

April 1, 2019

To the attention of:

Sandra Kosek-Sills, Ph.D.

Director and Environmental Specialist/Balanced Growth Coordinator

Ohio Lake Erie Commission – Lake Erie Protection Fund

P.O. Box 1049, Columbus Ohio, 43216-1049

RE: City of Mentor – Mentor Lagoons Marina & Lakefront Preserve Living Shorelines Study

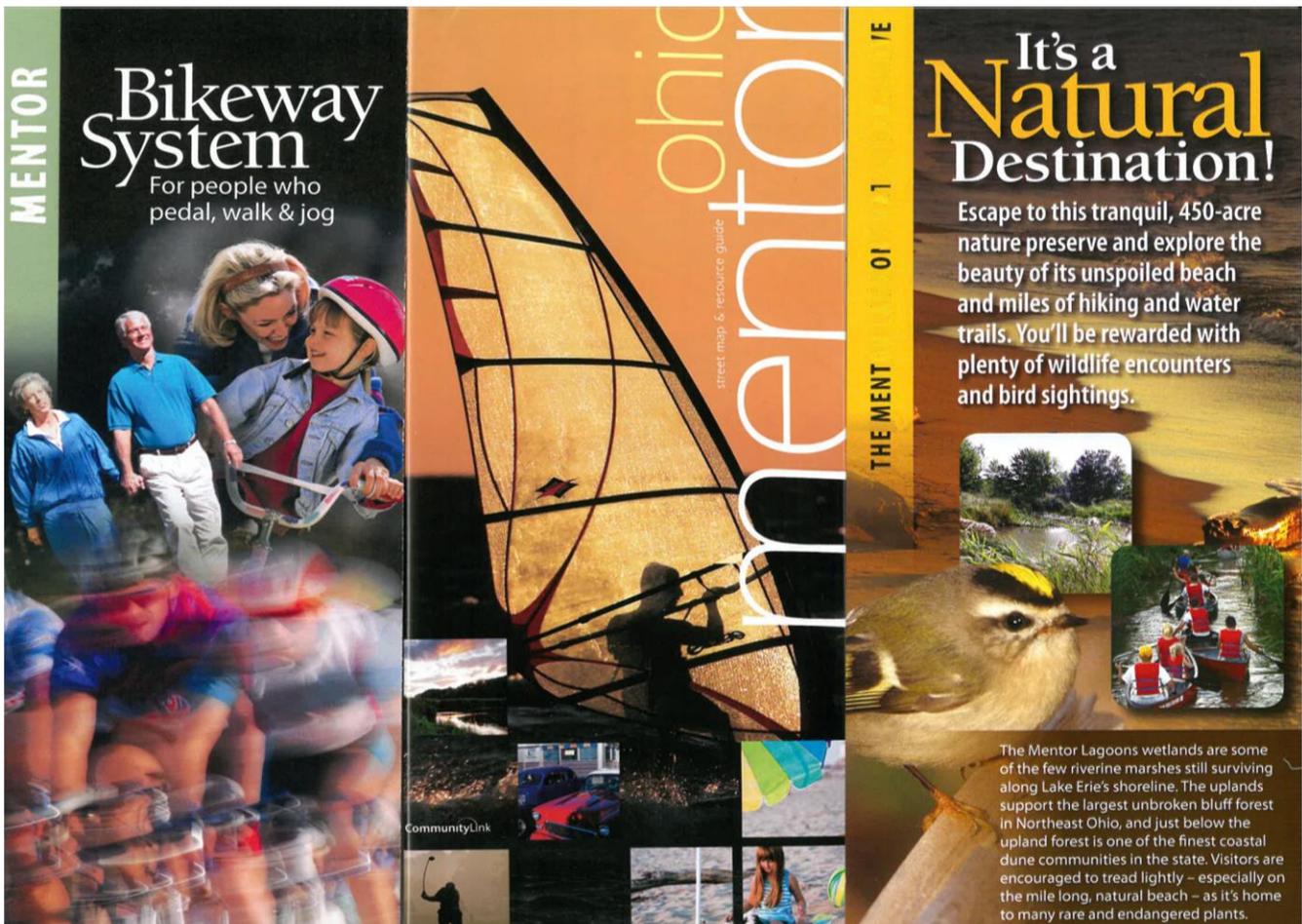


Dear Dr. Kosek-Sills,

Attached for your review is the final report for the City of Mentor LEPF Project 529-2018.

Please accept our apologies for the delays in getting the completed study in its entirety to your office. Though the project consultants; KS Associates of Elyria and Dr. Charles Herdendorf, completed and submitted their final study items by the 2/28 deadline, the fiscal accounting portion of the project lagged as it moved through the City's internal communications and fiscal review. Minor discrepancies in the salary scales used to calculate in-kind staff support were discovered and resolved. The final fiscal report is now completed and attached.

Included with the KS Report and its companion piece by Dr. Herdendorf are supporting images and details as complement to the main elements of the report. My move out of Ohio and the passing months have offered a sense of perspective about this project, so I wanted to add a few observations and comments to help convey the larger potential significance of this study for Mentor, a community that actively promotes its scenic and recreational amenities, and how this study can serve the State of Ohio and future efforts to sustain Lake Erie.



The City of Mentor sought to secure grant funding through the Lake Erie Protection Fund for the included study because it seeks a balanced approach where it can both protect its long-established recreational infrastructure, and also serve as a responsible steward for those natural areas it owns that are contiguous and part of a larger ecosystem where landscape-scale habitat restoration efforts are now underway. The future placement and utilization of living shoreline structures and techniques along these stretches of public shoreline will provide the State of Ohio an unusual opportunity to demonstrate the viability of these methods and serve to promote other initiatives that improve coastal resiliency in a more environmentally sensitive fashion.

Though the City does wish to preserve and protect its shorelines areas, it does not wish to do so by the use of stone barriers along the entire length of its coastline – nor does it wish to employ a regular series of offshore breakwaters that, by design and permit necessity, would forever alter the remaining portions of Lakefront Preserve and keep them in a physical state that would belie the City’s original intent in purchasing and protecting these 450 acres of land – *as a nature preserve* to complement adjacent areas owned by the State and the Cleveland Museum of Natural History. It is important to note here that, unlike beach protection / beach reestablishment schemes as found in other Ohio Lake Erie coastal communities, the look and function of any new beaches here as created by City of Mentor and its future project partners will have a different look and feel.

Water’s edge view – Fall 2017. Mentor Lakeshore Preserve – looking east from current end of revetment, to Sawyer’s Point the far left of picture – the extent of the LEPF project study area.



The Mentor LEPF report is meant to serve as a platform for additional efforts to secure the resources for the development of permit-ready engineering designs to build a series of structures that will feature both hard infrastructure in tandem with a range of timber designs that, altogether, will be used to seek and obtain implementation funds for a phased implementation program of nature based, ‘living shoreline’ projects along 3,500 linear feet of Lake Erie coastline in the coming years. For any coastal community that would be an ambitious initiative – and certainly so for a city the size of Mentor. But given Mentor’s location along the Lake Erie coastline and the surrounding context, this desire is particularly apt. There are only a handful of northeast Ohio coastal sites where such opportunities still exist, and even fewer communities with the resources that will be needed to supervise and maintain these future projects, once they are in place.



Much of the Ohio Lake Erie coastline is armored by some combination of stone and concrete revetments, groins and breakwater barriers. Public and private beaches, such as they exist, are the exception, and often found in conjunction with some protective shoreline structure. With the exception of locales such as the Lake Metroparks, Lake Erie Bluffs Park, there are few free, publicly-accessible shoreline stretches in Northeast Ohio where visitors can walk or boat along the coastline and experience the combination of wild beaches and dramatic, dynamic coastline conditions such as one finds in the City of Mentor's Lakefront Preserve.

The KS Study and companion research by Dr. Herdendorf suggest that a combination of structures utilizing organic and inorganic elements can be installed along these reaches of Mentor's coastline, and that these can be designed and installed so as to provide a future means to incorporate less formal construction techniques, such as the anchoring-in-place of already fallen large trees along the shoreline, and debris catchments.

Most public beaches in Ohio, by necessity and intent, are swept clean of large debris prior to the start of the warm weather seasons. Under a nature-based, living shoreline program in the future, the City will not so. City Mentor staff have observed that larger diameter trees, as they topple into the Lake, tend to remain in place for anywhere from one to three annual cycles. As they become waterlogged and, with their root wads still partially anchored, these trees form small catchment areas where collections of small timber and sediment build up again – which is part of the natural shoreline cycle. Both Dr. Herdendorf and the KS Associates team members, in discussion with City staff, have discussed the possibility of extending the time span of these organic structures by anchoring newly fallen trees in place. These structures, though temporary, will serve to create small habitat areas that are favored by certain bird, plant and insect species.

Dr. Herdendorf speculated that, with the basic structural components of any future stone revetments or similar structures in place, that stone structures can also have deliberately arranged crags and interstices that could provide other habitat opportunities. The overall result along this 3500 -linear foot stretch of shoreline will be more like the conditions one can see to a limited extent now at Lake Erie Bluffs Park or along more remote locales found in the less-populated areas of the Great Lakes region.

### More about the 'Area A' segment.

The Mentor Marsh is part of a now-rare coastal estuary system along the Ohio Lake Erie waterfront. The Marsh itself is an old meander of the Grand River which was hydrologically disconnected by historic settlement patterns and early industrial efforts. Marsh hydrological function, now the subject of study by Youngstown State University via a U.S. EPA grant, is fed by sub-watersheds within a 26-square-mile area, most of which is in the City of Mentor, that drains into Lake Erie. The Marsh itself is comprised of three historic basin formations. The Marsh east basin drains waters from the Blackbrook Creek sub-watershed, with the Marsh's western and middle basin receiving water from the larger Marsh Creek sub-watershed.

The Marsh itself performs a valuable ecological function in that it traps sediment and excess nutrients from flowing into Lake Erie. Historic sediment flow from Marsh Creek used to flow through the Marsh basin – now the site of Mentor Harbor, which then combined with sand deposited by prevailing Lake Erie currents and the littoral drift. Together, these formed a larger barrier beach structure over time along the shoreline edge of the west basin. This barrier beach protected the higher-elevation woody swampland areas to the immediate east, and at times separated Lake Erie and Marsh waters – significant relative to future efforts as outlined here.

All the possible scenarios outlined by KS Associates include the planned revetment extension by the City, which the Mentor will seek permit approval to build as a means to forestall a breach into the Mentor Harbor along the 'Dock A' Road near the entrance to the Mentor Harbor Channel - also referred to as 'Area A' in the KS report. These scenarios all suggest the possibility of the inclusion of *only a single breakwater* structure. There is a specific rationale for this, though not outlined in detail by KS due to the limitations of this modest study.

A nearby and pertinent example would be found further to east in Lake County in the village of Madison-On-The-Lake, as is shown in the supplementary image here. Madison obtained State of Ohio capital funds to build a series of three

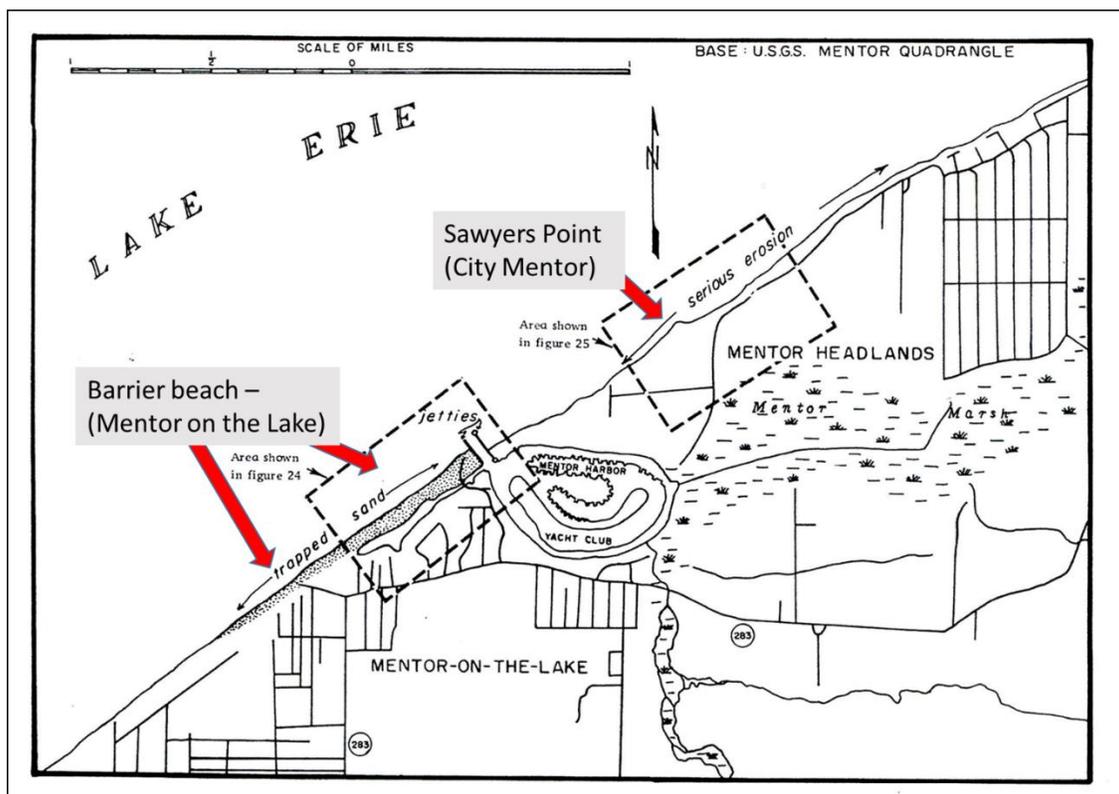


breakwater structures in 2011-12. The result, as shown, certainly serves the public interest as a free beach adjacent to park land. But this is also a beach with a most un-natural profile that certainly diminishes the quality of the experience, and arguably does little to promote a more dynamic and responsive coastal ecosystem. The City of Mentor, with its lengthy stretch of nearly two miles of public coastline, seeks to initiate a different, more nuanced and ecologically sensitive program.

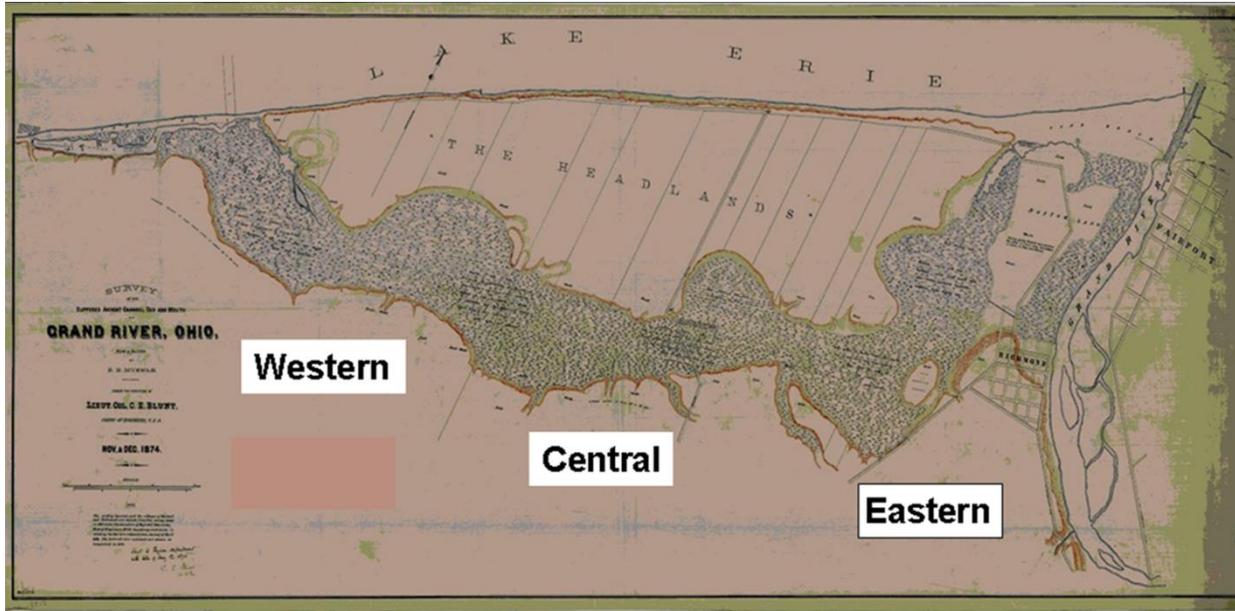
Dr. Herdendorf has also postulated that, as part of the first future efforts made by the City and its partners to re-establish a more natural regime of erosion and land-building cycles along shoreline reaches of its own Lakefront Preserve, that the City could make a special-case application to harvest and utilize some of the sizable sand deposits found just further offshore – sand deposits that are too deep to be overly impacted by littoral drift and seasonal currents. The City would likely seek the means and resources to attempt to draw from these deeper sand deposits within some combination of structure-building scenarios, as outlined in the KS report, and as part of the initial sand prefill / beach nourishment individual permit condition that will certainly be required from the US Army Corps of Engineers and Ohio EPA in order to proceed with this overall initiative.

It may also be that the City will seek special circumstance permissions as well under these future coastal protection scenarios to obtain a waiver from the annual sand-replenishment requirement that other communities often have to undertake once they build hard erosion structures in order to save or re-establish public beaches. Madison Village once again serves as a pertinent and useful example in this regard. Village officials have commented to City Mentor staff that the annual outlay of funds required to move sand under the technical conditions of the permit requirement varies annually. For a community the size of Madison Village, this can constitute a potential hardship in that impairs their capacity to make predictable budgets for park maintenance. The City of Mentor, being fiscally conservative, and by necessity of the scale of investment needed to maintain its more extensive and aging coastal infrastructure, would rather make annual capital investments first to maintain critical coastal infrastructure. Following that, the City will likely seek to use funds that might otherwise be required for annual sand replenishment to continue to expand upon a series of living shoreline techniques along those reaches between the Mentor Harbor / Marina entrance, and Sawyer's Point some two miles to the east, as identified within the KS study and companion reports. This is why, for 'Area A', *only one breakwater structure* is proposed. Under the future scenarios which the City and its consultants will further refine, the planned revetment extension, in tandem *with one other significant structure at the eastern terminus of the revetment*, will serve to help prevent the 'scouring' around the leading edge of the revetment, as seen to take place on that site almost immediately after the construction of the first revetment phase in late 2016. The combination of revetment and some other significant structure at the revetment terminus could then possibly serve to help re-establish the barrier beach system that once protected much of the coastline to the east from the natural Lake Erie erosion process in a more natural and organic fashion.

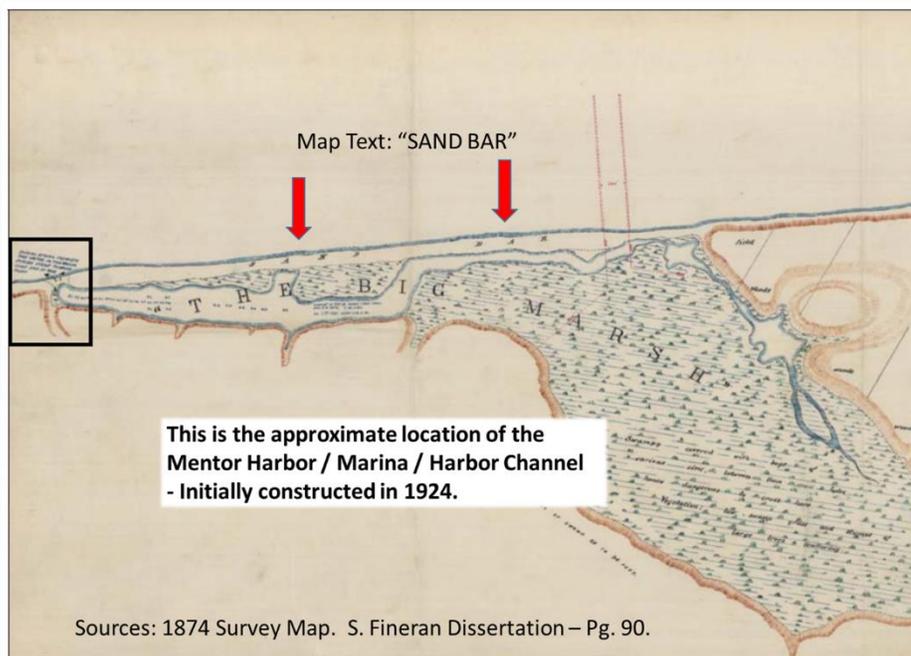
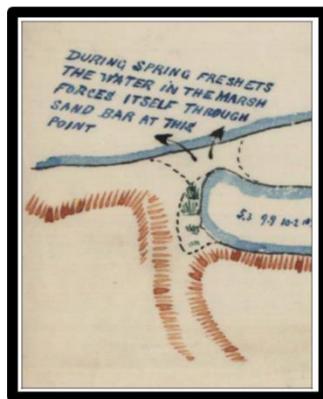
Dr. Herdendorf's research includes interesting historic maps and charts of shoreline and nearshore underwater conditions to help inform likely parts of this future shoreline strategy. Shoreline conditions as schematically depicted in the Hartley Map of 1964, for example, as seen here, indicate a structure referred to as 'trapped sand' which, according to ODNR staff member Jim Park and Cleveland Museum Chief Botanist Jim Bissell, was part of the former large barrier beach that defined the west basin of the Marsh, and served to help buffer the adjacent woody upland areas to the east from the annual variations of harsh Lake Erie seasonal weather.



These maps and survey materials help expand the vision of future efforts to take into consideration the slow-moving natural processes that took many centuries to establish the natural characteristics of the Marsh system – a system which was then altered through several large-scale human interventions that substantially diminished the annual deposits of sedimentation that caused the development of the barrier beach structure, which in turn helped protect the woody upland areas that separate the Marsh from Lake Erie. Some sense of the size and characteristics of this barrier beach structure and the open water areas immediately to the south and west of it are found in an 1874 survey map studied in greater detail by a Ph.D. dissertation authored by Stacy Fineran in 2003. The City of Mentor has located historic photos that show what this barrier beach / west basin area actually looked like in the early 1920’s, shortly before much of the west basin was dredged and reconstructed into the current configuration of Mentor Harbor and the Marina Channel. (See below).



Research / conceptual design - Shoreline Protection Initiative – Marina / Harbor Reach



Sources: 1874 Survey Map. S. Fineran Dissertation – Pg. 90.

Research / conceptual design - Shoreline Protection Initiative – Marina / Harbor Reach

**1874 BLOUNT SURVEY TEAM:**  
“DURING SPRING FRESHETS THE WATER IN THE MARSH  
FORCES ITSELF THROUGH SAND BAR AT THIS POINT”

Barrier beach –  
(Mentor / Mentor on the Lake)

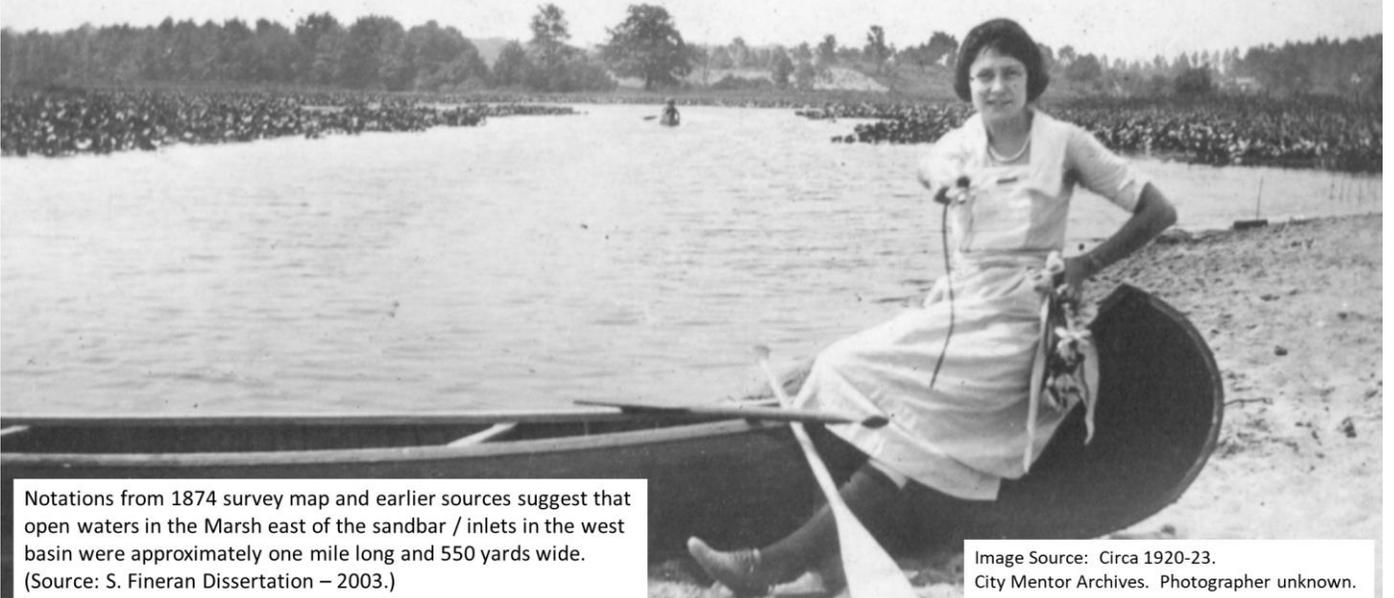


Image Source: Circa 1920-23.  
City Mentor Archives. Photographer unknown.

Research / conceptual design - Shoreline Protection Initiative – Marina / Harbor Reach

View of open waters – Marsh West Basin, looking northwest along approximate alignment of what is now  
'A' Dock Channel and 'A Dock Road' – Mentor Harbor and Marina.

Sandbar and trees / vegetation shown in prior photo would be to the left of this image, outside this photo.



Notations from 1874 survey map and earlier sources suggest that open waters in the Marsh east of the sandbar / inlets in the west basin were approximately one mile long and 550 yards wide. (Source: S. Fineran Dissertation – 2003.)

Image Source: Circa 1920-23.  
City Mentor Archives. Photographer unknown.

Despite the intrusion of the Harbor Channel in the 1920's, and even after many other physical structures here and further to the west, the beach system just to the east of the Channel seemed to largely stay in place and protect shoreline reaches to the east. It was only within the last decade that the combined impacts of diminished sand transfer and sustained high water levels in the Lake came to finally reduce the remnants of these sand deposits to the point that seasonal Lake Erie currents and weather impacts started to substantially erode into the City's Lakeshore Preserve areas. Mentor City staff have estimated that more than six acres of City land along these shoreline reaches have been lost to erosion – with a concurrent gain of six plus acres to Headlands Beach State Park five miles eastward, which itself is held in place by channel barriers at the mouth of Grand River, initially constructed more than a century ago. This also helps further explain why, from a strategic perspective, that the City wishes to focus its next capital investments on harder erosion methods at three specific physical points as shown in the KS study which, in all likelihood, will be developed sequentially. The 'Area A' segment will be the first phase and leading component of the strategy. High water levels and seasonal storm surges are already washing over the 'A Dock' Road near at the current terminus of the revetment, causing some damage. A Lake breach into the Marina here could cause substantial damage and, were it to happen, would be even more costly to repair. The City sees an extension of the existing revetment as a necessity, and it will provide a more secure point from which to begin a sequence of living shoreline techniques.

**The 'Area B' segment**, with emphasis on preserving the Woods Trail Road, will follow. This phase also serves the purpose of preserving the remaining portion this access road as a viable transportation and staging area for the movement and placement of timber debris and timber structures along the areas east of the 'Area A' phase. City staff have had conversations with various individuals; ODNR staff at Headlands Beach State Park and specialists from the Museum of Natural History, about the potential for re-purposing the many tons of driftwood and organic debris that annually collects at Headlands Beach S.P. The State now spends tens of thousands of dollars annually in annual beach cleaning to gather and dispose of this woody debris, which sometimes for lack of other options ends up in a landfill. Some of these materials could be deposited along shoreline areas in the City's Lakefront Preserve. Other wood debris as selected by Museum staff could be used in their efforts to re-establish the woody swampland habitat that once had been so prevalent in the Marsh itself prior to the major disruption of that natural process by hyper-salinity and the ensuing destructive combination of Phragmites infestation and periodic fires that burned away much of the former habitat diversity – one of the key motivations that had led the U.S. Department of Interior to declare the Marsh a National Natural Landmark in 1965, and which then motivated the State of Ohio to establish the Mentor Marsh as one of its first State Nature Preserves in the 1970's. These background details speak to the sequential nature and importance of this initiative. For the City to use debris collected from Headlands Beach State Park, protocols and agreements between the State and City will be required – action steps that are not immediately necessary for work to begin in the 'Area A' segment of the plan area. Mentor can access debris from other local sources in the meantime.



ODNR may spend more than \$25,000 in a given year to clean up Headlands Beach and remove debris. Much of this material is placed in a landfill.

**The 'Area C' segment** will serve to reinforce and preserve existing historic breakwater structures built in the 1940's that up to now have preserved and protected a linear mile of coastal wild beach areas and a lakeshore path this is part of the Ohio Buckeye Trail leading to its Lake Erie terminus at nearby Headlands Beach State Park. It is a portion of the Lake shoreline where, during favorable conditions and weather, one can simultaneously see boats anchored offshore, people along the shore and biking nearby – all enjoying nature along the coastline. There are few public sites along the Northeast Ohio - Lake Erie shoreline where one can simultaneously experience these all at once.



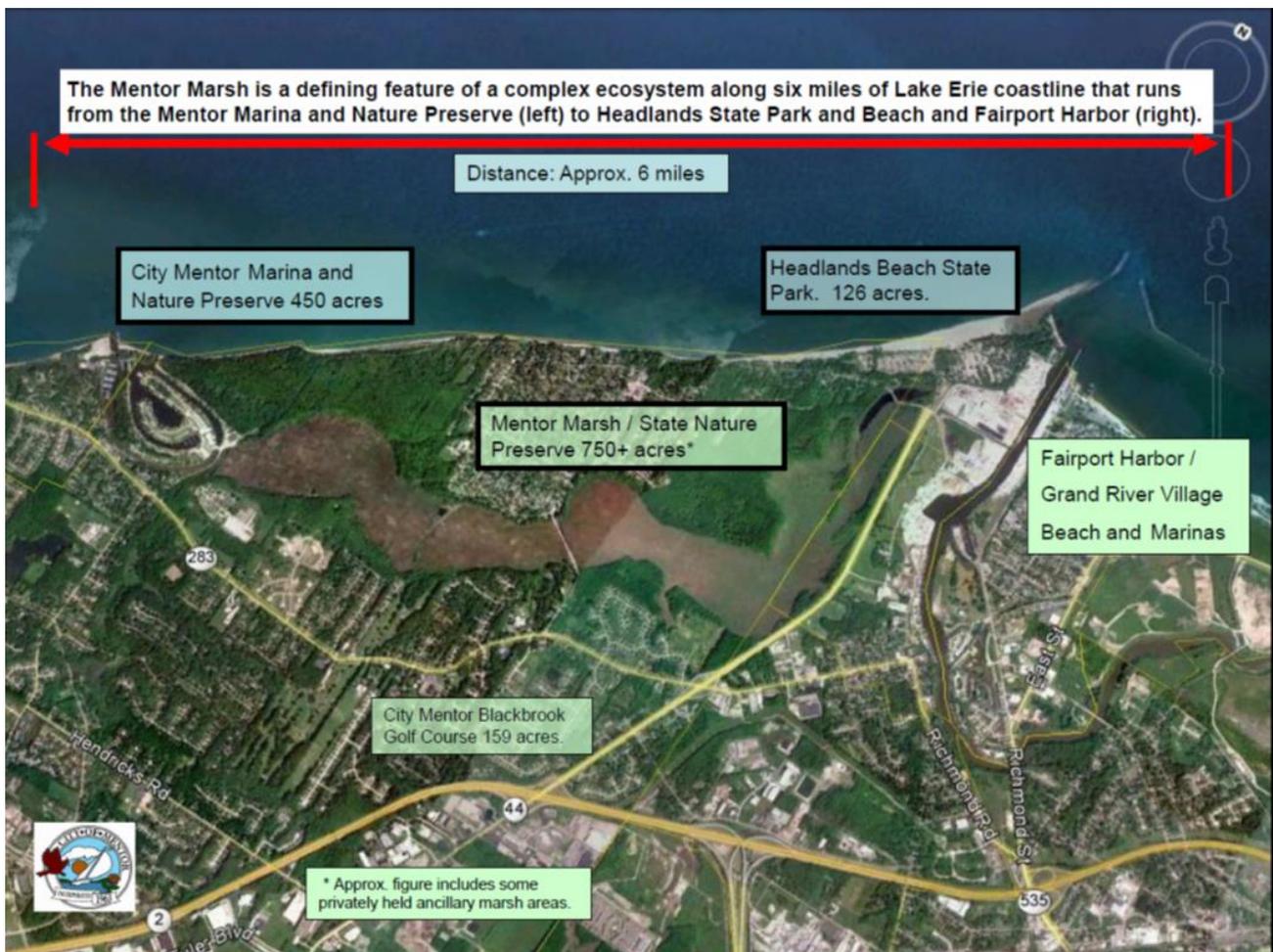
Drone view – Visitors enjoying Mentor's wild beach east of Sawyer's Point.

To our knowledge, a living shoreline program such as envisioned by Mentor has not been attempted at this scale along a mid-basin stretch of Lake Erie shoreline. Mentor is likely the only Lake Erie coastal community east of Cleveland with both the available un-protected shoreline and some of the in-house resources that would be necessary to develop and maintain such a long-range initiative. Mentor's coastal management strategy also reflects a desire to embrace a more comprehensive review of its lakefront's physical characteristics than the more immediate and short-term focus on discrete projects aimed at stopping erosion at specific points. The Mentor green spaces within and around the Marsh, in tandem with other adjacent areas within neighboring Mentor-On-The-Lake, the Museum's holdings, the Mentor Marsh State Nature Preserve and Headlands Beach State Park – altogether these comprise the remaining portions of the Mentor Marsh watershed where one can experience a diversity of natural habitat conditions and also perceive a sense of scale of this estuary system.

Marsh Habitat restoration as seen from Mentor Lakefront Preserve – Marina and trailhead parking lot. The Marsh as seen here had been dominated by a 900-acre monoculture of invasive Phragmites plants.



This view had previously been obstructed by Phragmites.



This stretch of Lake Erie, 'Harbor to Harbor', from the Mentor Harbor eastward to Fairport Harbor at the mouth of the Grand River include many marinas that, altogether have two thousand boat slips. The Grand River, south of the communities of Fairport Harbor and Grand River Village, is a designated Scenic River with protected habitat and fishing areas upstream that bring many nature enthusiasts to this part of Ohio. And, as Mentor and other agencies have demonstrated through annual programs at Headlands Beach State Park and sites nearby, the coastal communities of central Lake County have the ability to draw visitors from neighboring states and further afield. The City's intent to both protect its most critical coastal infrastructure and yet keep it as 'wild and natural' as possible is only in keeping with this larger regional vision. A few years earlier, Mentor joined the Lake County Health Department, Laketrans, the Lake County Planning Commission and four neighboring communities to develop a long-range transportation plan that envisioned Lake County's coastal destinations all linked by a fifty-five-mile-long network of recreational trailways. Staff from the Lake County Port Authority, while participating in that project, suggested that such a plan also include recreational 'blueways' and the designation of the six-mile stretch of coastline from Fairport Harbor to Mentor Harbor as a kayak-canoeing route, with landings and safe-harbor spots along the way, such as at Headlands Beach State Park and the wild-beach areas owned by Mentor east of Sawyer's Point, as seen in the study area for this project.

Lake Erie, as the shallowest, warmest and most diverse of the five Great Lakes, has a vibrant recreational economy that includes many forms of recreational wind and water sports that rely upon ready access and the appeal of these natural assets. ODNR figures show that Headlands Beach S.P. draws two million visits annually – much of that still only from two counties. Biking, windsurfing, paddle-boarding and hang-gliding are growing in popularity here – and the preservation of one nearly continuous stretch of free, publicly accessible and well-managed, natural coastline along the central Lake Erie basin will, in the future, become even more of a draw.

The Mentor Marsh itself, once badly degraded by salinity and Phragmites infested, is now undergoing rapid and landscape-scale habitat restoration. Long regarded by the Audubon Society as an Important Birding Area, the new emerging habitat in and around the Marsh is now bringing a five and tenfold increase in migratory bird populations - which in of itself is a revenue generator that, as reported within an OSU study published in 2012, brings millions of dollars in economic activity to communities near protected habitat areas along Ohio Lake Erie's western basin areas. The same phenomena could soon be happening in Lake County.

While it is true now that northeast Ohio and the greater Cleveland metropolitan area have been population-static for several generations, that paradigm will eventually change. Far-sighted efforts by groups within Cuyahoga County such as the Cleveland Metroparks, the City of Cleveland and the Ohio and Erie Canalway Association, have knit together hundreds of miles of recreational pathways within an 'Emerald Necklace' that includes a growing network of connections to Lake Erie and local populations. This work is serving to regenerate interest in the revitalization of nearshore urbanized areas, as well as living and working opportunities all along these protected greenspaces. These efforts are helping change the paradigm of Cleveland and northeast Ohio from that of being rust-belt communities into areas seen as more desirable, livable, affordable and sustainable.

Mentor Harbor Marina view from a vantage point similar to the historic image included earlier, looking northwest along a present day view of what is now 'A' Dock Channel and 'A Dock Road'. 'A' Dock Road is to the left, and Lake Erie is immediately beyond the screen of trees to the left.



This may all seem like a lot to imply as the end result of an initiative which in all modesty, proposes to hold Lake Erie waves back from pounding away a few more acres of land, like it always has, with a few more piles of man-placed rocks and, then even more modestly, designating a few reaches of public coastline, where the ebb and flow of land erosion and land accretion will play out, as it always will. And yet, how many urbanized Ohio coastal communities would even entertain such a possibility, let alone have the available public land, to set aside areas where the Lake and land are allowed to interact in a way that is more responsive to natural cycles. Most waterways leading into Lake Erie on the Ohio side are now in largely in urbanized areas, with former marshland sites adjacent to river mouths seen only as places to drain and fill with factories and railyards. It is worth including this fact, known to Ohio state agencies and staff, that less than 10% percent of Ohio's coastal marshlands remain. Were it not for failed real estate ventures early in the 20<sup>th</sup> century and in the 1920's, the Mentor Marsh / Marsh waterfront approaches would have either become an exclusive residential waterfront community or would have been heavily industrialized, such as they were in downtown Cleveland near the mouth of the Cuyahoga River, in Lorain along the Black River, and other such Lake Erie port communities.

The City of Mentor, now just over fifty years old, took the remarkable initiative in the 1990's of using a referendum-supported and rarely used eminent domain process to buy and secure 450 acres of coastal wetland, at a cost which would then include long-neglected, long-overdue maintenance to an aging marina, dealing with a festering environmental challenge that was the site of repeated fire events (the aforementioned pollution impacts in the Marsh), and sustained debt service on the land purchase that, only recently was paid off. The pollution impacts, largely attributed to a point-source event at the mouth of the nearby tributary Blackbrook Creek, and itself the source of a drawn out legal challenge involving Ohio EPA and State Attorney General's Office, the City and other interested parties, has finally reached a conclusion that will allow for future transfer of the polluted site from private hands to an agency with access to the resources needed to clean and restore that site as well. In other words, from a regional perspective, the Mentor Marsh and adjacent coastal areas are at the cusp of significant, long-term and positive change.



Lake County's signature natural areas and waterfront amenities: Mentor Lakefront Preserve, Mentor Harbor - Mentor City and Mentor on the Lake Marinas, Headlands Beach State Park, Mentor Marsh State Nature Preserve, Fairport Harbor Beach, Grand River Marinas, the Ohio Buckeye Trail.

All gain through improved stewardship of this complex coastal ecosystem. The results will include new economic vitality based on recreational economy and tourism along Lake Erie's coast.

It is in this regard, then that the City's efforts as demonstrated through this now-completed study, graciously supported through the Lake Erie Protection Fund, should be seen. Seeking resources to plan and initiate a nature-based program of projects along its public coastline is all in keeping with comments made three years earlier to an assembled group of City staff and interested parties by Dino DeSantis, aide to Lake County Congressman Dave Joyce that, for efforts henceforth to be made regarding assistance for desired improvements to any natural areas within the Marsh estuary system, that an ecosystems approach, from the Mentor Harbor Channel and eastward to the mouth of Grand River, be taken into consideration.

Respectfully submitted,

Abraham Bruckman, AICP  
Mentor City Grants Coordinator