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Downtown Traffic Circulation Analysis

Prepared for :

Nantucket Downtown Partnership

48 Main Street

Nantucket, Massachusetts 02554

LOCATION MAP

map source: "U.S. Geological Survey (U.S.G.S.)
Nantucket Quadrangle"

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DOWNTOWN CIRCULATION ANALYSIS
NANTUCKET, MASSACHUSETTS

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Executive Summary

RECOMMENDATIONS

The solutions to the existing traffic circulation problems within the historical Core of Nantucket Town may be implemented by optimizing the many constraints placed upon a road and transportation system constructed centuries ago. The town center was developed without consideration for the widespread appeal the island has for the current and anticipated summertime visitors. The town center is a quaint return to a time without the automobile and the ideal solutions for improvements of the transport of vehicular traffic may come only at the expense of the appeal of the historic era. Improvements listed within this report consider both the preservation of the Town's character, as well as enhancements that may serve to improve the transportation problems currently experienced. The consideration of any of these transportation alternatives should be carefully weighed, as generally the higher the enhancement level, the higher the costs.

Implementation of the following items can effectively improve traffic conditions in the Downtown area:

- Development of a public transit system such as a replica trolley system to reduce the demand for individual travel into Town. This could be linked with peripheral parking facilities and controlled by interactive sensors which determine when and where demand is the greatest.

- Creation of an improved awareness system for negotiating transportation modes through town. This includes better informational signing, informative traffic officers, and destination paths and maps (color coded).

- Regulation of large vehicle traffic and deliveries. An improved storage facility at the entry point to the island would be required.

- Incentives or regulations to restrict the amount of vehicles in Town and/or on island.

Introduction

This report has been prepared to derive alternative solutions to the existing traffic congestion within Nantucket's Central Business District (Town). The analysis of the existing conditions considers the summertime season that is the period in which the heavy influx of visitors and tourists inhabit the island. Nantucket exemplifies great historical and natural resources which make it a popular destination for summertime visitors. The Historic section of Town is the center of the island's commerce and activity and is not conducive to the heavy intermodal transportation demands placed upon it during the busy summertime months.

The roadways of Nantucket's downtown were aligned prior to the invention of the automobile when the horse was considered the major transportation alternative to walking. Currently, the roadways are mostly cobblestone and the sidewalks brick pavers. Although these elements are esthetically pleasing, they are not optimal for high volume and multi-modal transportation demands. The clash of the centuries old historic design of the Town with today's demand to be associated with it, is the basis for the traffic problems currently experienced.

The Town's center is densely developed with commercial and retail establishments. The density of this development is extreme, with minimal areas reserved for much needed parking facilities and open spaces. Construction of new roadway facilities would be considered impossible due to its disruption to numerous homes, businesses, and the basic character of the Town itself. The attractiveness of the island only grows with time as many new homes for both year round and summertime residents continue break ground.

This report has reviewed the basic transportation system, its capacity and constraints, and proposes alternatives to alleviate the congestion that results from the islands unique attractiveness and limited transportation means. The alternatives may be implemented immediately or considered long term. The current conditions warrant seemingly drastic measures which introduced some of the more involved alternatives.

Existing Conditions

ROADWAY NETWORK

The downtown roadway network is composed of streets aligned in a grid like pattern. The major streets are arranged in a system of blocks approximately 3 blocks wide by 4 blocks deep. This central business district is relatively small and can easily be covered by foot. The limits of this project are depicted in Figure 1.

The roadways within the project limits running perpendicular to Nantucket Harbor include:

- Broad Street
- Main Street
- Chestnut Street
- Pearl Street
- Whalers Lane
- Oak Street
- Cambridge Street
- Salem Street
- Steamboat Wharf
- Straight Wharf

The major cross Town study area roadways that run parallel to the harbor include:

- Center Street
- Federal Street
- South Water Street
- Easy Street (Candle Street)
- New Whale Street
- Union Street
- Washington Street
- Orange Street
- Fair Street
- North Water Street

Within this network of roadways, there are many locations of traffic congestion problems. The streets are closely spaced so congestion from one intersection often extends to the downstream intersection.

Interaction between the high volumes of cars, mopeds, bicycles, and pedestrians can not be efficiently mobilized within the constricted right-of-way. These streets maintain a variety of parking and no-parking areas, loading zones, heavy commercial activity, curb openings, restricted sidewalk widths, and numerous other deficiencies that can lead to traffic congestion.

Travel patterns are essentially along roadways leading to and from the downtown district to the outlying residential and recreational areas. The major roadways supporting this traffic include Orange Street, Washington Street, Union Street, Francis Street, North Center Street, and North Water Street. These roadways do not maintain the carrying capacity to efficiently satisfy the travel demands of the peak season traffic flow. They are characterized by narrow, winding roadways with areas of poor visibility and numerous driveway openings.

The Steamboat Wharf originates from Lower Broad Street and is a major traffic generator within Town. The Steamship Authority Ferry embarks and departs from this location and is a major point of vehicular and pedestrian conflict when the ferry arrives and departs. Over 500,000 visitors are anticipated to utilize the ferry service each year, with the highest concentration occurring between the Forth of July and Labor day holidays.

TRANSPORTATION MODES

Non-Automotive

Nantucket's central core is the central heart of the island, and therefore is a gathering place for many people, visitors and islanders alike. As mentioned previously, pedestrian traffic is dominant and often uncontrollable. With the sheer volume of pedestrian activity and the fact that a majority of the roadways in the downtown area are paved with cobblestone which keeps traffic speeds to a minimum, pedestrians take over roadways otherwise reserved for vehicular traffic.

Competition for roadway space is fierce during these peak summer months, with vehicular parking maneuvers, deliveries, mopeds and cyclists also competing for this valuable roadway space.

Public transportation is lacking on the island, and its efficient introduction would certainly be needed to ease some of the traffic congestion. Public transportation is not a popular means of travel in the United States with our society virtually based on the freedom of the automobile. Any public

transportation implemented should be both attractive, efficient, and of minimal cost to the user to make it successful.

Ferry services to and from the island are based in town. Both the Steamship Authority and the Hi-Line service vessels maintain their docks in Nantucket Harbor at the Steamboat Wharf and Straight Wharf, respectively. These docks are not equipped to service the pedestrians and vehicles associated with the peak season. Many visitors to the island are lost or confused when departing the ferries.

In recent years, statistics show an increase in the truck traffic on the Steamship ferries. These trucks are dumped into the narrow, pedestrian clogged streets of Town adding to the traffic dilemma.

The most common means of transportation in Town is by foot. Many day-trippers to the island do not rent automobiles and either walk, rent bicycles or mopeds, or take a tour bus or taxi ride to other parts of the island. The center of Town maintains the highest attraction as it is filled with many of the islands' shops, restaurants, and activities. The sidewalk facilities are varied at different locations within Town. In many cases the sidewalks are not able to facilitate the on rush of pedestrian activity and people flood into the streets. This is typical of South Water Street which has sidewalks but is the location where many of the ferry passengers enter into Town.

The bicycle and moped rental shops are located in Town as the proximity to the ferry services where many of the potential renters originate is highly desirable. These shops distribute maps indicating locations of attractions, landmarks, and existing bicycle routes. The island maintains bicycle facilities outside Town, but a marked route within town has not been established. Many cyclists find difficulty navigating the downtown streets due to the cobblestone riding surfaces. Other deficiencies within Town also lead to inefficient bicycle operations. It has been pointed out in earlier studies that these deficiencies are namely a lack of bicycle parking facilities and information on bicycle routes.

Some intersections within the central core maintain handicap accessible ramps at intersection locations. However, there exists room for improvement at specific locations where sidewalk access and crossing areas lack the necessary components for handicapped accessibility. Almost the entire sidewalk system is set with brick pavers. Upheaval in isolated areas has disrupted these pavers with tree growth and other forces disturbing the level surface of the walkway. The following illustrations show some of the typical sidewalk features within Town.

Automotive

During the summertime season, the automobiles which flood Town create havoc and take away from the otherwise pleasing experience gained from a visit to Nantucket. With the Historic Town being the major gateway for visitors arriving to and leaving from the island, all vehicles at some point travel through its ages old, characteristic travel ways.

Besides being the gateway for these vehicles due to the ferry location, vehicles also travel back and forth to Town as it is the center of most of the island's social activities. The are a number of problems associated with today's automotive traffic utilizing yesterday's roadways, and this is clearly seen on almost any given day in the summertime. One of the problems is due to a lack of capacity on the roadways. Main Street and parking lanes aside, most of the roads maintain only one travel lane per direction. The restricted width associated with a majority of roadways is the attributing factor for the establishment of one-way traffic.

The current system of one way roads has been established due to both the restricted width as stated above, and the need for an organized road system to efficiently move vehicular traffic. From an earlier transportation study, the recommendation and implementation of these one way routes was developed. A review of the roadway network was initiated to attempt to improve the efficiency of motor vehicle travel in the town. The conclusion which presented itself most clearly was that the system of existing roads, no matter how they were controlled, can not effectively satisfy the heavy peak hour demands associated with the summertime season. Therefore, one conclusion drawn from the analysis indicates that the reduction of demand for vehicles in Town would help to alleviate the congestion currently experienced.

Notwithstanding the issues of pedestrian, bicycle, and moped traffic, automobile traffic is the major contributor to the poor transportation operations within Town. A number of strategies aimed to reduce the amount of vehicles destined for the downtown area are discussed in the later sections of this report.

Accident Analysis

Accident statistics were obtained from the Nantucket Police Department for the years 1993 through present. Discussions with the Department corroborated the statistical database. Within this three year time period analyzed, there were a total of 333 accidents referenced to the streets and intersections in Town. Due to the general records, a number of these collisions may have been outside of the study area, but were referenced to a street name which was within Town. The exact location of the collisions was not always stated in the reports.

Most of these collisions were uneventful, resulting in property damage only. However, one fatality occurred during the study period on South Water Street. This event was considered by the Department as an isolated incident in which an elderly pedestrian entered the street and was struck by a moving vehicle. Other than that particular occurrence, most of the collisions are relatively minor due to the slow moving traffic on the roadways in Town.

Injury type accidents accounted for 4% or 13 total accidents of the 333 recorded.

A summary of the statistical data is listed in the table shown on the next page.

The statistics show 66% of the collisions occurred during the busiest travel times on the island, from the beginning of June through mid-September. This correlated with the season of activity associated with seasonal residents and tourists. Many of the tourists can be considered unfamiliar with the island and therefore may not be devoting their attention to driving. There are many distractions associated with driving in Town during these busy times, and these distractions can lead to poor motor vehicle operation and collisions.

Mopeds and bicyclists accounted for 33 or 10% of the total accidents in Town. The lack of a bicycle route and the limited visibility of these types of vehicles can be seen as contributing factors to the accidents.

There were seven pedestrian accidents during the three and a half year study period.

Sight visibility restrictions can be listed as a reason for a number of the in-Town accidents. On street parking always reduces a motorist's view of intersections and sidewalks. Also, the tight turning radii at intersections and the lack of building setback compound the problem. These problems are inherent on these type of historical streetscapes. Adding the heavy interference due to pedestrians, cyclists, parking maneuvers, and mopeds, and there is the potential for accidents. The potential, however, has mainly resulted in minor accidents without personal injury.

The accident summary table represents approximately 85% of the accidents recorded by the Nantucket Police department. The remaining 15% of the accidents occurred at locations with less than 5 incidents per location. Other noteworthy statistics include the details of some of the accident numbers listed in the table.

Union Street, for instance, had 2 injuries, 5 moped accidents, 2 bicycle, and 2 pedestrian accidents. These numbers accounted for a significant percentage of the totals in those individual categories. For the most part, Union Street is located outside of the study area, but the safety record of the entire street length is at question.

Of the 14 total injury accidents, 4 involved police emergency vehicles.

The table on the following page indicates the locations with the highest incidents of collisions. As can be seen in the table, although the number of accidents reported in Town is high, the number has been decreasing over the years studied.

Table No. 1

ACCIDENT SUMMARY 1993 - 1996

ACCIDENT LOCATION	1993	1994	1995	1996	TOTAL
Main Street	13	30	7	1	51
Union Street	17	19	6	0	42
Federal Street	7	13	3	1	24
Washington Street	13	13	2	1	29
Center Street	10	7	7	1	25
South Water Street	10	14	6	0	30
India Street	9	7	7	1	24
South Beach Street	4	9	1	0	14
Easy Street	6	5	0	0	11
New Whale Street	5	3	0	0	8
North Water Street	3	1	1	1	6
Fair Street	3	5	0	0	8
Cambridge Street	3	1	2	1	7
TOTAL	103	127	39	10	279

Proposed Improvements

The improvements to the overall transportation system in Town are aimed at reducing the automotive demand within the Town's limited capacity streets. This attempt is based on the logical conclusion that higher capacity roadways can not be constructed within Town and the most must be made from what exists.

All of the following recommended improvements can be implemented individually or in conjunction with others. Any combination of the alternatives would serve to ease congestion in Town during the peak season.

TRAFFIC REDUCTION

One way to reduce automobile traffic in Town is to provide a public transportation system. The system could be modeled after a unique system such as the San Francisco trolleys. This type of public transportation would be attractive to the rider and therefore would overcome a major stigma of public transportation. The trolley system need not be a cabled system, as a more modern propulsion system could power the typically attractive trolley car.

Any introduction of a public transportation system would benefit in-Town travel needs. The system should be timely, efficient, and inexpensive to be considered advantageous to solve the travel demands from outside of Town. A public transportation link from Town to the airport would be a much needed link to connect these two centers of activity.

Employees and business owners should be encouraged to utilize public transportation or ride sharing to leave the scarce and valuable parking spaces for their patrons.

The trolley service would be efficient with service to out of Town, satellite parking facilities. As parking is so limited, and space so valuable within Town, these satellite parking facilities would provide the service without creating an uncharacteristic element within Town. Besides using such facilities as the high school lot, additional satellite parking areas could be constructed with alternative surface layers to make them aesthetically pleasing. Current products include pavers which allow vegetation

(grasses) to grow through and modern geo-textile additives which can strengthen existing soils to satisfy the dual purpose of accommodating vehicular parking loads and sustaining vegetation.

COMMERCIAL VEHICLES

Commercial deliveries should be restricted to off peak time periods. These periods typically would be pre-10 am. In order to successfully realize this, improved storage facilities may need to be constructed to house the perishable and unperishable goods at the entry point onto the island. Additional storage would need to be created adjacent to the docks where the commercial vehicles originate. Truck traffic has been on the rise in Nantucket, and larger trucks are not conducive to the Towns road system. Consideration to restrict larger trucks by utilizing smaller delivery vehicles may improve conditions by reducing loading time and space at site specific locations. An expanded commercial vehicle facility at the point of origin would aid in delivery conflicts on the street system within Town.

SIGNAGE / INFORMATION

An improved system of directional signs and maps to guide the many visitors to the island could only help to aid in a portion of the traffic congestion. The systematic distribution of maps at strategic points can help to aid the numbers of visitors to the island. To augment this, more "Traffic / Information" officers could be stationed at key locations to aid tourists and prevent the constant circling of the downtown area searching for particular locations. These officers could be provided along lower Broad Street and at the South Beach Street intersection where visitors first arrive. Also, key intersection locations such as Main Street at South Water Street and Broad Street at Center Street could be useful to provide much needed assistance during peak rush hours as when the ferries arrive. A color coded free standing sign or sign system clearly indicating attractions and lodgings could also be developed and implemented for this use.

SYSTEMS

Another potential traffic control improvement which can be implemented for improved operations in Town could be introduced with some of the latest technological advances from the traffic engineering industry. An Intelligent Transportation System (ITS) could be developed with the special interests of Historic Nantucket to create a unique system of traffic control. The system which could be introduced on the island would be

somewhat modified from similar systems being put into action around the globe. Typically an ITS would link traffic sensors to a message sign to inform motorist of conditions in store for them down the road. These systems also vary the timings at traffic signals which can control the amount of traffic heading in a particular direction. As typically Nantucket is a retreat from high technology, any ITS considered for the island would be designed and applied accordingly.

For use in this application, vehicle sensors could be placed in the peripheral roadways and arteries leading into and out of town. Examples of these major roadways include Lower Orange Street, Union Street, and Washington Street. Other sensors would also be located at strategic locations within Town, such as along Main Street, Broad Street, and Straight Wharf. These sensors would determine the occupancy of the interior roadways in Town. When the occupancy level reaches a predetermined threshold, certain messages could be issued to provide advance warning to people destined for the congested area. The messages could be displayed on mechanized, changeable wooden signs which reflect the historical nature of the island. Used in conjunction with peripheral parking facilities and public transport, this effort to reduce the amount of traffic destined for the center of Town could be more efficient.

PARKING

Parking, or lack of it within Town, is also a problem which relates to traffic woes in town. Many vehicles circle the roadways looking for a place to park. Illegal parking causes problems of visibility and capacity. Parking regulations should be strictly enforced.

With a lack of parking and space in the heavily demanded downtown district, a somewhat outlandish option could be to provide a parking area over the water, on a stationary barge or dock system. The barge could be screened with trees or have a backdrop of shops for aesthetics. It could be positioned near the industrial waterfront or a nearby section of the harbor with a separate roadway and pedestrian gateway linking it to the downtown district.

ACCESSIBILITY

Specific improvements which can be made to the street and sidewalk system are listed below. A number of intersection locations do not maintain adequate handicapped access or crossings. Figures listing these improvements can be found in the Appendix. The figures describe

the details of the improvements as well as show the locations which need attention.

- Straight Wharf has two locations where crosswalks do not maintain handicapped access.
- The Candle Street / Salem Street intersection requires an access ramp.
- An improved crossing is required at Orange Street and Main Street. Ramps and a smooth crossing path need to be established.
- Main Street crosswalks are inconsistent. The solid granite slabs placed within the cobblestone street should be placed at all crossing locations where cobblestone roads maintain crossings.
- Sidewalks should be developed along Easy Street along with access ramps and crosswalks where sidewalks exist.
- The intersections of Main Street with Union Street, Washington Street, and South Water Street should be improved to facilitate crossings and accessible ramps at all corners.
- A crosswalk and access ramps should be installed on Broad Street at the North Centre Street intersection.
- A brick paver sidewalk should be installed to replace the bituminous sidewalk section on Centre Street between India Street and Hussey Street.
- Access ramps should be installed on Federal Street adjacent to Pearle Street.
- A wider sidewalk area can be installed at the Cambridge Street / Old north Wharf intersection. The intersection maintains adequate space to pull the curbline out to provide additional pedestrian refuge.
- At Oak Street and Easy Street, obstacles should be removed to improve accessibility and provision for ramps and a crosswalk.
- An accessible loading ramp can be installed at Old South Wharf and New Whale Street and the mountable curbing be removed.
- Improved sidewalk access to the Straight Wharf from New Whale Street should be implemented.

OTHER METHODS

Control of the Steamship Authority and Hy-Line ferries can also aid to reduce traffic congestion. Offsetting the arrival and departure times of the ferries and scheduling to off peak times can reduce the volume peaks of traffic and pedestrians in Town. Regulation of the amount of vehicles which enter onto the island could also be negotiated with the Steamship Authority to reduce the amount of traffic on the island from its entry point.

Limits could be set on the numbers of vehicles which could occupy any dwelling at any time. Residences which transport and utilize numerous vehicles only exacerbate the conditions during peak periods. Families must learn to ride share and be less dependent on individual travel.

Other strategies can also be employed to reduce the amount of traffic within the congested streets in Town. Although an island wide investment, other places could potentially be developed which would create an option for people to choose where to eat, shop, and enjoy the island. One inherent reason for the traffic in Town is that there are no comparable alternative centers of activity on the island. The options exist to create planned developments with the characteristics of Town in other locales on the island to offer diversity and choices which would dilute traffic flows.

- Ideal configuration of crossing and access ramps

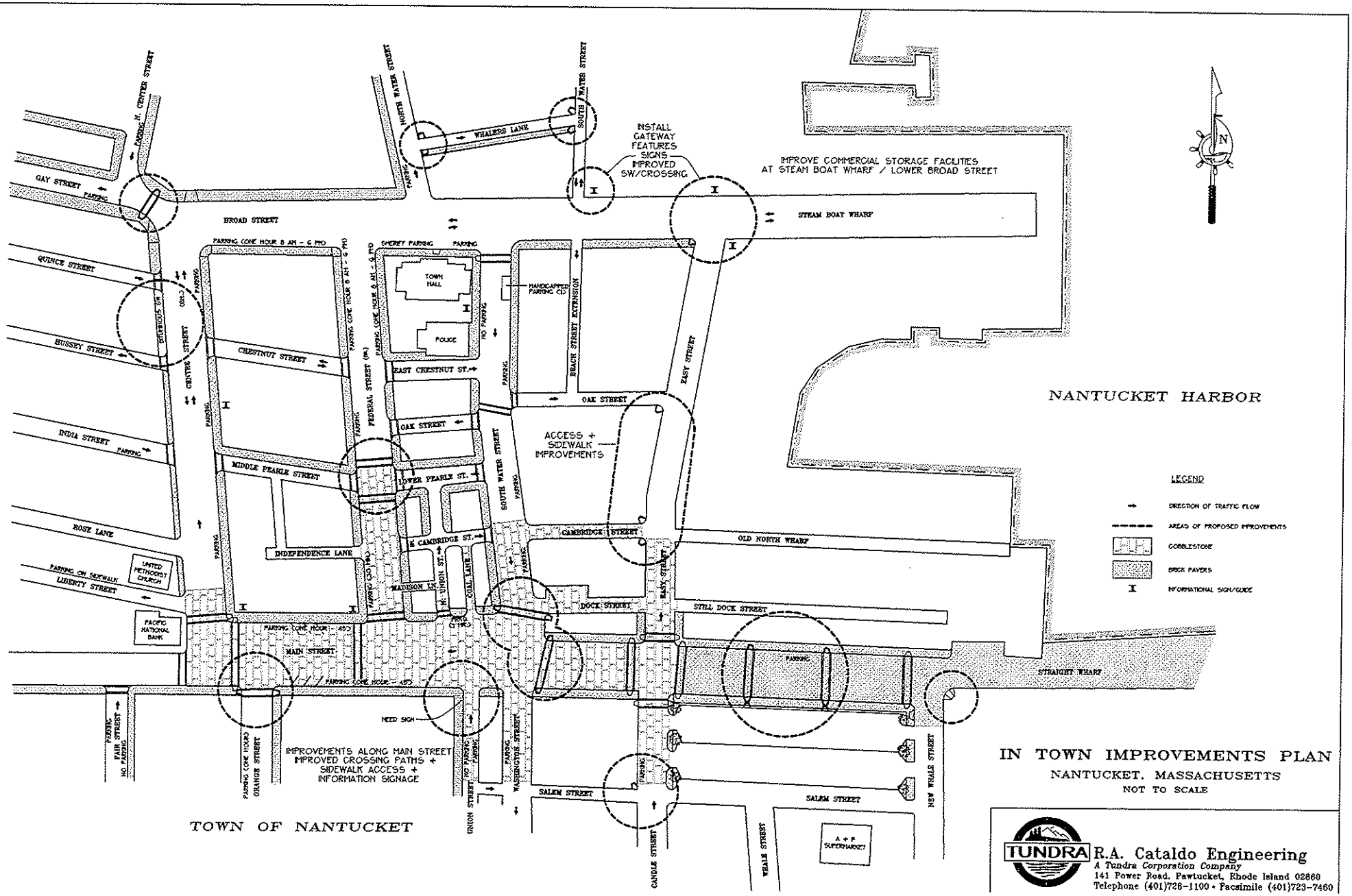
- Location for improved sidewalk on Easy Street

• Location for access ramps on Straight Wharf

• Typical obstructions of sidewalk areas

APPENDIX

DETAILS OF IMPROVEMENTS



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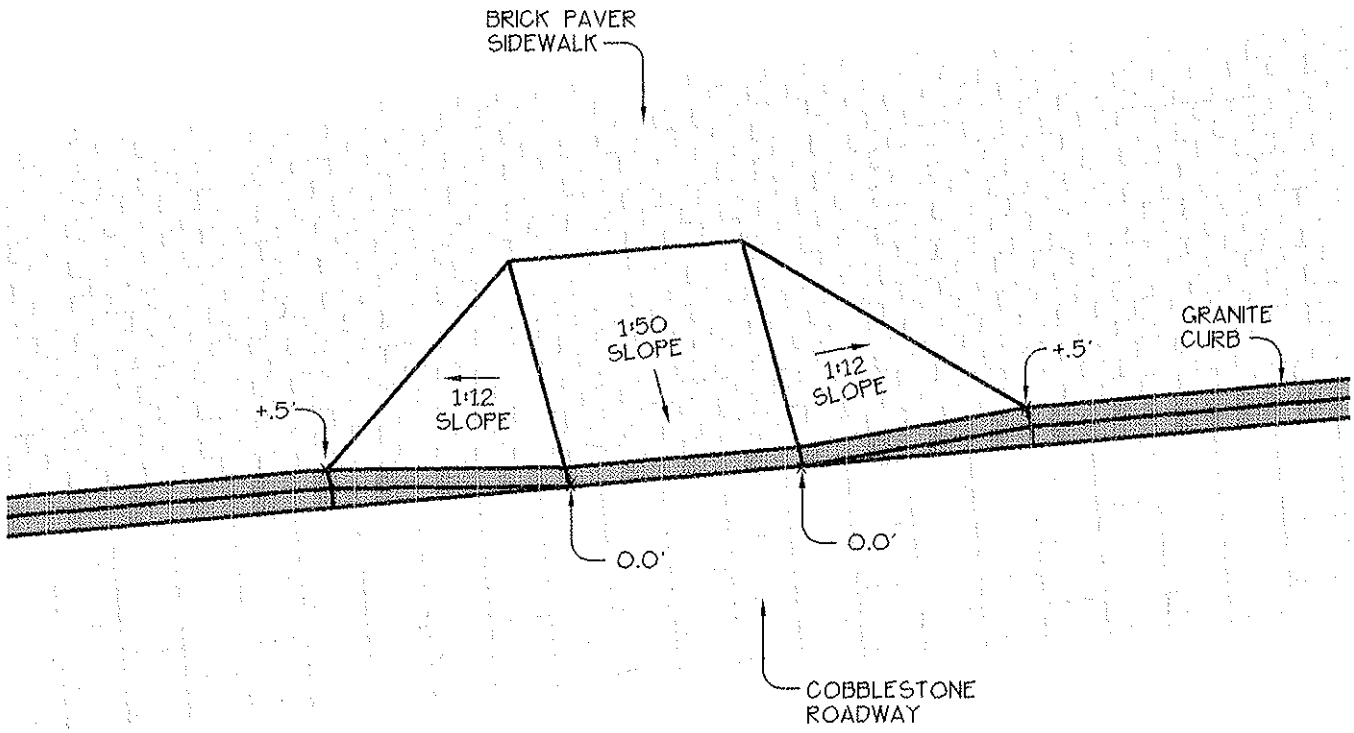
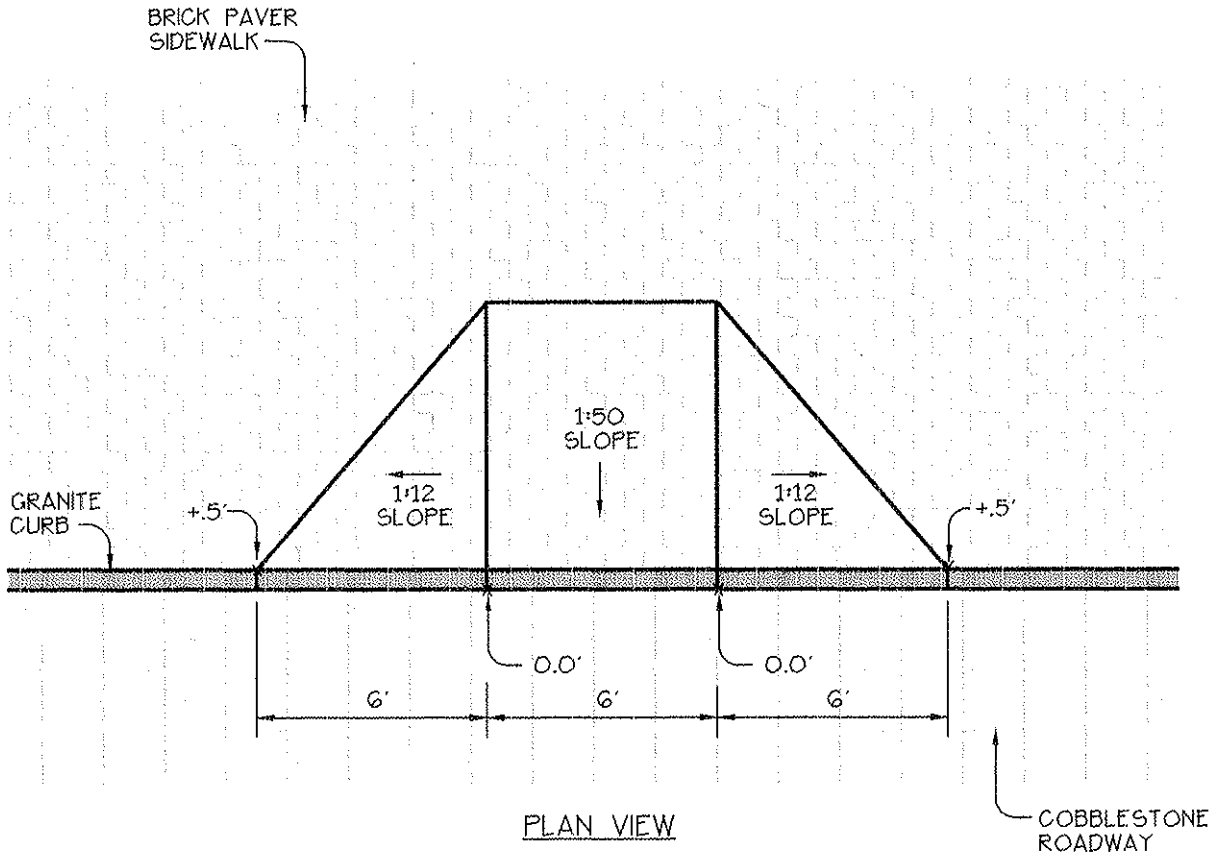


PERSPECTIVE VIEW



PLAN VIEW

TYPICAL ACCESS RAMP
NOT TO SCALE

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