Max Arai, PhD MD CFA
July 6, 2018
Version 1.0.0

The Seawall at Hawthorne Point

Hawthorne Point circa August 29, 1982

This report will review what is known about the seawall at Hawthorne Point. By exploring the history of the seawall, this report expresses the author's opinion that the currently damaged seawall requires reconstruction from the bedrock ledge. This report also critically examines the Notice of Intent (NOI #028-2597) and the Seawall Rehabilitation Study, rebutting key assumptions of option 1 and option 2 in the Seawall Rehabilitation Study.

“We try to keep in mind a saying attributed to Einstein—that everything must be made as simple as possible, but not one bit simpler.”

-Time magazine
(14 December 1962)

The report contains the following sections:

0) an executive summary of the findings
1) a brief introduction to seawall construction,
2) a review of the current conditions,
3) a summary of the regulations, the NOI and the Seawall Rehabilitation Study,
4) a summary of relevant recorded deeds and plans,
5) a summary analysis and conclusions

An appendix lists and explains the relevance of external documents and deed references.

Executive Summary

During the storm of March 2, 2018, the existing seawall sustained significant damage. The essential engineering components of the Notice of Intent (#028-2597) contain sufficient contingencies that the regulatory process may not suffer significant disruption, assuming that prompt corrective action gets applied to the restoration plans.

At the time of the storm, the seawall was an unlicensed coastal engineering structure. The seawall was not constructed according to design standards effect even as far back as 1900. The seawall structure has suffered failures and extensive, unlicensed rework during the tenure of the Hawthorne Point Condominium Association. Even before the March storm, the seawall showed signs of continued failure.

The licensing issue is more than a mere bureaucratic oversight. The licensing process insures that a given seawall design meets all applicable standards, both construction and environmental. Proper licensure assures future residents that the seawall design is appropriate for the site and stated purpose, and that the construction and maintenance conforms to modern building codes.

The history of the seawall also cannot be ignored. While there is no doubt that there have been structures on the shoreline of Hawthorne Point for over a hundred years, significant portions of the damaged structures were constructed after the condominiums themselves. A world of difference separates structures which have survived for over a hundred years and those, like the ones at Hawthorne Point, which have a much shorter history. The present restoration project concerns a relatively short-lived structure, not a century old bulwark, so assumptions about the construction methods used need to take into account the unlicensed conditions under which it was constructed and the corresponding short lifespan.

The restoration effort promises to significantly disrupt the condominium's common areas. Excavation, machinery and materials will impair access to areas near the seawall for many weeks if not months. To minimize future disruption for owners, the restoration effort needs to plan for future maintenance, balancing investment against future loss of use by owners. Inadequate restoration simply wastes owners' money.

The key contingency in the NOI is that "Excavation is only anticipated to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall". Since the stacked granite appears to be only a facade, this will lead to the excavation of the entire structure and a full reconstruction from the bedrock of the shoreline. As a result, additional dressed stone (or concrete) will be required to complete the expected cross section of the seawall. The increased excavation and material requirements may significantly increase the cost, more in line with Option 3 of the Seawall Rehabilitation Study.

Positive outcomes of the corrective process may include deeded licensure of the seawall and conformity with modern construction standards.

A Brief Introduction to Seawall Construction

Without some understanding of the basics of seawall construction, readers will have great difficulty in sorting out what is and is not reasonable. Seawall construction, and maritime engineering in general, have evolved greatly over the past several hundred years. Even in the past twenty to thirty years, significant progress has been made in the understanding of maritime environments and structures. The following introduction attempts to provide some basic background into modern seawall construction, using local examples where appropriate.

The 1995 paper by Rosen and Vine, "Evolution of seawall construction methods in Boston Harbor, Massachusetts" provides historical background relevant to Massachusetts structures. The figure below is taken from that paper. This seawall has a cross section very similar to that proposed in the 1900 plan licensed to George Stacy discussed in the section on recorded deeds.

This diagram illustrates many of the key features of a seawall. First, the core of the seawall consists of concrete (dotted region) with a dressed stone facing. The facing stones are secured to the concrete via the interlacing layers of stone and concrete in the center of the structure. The base of the structure extends inland a distance slightly more than half the height of the wall. The bottom layer of concrete has a toe extending seaward to protect the base of the wall from scouring and undermining. This toe is further protected and covered by a low revetment (the ramp of underwater stones sloping up to the face of the wall). Notice that a significant portion of the seawall structure extends into the ground. This prevents the wall from toppling forward into the water. Inland of the top of the wall, extending quite a distance landward is a thin layer pf paving stones (stones 13, 14) sloped down towards the water. This skirt will shed water which overtops the wall (e.g. splashes over the wall), and helps protect the fill underneath from erosion. Further landward, the filled surface continues to slope upward, facilitating drainage back towards the ocean.

The hatched area gently sloping up from the foot of the seawall towards the surface is the original shore profile. This shows how the seawall and fill have reduced but not eliminated the slope into the water.

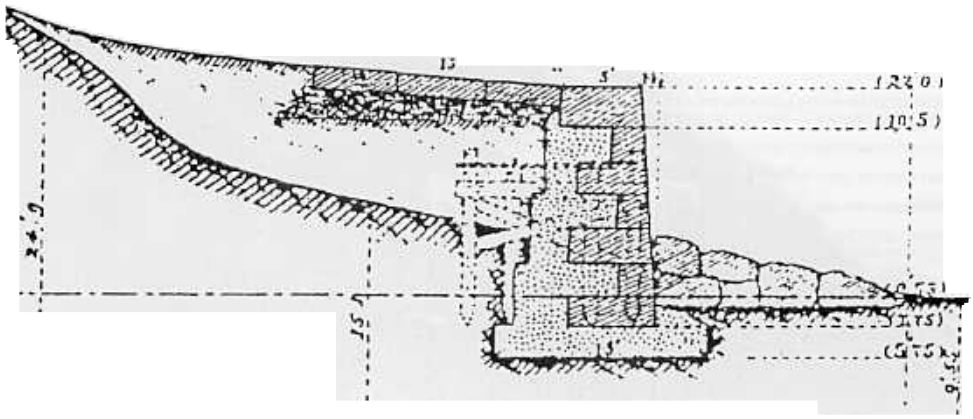


Fig. 10. Cross-section of seawall on Gallops Island, Boston Harbor, constructed in 1870 of concrete with facing of dressed granite

This 150 year old design lacks a few key elements. From the drawing, one cannot see how any water penetrating the fill behind the seawall can escape. Seawalls should not be dams; the problem of controlling wave action and tides is a big enough problem.

The US Army Corps of Engineers engineering manual 1110-2-1614 (USACE-EM) notes that

> *"It is generally preferable to design shore protection structures to be high enough to preclude overtopping. In some cases, however, prohibitive costs or other considerations may dictate lower structures than ideally needed. In those cases it may be necessary to estimate the volume of water per unit time that may overtop the structure. "*

Given that the water level in the March 2018 storms reached the building foundations, any seawall at Hawthorne Point will need to be designed to sustain inundation. A seawall high enough to preclude overtopping would substantially interfere with the view: they would need to be about 10 feet higher than they are now.

EM 1110-2-1614
30 Jun 95

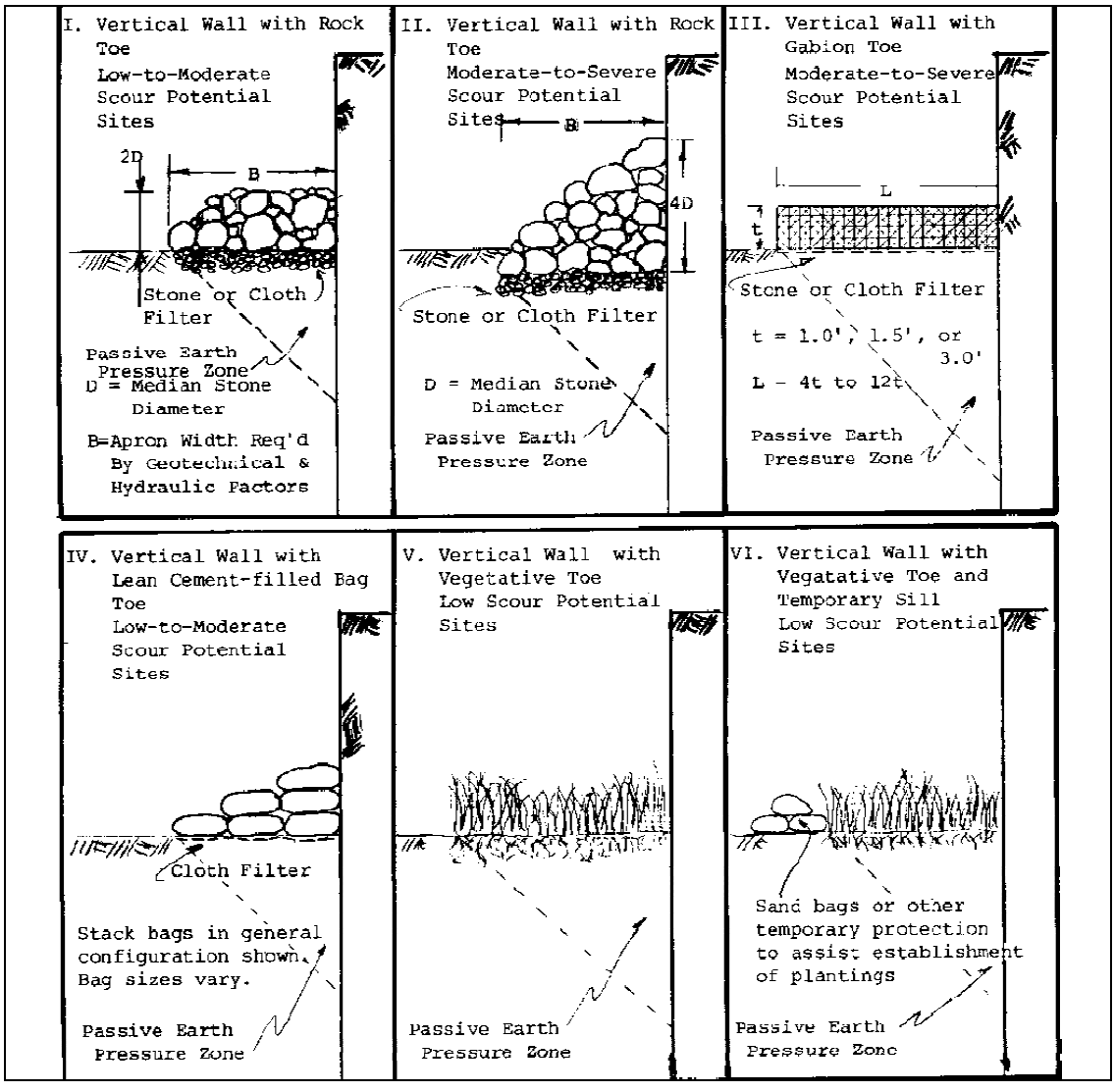


Figure 2-5. Seawall and bulkhead toe protection

The USACE-EM contains a figure that helps explain how seawalls remain standing. The triangle labeled "passive earth pressure zone" supports the wall against toppling forward. The figure shows various techniques for protecting the support structure from erosion or scouring by wave action.

The USACE-EM also points out that curved walls can provide better protection for landward structures:

"A curved-face seawall is designed to accommodate the impact and runup of large waves while directing the flow away from the land being protected. As the flow strikes the wall, it is forced to flow along the curving face and ultimately is released in a vertical trajectory, falling harmlessly back to the ground, or it is recurved to splash back seaward, the tremendous wave forces that must be resisted and redirected require a massive structure with an adequate foundation. Wave reflections from the wall also demand sturdy toe protection."

EM 1110-2-1614
30 Jun 95

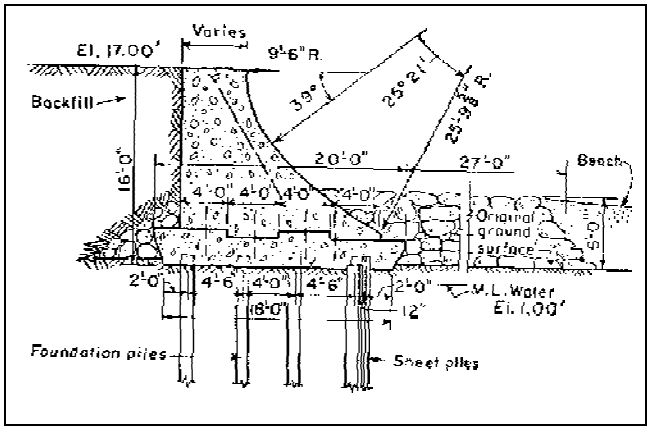


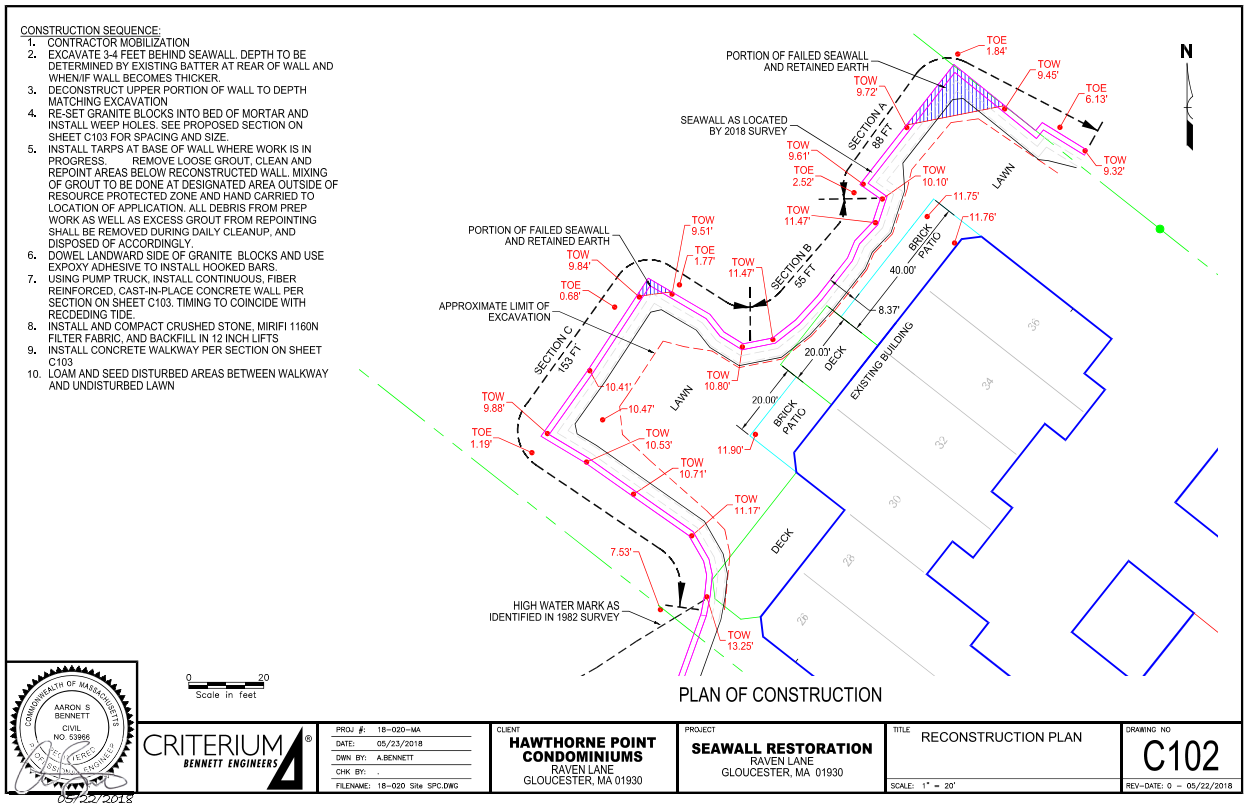
Figure C-2. Curved-face seawall cross section

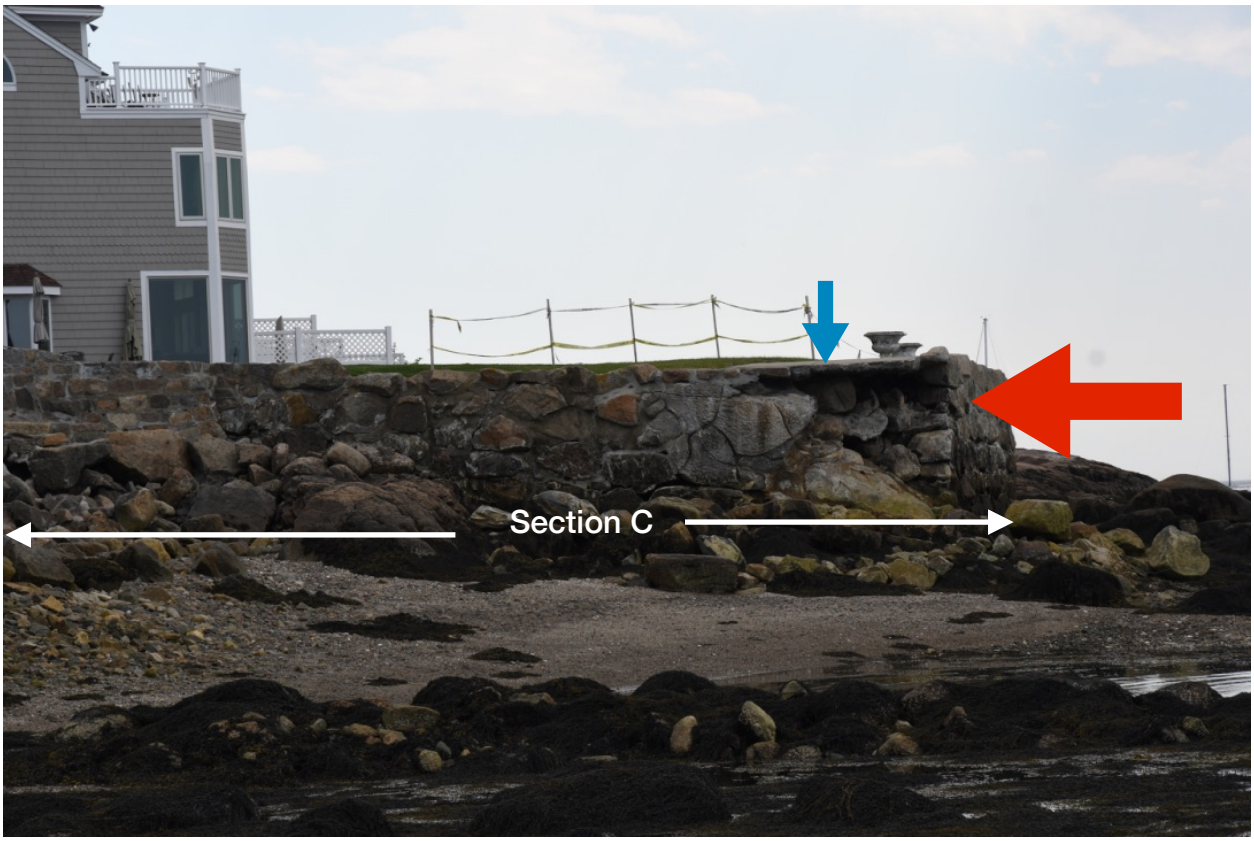
The key takeaways from this short introduction are

seawalls must be engineered for the specific site
seawalls are more complicated than a simple vertical barrier
overtopping must be taken into account for this seawall

Current Conditions

During the storm of March 2, 2018, the existing structure sustained significant damage. The Notice of Intent (NOI #028-2597) includes the following schematic drawing outlining the damaged areas. Some photos taken June 21, 2018 of section A and section C respectively help illustrate the damage.





view of section C showing the failed corner just below the two urns

One area of concern is the portion of section A adjacent to the failed corner marked with a red arrow. The next photo shows a closer view of this part of section A starting from the failed corner.

The red arrow indicates an uncollapsed portion of section A which appears to be buckling. The stones indicated with green arrows adjacent to the buckled portion of the wall fell in a pattern consistent with a buckling failure of the corner of the wall.

The photographs also provide information regarding the construction of the seawall. Blue arrows in the photographs point out overhanging slabs of cast concrete. The material of the seawall in this area must have been comprised of small to medium sized stones or rubble, since large stones would have resisted being washed away. There is no evidence of a systematic structure behind the facade of large dressed stones (here "dressed" means chiseled/split/finished to have flat and fitted surfaces).

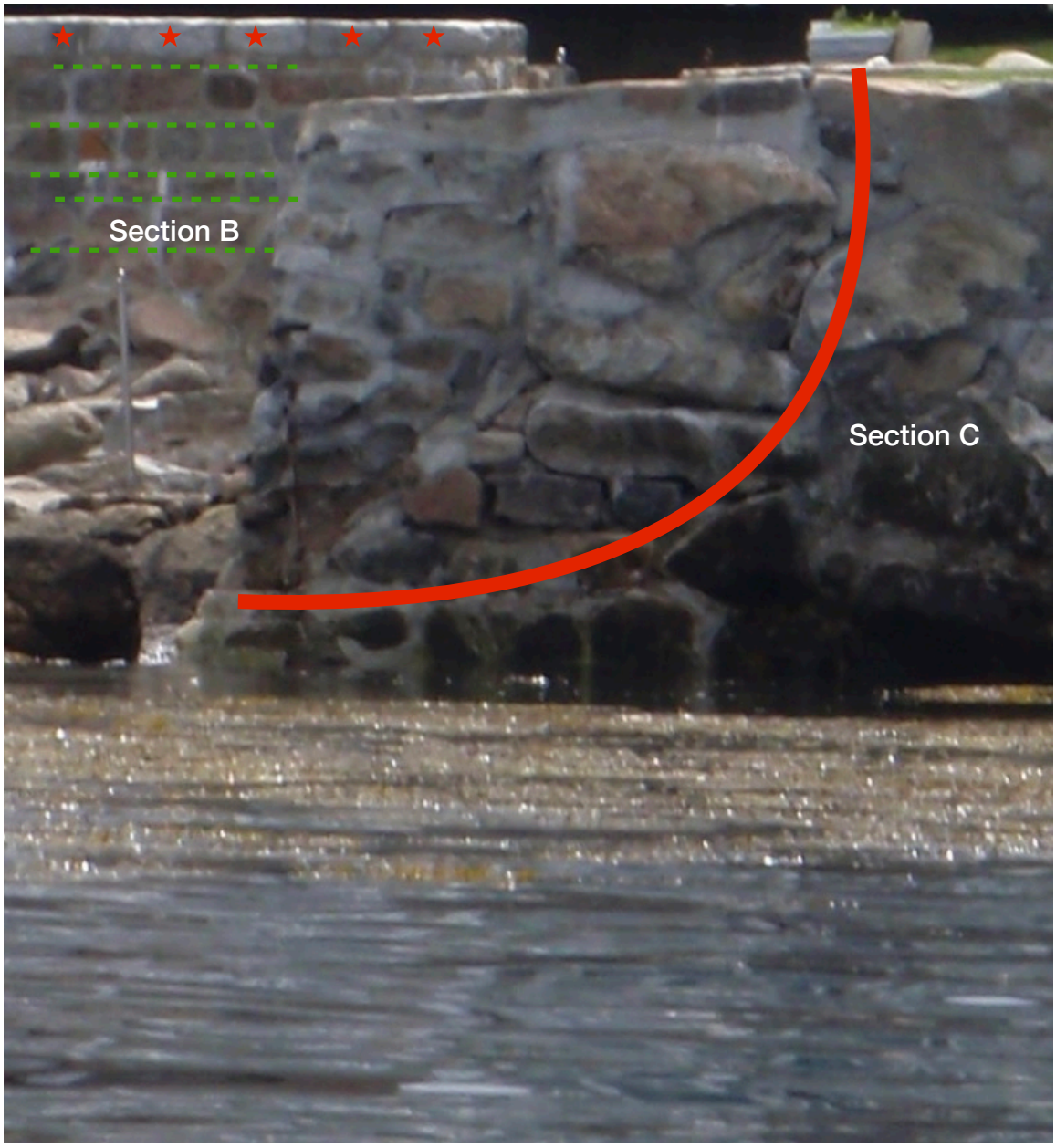
The closeup view of open corner also reveals the complete absence of large dressed stones in the interior of the structure. There are some smaller dressed stones marked with red stars which appear to have fallen into the structure from the very top of the wall. One stone at the top of the wall also marked with a red star demonstrates the likely course for these fallen smaller stones. Otherwise, there are no dressed stones within the structure.

The photo at the bottom of this page, taken June 30, 2011, provides some historical context for the current masonry failures. The red boxes indicate the approximate locations of the insets on pages 10 and 11.

The leftmost inset on page 9 is expanded here to show a detailed portion of section B.

The top of the wall uses small dressed stones (marked with a red star) to cap a structure comprised of irregular stones mortared together. The masonry in this part of section B is somewhat irregular. The green dotted line indicates one possible course, but much of the masonry in the right side of the image consists of undressed stones mortared together irregularly. This is typical of rubble masonry.

The right inset on page 12 shows the rightmost portion of section B along with the corner in section C which failed in 2018.



Comparing the right and left portions of section B, notice that the construction of the righthand portion of section B uses much more regular stone than in the previous photograph. The capstones (red stars) are similar, but the structure underneath is much more regular, showing some evidence of regular courses (green dashed lines). The heterogeneity in Section B also suggests construction and subsequent repair work use a variety of masonry techniques, probably at different times. Rubble

masonry capped with dressed stone would present the appearance of a solid wall to a pedestrian observer, concealing the rubble masonry construction below.

The red arc highlights the corner of section C which has now failed. Notice the irregular small stones mortared together, along with the line of mortar cracks just inside the red arc. Use of rubble masonry to reconstruct the corner suggests a patchwork repair was employed, and limited attention applied to prevent subsequent failure.

This recent photographic evidence highlights the variety of masonry techniques employed in the wall. The seven year old image shows that failure of the corner in section C had occurred in the past and had been repaired with methods and materials distinct from the surrounding wall; unfortunately, these patches appear to provide little longevity.

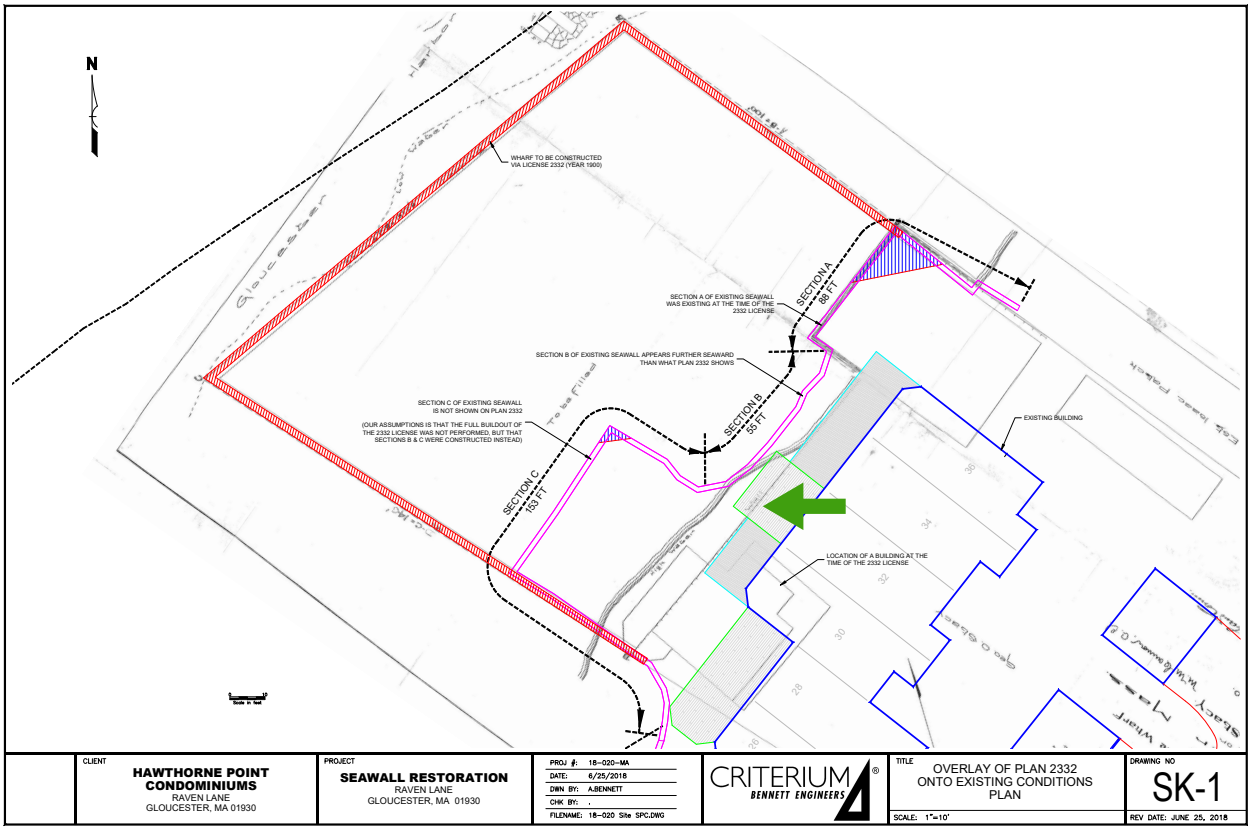
The last photograph pertaining to current conditions is the 1982 photograph. The inset from the title page is reproduced again here with some annotation:

Section A lacks the capstones from more recent photographs (and the current conditions). Section A may also have an additional course of dressed stone; there is some difficulty in reconciling the dressed stones in the images.

Section B was more of a revetment than a wall in 1982. The slope of the revetment ends near the edge of the brick patios. Note that when the 1900 plan drawing is superimposed on the current engineering drawings, the edges of the brick patios are consistent with the 1900 line marked “Wall”. (see green arrow on the next page).

Section C is also more of a revetment or a previously collapsed wall than in current conditions.

This photograph establishes that significant changes and rework have been applied to the seawall since construction of the condominiums.



	CLIENT **HAWTHORNE POINT CONDOMINIUMS** RAVEN LANE GLOUCESTER, MA 01930	PROJECT **SEAWALL RESTORATION** RAVEN LANE GLOUCESTER, MA 01930	PROJ #: 18-020-MA DATE: 6/25/2018 DWN BY: A.BENNETT CHK BY: . FILENAME: 18-020 Site SPC.DWG	CRITERIUM BENNETT ENGINEERS	TITLE OVERLAY OF PLAN 2332 ONTO EXISTING CONDITIONS PLAN SCALE: 1"=10'	DRAWING NO SK-1 REV DATE: JUNE 25, 2018

The regulations, the NOI and the Seawall Rehabilitation Study

This section of the report summarizes the relevant regulations, the Notice of Intent (NOI #028-2597) and the Seawall Rehabilitation Study. The section begins by presenting the relevant regulations and their applicability. Next summarized are the key components of the proposed seawall restoration project as proposed in the NOI. Some apparent clerical errors in the application are highlighted. Additional detail regarding alternative options from the Seawall Rehabilitation Study suggest that the NOI selects option 2. The section concludes with a summary of the apparent internal contradictions.

The Waterways Act and the Wetlands Act

Consider the regulations applying to the seawall. Seawalls are explicitly named as a water-dependent use by the law (309 CMR 9.12 (2)(a)11). In section 309 CMR 9.12 Determination of Water-dependency, the current Wetlands Act states:

"*The Department shall find to be water-dependent the following uses:*

1-10…other clauses

11. shore protection structures, such as seawalls, bulkheads, revetments, dikes, breakwaters, and any associated fill which are necessary either to protect an existing structure from natural erosion or accretion, or to protect, construct, or expand a water-dependent use;"

(309 CMR 9.12 (2)(a))

As a result, seawalls fall under the jurisdiction of the Waterways act.

As the FAQs in the MassDEP website states:

"Chapter 91 authorization is required for structures in tidelands, Great Ponds (over 10 acres in natural state) and certain rivers and streams. Types of structures include: piers, wharves, floats, retaining walls, revetments, pilings, bridges, dams and some waterfront buildings (if on filled lands or over water). You may also need a new license if there has been a structural change or a change in use of a previously licensed structure."

https://www.mass.gov/guides/chapter-91-frequently-asked-questions

So the seawall requires a Chapter 91 license.

To further quote from the FAQs:

"All Chapter 91 licenses must be recorded against the deed of a property to be valid."

"There are two remaining steps to ensure that your license remains valid:

- *To become valid, a Chapter 91 License must be recorded against the deed of a given property at the county Registry of Deeds within 60 days of issuance. In the case of registered land, the License must be recorded at the Land Registration Office within 60 days.*

• Within 60 days of completion of a project, but no later than five years from license issuance, the licensee must request a Certificate of Compliance form. A License for any project can be revoked if a request for a Certificate of Compliance is not filed."

"Although your license may be valid between 30 and 99 years, the proposed project MUST be constructed within 5 years. "

As a result, the presence or absence of a Chapter 91 license can be confirmed by examining the recorded deeds for the property.

As a practical matter, unlicensed coastal engineering structures are not uncommon, and the MassDEP's policy is to bring such structures into compliance with the Waterways Act. Again from the FAQs:

"Approximately 20,000 licenses have been issued since 1866, but many structures remain unlicensed for a variety of reasons. Many landowners don't realize they need authorization. Some owners simply are unaware of the law; others assume that prior owners obtained proper licensing; and still others don't know that a change in structure or use requires new licensing. Unlicensed structures are considered a public nuisance under M.G.L. Chapter 91, and their owners may be subject to MassDEP enforcement for maintaining unauthorized structures."

The Hawthorne Point Condominium Association does not have a validly recorded Chapter 91 license. The section titled "A Summary of Relevant Recorded Deeds and Plans" provides the deed research on this issue.

The most important implication of the unlicensed nature of the existing structure is that the structure has not been subject to regulatory review, including design review, inspections or scheduled maintenance. From an owner's perspective, this carries the same implications as building construction without permits or inspections: owners have no assurance of the safety or integrity of the existing seawall, even prior to the current set of failures.

The Notice of Intent

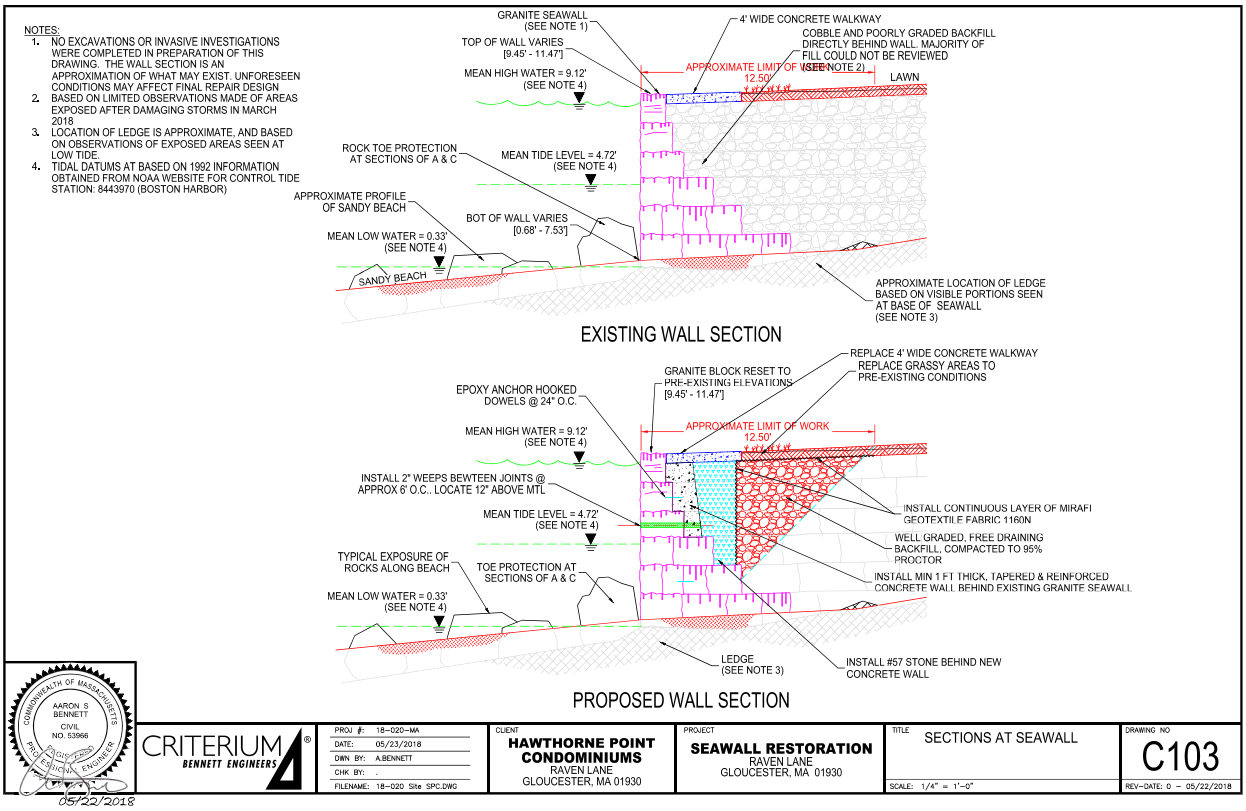
The Notice of Intent (NOI #028-2597) is an official document filed with the Gloucester Conservation Committee and the Massachusetts Department of Environmental Protection (MassDEP). An NOI is required by the Massachusetts Wetlands Protection Act under the Wetlands Regulations, 310 CMR 10.00.

The NOI #028-2957 calls for a "Proposed Seawall Restoration" at Raven Lane, Gloucester. The scope of this activity is described as

"The Applicant wishes to restore and improve the existing seawall and lawn areas back to pre-damaged conditions."

The NOI goes on to provide a more detailed description of the anticipated work:

"The proposed project involves excavating approximately 3-4 feet deep behind the existing seawall at Sections A & C, followed by dismantling the upper portion of wall at those sections to the depth of excavation. Excavation is only anticipated to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall. The granite blocks which were removed would then be reset in a bed of mortar to stabilize their condition. Weep holes will also be installed during this work."



Drawing number C103 in the NOI illustrates these parameters. Note number 1 disclaims the accuracy of existing wall cross section:

"No excavations or invasive investigations were completed in preparation of this drawing. The wall section is an approximation of what may exist. Unforeseen conditions may affect final repair design."

The second item of note are the levels for mean tide level just below the mid-point of the seawall and the mean high water, only inches below to top edge of the seawall. The tide levels are relevant to the discussion in the next section.

Errors in the Notice of Intent (possibly clerical)

The WPA Form 3 filed as part of the Notice of Intent (NOI #028-2597) is a form designed to collect general information about the parties involved, and to indicate which regulatory bodies should be involved in the proposed activity. Two responses are incorrect.

The first error pertains to question 3 in section C ("Other Applicable Standards and Requirements"). Question 3 asks:

> *"For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?"*

The response given was "No". This is internally inconsistent with the drawing C103 shown in the previous section. The drawing shows the majority of the damaged structure is below mean high water.

A positive response given on the form requires proof of notification to the Division of Marine Fisheries. In addition, a positive response requires the applicant to discuss the Chapter 91 licensing with the Boston DEP office.

The second error pertains to question 7 in section C ("Other Applicable Standards and Requirements"). Question 7 asks:

> *"Is this project subject to provisions of the MassDEP Stormwater Management Standards?"*

The response claims exemption from the stormwater standards as a "Small Residential Subdivision (less than or equal to 4 single-family houses or less than equal to 4 units in multi-family housing project) with no discharge to Critical Areas". Since the applicant and deed owner is the Hawthorne Point Condominium Association, the property contains 28 units and appears to be subject to the MassDEP Stormwater Management Standards' requirements for engineering plans demonstrating adequate handling of stormwater discharge.

Seawall Rehabilitation Study

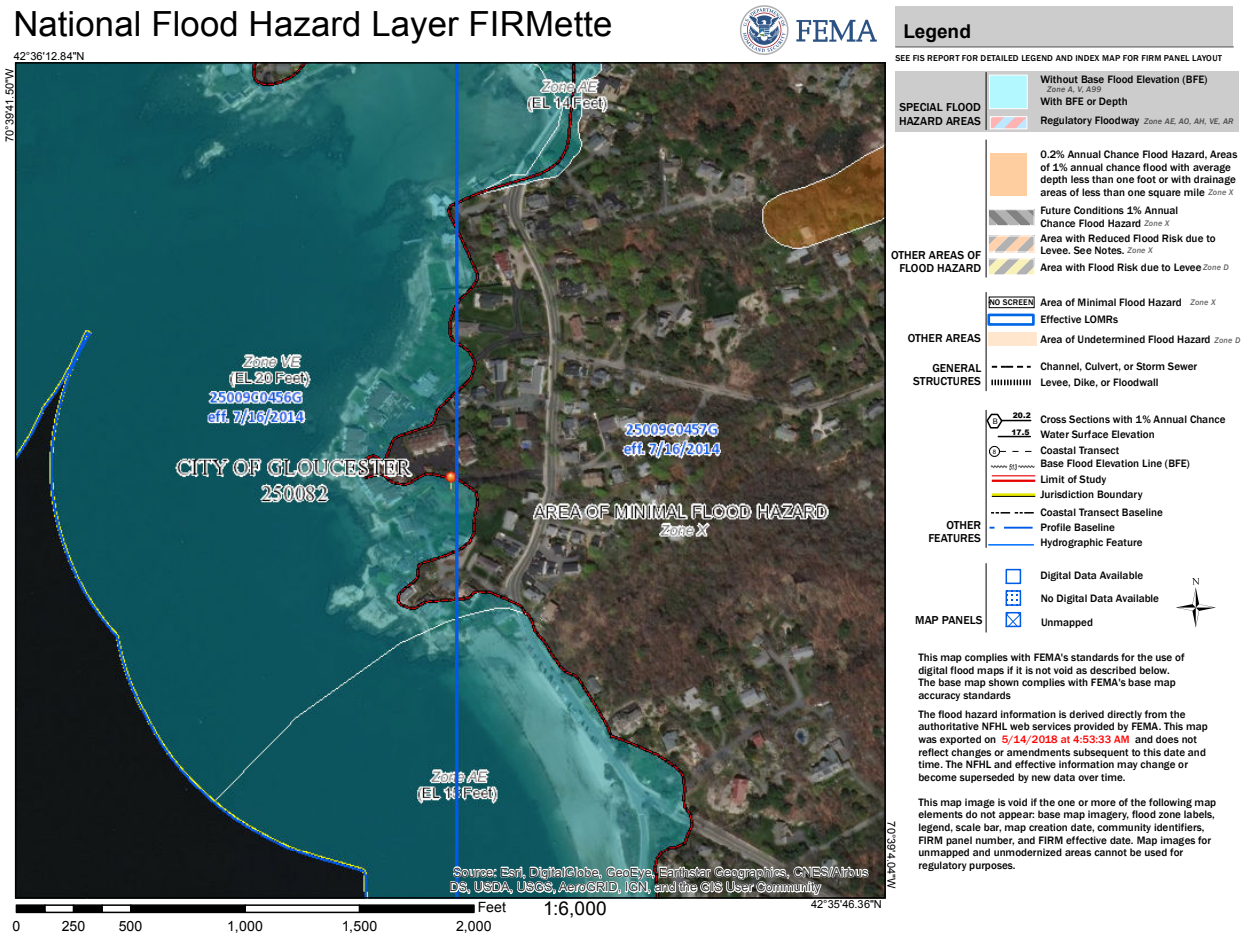
The Hawthorne Point Condominium Association commissioned Criterium Bennett Engineers to present a Seawall Rehabilitation Study (the “Seawall Study”) for repair and/or replacement of the seawall. The study notes that the seawall along the shoreline has shown signs of aging for some time, but recently failed in several locations as a result of the March 2018 storms.

This summary of the Seawall Study concerns two sets of issues. The first set of issues concerns the nature of the flood hazard. The second set of issues concerns the options for rehabilitation of the seawall.

The seawall is located in one of the most exposed areas in the harbor, with flood hazards including both storm surge and wind driven water. Photographs taken during the storm show both wind driven wave action and storm surge, but there are no pictures showing the two effects superimposed. As such, the March 2018 storm was not as severe as it could have been were the winds a few hours earlier or later.

The rehabilitation options presented in the Seawall Study roughly offer increasing longevity at increasing investment. The less comprehensive options make significant assumptions regarding the seawall structure.

The Nature of the Flood Hazard

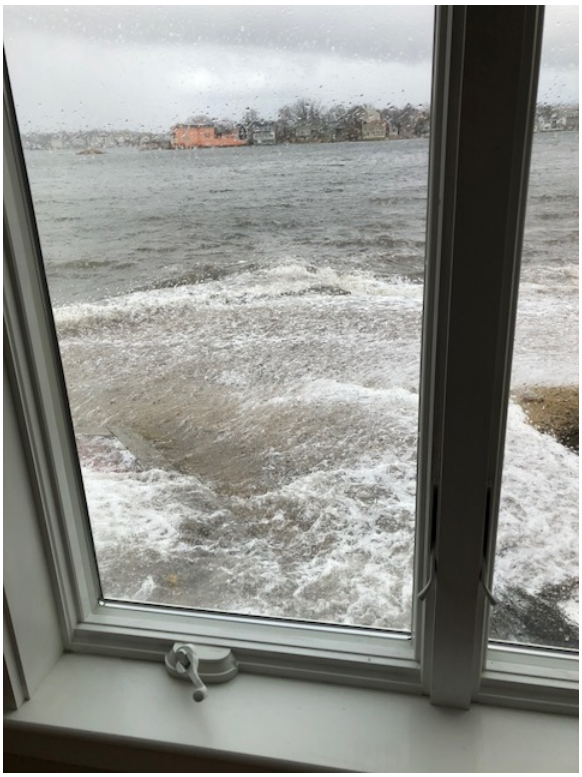


The Seawall Study notes that current FEMA maps show that the coastal areas associated with this seawall are located in the VE Zone. Further,

> *"This zone is subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm- induced velocity wave action. The Base Flood Elevation (BFE) of 20.0' (NAVD88) shown on the FIRM has been derived from detailed hydraulic analyses. The majority of elevations found on top of all three sections of the seawall fall between 9.3' and 11.4' (NAVD88). The highest elevation found in these three sections was 13.25', found near the southern end of Section C. "*

The National Flood Hazard Layer FIRMette provides some insight into the variation of flood hazards over the immediate neighborhood of the seawall. Both Wonson's Cove (upper part of the firmette) and Nile's Beach (lower part of the firmette) show zones AE 14, meaning the principal hazard in those areas is a storm surge to 14 feet. The VE designation indicates the hazard is worsened due to wind driven water.

Under conditions of the "100 year flood", this hydraulic analysis suggests that storm driven waves could rise more than 10 feet above the lowest parts of the wall.



This picture on the left taken during the March 2018 storm clearly shows the water level completely inundating section A. Notice that the surface of the water in this picture is relatively flat. Drawing C102 indicates the high point on the brick patio is approximately 11.76 feet, so this storm surge appears to have been approximately 12 feet above mean low water.

The relative calm during this period should be contrasted to the picture on the right taken when the tide was lower but wind and waves were more significant. Fortunately, the surge did not coincide with the wave action.

The Rehabilitation Options

The Seawall study presented three options which will now be reviewed. The preface to these options clearly indicate the tentative nature of the proposals. For example:

> *"Test pits, borings, probes, so some combination thereof should be employed to better understand the bearing soils and composition of backfill for the structural analysis to be accurate."*

In addition, the Seawall Study notes that the existing structure may have been inadequate by current construction standards:

> *"The age of this wall would suggest design practices at that time would have applied lower factors of safety for stability, sliding and overturning. Current design standards will be applied which may conflict with the configuration of the wall directly adjacent to the repairs. We therefore see it more economical to provide longer, continuous repairs rather than rehabilitation of shorter sections. "*

Option 1 provides for minimal rehabilitation:

"Remove backfill for a depth of 3 feet, and back 4 feet from the seawall at Sections A & C. Rebuild collapsed portions of the seawall and repoint throughout with an appropriate mortar mix for this application. Install filter fabric behind seawall for the upper 3 feet, backfill with clean free draining material and loam/seed."

Option 2 provides a more complete version than option 1 by adding a concrete backfill layer:

"Remove backfill to the base of the seawall at Sections A & C. Rebuild collapsed portions of the seawall. Install new concrete wall behind and in contact with the seawall with weep holes positioned as necessary to relieve hydrostatic pressures. The concrete mix should be appropriate for this application. Install filter fabric as necessary, backfill with clean free draining material and loam/seed."

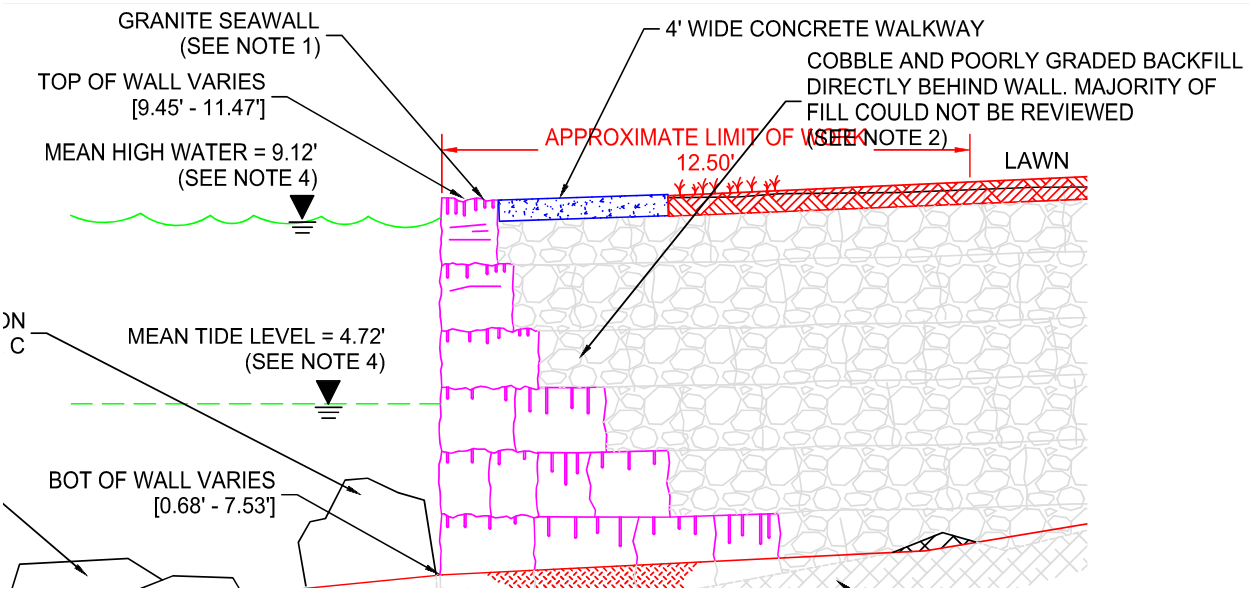
Option 3 reconstructs the seawall entirely:

"Install new concrete seawall by demolishing the old, preparing a new footing. Form and construct new cast-in-place concrete wall in place of old wall. The concrete mix should be appropriate for this application. Install filter fabric as necessary, backfill with clean material and loam/seed."

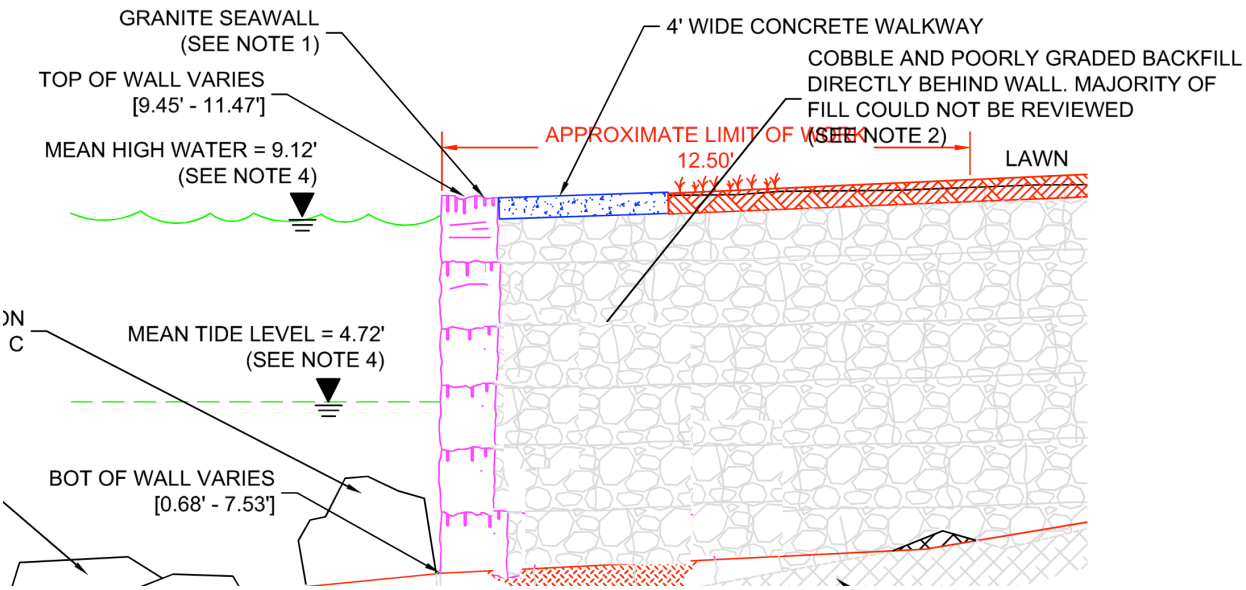
The NOI uses language superficially representing a hybrid between options 1 and 2:

"The proposed project involves excavating approximately 3-4 feet deep behind the existing seawall at Sections A & C, followed by dismantling the upper portion of wall at those sections to the depth of excavation. Excavation is only anticipated to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall. The granite blocks which were removed would then be reset in a bed of mortar to stabilize their condition. Weep holes will also be installed during this work."

The key contingency in the NOI is that "excavation is only anticipated to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall". Thus option 1, option 2 and the work proposed by the NOI are all predicated on the existence of a seawall cross section as shown in drawing C103, the key inset shown here. Notice the increasing thickness of the wall with depth. This is not consistent with the current conditions detailed in the first section of this report.



The exposed portions of the seawall, the wreckage from the failed sections and the historical photographs all suggest that the seawall cross section is more likely to look like the following figure, where a facade of dressed stone retains a rubble layer.



Should this figure more closely represent the existing structure, then “excavation … to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall” will naturally lead to option 3, where the entire wall is deconstructed. The main difference relative to option 3 might be that after the structural concrete layer is installed, a facade of dressed stone is used to conceal the bulk of the concrete.

Overtopping

Overtopping refers to water going over the top of the seawall. A seawall designed to keep the sea completely at bay would normally be designed to have minimal overtopping. As we know from the flood zone designation and the siting of the property, construction of such a seawall is not feasible at Hawthorne Point. As a result, any seawall design for this site must take into account overtopping.

Overtopping presents two hazards to the seawall: buoyancy and erosion. Water behind the structure in combination with water outside the seawall provides a buoyant force, thereby offsetting some of the force of gravity. As a result, the frictional forces holding the wall in place are reduced. Structures designed for inundation must take into account additional mass requirements resulting from the structure's buoyancy.

Overtopping can also erode any fill behind the structure, thereby reducing the support for the upper parts of the seawall. Portions of the structure exposed by erosion can be damaged from the landward side by water returning to the sea. Below is a photo taken June 7, 2018 showing a section of the Western Avenue (Stacy Boulevard) seawall in Gloucester damaged in the same storm.

Despite drainage and fabric to limit movement of fines, overtopping water severely eroded the grassy area behind the seawall and displaced several large stones. This portion of the Stacy Boulevard seawall was the only section of the seawall not having a protective skirt covering the fill behind the seawall; the

other half mile of seawall was not damaged. The following photo taken two weeks later (June 21, 2018) shows progress on the repair, with the large stones set into place, the handrail removed for replacement and the crushed stone underlayment being readied for pouring of a concrete walkway (the skirt).

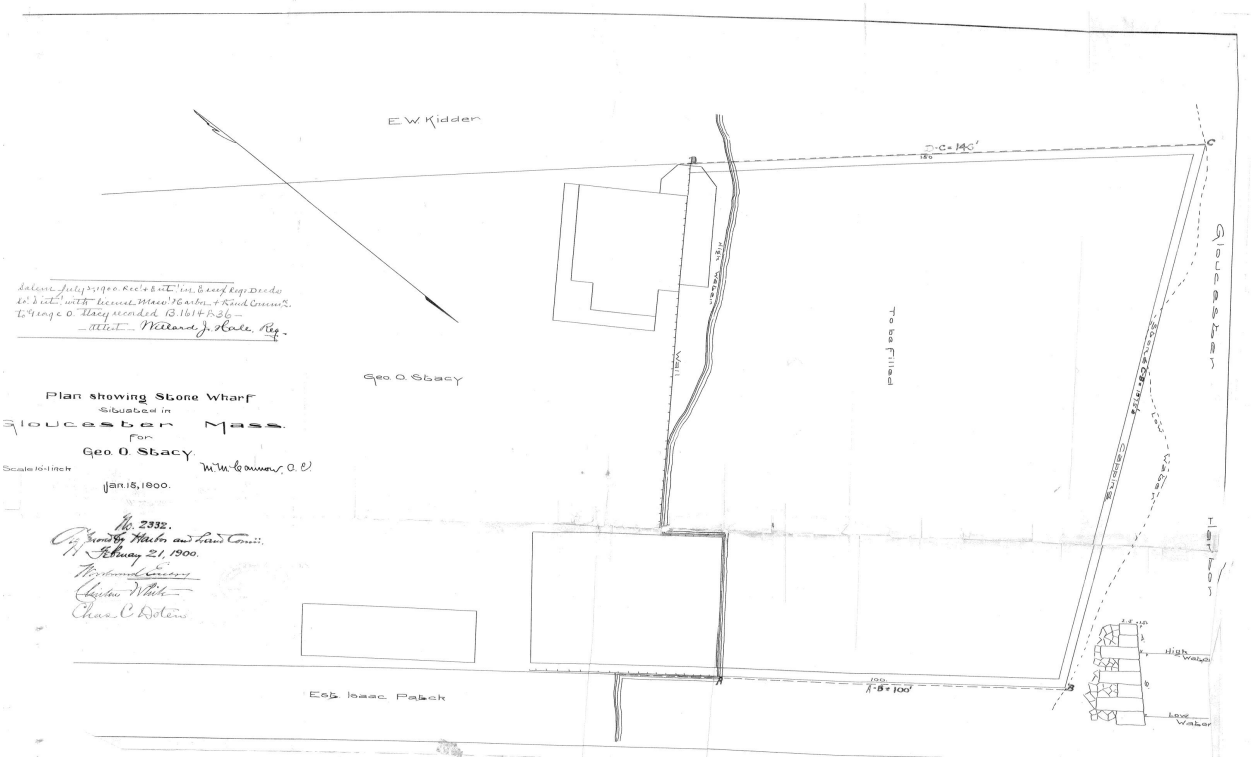
The work at Stacy Boulevard should help reinforce the need for adequate protection against overtopping. Note that other parts of the Stacy Boulevard promenade have flower beds protected by granite berms, allowing overtopping water to flow around the flower beds en route to either storm drains in the street or back over the seawall.

A Summary of Relevant Recorded Deeds and Plans

Seawalls, and all coastal engineering structures requiring Chapter 91 licenses, will have those licenses recorded at the registry of deeds. Given the time limits for license filing and construction of approved structures, the registry of deeds is a definitive source for the existence of all but the most recently issued licenses. This section aims to provide definitive references from the registry of deeds establishing the absence of a current valid license for the existing seawall, and to place into perspective some historical documents.

In particular, two licenses are of interest to Hawthorne Point Condominium Association. The first, license 2332, was a valid license granted to George O. Stacy to construct a very large pier extending to the low water line in front of seawall sections A, B and C. The second license, license 551, belongs to another property but was historically mistaken as a license for the seawall at Hawthorne Point.

License 2332 was recorded July 2, 1900. A digital copy of this record can be obtained from the Salem Registry of Deeds (salemdeeds.com) at book 1614 pages 36-37. The plan drawing accompanying this license was drafted January 15, 1900; a digital image of this plan drawing is located at plan book 1614 page 600. Below is a copy of this image.



Note that this plan drawing shows a pre-existing seawall in the same location as section A. The license granted George Stacy the right to construct a structure extending to the low water line. The drawing also shows the expected cross section of the proposed seawall. There is another wall indicated parallel to the current section B, but section C is missing entirely.

This proposed structure was apparently never implemented. Postcards of the Hawthorne Inn circa 1910 show a cottage on section A (left black arrow), and another cottage on section C (right black arrow). No license is recorded for the seawall in section C. All deed transfers of the property after 1900 make no mention of any seawall license. As the discussion regarding license 551 will show, this omission is not due to George Stacy's or his widow Jane Stacy's lack of awareness of the value of such a license.

George Stacy was prodigious developer in the early twentieth century; the index pages for the registry of deeds are filled with records of his transactions. Among these are deeds for 55 Eastern Point Boulevard. Jane Stacy sold this property to Arther B. and Zerelda L. Grover in a deed recorded June 24, 1925. This document is a registered land record, document #13381, with digital images available from the registry of deeds (salemdeeds.com). This deed transfer refers to and includes license 551, a seawall license granted June 18, 1925 and recorded the same date as the deed transfer. License 551 is a registered land record, document #13380, with digital images available from the registry of deeds (salemdeeds.com). The Department of Public Works and the Division of Waterways and Public Lands issued license 551 as a substitute for license 535 issued April 30, 1925. License 535 apparently failed to be recorded.

An original Hawthorne Point resident, Joe Geary, who grew up in Gloucester and later purchased one of the first condominium units prepared a historical presentation which refers to license 535 in the context of Hawthorne Point. This seems to reflect confusion over whether or not the seawall was in fact a licensed structure. However, this ownership of this license can be resolved by a very recent transaction recorded October 14, 2017, the transfer certificate #89869. Certificate #89869 (Book 532 Cert. No. 89869 Document No. 576306) certifies that the property at 55 Eastern Point Boulevard, Gloucester MA is owned by Anthony R Klein and Sheryl N Klein.

This transfer certificate states:

> *"There is appurtenant to the above described land the right to maintain a wall and solid filling in said Gloucester Harbor, as described in License from the Department of Public Works, Division of Waterways and Public Lands to Jane P. Stacy, and filed as Document #13380 in said Registry.*

The above described land is subject to the rights and provisions described in deed from George O. Stacy et ux to Zerelda L. Grover, dated June 24, 1925, and filed as Document #13381 in said Registry. ”

Here document #13380 is license 551, successor to license 535.

In summary, the seawall at Hawthorne Point is currently an unlicensed structure. The deed records help clarify that George Stacy did obtain licenses for other structures, but those licenses do not apply to Hawthorne Point.

Summary Analysis and Conclusions

This section summarizes the key data presented so far and outlines the implications for the seawall rehabilitation.

First, the seawall is a coastal engineering structure requiring but lacking a Chapter 91 license. There may be additional regulatory compliance issues to be addressed, such as stormwater planning.

Second, while portions existing seawall were probably constructed in the nineteenth century, the existing structure has changed extensively over the past century, and even over the past 35 years. As noted in

the Seawall Study, “we see it more economical to provide longer, continuous repairs rather than rehabilitation of shorter sections.”

Third, the masonry of the existing structure does not appear to be consistent with modern construction standards. As a result, the sound substructure required to support limited repair work appears to be missing. There does not appear to be any recorded design data for the seawall; the only cross sectional drawing from 1900 does not conform to modern standards.

Fourth, the proposed statement of work in the NOI appears to contain sufficient contingencies to allow for the reconstruction of the wall from the base up. The key contingency in the NOI is that

> *"Excavation is only anticipated to a depth where the thickness of the stacked granite block becomes greater than 5-6 feet from the face of the wall".*

Since the stacked granite appears to be only a facade, this will lead to the excavation of the entire structure and a full reconstruction from the bedrock of the shoreline. As a result, additional dressed stone (or concrete) will be required to complete the expected cross section of the seawall. The increased excavation and material requirements may significantly increase the cost, more in line with Option 3 of the Seawall Rehabilitation Study.

Overtopping needs to be addressed in the restoration of the seawall. The seawall cannot be constructed to prevent overtopping, so the design must accommodate significant overtopping including outright flooding. This could require increased material to handle buoyant forces and erosion, and/or pavement/berms to direct surface flows.

Finally, a curved seawall would probably provide better protection for the landwards structures, particularly if the seawall were designed specifically to reduce landward movement of water. However, such a structure does not appear to be within the scope of the current NOI.

Appendix

This appendix provides annotated references for various documents and media incorporated into this report.

Public documents

Notice of Intent (NOI #028-2597)

The NOI package is a public record.
The Massachusetts Department of Environmental Protection (MassDEP) posts the notice of the NOI filing on the MassDEP website:

https://eeaonline.eea.state.ma.us/portal#!/search/wire

In order to review the actual documents, interested parties must make a formal request to review the file contents. The MassDEP Northeast Regional Office (NERO) in Wilmington provides an online form to request a file review:

https://www.mass.gov/forms/massdep-northeast-region-file-review-public-records-request-form

In the case of this NOI, the Gloucester Conservation Committee is the keeper of record, and may provide access to interested parties. However, file review can always be requested at NERO.

Deed Records

Most Massachusetts Registry of Deed offices provide online access to recorded deeds through various regional websites. Online records for Gloucester are available at

http://salemdeeds.com/salemdeeds/Default2.aspx

Deed records for Gloucester can be searched and viewed as far back at 1640. When searching for recorded deeds and plans, one needs to make sure to search in all appropriate indexes. Deed records recorded by the land court show up as registered deeds, and are indexed separately from ordinary recorded land records. Plan drawings may be found in plan books, although some older plan drawings may need to be located by book and page number.

Quote

(page 2) https://en.wikiquote.org/wiki/Albert_Einstein

A Brief Introduction to Seawall Construction

(page 4) Figure 10 is copied from the Rosen and Vine paper, cited below.
(page 5) Figure 2-5 is copied from the US Army Corps of Engineers manual EM_1110-2-1614.pdf, cited below.
(page 6) Figure C-2 is copied from the US Army Corps of Engineers manual EM_1110-2-1614.pdf, cited below.

Rosen, Peter & B VINE, D. (1995). Evolution of seawall construction methods in Boston Harbor, Massachusetts. Proceedings of The Institution of Civil Engineers-structures and Buildings - PROC INST CIVIL ENG-STRUCT B. 110. 239-249. 10.1680/istbu.1995.27868.
(downloaded from https://www.researchgate.net/publication/245412532_Evolution_of_seawall_construction_methods_in_Boston_Harbor_Massachusetts)

"Design of Coastal Revetments, Seawalls, and Bulkheads." Dept. of the Army, Corps of Engineers, Washington, DC (1995). (downloaded from https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1614.pdf)
The 1900 plan document can be retrieved from salemdeeds.com This plan is part of the record of license 2332, consisting of the handwritten transcription of the license recorded on book 1614 page 36 and the plan drawing stored as plan 1614 page 600.

The plan drawing for license 2332 was drawn January 15, 1900 and approved by the Harbor and Land Commission on February 21, 1900. This drawing shows section A is present (the part now near unit 36), and section C is missing. The modifications licensed under license 2332 were never completed; instead section C was built without a license and no license was conveyed in any of the deed transfers from the property now known as the Hawthorne Point Condominium Association.

Current Conditions

The plan drawing comes from the NOI packet. Photo credits are below.

The regulations, the NOI and the Seawall Rehabilitation Study

The Massachusetts Department of Environmental Protection (MassDEP) maintains a website which provides access to online applications and information resources.

https://www.mass.gov/topics/environmental-protection

The State of Massachusetts governmental website hosts an unofficial copy of the Code of Massachusetts Regulations (CMR):

https://www.mass.gov/code-of-massachusetts-regulations-cmr

(page 16) Drawing C103 is part of the filed NOI package.
(page 19) The FEMA firmette is part of the NOI package. Custom firmettes can be generated on the FEMA website:

https://msc.fema.gov/portal/search

(page 20) photos taken during the storm from unit 36. The left picture was taken during the surge. The rightmost image is a single frame captured from a video clip.

(page 21) an enlarged portion of drawing C103 in the NOI package

(page 22) a version of the image on page 21 modified to demonstrate an alternative structure consistent with the photographic evidence. The actual cross section of the seawall structure at Hawthorne Point may be a mixture of the two cross sections, varying along the length of the wall. Without the benefit of test pits, the only visible parts of the damaged structure suggest the model on page 22.

(page 23) photograph of the damaged Stacy Boulevard seawall on the west side of Blynman Canal taken June 7, 2018 by Max Arai
(page 23) photograph of the repair work to the damaged Stacy Boulevard seawall on the west side of Blynman Canal taken June 21, 2018, and a photograph of the flower beds on the promenade (both by Max Arai)

A Summary of Relevant Recorded Deeds and Plans

(page 25) plan drawing for license 2332 retrieved from the Salem Registry of Deeds (salemdeeds.com) , plan book 1614 page 600.
(page 26) postcard image of the Hawthorne Inn circa 1910 retrieved from Hippostcard..com

https://www.hippostcard.com/uploads/9df09f5867b803e4382a5d71700b5d6d.jpg

Photo Credits

(cover) Hawthorne Point circa August 29, 1982

This image appeared in an advertising supplement of the New York Times on August 29, 1982. Dr. Geary's presentation on the history of Hawthorne Point includes a copy of this advertisement. The image included in this report comes from a scanned copy of a postcard owned by a former owner at Hawthorne Point. The scanned image provides a clearer picture of the seawall than the newspaper advertisement, but the advertisement provides clear dating for the image.

(page 2)
detail from Photo 1 in the NOI package.
detail from Hawthorne Point circa August 29, 1982

The top image is a portion of a photo dated April 18, 2018, taken by Aaron Bennet, PE.
The bottom image is detail of roughly the same area from the 1982 photograph.
The images are not taken from the same angle, but clearly show differences in the standing parts of seawall today from the corresponding sections as they existed in 1982.

(page 7) photograph taken by Max Arai on June 21, 2018
(page 8) both photographs taken by Max Arai on June 21, 2018
(page 9) photograph taken by Max Arai on June 30, 2011
(page 10) inset from the photograph on page 10 taken by Max Arai on June 30, 2011
(page 11) inset from the photograph on page 10 taken by Max Arai on June 30, 2011
(page 12) inset from 1982 photo on the report cover
(page 13) figure supplied by Aaron Bennett

(page 20) photos taken during the storm on March 2, 2018 from unit 36
(page 23) photograph of the damaged Stacy Boulevard seawall on the west side of Blynman Canal taken June 7, 2018 by Max Arai
(page 23) photograph of the repair work to the damaged Stacy Boulevard seawall on the west side of Blynman Canal taken June 21, 2018, and a photograph of the flower beds on the promenade (both by Max Arai)

Disclaimer

Any opinions expressed in this paper reflect the author's personal views on the subject, and do not reflect the official views of the Hawthorne Point Condominium Association. These opinions are provided for personal use only, and do not constitute legal, financial or other advice.