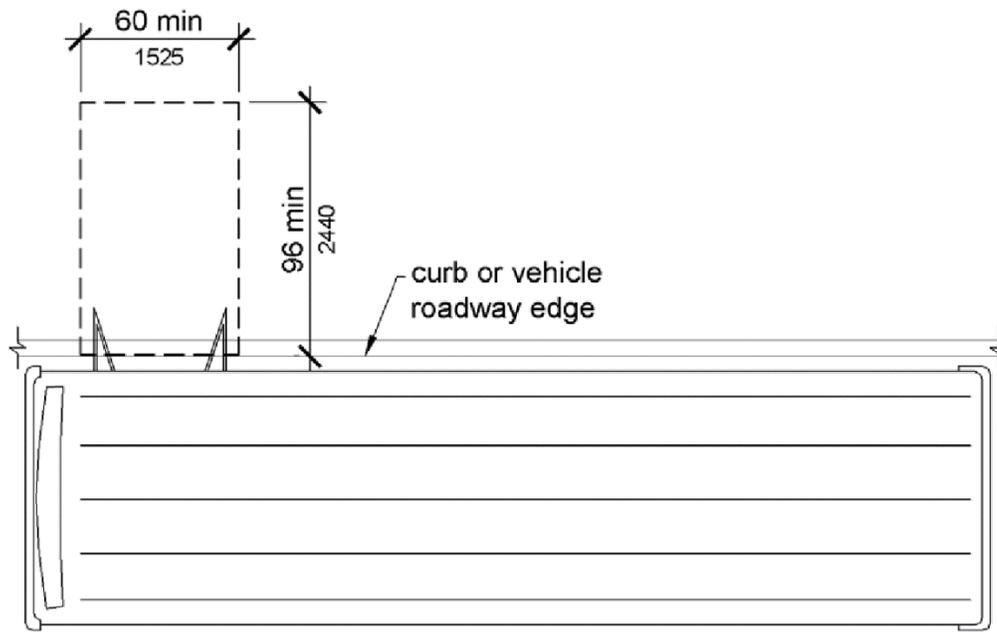
Sidewalks

- Existing sidewalks must have a continuous width of at least 36”.
- If there is an obstruction, the width must be 32” and last for no longer than 24” in length.
- The space between obstructions must have a width of 48”.
- There must be a passing space of 60” X 60” every 200’.
- Curb ramps are necessary whenever an accessible route crosses a curb.
- The cross slope or ramp of a sidewalk must be less than 2%.
- The running slope of the sidewalks must be less than 5% (Delaware T² Center, 2011).

Bus Stops

- Bus stop boarding areas shall provide a length of a minimum of 96” inches from the curb or roadway edge.
- The width of the boarding area must have a width of a minimum of 60” parallel to the roadway.
- The bus route must be connected by accessible routes such as sidewalks, pedestrian paths, or streets.
- The slope of the bus stop boarding must be the same as the roadway.
- There must be identification signs for every bus stop (United States Access Board, 2010)

The figure on the next page shows an ADA schematic of how a bus stop boarding area should be constructed.



Example of a Bus Stop Boarding Area
(ADA, 2010)

Appendix B: Standards for Sidewalks and Bus Stops under the Public Rights-of-Way Accessibility Guidelines

Sidewalks

- Sidewalks must be a width of 4'.
- PROWAG does not provide for obstructions, so the width of sidewalk is always measured from the back of the curb.
- Passing spaces of 5' X 5' are required every 200'.
- The cross slope must be under 2%.
- The running slope must be under 7%.
- The surface can have no more than 1/2" discontinuity.
- The joints and gratings had no more than 1/2" diameter openings.
- Detectable warning surfaces are required at every curb ramp in the form of truncated domes aligned in a radial or square grid pattern.
 - These detectable warning surfaces must have a visual contrast with ramp material.
 - These surfaces must be the full width of the ramp.
- Cross walks must be at least 6' wide.
 - The cross slope of crosswalks must be under 2%.
 - The running slope of the crosswalk must be under 5% (Delaware T² Center, 2011).

Bus Stops

- The surface of the boarding area must be firm, stable and slip resistant.
- The boarding area must be a minimum of 5' along the curb and a minimum of 8' wide.
- There must be an accessible route to the boarding area.
- The cross slope must be less than 2% (Delaware T² Center, 2011).

Appendix C: Walk Audit Form Survey

Walk Audit Form

Recorder _____

Date/Time _____

Weather _____

Street/Intersection _____

Street Description

Arterial or Local

Number of travel lanes

Parking: none, one, or both sides?

Sidewalks: none, one, or both sides?

Speed & Driver Behavior

Estimated speed of cars?

Speed limit posted?

Are walkers separated from roadway?

Do drivers yield to pedestrians? Do pedestrians step out in front of cars?



Neighborhood Features

Land use: residential, commercial, industrial, or mixed use?

Are there community facilities (schools, parks, businesses, etc.) and sidewalks that connect them?

Public transportation: stations, shelter, seating, lighting?

Bike paths? Are there bicycle/pedestrian conflicts?

Sketch

Sketch the street or intersection. Note positive aspects and areas in need of improvement.

Intersection & Crossings

Traffic signal: enough time or too much time to cross? Countdown? Pedestrian-activated?

Crosswalks: painted? striped? raised? curb ramps? detectable warning strips?

Crossings at regular intervals? Too few or too distant?

Pedestrians easily seen by drivers?

Is there a traffic median or pedestrian island?

Curb extensions or other traffic calming devices?

Attractiveness of Walking Route

Condition of sidewalks?

Presence of trees/greenery?

Attractive buildings, blank walls, parking lots?

Garbage/recycling bins? Trash on the ground? Graffiti?

Street furniture/benches?

Street lighting?

Overall Impression

Is street inviting/safe for ALL users (children, parents with strollers, elderly, etc.)?

Would you walk in this area again?



Appendix D: Sidewalk Survey Summary Sample

Street	Number or run of numbers	Cross Street	Surveyed by	Surface, A=Asphalt; B=Brick; Gr = Granite; C= Concrete	Condition	Comments
Academy Ln, N		56 Center St	JM	B	2	Alongside No. 56 Center, sidewalk = 48"
Academy Ln, N	3		JM	B	3	3' wide
Academy Ln, N	5		JM	A	3	Driveway fills entire street-front space
Academy Ln, N	7		JM	none	5	No sidewalk
Academy Ln, N	9		JM	none	5	No sidewalk
Academy Ln, N	11		JM	none	5	No sidewalk
Academy Ln, N	13		JM	none	5	No sidewalk
Academy Ln, N	1		JM	none	5	No sidewalk, driveway
Academy Ln, S		54 Center St.	JM	B	2	5-ft wide alongside No. 54 Center St.
Academy Ln, S			JM	B	2	Sidewalk is at rear of 5 Gay St.
Academy Ln, S	6		JM	B	5	5-ft wide on east and none on north (corner lot)
Academy Ln, S	8		JM	none	5	no sidewalk
Academy Ln, S	10		JM	none	5	no sidewalk but driveway
Academy Ln, S	12	Westminster St	JM	none	5	No. 12 is on both sides of Westminster
Academy Ln, S	4		JM	B	2	Sidewalk is 5' wide but parking blocks walkway at driveway
Broad Street, N	Steamboat Wharf to	Easy St	AR	C	1	
Broad Street, N	2		AR	B	2	
Broad Street, N	4, 6		AR	B	3	uneven
Broad Street, N	8 (Stubby's)		AR	B	3	uneven
Broad Street, N	10	S. Beach St.	AR	B	1	
Broad Street, N	alongside 23 S. Wate	S. Water	AR	B	3	uneven brick
Broad Street, N	16	Federal St	AR	B	3	uneven brick, tripping hazard
Broad Street, N	alongside 22 Federal	(Mooney Bldg)	AR	?	5	Covered with temporary construction shelter
Broad Street, N	18, 20, 22, 24, and alc	Center Street	AR	B	3	uneven
Broad Street, S	Steamboat Wharf	Steamboat Wharf	AR	C, A	1	
Broad Street, S	Steamboat Wharf	S. Beach St	AR	B	2	Alongside truck parking lot, wide but uneven brick and curb height

Appendix E: Sidewalk Survey and Protocols

Street Name: _____

Sidewalk Location: _____

Width of sidewalks: Min: _____ Max: _____

Is it a minimum 36" everywhere?: Yes No

Materials used:

Curb: _____

Sidewalk Surface: _____

Slopes:

Cross Slope: Min: _____ Max: _____

Running Slope: Min: _____ Max: _____

Obstructions: Yes No

If yes, list the obstructions: _____

Is there 32" of passing room?: Yes No

If no, what is width?: _____

Is there 48" width of room between each obstruction?: Yes No

Passing Area:

Is there 5' X 5' area every 200'?: Yes No

Surface Condition: 1 2 3 4 5

Comments:

Protocols:

All measurements will be in feet and inches using a tape measure.

Street Name:

- Write down the name of the street the sidewalk is on and which side of the street it is on using cardinal direction.

Street Location:

- The two distinguishable features or streets that the sidewalk lies in between.

Width of Sidewalks:

- Width of sidewalk measurement will not include curbs.

Slopes:

- The cross slope is the slope of the sidewalk from the edge of the sidewalk to the street.
- The running slope is the slope of the direction of movement.
- The slopes will be measured using a 2' level and a tape measure.
- The slopes will be measured as a percentage.

Obstructions:

- Mark the number of obstructions and what the obstructions are.
- Examples of obstructions include trees, lamp posts, etc.
- Measure the width of the sidewalk around the obstruction and see if they are a minimum of 32'.

Passing Zones:

- Note if there is a 5' X 5' space to wait or rest every 200' of sidewalk.

Surface Condition:

- Rate the surface condition on a scale from 1-5 with 1 being the best and 5 being the worst.

Protocols:

Street Intersection:

- List the name of the two streets that are intersecting

Curb Ramps:

- When numbering the curb ramps in a T-intersection, start by facing the intersecting street, on the opposite side of the street that it intersects. Label the curb ramp most left number 1, and then chronologically number the rest of the curbs 2-6 by moving forward then right as if in a square motion. There should be six curbs ramps.
- When number the curb ramps in a 4-way intersection, start at the southern left curb. Then label the curb ramp that leads north number 1, and then by moving forward and right name the rest in chronological order 2-8. There should be eight curb ramps.
- If a curb ramp is missing, label that number as N/A.
- Label each intersection with the appropriate number of curb ramps that they should have.
- A curb ramp is needed at every street intersection.
- The width is the part of the curb that is ramp down.
- Ramp slope should be measured using a 2' level and a tape measure.
- The slope should be recorded as a percentage
- For each extra space for the curb ramp width, just put N/A.

Crosswalks:

- At a T-intersection, label the crosswalks chronologically 1-3 in the same way as moving to name the curb ramps.
- At a 4-way intersection, label the crosswalks chronologically 1-4 in the same way as moving to name the curb ramps.
- There should be a crosswalk at every intersection with the curb ramp.
- For each extra space for the crosswalk width, just put N/A.

Detectable Warning Surfaces:

- Measure the width that is parallel to the curb ramp.
- Every curb ramp should have one.
- Types could include truncated dome pads, rumble strips, etc.

Appendix G: Bus Stop Survey and Protocols

Bus Route: Madaket Miacomet Mid Island Sconset (via Old South)

Bus Stop Location: _____

Boarding Area: Yes No

Is boarding area at least 60" X 96"?: Yes No

If no, what is size?: _____

Type (material): _____

Is the slope the same as the roadway?: Yes No

Sitting Area: Yes No

Accessibility:

Is it accessible by: Street Sidewalk Pedestrian Path None

Bus Stop Marking: Yes No

Visual Impairment Aids: Yes No other: _____

Size: _____

Type: _____

Space for bus to pull over: Yes No

Size: _____

Condition (1 being best and 5 being worst): 1 2 3 4 5

Comments:

Protocols:

Bus Route:

- Choose the bus route that the survey is being implemented on.

Bus Stop Location:

- Put the certain number labeled on the bus route map.

Boarding Area:

- The area of 60" X 96" needs the 60" to be parallel to the road and 96" perpendicular to the road.
- Determine the type of material the waiting area is and whether it limits access to sidewalks or to the actual bus stop.
- Note if there is a sitting area for the bus stop.

Accessibility:

- Look for a method of accessibility to the sidewalks.

Bus Stop Marking:

- This marking should be with blue tape.

Obstructions:

- Look for uneven areas along the bus stop that could cause accidents.

Visual Impairment Aids:

- Determine if there are aids to replace truncated dome pads.
- Measure them and give descriptions such as color and material.

Space for Bus to Pull Over:

- Measure the area for a bus to pull over.

Appendix H: Interview Preamble/Questions Sample

Preamble:

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting a survey to learn more about the current condition of the walkways in the Old Historic District as well as the bus stops on the Madaket, Sconset, Mid Island, and Miacomet bus routes. We strongly believe that this research will aid us in making recommendations to update the walkways and bus stops to make them more accessible.

Your participation in this survey is completely voluntary and you may withdraw at any time. Please remember that your answers will remain anonymous. No names or identifying information will appear on the questionnaires or in any of the project reports or publications.

This is a collaborative project between the Nantucket Planning Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

Sample Survey Questions:

1. How is your committee involved in/advocate for maintaining the sidewalks and bus stops?
2. What is your opinion on the current accessibility of the sidewalks in the Old Historic District?
3. Have you reviewed any of the current ADA, MAAB, or MassDOT accessibility standards?
4. Have there been any injuries or lawsuits concerning the sidewalks or bus stops that you know of?
5. Has your committee ever received a complaint regarding the accessibility of the sidewalks or bus stops?
6. Have you ever been injured/ affected personally by the sidewalks or bus stops?
7. Do you know of any previous efforts to improve the accessibility of sidewalks in the Old Historic District?
8. Do you have any recommendations on improving the bus stops or walkways?
9. Do you have any questions for us?

Appendix I: Sidewalk Spreadsheet Sample

Street	Location	Over 36" Width	Cross 1/24	Run Pass 1/12	Obstructions	Passing Room	Passing Area	Condition
Broad	(N) South Water to North Water	Yes	Yes	Yes	Yes	Yes	Yes	1
Broad	(N) Beach to South Water	Yes	Yes	Yes	Yes	Yes	Yes	1
Broad	(N) Easy to North Beach	Yes	No	Yes	Yes	Yes	Yes	2
Broad	(S) Easy to South Beach	Yes	No	No	Yes	Yes	Yes	2
Broad	(S) South Water to South Beach	Yes	No	Yes	No	N/A	N/A	2
Broad	(S) South Water to Federal	Yes	No	No	Yes	Yes	Yes	2
Broad	(S) Federal to Center	Yes	No	No	Yes	Yes	Yes	2
Broad	(N) North Water to Center	Yes	No	Yes	Yes	Yes	Yes	2
Cambridge	(S) South Water to Union	Yes	Yes	Yes	Yes	Yes	N/A	1
Cambridge	(S) North Union to Federal	Yes	No	Yes	Yes	Yes	Yes	1
Cambridge	(N) Federal to North Union	Yes	Yes	Yes	Yes	Yes	No	1
Cambridge	(S) Easy and South Water	Yes	No	Yes	Yes	Yes	N/A	2
Cambridge	(N) South Water to Union	Yes	No	No	No	N/A	N/A	2
Cambridge	(N) Easy to South Water	Yes	No	Yes	Yes	No	Yes	3
Candle	(E) Salem to Main	Yes	Yes	Yes	No	N/A	Yes	2
Candle	(W) Salem to Main	No	No	Yes	Yes	No	Yes	3
Candle	(W) Salem to Washington	Yes	No	No	Yes	No	No	4
Candle	(N) Salem to Washington	N/A	N/A	N/A	Yes	N/A	No	5
Center	(W) Broad to Quince	Yes	No	Yes	Yes	Yes	Yes	1
Center	(W) Hussey to India	Yes	No	Yes	Yes	Yes	Yes	1
Center	(E) Chestnut to India	Yes	No	No	Yes	Yes	Yes	1
Center	(W) India to Rose	Yes	No	No	Yes	Yes	Yes	2
Center	(W) Rose to Liberty	Yes	Yes	No	No	N/A	Yes	2

Appendix J: Intersection Spreadsheet Sample

Street Intersection	Intersection Type	# Crosswalks	Crosswalk Widths	# Curbcuts	Curb Widths >36"	Curb Slopes <1/12
Main and Center	T-Intersection	3/3	1. 69"2. 66"3. 76.5	6/6	2. Yes	1. Yes2. Yes3. No4. Yes5. No6. No
Main and Orange	T-Intersection	3/3	1. 62"2. 122"3. 76.	5/6	1. Yes2. Yes3. None4. Yes5. Yes6. Yes	1. No2. No3. None4. No5. No6. No
Main and Federal	T-Intersection	3/3	1. 85"2. 99"3. 60"	6/6	1. Yes2. Yes3. Yes4. Yes5. Yes6. Yes	1. No2. Yes3. Yes4. Yes5. Yes6. No
Main and Union	4-Way	2/4	1. 65"2. 114"3. No	6/8	1. Yes2. Yes3. Yes4. Yes5. None6. None7. Yes8. Yes	1. Yes2. No3. No4. No5. None 6. None7. No8. No
Main and Washington	4-Way	4/4	1. 60" 2. 74"3. 72"	8/8	1. Yes2. Yes3. Yes4. Yes5. Yes6. Yes7. Yes8. Yes	1. Yes2. No3. No4. Yes5. No6. No7. No8. No
Main and Easy	4-Way	4/4	1. 60"2. 62"3. 60.5	8/8	1. Yes2. Yes3. Yes4. Yes5. Yes6. Yes7. Yes8. Yes	1. No2. Yes3. No4. No5. Yes6. No7. Yes8. Yes
Salem and Candle	4-Way	3/4	1. 98"2. None3. 69	7/8	1. Yes2. Yes3. Yes4. None5. Yes6. Yes7. No8. Yes	1. Yes2. No3. Yes4. None5. Yes6. No7. No8. No
Salem and Washington	4-Way	1/4	1. None 2. 98"3. N	6/8	1. Yes2. Yes3. Yes4. None5. Yes6. Yes7. Yes8. None	1. Yes2. No3. Yes4. None5. Yes6. No7. No8. None
Salem and Union	T-Intersection	0/3	1. None2. None3.	12/6	1. None2. None3. Yes4. Yes5. None6. None	1. None2. None3. No4. No5. None6. None
Easy and Still Dock	4-Way	1/4	1. None2. None3.	4/2/8	1. None2. None3. None4. None5. Yes6. Yes7. None8. None	1. None2. None3. None4. None5. Yes6. Yes7. None 8. No
Cambridge and Easy	4-Way	0/4	1. None2. None3.	15/8	1. Yes2. None3. Yes4. No5. Yes6. Yes7. None8. None	1. No2. None3. No4. Yes5. Yes6. Yes7. None8. None
Oak and Easy	T-Intersection	2/3	1. 48"2. 60"3. Non	4/6	1. Yes2. Yes3. Yes4. Yes5. None6. None	1. No2. Yes3. Yes4. No5. None6. None
Easy and Broad	T-Intersection	1/3	1. None2. 118"3. N	5/6	1. Driveway2. None3. Yes4. Yes5. Yes6. Yes	1. Yes2. None3. No4. Yes5. Yes6. No
Still Dock and South Water	T-Intersection	2/3	1. None2. 70"3. 70	4/6	1. None2. None3. Yes4. Yes5. Yes6. Yes	1. None2. None3. Yes4. Yes5. No6. No
Cambridge and South Water	4-Way	4/4	1. 72.5"2. 44.5"3.	8/8	1. Yes2. Yes3. No4. Yes5. Yes6. Yes7. Yes8. Yes	1. No2. Yes3. No4. Yes5. Yes6. Yes7. Yes8. No
India and South Water	T-Intersection	1/3	1. None2. 59"3. N	3/6	1. None2. Yes3. Yes4. Yes5. None6. None	1. None2. No3. No4. Yes5. None6. None
Oak and South Water	4-Way	3/4	1. 67"2. 72"3. 90"	46/8	1. Yes2. Yes3. Yes4. Yes5. Yes6. Yes7. None8. None	1. Yes2. Yes3. No4. Yes5. Yes6. Yes7. None8. None
South Water and Chestnut	T-Intersection	1/3	1. None2. 69"3. N	2/6	1. None2. None3. Yes4. Yes5. None 6. None	1. None2. None3. Yes4. No5. None6. None
South Water and Broad	T-Intersection	2/3	1. 72"2. 72"3. No	4/6	1. Yes2. Yes3. Yes4. Yes5. None6. None	1. No2. Yes3. Yes4. Yes5. None6. None
Beach and Broad	4-Way	4/4	1. 118.5"2. 119"3.	7/8	1. Yes2. Yes3. No4. Yes5. None 6. Yes7. Yes8. No	1. No2. Yes3. Yes4. Yes5. None6. No7. No8. Yes
Oak and South Beach	T-Intersection	0/3		2/6	1. None 2. None3. Yes4. Yes5. None6. None	1. None 2. None 3. Yes4. Yes5. None 6. None
Broad and North Water	T-Intersection	2/3	1. None2. 96"3. 72	1/6	1. None2. None 3. Yes4. Yes5. Yes6. Yes	1. None2. None3. Yes4. Yes5. Yes6. Yes

Appendix K: Bus Stop Spreadsheet Sample

FID	ID	Bus Route	Boarding Area	Correct Size	Accessible by	Blue Markers	Bus Pull Over	Rating	Material	Heavy Use	Adjacent to Road
0	1	Madaket	Yes	Yes	Sidewalk	No	No	2	Brick	Yes	No
1	2	Madaket	No	N/A	Sidewalk	Yes	No	4	N/A	No	No
2	7	Madaket	Yes	No	Street	Yes	No	3	Pulloff	No	Yes
3	9	Madaket	No	N/A	Street	Yes	No	4	N/A	No	No
4	42	Madaket	Yes	No	Street	Yes	No	3	Grass	No	No
5	11	Madaket	No	N/A	Street	Yes	No	4	N/A	No	No
6	13	Madaket	Yes	No	Street	Yes	No	3	Grass	No	No
7	15	Madaket	No	N/A	Pedestrian Path	Yes	No	4	N/A	No	No
8	19	Madaket	No	N/A	Street	Yes	No	3	Driveway	No	Yes
9	17	Madaket	Yes	No	Street	Yes	No	4	Grass	No	Yes
10	21	Madaket	Yes	Yes	Sidewalk	Yes	No	2	Concrete	No	Yes
11	22	Madaket	Yes	Yes	Street	Yes	Yes	2	Grass	No	Yes
12	24	Madaket	Yes	Yes	Street	Yes	Yes	1	Grass	No	Yes
13	26	Madaket	Yes	Yes	Street	Yes	No	2	Sand	No	Yes
14	28	Madaket	No	N/A	Street	Yes	No	4	N/A	Yes	Yes
15	30	Madaket	Yes	No	Street	Yes	No	4	Grass	Yes	No
16	32	Madaket	Yes	Yes	Street	Yes	No	1	Concrete	Yes	Yes
17	34	Madaket	Yes	Yes	Street	Yes	No	2	Dirt	Yes	No
18	36	Madaket	Yes	Yes	Street	Yes	No	3	Concrete	Yes	Yes
19	38	Madaket	No	N/A	Street	Yes	No	4	N/A	No	Yes
20	39	Madaket	No	N/A	Pedestrian Path	Yes	No	4	N/A	No	Yes
21	37	Madaket	Yes	Yes	Pedestrian Path	Yes	No	2	Grass	Yes	Yes
22	35	Madaket	Yes	Yes	Pedestrian Path	Yes	No	2	Dirt	Yes	No
24	30	Madaket	Yes	Yes	Pedestrian Path	Yes	Yes	1	Concrete	Yes	Yes
25	29	Madaket	No	N/A	Pedestrian Path	Yes	No	4	N/A	Yes	Yes