



Shabica & Associates, Inc.
WE BUILD BEACHES

Federal Consistency Coordinator
Illinois Coastal Management Program
Illinois Department of Natural Resources
160 N. LaSalle Street, Suite 700
Chicago, IL 60601

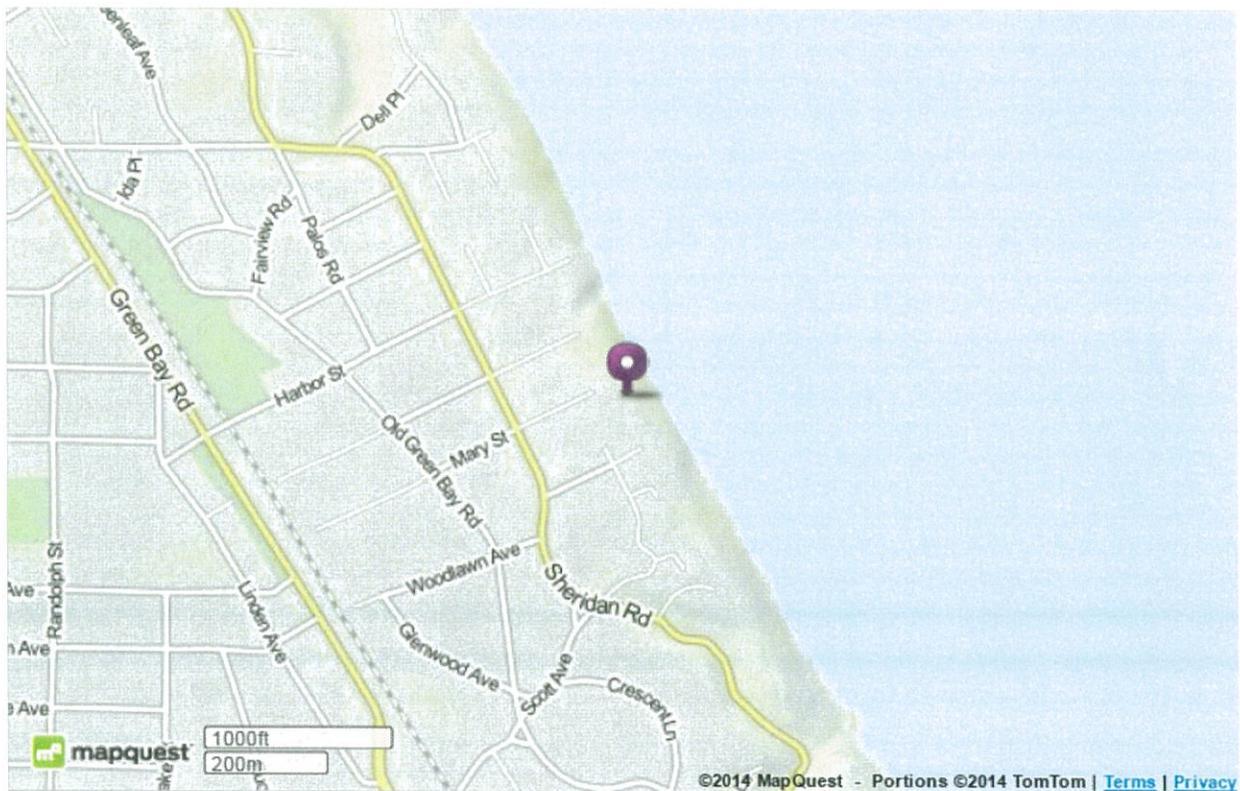
March 19, 2014

To Whom It May Concern:

In compliance with the Illinois Coastal Management Federal Consistency Review Procedures, we provide the following information for a proposed quarystone breakwater island system for the property located at 94 Mary Street, Winnetka, Illinois 60043, owned by Mr. Louis Kenter and Ms. Leslie Graham.

Location of Project

The proposed quarystone breakwater island system will be built on the lakefront of the property located at 94 Mary Street, Winnetka, Illinois 60043, owned by Mr. Louis Kenter and Ms. Leslie Graham.



Project Start Date and Duration

Work will not begin until all necessary permits have been received. It is anticipated that the project can begin by May 1, 2014. This work will require 10 weeks to complete.

Extent of Work to be Conducted

The revised proposed project includes constructing a quarystone breakwater island 25 feet north of the south property line at 94 Mary Street that extends 100 feet north, crossing the projection of the 91 Mary Street property line (owned by William Grant). The quarystone breakwater island will have a crest elevation of 582 feet (all elevations IGLD 1985), and the lakeward toe will extend 125 feet east of the existing concrete seawall. This plan also includes constructing a short breakwater providing groin toe protection at the lakeward end of the steel groin at 115 Mary Street (owned by Lance and Loanne Peterson). This short breakwater will provide groin toe protection as well as reduce the gap between the breakwaters to help maintain a more stable beach cell system. An additional component of this project is to rebuild the existing quarystone revetment at the subject property of 94 Mary Street, as it has deflated over time.

Letters of authorization from William Grant (91 Mary Street) and Lance and Loann Peterson (115 Mary Street) are included with the full permit submission.

Contact Information

All questions pertaining to this project can be submitted to:

Jon Shabica
Shabica & Associates, Inc.
550 Frontage Road, Suite 3735
Northfield, IL 60093
jon@shabica.com
847-446-1436 Tel
847-716-2007 Fax

The proposed activity complies with Illinois' approved Coastal Management Program and will be conducted in a manner consistent with such policies.

Sincerely,



Jon Shabica
Managing Director



2010 Google Earth Photo; see approximate property lines in yellow



Shabica & Associates, Inc.
WE BUILD BEACHES

Ms. Kathy Chernich
East Section Chief, Regulatory Branch
USACE, Chicago District
231 S. LaSalle Street, Suite 1500
Chicago, IL 60604

Dear Ms. Chernich:

June 10, 2013
REVISED March 19, 2014

Please find enclosed a revised permit application for shore protection for the property located at 94 Mary Street, Winnetka, Illinois 60093, owned by Mr. Louis Kenter and Ms. Leslie Graham. This permit application was originally submitted on June 10, 2013. The enclosed permit application should replace the previously submitted application dated June 10, 2013. A full set of revised drawings is included with this submittal.

The original 6/10/13 plan included a shore-connected quarrystone breakwater along the subject property's south property line. Since that time, the project has been revised to keep the beach system open for beach walkers traversing the beach. The previously proposed shore-connected south breakwater has been redesigned to be a quarrystone breakwater island beginning approximately 25 feet north of the 94 Mary Street south property line and extending 100 feet to the north. As the project will include work on the two properties to the north (91 Mary Street, owned by William Grant, and 115 Mary Street, owned by Lance and Loann Peterson), letters of authorization from Mr. Grant and M/M Peterson are attached. A quarrystone breakwater spur will be constructed at the lakeward end of the existing steel groin at the 115 Mary Street property (Peterson) to narrow the gap between the groin and the proposed island. Sandfill, as required by the IDNR, will be placed entirely within the subject properties boundaries. Proposed work includes construction of a quarrystone breakwater island, a short breakwater providing groin toe protection at the lakeward end of an existing steel groin, reworking the existing revetment with a short extension to help reduce sand movement, and sandfill as required for this work.

A *Design of Shoreline Erosion Protection* report has been attached to this cover letter as the coastal design specifications component of this permit. All references and figures referred to in the cover letter and the following report can be found in the Appendix.

The proposed activity complies with the approved Illinois Coastal Management Program and will be conducted in a manner consistent with such policies.

Project Purpose Statement

Mr. Kenter and Ms. Graham have retained Shabica & Associates (SA) to help stabilize the existing beach on the Lake Michigan coastline at 94 Mary Street, Winnetka. The property currently has a quarrystone revetment that has deflated with an ephemeral beach lakeward. This site is typically the narrowest section of beach in this beach cell and at times has no beach lakeward of the existing quarrystone revetment even during low lake levels. As there has been wave overtopping of the revetment during larger storms (even during the current low lake levels), it is necessary to provide a shore protection system that will protect the property during all lake

levels. The proposed system will move the locus of wave action further offshore where lakebed downcutting will be reduced.

The revised proposed project includes constructing a quarystone breakwater island 25 feet north of the south property line at 94 Mary Street that extends 100 feet north, crossing the projection of the 91 Mary Street property line (owned by Grant). The quarystone breakwater island will have a crest elevation of 582 feet (all elevations IGLD 1985), and the lakeward toe will extend 125 feet east of the existing concrete seawall. This plan also includes constructing a short breakwater providing groin toe protection at the lakeward end of the steel groin at 115 Mary Street (owned by Peterson). This short breakwater will provide groin toe protection as well as reduce the gap between the breakwaters to help maintain a more stable beach cell system. An additional component of this project is to rebuild the existing quarystone revetment at the subject property of 94 Mary Street, as it has deflated over time.

The proposed system is designed to help retain the sandy beach, reduce wave energy that impacts the revetment, reduce lakebed downcutting in this area, and provide access for pedestrians and watercraft to Lake Michigan. In accordance with IDNR requirements, 2,550 tons of clean sand will be placed on the subject beach, as well as on the beaches to the north and south as sand mitigation.

The Illinois Lake Michigan shoreline is considered “sediment starved” by coastal scientists. This is in contrast to East Coast and Gulf Coast open ocean shores where tens of thousands of tons of sand are found in the nearshore system that provides a primary line of defense against stormwaves. On most Great Lakes shores including southern Lake Michigan, natural sand beaches are not able to protect the lakeshore (exceptions may be during very low lake levels like 1964 or 2004-09). Large quantities of sand have been trapped or diverted offshore by municipal structures that extend 900 feet or more into the lake. Today, the main sand supply is wave erosion of the nearshore glacial clay lakebed that contains only about 10% sand (Shabica and Pranschke, 1994). The result is that groins are losing their effectiveness at holding a sandy beach during average to high lake levels. To retain a sand covering of the shallow lakebed (where downcutting is most active), as well as to protect the seawall and bluff, SA has designed a pocket beach system to hold sand as necessary to protect the lakebed and bluff during higher lake levels.

This section of coastline has historically lost sand due to lakebed downcutting especially during prolonged periods of low lake levels. Nearshore sand deposits are non-existent here (Figure 1, Appendix) and scientists estimate that the rate of lakebed erosion averages 6 inches per year (Nairn, 1997). The net result is similar to the effects of global warming and rising sea level on marine coasts. This includes deeper water nearshore, larger stormwaves and progressively narrower beaches as the nearshore lakebed continues to erode. This has resulted in bluff toe erosion especially during average to high lake levels. While a narrow beach has been present at this site during higher lake levels, stormwaves have scoured the beach at the toe of the seawall. If ignored, this will lead to destabilization of the seawall and bluff face causing loss of tableland and infrastructure.

If beach and nearshore sand is lost, degradation of the nearshore ecosystem will result. Meadows et al., (2005) reports an increase in zebra mussels *Dreissena polymorpha*, and a decrease in native zooplankton in waters where the lakebed is eroding clay and rocks. In comparison, a nearshore area with 100% sand cover supports a species-rich community. The report concludes, “it [is] nonetheless clear that sand-based areas were characterized by sufficient shallow water fish CPUE and species richness to suggest that these are important habitats within the context of the Great Lakes Basin and not simply ‘wet deserts’ as they are often considered.”

Design Options

The site at 94 Mary Street, Winnetka has been inspected and options for shore protection were determined using desktop coastal engineering, site conditions from the 2011 bathymetric survey, and three years of observations of the deteriorating shoreline conditions at this site. Given the extreme beach erosion to the shoreline over the last three years during below-average lake levels, as well as the uncertainty of future lake levels, it is prudent to engineer and design systems that will anticipate greater lakebed downcutting, higher amounts of beach erosion, more extreme storm events with larger waves, and potential loss of land. These five design options were considered:

OPTION 1

Do Nothing –

The first option of “Do Nothing” results in leaving the currently eroding beach in its existing state. In recent years, the beach has frequently been non-existent here with evidence of waves overtopping the revetment. Continued deflation of the beach will allow stormwaves to impact and overtop the existing revetment and seawall at current levels and will cause increased erosion of the bluff during high lake levels.

OPTION 2

Enhance the Revetment Only –

The second option considered is to merely enhance the existing revetment. This option provides protection of the bluff at the cost of the following:

1. Continued erosion of the lakebed, which will ultimately destabilize the revetment toe
2. Modification of the revetment crest, raising it to an elevation of about 5 feet higher than the existing to adequately protect the toe of the bluff
3. Substantial modification to the lower bluff to maintain the area’s functionality (a patio and storage area where access and view of the lake would be reduced)
4. Modification of the revetment will reduce the amount of beach at this site, which is already non-existent during parts of the season

Due to the reasons listed above, this option is not recommended.

OPTION 3

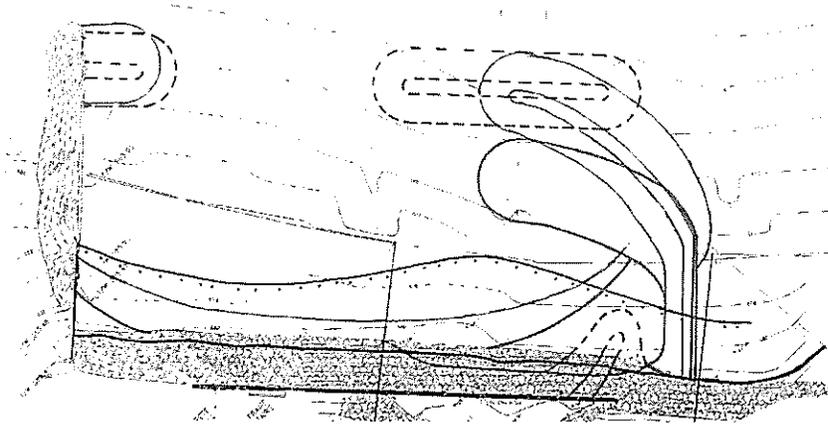
Design a Shore-Connected Breakwater Extending 125 Feet Offshore –

This option was the previously preferred option in the 6/10/13 permit submittal. This option protects the property with a shore-connected pocket breakwater system. In this option, a steel and quarrystone breakwater along the south property line would extend east from the bluff toe as far as the existing steel groin structure immediately to the north, approximately 125 feet east of the seawall (110 feet east of the revetment toe). This plan would require a short breakwater at the lakeward end of the steel groin at 115 Mary Street. This short breakwater would provide groin toe protection as well as reduce the gap between the breakwaters to help maintain a more stable beach cell system. Although this plan was feasible for shore protection, it was not selected due to opposition from south neighbors, who preferred to keep the beach system open.

OPTION 4

Design a Shore-Connected Breakwater Extending Less Than 125 Feet Offshore –

Designing a smaller shore-connected breakwater system was reviewed. With the current lake conditions and narrow beaches during low lake levels, a smaller cell system would not adequately serve as shore protection. Also, as this design is not an open beach system for traversing the property, it would not meet the approval of the neighbors.



OPTIONS 3 & 4 versus OPTION 5: Shore-Connected Breakwater versus Island Breakwater
Plans for Options 3 & 4 shown in red overlain on top of the proposed plan (dotted black)

OPTION 5

Preferred Option: Design a Quarrystone Breakwater Island 125 Feet Offshore –

The preferred option for shore protection is to construct a quarrystone breakwater island and a short quarrystone breakwater spur at the end of the existing steel groin to the north. The breakwaters are designed with a gap that will allow the system to function as designed during all lake levels while accommodating the neighbors' concerns for an open beach system. The proposed plan will help protect the glacial clay lakebed, as well as the beach and bluff, while allowing safe access to Lake Michigan. This option will help stabilize the sand on the adjacent beaches by reducing wave energy in the immediate area. Additionally, this option maintains pedestrian access across the sandy beach with no obstruction north or south.

Benefits of Sandy Beaches

The Great Lakes represent the most important natural resource in the United States. Sandy beaches play an important role in maintaining water quality and safe access. Furthermore, a sandy beach makes a better ecotone (transitional environment) for flora and fauna than seawalls and revetments. Summary arguments supporting a sandy beach system include:

- 1) Beaches are filters for non-point source runoff.
- 2) Beaches reduce lakebed downcutting, a source of fine clay pollutants.
- 3) Beaches support endangered species such as sea rocket, marram grass, and seaside spurge.
- 4) Beaches make better wildlife habitat than actively eroding bluffs or seawalls.
- 5) Stone headlands make better fish habitat than eroding lakebed clay.
- 6) Beaches protect the lakebed from erosion that causes larger stormwaves to impact the shore.
- 7) Beaches are far safer for swimmers and boaters than a coast lined with seawalls or revetments, especially in an emergency.

Impacts to Downdrift Properties

The impact to the downdrift properties, if any, will be a small increase in the sand quantity in the beach cell adjacent to the project. Immediately downdrift of the proposed project is a property protected by a groin-held beach. The proposed system will reduce wave energy in the immediate vicinity of the structure and will have a positive impact on sand stability in the beach cell on the south neighbor's property. As required by the IDNR, the

quantity of sand that would be required for the south neighbor's property will be placed immediately offshore of the project.

Impact to Littoral Drift System

The proposed plan for this site includes construction of a breakwater-protected pocket beach system and placement of mitigational sandfill as required for permit. The design of the proposed system, including the mitigational sandfill, will help assure no negative impact to the littoral drift system. The existing section of Lake Michigan shoreline at 94 Mary Street, Winnetka is completely engineered. This section of the coastline consists of breakwater-held beaches, groins and revetments.

The proposed southern quarystone breakwater will extend approximately 125 feet offshore (similarly offshore as the existing groin along the north neighbor's property line). The proposed groin toe protection (at the lakeward end of the north existing groin) will extend only as far lakeward as the end of the groin. The proposed structure has been designed to fit in with the adjacent structures. The littoral drift system should remain at an equilibrium once the mitigational sand is placed (anticipated quantity plus 20% overfill).

The proposed beach system will be nourished with sand including a 20% overfill placed north and south of the system. IDNR regulations for structures that will retain sand require pre- and post-construction surveys, as well as surveys at the one and five-year intervals. This requirement will help assure that a sand equilibrium is met and that the new project is gaining and losing sand at a similar rate to neighboring properties or mitigation may be required.

According to the Illinois State Coastal Geologist (Chrzastowski, 2005), "the design to contain placed sand is becoming necessary because of reduced volume of littoral sand in transport." He further states, "beach-cell systems may represent the future for beaches along much of the Illinois bluff coast from Waukegan south to Evanston."

Impact on Public Uses

Public access will be not be impacted by the new system. If anything, public access will be improved as a sandy beach will be available to traverse at most times. The beach will provide a safe place for boaters and swimmers in distress. Fishing will not be impacted negatively, as the underwater area of the quarystone protection will create an improved fish habitat. Additionally, navigation of water craft will not be impacted, as the proposed construction will not extend further east than the existing structure immediately to the north.

Impact on Natural Resources

Quarystone structures in the nearshore waters of Lake Michigan and sandy beaches improve native species habitat. The LandOwner Resource Centre with support from the Canadian Wildlife Service and the Ontario Ministry of Natural Resources states that, "unstable shorelines can release silt that can choke nearby aquatic habitats." Additionally, underwater structures such as artificial reefs constructed of large boulders and clean riprap material "in large water bodies, such as the Great Lakes . . . are often the best method of creating habitat." As stated above, according to Meadows, et al., 2005, "a nearshore area with 100% sand cover support[s] a species rich community." As the design does not impact the bluff and vegetation, the local terrestrial wildlife will continue to inhabit this property.

Type of Permit

The scope of this project requires an individual permit.

Description and Schedule of Proposed Activity

This project will be completed via marine construction with a barge and crane delivering all materials and equipment to the site. The proposed work will be completed using a backhoe that will work from the beach to place the materials. Work will not begin until all necessary permits have been received. This work will require approximately 10 weeks to complete.

Type and Quantity of Fill/Measures Taken to Avoid Impact/Erosion and Sediment Control Plan

All material will be clean and from inland quarries. Approximately 1,325 tons of clean quarried stone will be placed to construct the breakwater. Approximately 2,550 tons of clean sand will be placed as sandfill in and around the system.

The amount of fill to be placed below the Ordinary High Water Mark (581.5 feet, IGLD 1985) is 0.099 acres.

Summary

All of the above described activities and plans will follow IPP terms and conditions. All of the proposed work adheres to the guidelines prescribed by the Illinois Environmental Protection Agency and its Anti-Degradation Assessment. U.S. Fish & Wildlife Service and the Illinois Historic Preservation Association will be updated on all relevant correspondence.

If you have any questions please feel free to call me at the phone number below.

Sincerely,



Jon Shabica
Vice President

cc: IDNR, Water Resources (Casey)
IEPA (Heacock)
U.S. Fish & Wildlife Service
Illinois Historic Preservation Agency (Haaker)
Louis Kenter and Leslie Graham

DESIGN OF SHORELINE EROSION PROTECTION

Introduction

The following report summarizes assumptions and design criteria for a quarystone breakwater and sandfill to help retain a beach, provide lake access, and better protect the property located at 94 Mary Street, Winnetka. The design is based on the drawings included in the permit application dated March 19, 2014 to the U.S. Army Corps of Engineers.

The site lies within a fully engineered section of urban lakeshore that is typically protected with steel sheetpile groins, revetments and breakwater-protected beaches. This section of coast is sand-starved due to municipal structures (littoral barriers) constructed over the past 100 years that extend east past the littoral zone and reduce sand bypass, as well as armoring of the shoreline reducing erosion of the glacial clay bluffs. According to the Illinois State Geological Survey, there is almost no sand moving along this section of coast. All structures in the area have been steadily losing their effectiveness at holding beach sand. This problem is exacerbated by lakebed erosion. In many cases where all the sand has been lost, the adjacent bluffs have begun to erode. To provide adequate protection for the upland property, solutions have typically been of two types: breakwater- or groin-anchored beaches to protect the bluffs, or a lower-cost system with a lower level of protection in the form of quarystone revetments placed against the toe of the bluff that prevents stormwave erosion but at the expense of the beach and pedestrian access.

Project Description

The proposed design includes designing a beach with a quarystone breakwater island system. The project will include sandfill mitigation that fulfills the design requirements of 20-year stormwave erosion protection. While the revetment at this site continues to provide shore protection for the bluff, continued lakebed downcutting could undermine the integrity of the revetment. When the lake rises, stormwaves may cause severe icing problems and impacts to the property, as well as cause deeper water in the nearshore. The quarystone breakwater island system is designed to help retain and enhance the beach that occurs on this property.

Summary Specifications

Using the Army Corps of Engineers Shore Protection Manual (1984), performance of nearby prototypes and other sources, the following specifications were developed for this site (elevations are based on IGLD 1985):

Breakwater Specifications

Lakeward Crest Elevation:	582 ft
Toe of Breakwater:	573 ft
Crest Width:	6 ft
Average Armor Size:	3.5 tons
"B" Stone	200 - 1,000 lbs
Slope:	1:1.5
Tons/linear ft:	11.5 tons

Assumptions

- Design High Water (DHW): 582.5 ft *
- Design Water Level: 580.0 ft
- Design Low Water (DLW): 577.5 ft *
- Existing clay till elevation at groin toe: 573.0 ft
- 20-yr lakebed erosion at toe of groin: 3 ft**

- Design wave height: Hs = 10.6 ft
- Nearshore Slope: 1:20
- Design Wave Period (T): 9.9 s **
- Depth at Structure Toe DHW (Ds): 9.5'
- Design Deepwater Wave (Ho): 18.0'
- Design Wave Length (Lo): 501.8'
- Stone Porosity: 37%

* DHW includes 2 ft storm setup, DLW is equivalent to Low Water Datum

** Resio & Vincent, 1976

Bathymetry

Bathymetric surveying was performed in December 2012. Six transects were completed in the project area and on adjacent properties. The survey data points were taken to approximately 250 feet east from the revetment. The survey was performed using an electronic total station with a diver in the water and a licensed survey crew on land. Site benchmark utilized was Village of Winnetka Benchmark 8-SC.

Water Levels

The following table summarizes water level data representing daily highest extremes measured at Calumet Harbor, Illinois, approximately 30 miles to the south of Highland Park. Note: Low water datum LWD = 577.5 ft (IGLD 1985).

Lake Level	LWD	IGLD 1985
Record High	+5.5	583.0
Record Low	-1.4	576.1

Project Supporting Data

To help facilitate project review, Shabica & Associates offers the following supporting data based on standard coastal engineering practices:

1. Sediment transport around structure

The structure is designed to lie within the surf zone (zone of breaking waves), therefore allowing sediment transport around the structure. The range of breaking wave heights is from 8.3 ft based on a 6-second wave with a wave length of 184 ft (using $1/25 L_o$) to 18 ft based on a 9.9-second wave with a wave length of 501.8 ft (Resio and Vincent, 1976). The commonly accepted zone of sediment transport is to 18 ft (depth of closure) in this section of Lake Michigan, which is a function of the design wave parameters. Based on this data, once the structure has been filled with sand, it will continue to bypass littoral drift sand. Rod and transit survey monitoring will be conducted, as required by the IDNR, to assure that the system performs as designed.

The IDNR requires sandfill in areas where sediment will be trapped by the new system. Sand volume quantities have been calculated as shown in the permit drawings. As required by the IDNR, a 20% overfill will be added to the calculated volume. Additionally, the new pre- and post-construction monitoring will be performed and submitted to the IDNR to verify the impacts to the system.

2. Effect on Adjacent Shorelines

A wave diffraction diagram (Figure 2, Appendix) has been overlain on the proposed shore protection system. Using a refracted incident wave angle of 90 degrees (USACE, Shore Protection Manual), with average and design waves, there will be a decrease in wave energy on adjacent properties. The wave

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diffraction pattern shows that the coefficient of diffraction (K) reduces the wave energy to a distance of about $\frac{1}{2}$ the wave length downdrift and does not have an impact further downdrift. For the average 6-second wave, that distance of reduced wave energy is about 90 ft and for the design wave, the protected distance is about 250 ft. This protected area close to the structure has diminished wave energy that will in turn reduce erosion in the area.

3. Wave Reduction in Rubble-Mound Structures

The Iribarren number (ξ), or surf similarity number, is used to determine the wave reflection coefficient. For rubble-mound structures, wave reflection (and wave energy) is reduced by one half or more (0.2 to 0.53) (Figure 3, Appendix). For example, a wave reflection of 0.25 means that the wave energy is reduced by 75%. The range of wave reflection for beaches peaks at about 0.44. The range for plane slopes, however, quickly rises to 0.5 and peaks at .91. This illustrates that rubble-mound structures reduce wave energy almost as well as beaches.

Lakebed Erosion

Lakebed erosion, active in water depths of 10 ft or less, is a design component of this plan. This section of Winnetka lakeshore is considered sediment-starved. Sand deposits were measured near this site (Harbor Street, Glencoe) from the backshore to a depth of 6.3 m (21 ft). Sand deposits were thin to non-existent to a distance of 150 ft from shore (Shabica & Pranschke, 1994). Also, the site is underlain by highly-erodible, cohesive glacial clay-till. This condition increases the rate of irreversible lakebed erosion that causes deepening of the water and larger waves to impact the shoreline. According to Robert Nairn, approximately 200 m³ of sand cover per meter of lakeshore (out to a depth of 4 m) is necessary to protect the underlying cohesive profile from lakebed erosion under most conditions. Sand and coarser sediments represent typically less than 15% of the material eroding from the lakebed and bluffs.

Using the historic rate of lakebed downcutting of 0.15 ft/yr, an irreversible lowering of the nearshore lakebed clay of approximately 3.0 ft over a 20-year period is predicted in unprotected areas. With the breakwater and sandfill installed, the lakebed erosion will be reduced.

Stone Stability, Armorstone

The proposed steel and quarrystone breakwater will have two layers of 3 to 5-ton armorstone placed on a 1:1.5 slope for the east face of the structure. The west face of the structure will have one layer of special placement armor (long axis perpendicular to the structure) using 1 to 5-ton armorstone. Overtopping of the breakwater is expected during high water levels. Design conditions include:

- Lakeward breakwater crest elevation at 0.5 ft below DHW, 4.5 ft above DLW
- Depth-limited breaking waves will break on the stone groin and sand beach
- Depth at the toe of the structure is 9.5 ft (573.0) at DHW
- Incident wave directions: NE, E and SE
- Wave period for DHW: T = 9.9 seconds
- Wave period for average conditions T = 6 seconds

Quartzite armorstone is recommended as it is highly durable and is locally available in most gradations under 5 tons. Hudson's formula was used to estimate armorstone size. Using the design conditions, an armorstone of 3.9 tons is predicted for special placement.

Project Monitoring

As the performance of shore protection structures cannot be predicted with absolute certainty, the shore protection system for 94 Mary Street, Winnetka, will be inspected as required by IDNR guidelines. This includes topographic and hydrographic surveys beginning at an elevation of 581.5 feet (IGLD 1985) and progressing to 300 feet lakeward of the lakeward end of the project within the north and south property lines. Additionally, all structures should be inspected to assure that they continue to meet design specifications.

References

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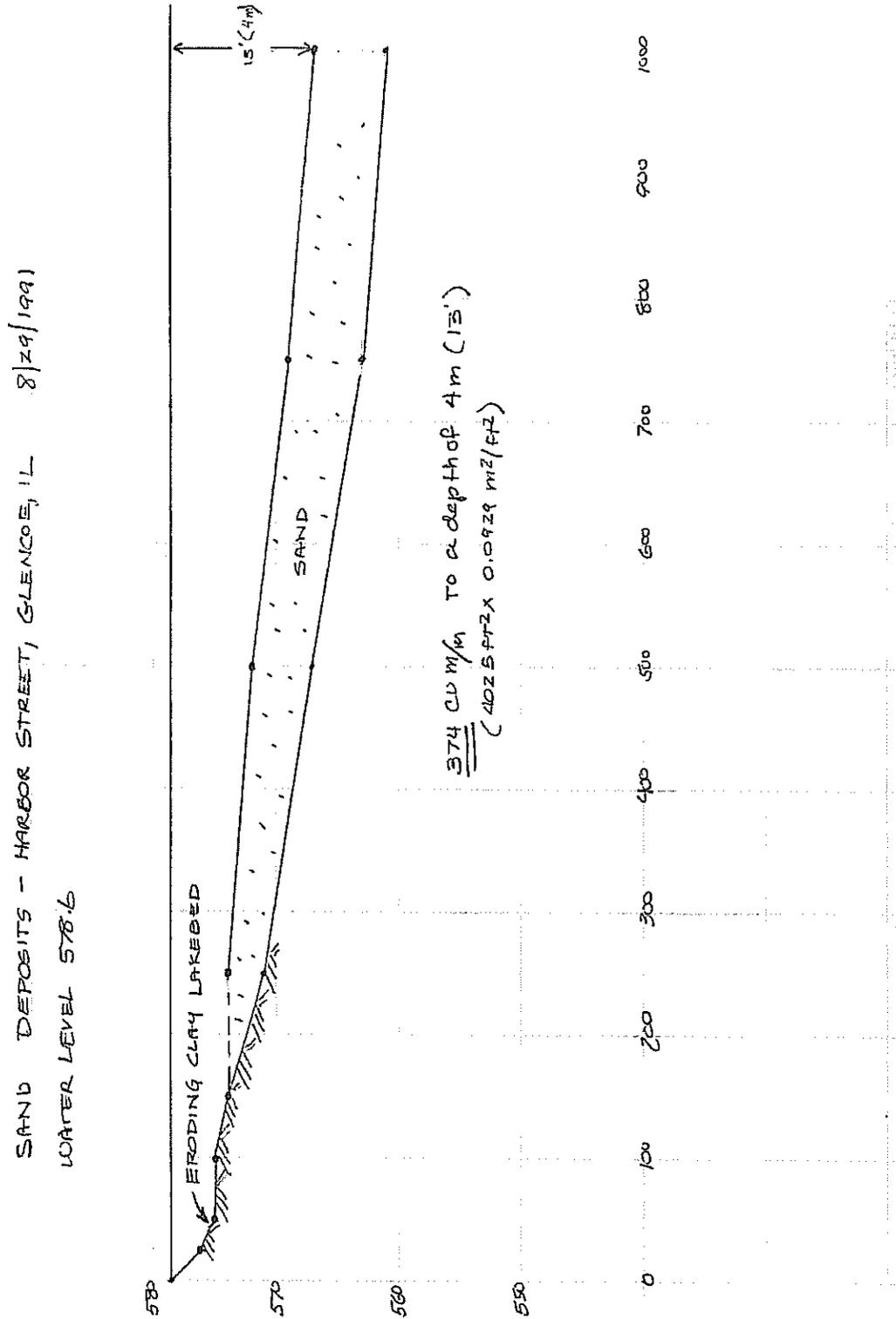
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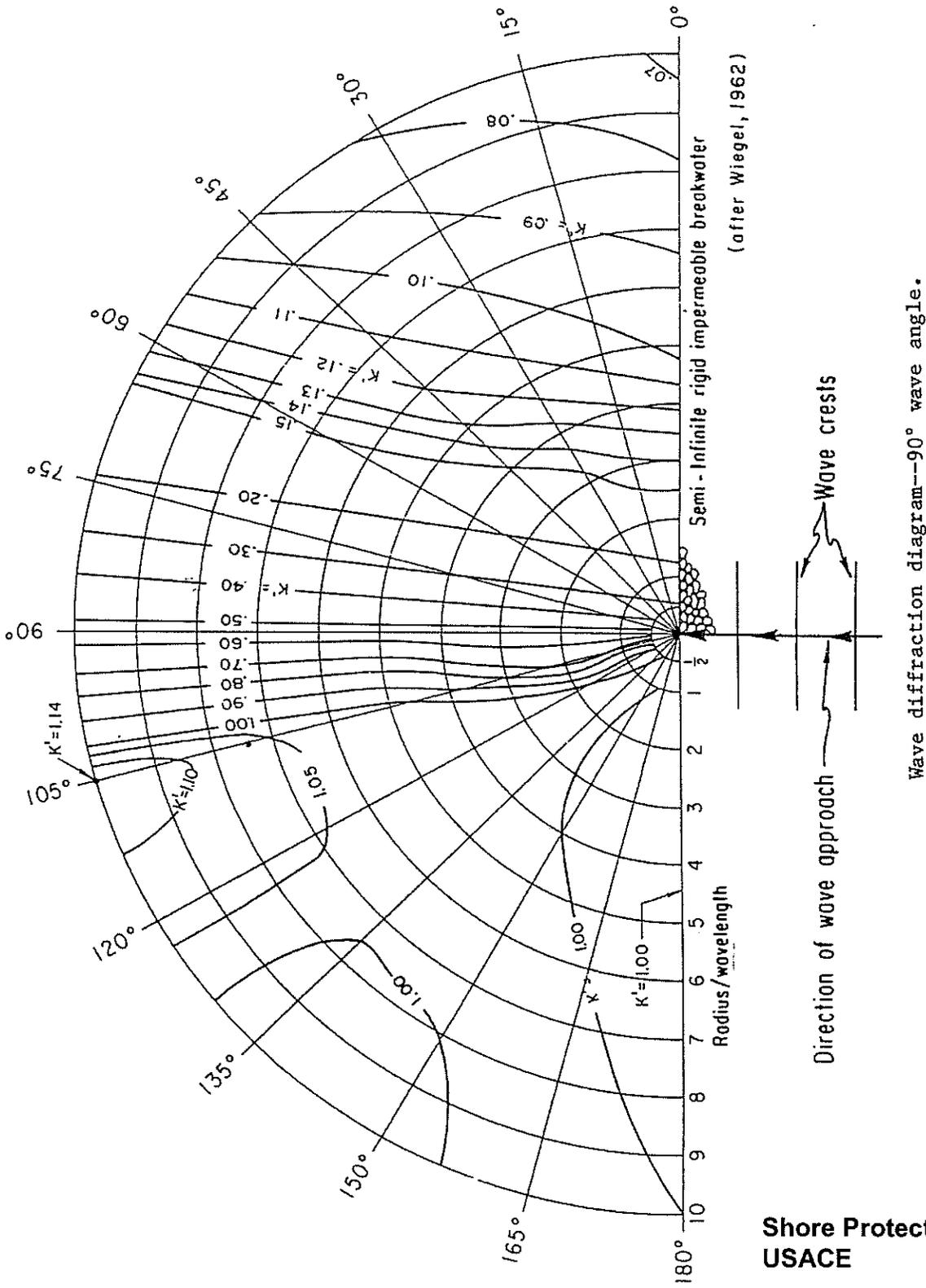
US Army Corps of Engineers, 1984, *Shore Protection Manual*, Coastal Engineering Research Center, Vicksburg, Mississippi.

FIGURE 1



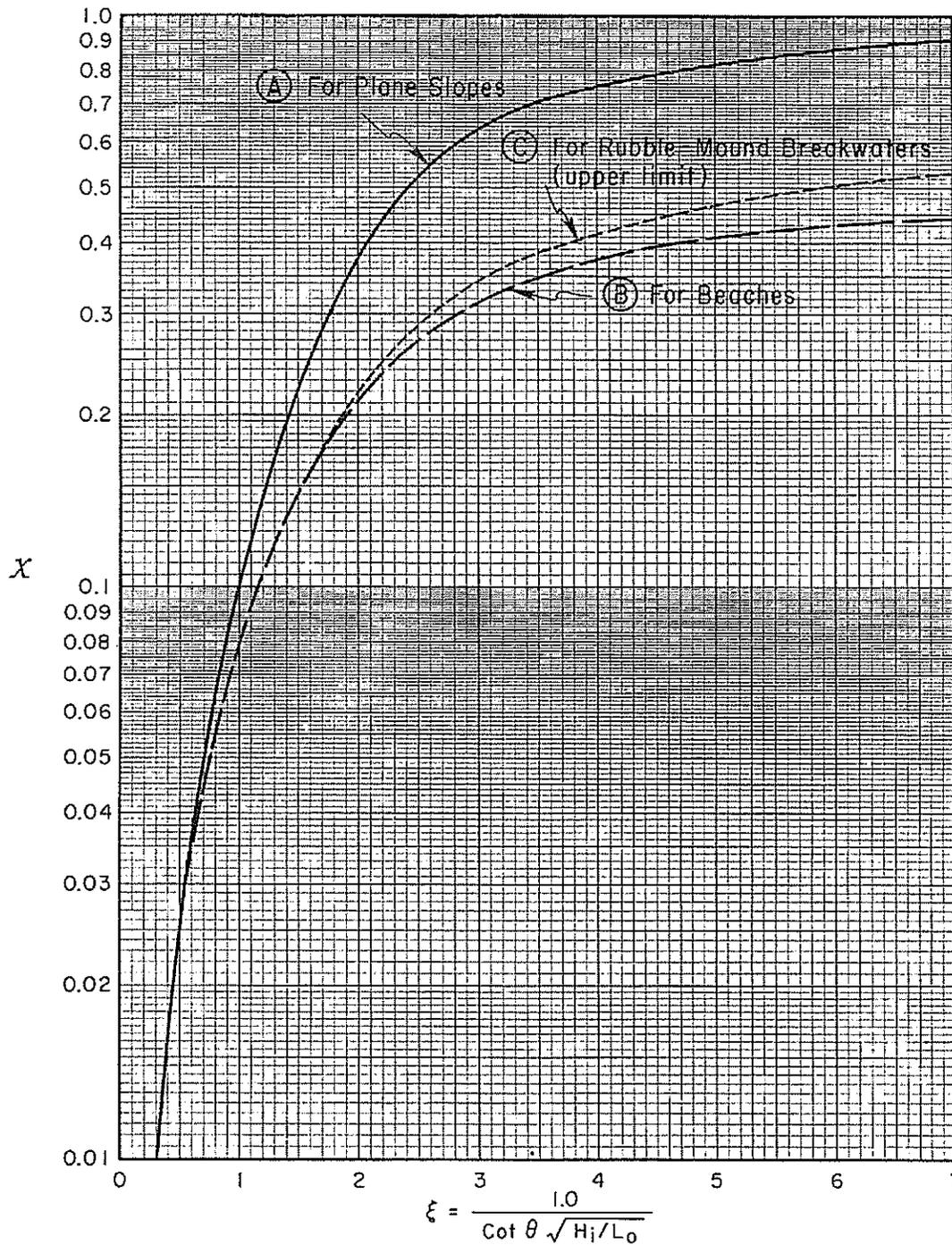
Typical cross-section of Glencoe/Winnetka lakebed and sand cover
(From Shabica et al., 1991)

FIGURE 2



**Shore Protection Manual
USACE**

FIGURE 3

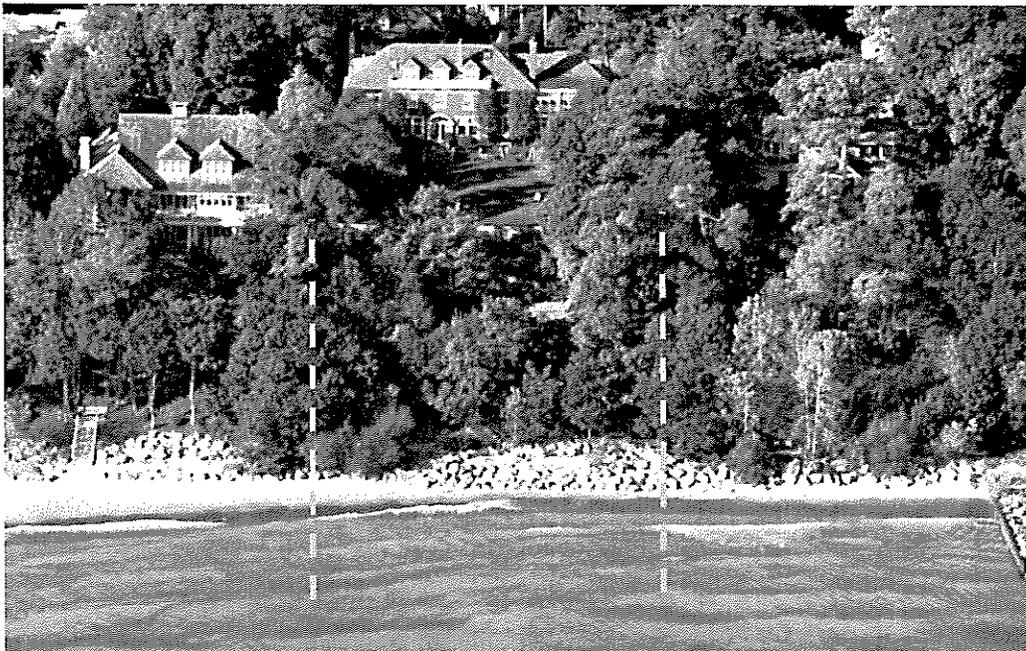


Wave reflection coefficients for slopes, beaches, and rubble-mound breakwaters as a function of the surf similarity parameter ξ .

**Shore Protection Manual
 USACE**



2010 Google Earth Photo; see approximate property lines in yellow



2010 Aerial Photograph; see approximate property lines in yellow



2011 Photo looking to the north



2011 Photo looking to the south

(Note: 94 Mary Street is the property where people are standing, see arrow)



2012 Photo of the north groin at 115 Mary Street, Winnetka

JOI APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

1. Application Number <p align="center" style="font-size: 1.2em;">C20130006</p>	2. Date Received <p align="center" style="font-size: 1.2em;">03/21/14</p>
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3. and 4. (SEE SPECIAL INSTRUCTIONS) NAME, MAILING ADDRESS AND TELEPHONE NUMBERS

3a. Applicant's Name: Louis Kenter & Leslie Graham Company Name (if any) : Address: 94 Mary Street Winnetka, IL 60093 Email Address: [REDACTED]	3b. Co-Applicant/Property Owner Name (if needed or if different from applicant): Company Name (if any): Address: Email Address: Applicant's Phone Nos. w/area code Business: Residence: [REDACTED] Cell: Fax:	4. Authorized Agent (an agent is not required): Jon Shabica Company Name (if any): Shabica & Associates, Inc. Address: 550 Frontage Road Suite 3735 Northfield, IL 60093 Email Address: jon@shabica.com Agent's Phone Nos. w/area code Business: 847-446-1436 Residence: Cell: Fax: 847-716-2007
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STATEMENT OF AUTHORIZATION

I hereby authorize, Shabica & Associates, Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ 3/19/2014
 Applicant's Signature Date

5. ADJOINING PROPERTY OWNERS (Upstream and Downstream of the water body and within Visual Reach of Project)

Name	Mailing Address	Phone No. w/area code
a. See attached vicinity map		
b.		
c.		
d.		

6. PROJECT TITLE:
Quarrystone Breakwater Island System

7. PROJECT LOCATION:
94 Mary Street, Winnetka, IL 60093

LATITUDE: 42.12589 °N LONGITUDE: 87.74182 °W	UTM's Northing: 4664044.36 Easting: 438750.82										
STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION 94 Mary Street	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:15%;">LEGAL DESCRIPT</th> <th style="width:15%;">QUARTER</th> <th style="width:15%;">SECTION</th> <th style="width:15%;">TOWNSHIP NO.</th> <th style="width:15%;">RANGE</th> </tr> <tr> <td></td> <td align="center">SE</td> <td align="center">8</td> <td align="center">42N</td> <td align="center">13E</td> </tr> </table>	LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE		SE	8	42N	13E
LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE							
	SE	8	42N	13E							
<input checked="" type="checkbox"/> IN OR <input type="checkbox"/> NEAR CITY OF TOWN (check appropriate box) Municipality Name Winnetka	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:75%; text-align: center;">WATERWAY Lake Michigan</td> <td style="width:25%; text-align: center;">RIVER MILE (if applicable)</td> </tr> </table>	WATERWAY Lake Michigan	RIVER MILE (if applicable)								
WATERWAY Lake Michigan	RIVER MILE (if applicable)										
COUNTY Cook	STATE IL	ZIP CODE 60093									

8. PROJECT DESCRIPTION (Include all features):
 Construct a quarystone breakwater island 25 feet north of the south property line at 94 Mary Street, Winnetka, extending 100 feet to the north. The proposed quarystone breakwater island will have a crest elevation of 582 feet, and the lakeward toe will extend 125 feet east of the existing concrete seawall. This plan also includes constructing a short breakwater providing groin toe protection at the lakeward end of the steel groin at 115 Mary Street. The existing stone revetment at 94 Mary Street will be rebuilt with a crest elevation of 586'. 2,550 tons of clean sand will be placed, as required by the IDNR. All elevations IGLD 1985.

9. PURPOSE AND NEED OF PROJECT:
 The existing revetment is exposed to stormwave action during most lake storms under the current low lake level. The proposed quarystone breakwater island system will reduce impact on the revetment, erosion landward of it, and will reduce lakebed downcutting at the revetment toe.

COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

10. REASON(S) FOR DISCHARGE:
 Shore protection in the form of a quarystone breakwater island system

11. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS FOR WATERWAYS:
 TYPE: Quartzite/Clean Sand
 AMOUNT IN CUBIC YARDS:
 Quarried Quartzite: 900 cu yds / Clean Sand: 2,020 cu yds

12. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (See Instructions)
 0.099 Acres of stone on lakebed

13. DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION (See instructions)
 By constructing a breakwater that is not shore-connected, a smaller breakwater footprint is possible for this project.

14. Date activity is proposed to commence: May 1, 2014
 Date activity is expected to be completed: July 15, 2014

15. Is any portion of the activity for which authorization is sought now complete? Yes No
 Month and Year the activity was completed: _____
 NOTE: If answer is "YES" give reasons in the Project Description and Remarks section. Indicate the existing work on drawings.

16. List all approvals or certification and denials received from other Federal, interstate, state, or local agencies for structures, construction, discharges or other activities described in this application.

Issuing Agency	Type of Approval	Identification No.	Date of Application	Date of Approval	Date of Denial

17. CONSENT TO ENTER PROPERTY LISTED IN PART 7 ABOVE IS HEREBY GRANTED. Yes No

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)
 Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

 Signature of Applicant or Authorized Agent

 Date 3/19/2014

 Signature of Applicant or Authorized Agent

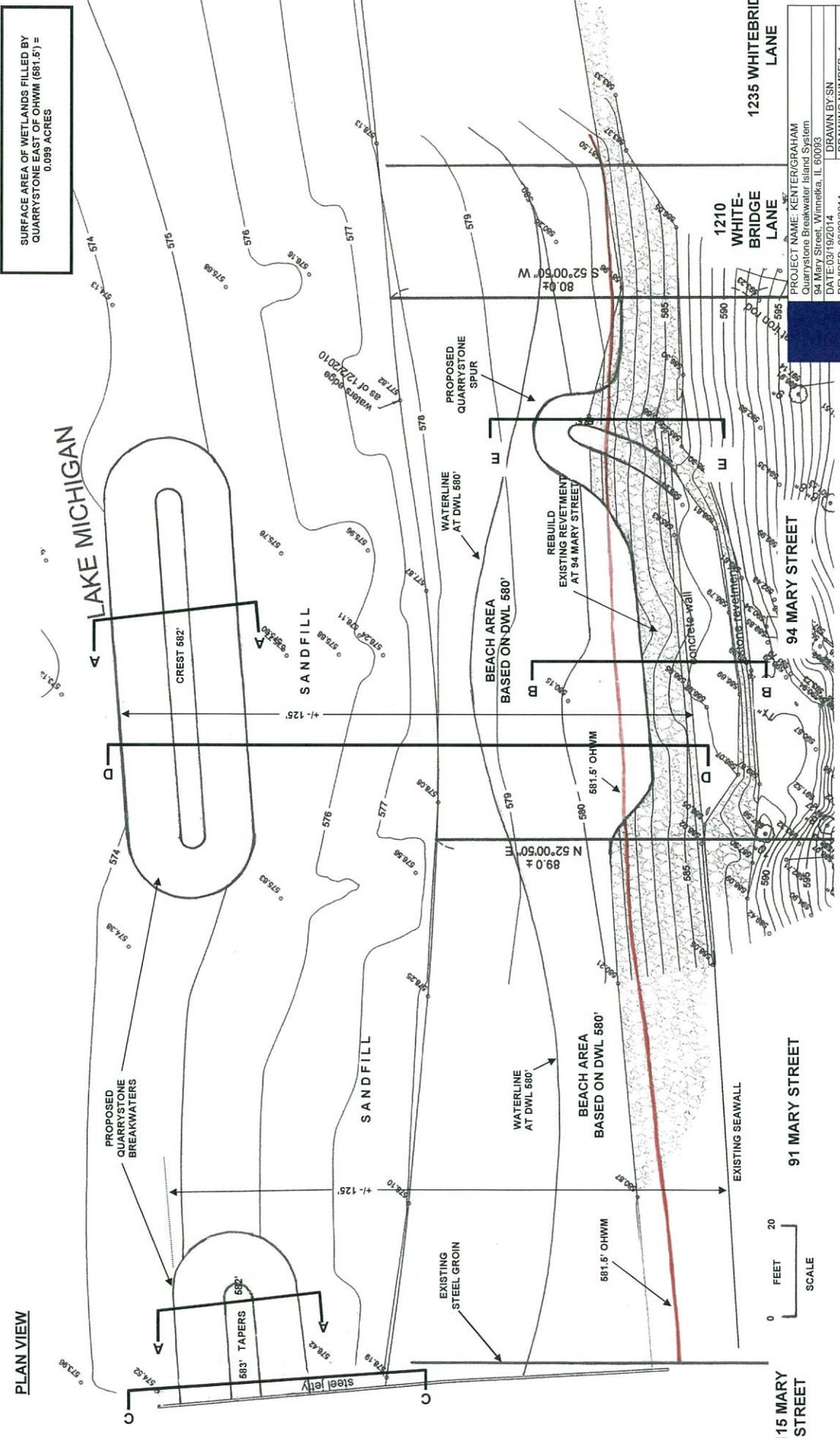
 Date

 Signature of Applicant or Authorized Agent

 Date

Corps of Engineers Revised 2010
 IL Dep't of Natural Resources
 IL Environmental Protection Agency
 Applicant's Copy

PLAN VIEW



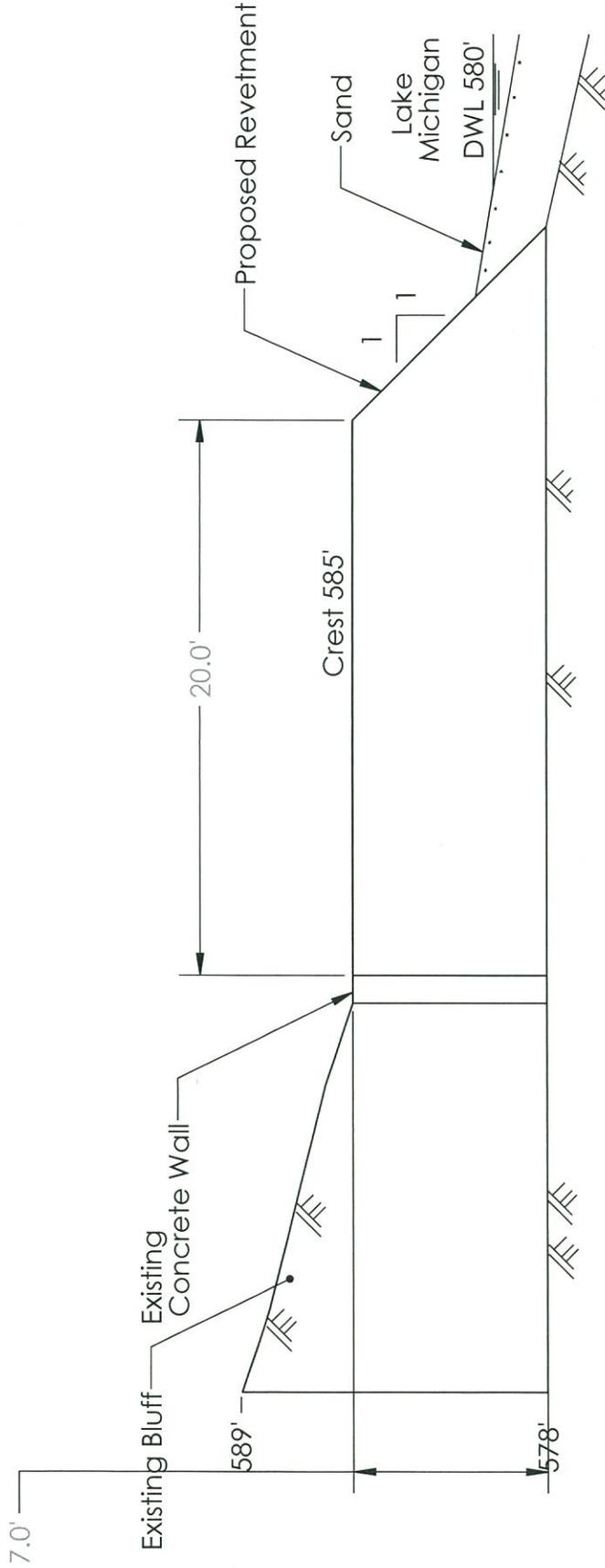
SURFACE AREA OF WETLANDS FILLED BY QUARRYSTONE EAST OF OHWM (581.5') = 0.099 ACRES

115 MARY STREET
91 MARY STREET
94 MARY STREET
1210 WHITE-BRIDGE LANE
1235 WHITEBRIDGE LANE

0 FEET 20 SCALE

ALL ELEVATIONS IN IGLD 1985

PROJECT NAME: KENTER/GRAHAM Quarrystone Breakwater Island System 94 Mary Street, Winnetka, IL 60093	
DATE: 03/19/2014	DRAWN BY: SN
REVISED: 06/02/2014	DRAWING NUMBER: 1
Shabica & Associates, Inc. 550 Frontage Rd. Ste. 3735, Northfield, IL 60093	
PLAN VIEW	



ALL ELEVATIONS IN IGLD 1985



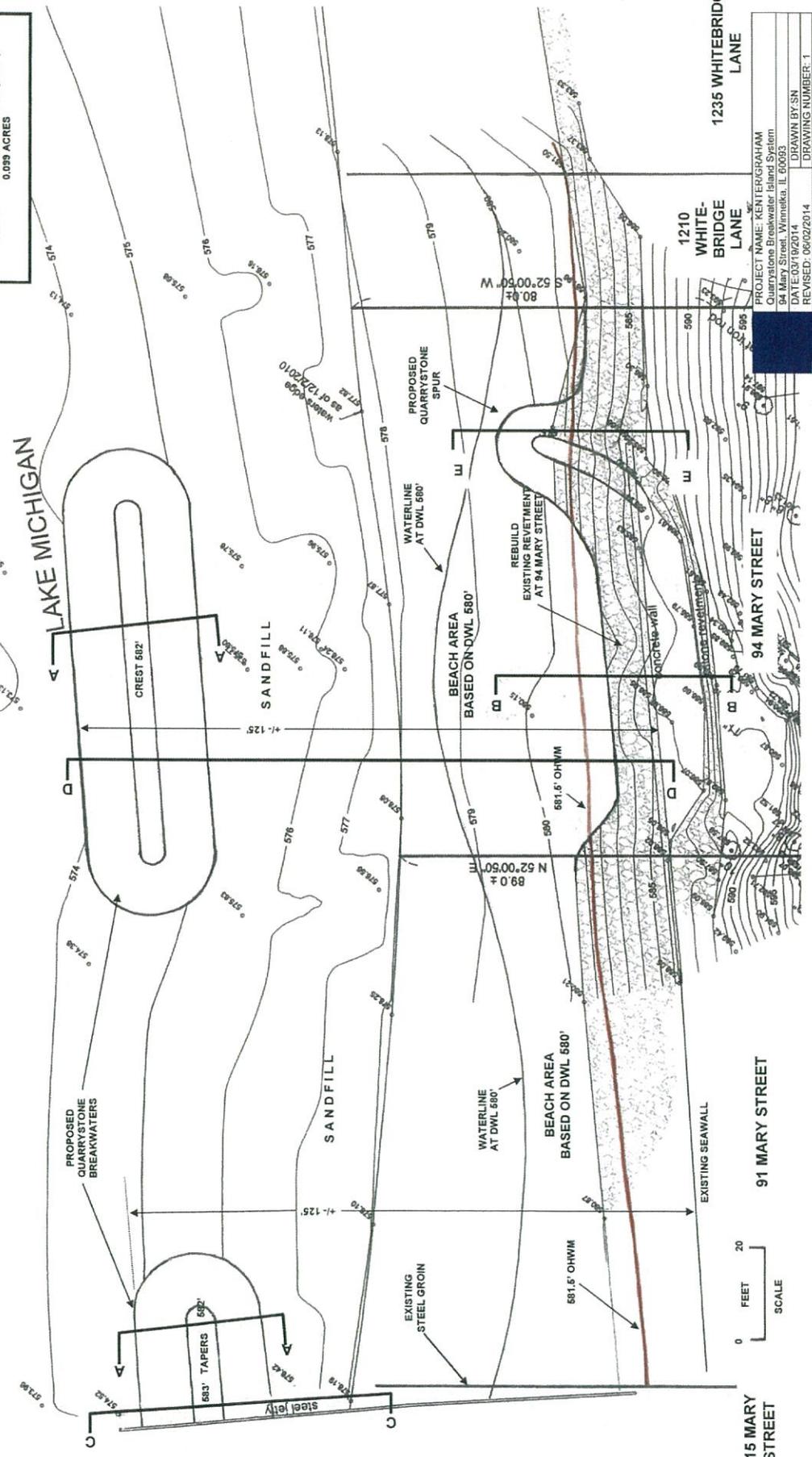
Project Location:		94 Mary Street, Winnetka, IL	
NAME	DATE	5/30/2014	
DRAWN	MS		
REVISED			
Checked	SN	6/02/2014	
COMMENTS:			
DIMENSIONS ARE IN INCHES			
TOLERANCES: +.5', -1.0'			
ALL ELEVATIONS IN IGLD 1985			
SIZE	Section EE Revetment		
SCALE	1"=6'		
REV	SHEET 1 OF 1		

PROPRIETARY AND CONFIDENTIAL
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Shabica & Associates, Inc.
 550 Frontage Rd., Suite 3735
 Northfield, Illinois 60093
 www.shabica.com

SURFACE AREA OF WETLANDS FILLED BY QUARRYSTONE EAST OF OHWM (681.5') = 0.099 ACRES

PLAN VIEW

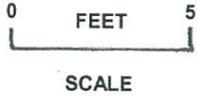
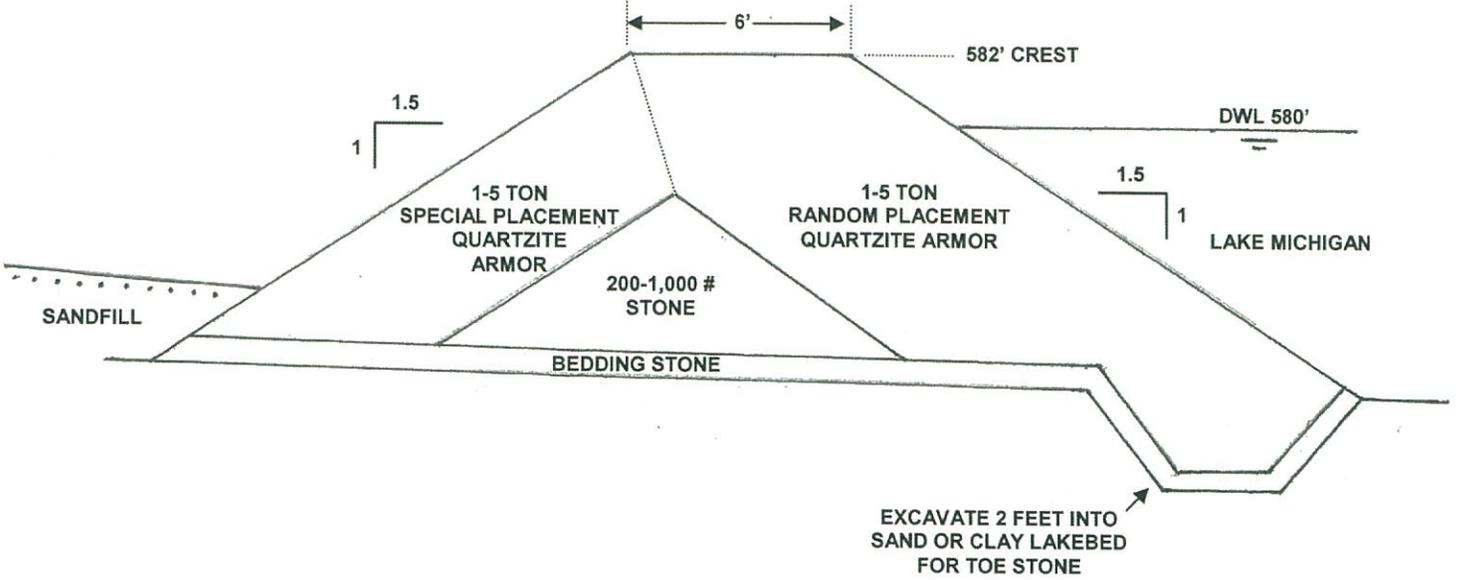


115 MARY STREET
91 MARY STREET
94 MARY STREET
1210 WHITE-BRIDGE LANE
1235 WHITEBRIDGE LANE

PROJECT NAME: KENTERGRAHAM Quarrystone Breakwater Island System 94 Mary Street, Wheeling, IL 60093	DRAWN BY: SN
DATE: 03/19/2014	DRAWING NUMBER: 1
REVISED: 06/02/2014	
Shabica & Associates, Inc. 550 Frontage Rd., Ste. 3735, Northfield, IL 60093	
PLAN VIEW	

ALL ELEVATIONS IN IGLD 1985

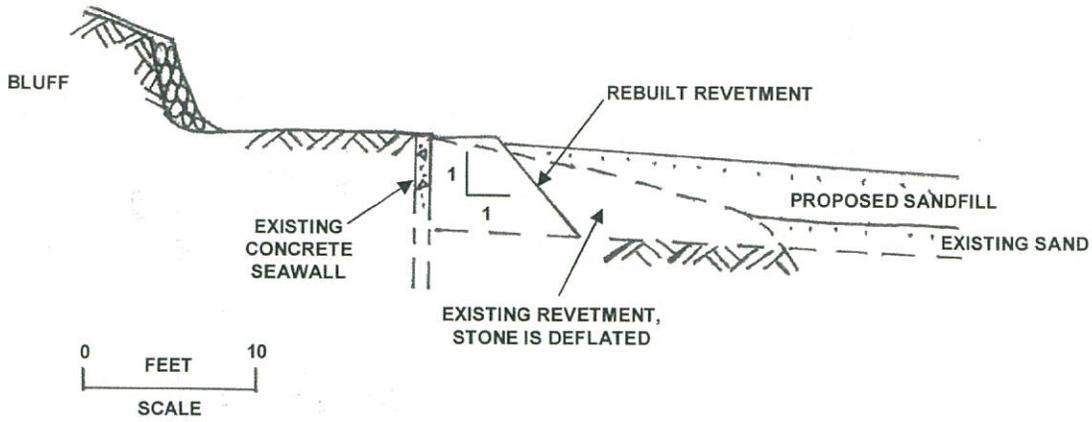
CROSS SECTION A-A – BREAKWATER



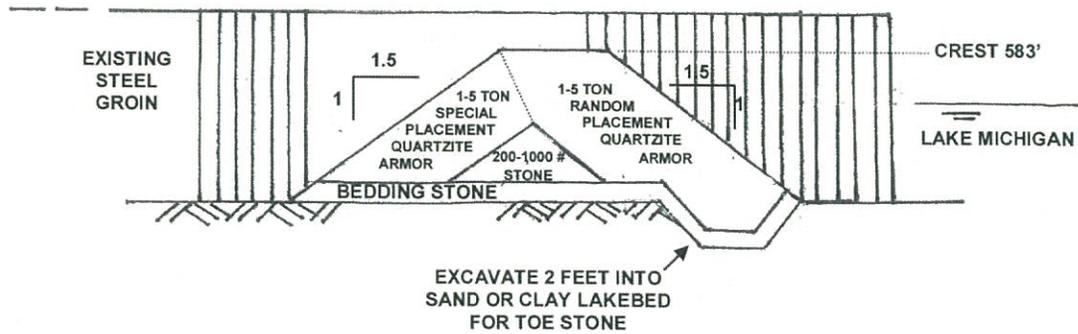
ALL ELEVATIONS IN IGLD 1985

	PROJECT NAME: KENTER/GRAHAM	
	Quarystone Breakwater Island System	
94 Mary Street, Winnetka, IL 60093		
DATE: 06/10/2013	DRAWN BY: SN	
REVISED: 03/19/2014	DRAWING NUMBER: 2	
Shabica & Associates, Inc.		
550 Frontage Rd, Ste. 3735, Northfield, IL 60093		
CROSS SECTION A-A		

CROSS SECTION B-B – REVETMENT



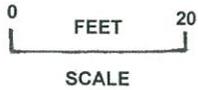
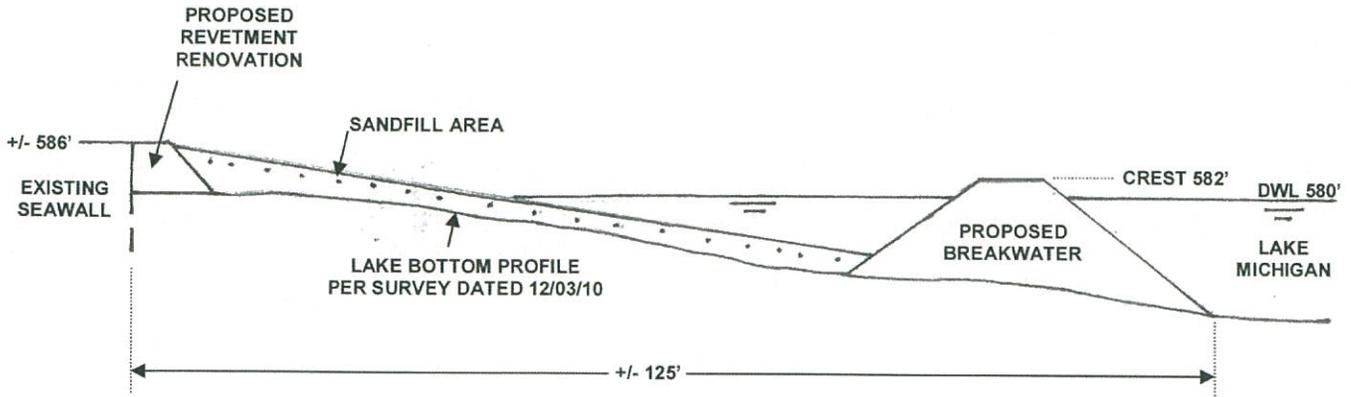
CROSS SECTION C-C – STONE TOE PROTECTION AT NORTH GROIN



ALL ELEVATIONS IN IGLD 1985

	PROJECT NAME: KENTER/GRAHAM Quarrystone Breakwater Island System 94 Mary Street, Winnetka, IL 60093	
	DATE: 06/10/2013	DRAWN BY: SN
	REVISED: 03/19/2014	DRAWING NUMBER: 3
	REVISED: 05/12/2014	
Shabica & Associates, Inc. 550 Frontage Rd, Ste. 3735, Northfield, IL 60093		
CROSS SECTIONS C-C and D-D		

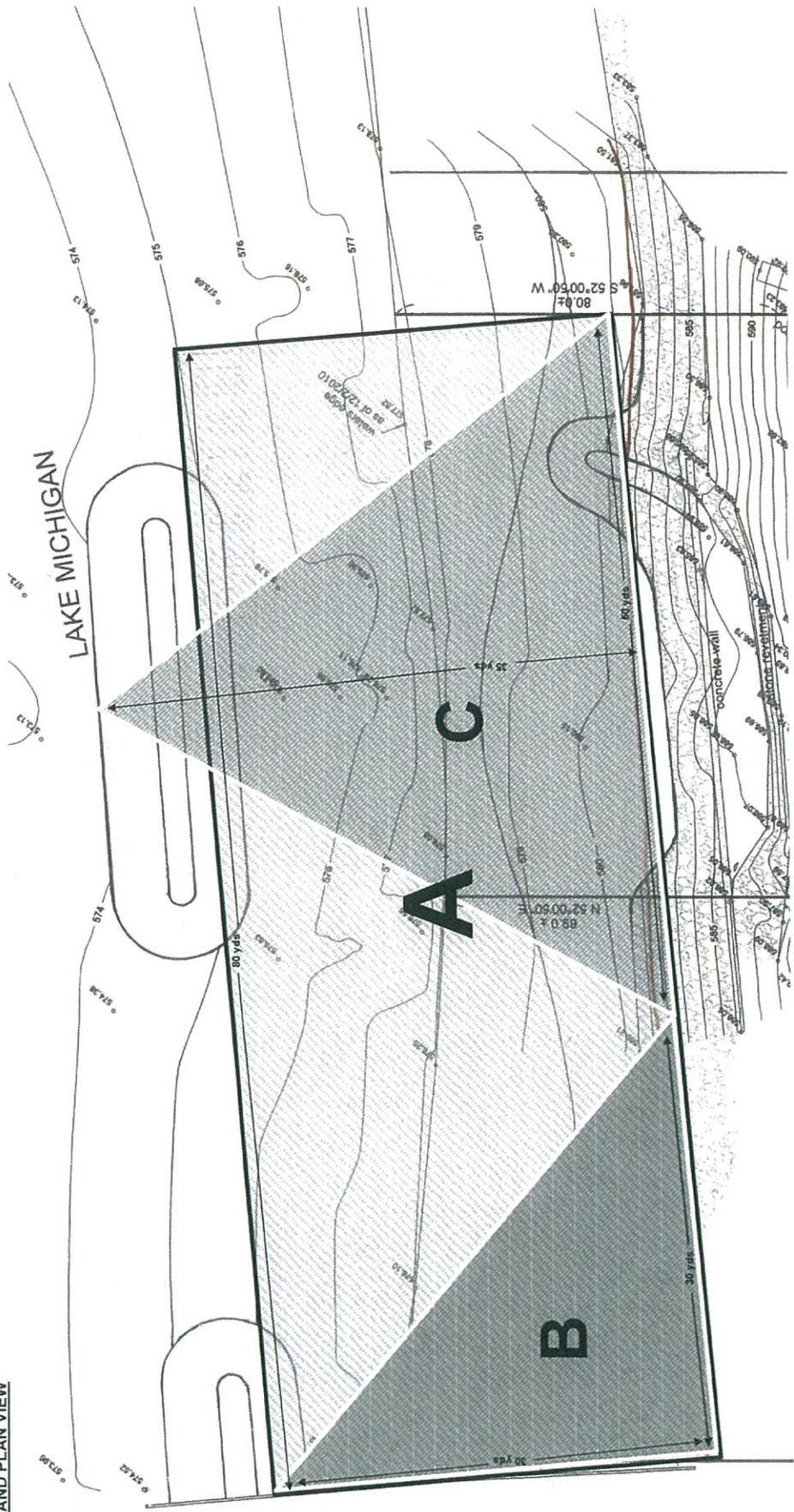
CROSS SECTION D-D – PROFILE



ALL ELEVATIONS IN IGLD 1985

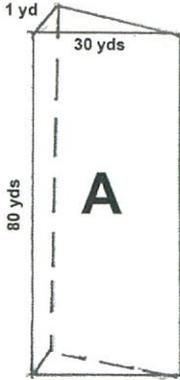
	PROJECT NAME: KENTER/GRAHAM	
	Quarrystone Breakwater Island System	
	94 Mary Street, Winnetka, IL 60093	
	DATE: 05/12/2014	DRAWN BY: SN
REVISED:	DRAWING NUMBER: 4	
Shabica & Associates, Inc.		
550 Frontage Rd, Ste. 3735, Northfield, IL 60093		
CROSS SECTION D-D		

SAND PLAN VIEW



PROJECT NAME: KENTER/GRAHAM Quarystone Breakwater Island System 94 Mary Street, Winnetka, IL 60093	
DATE: 03/19/2014	DRAWN BY: SN
REVISED: 05/12/2014	DRAWING NUMBER: 5
Shabica & Associates, Inc. 550 Fontaine Rd, Ste. 3735, Northfield, IL 60093	
SAND PLAN VIEW	

SAND CALCULATIONS



VOL A: $\frac{30 \text{ yds} \times 80 \text{ yds} \times 1 \text{ yd}}{2} = 1,200 \text{ yds}^3$

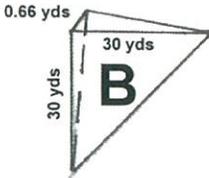
VOL B: $\frac{30 \text{ yds} \times 30 \text{ yds} \times 0.66 \text{ yds}}{6} = 99 \text{ yds}^3$

VOL C: $\frac{50 \text{ yds} \times 30 \text{ yds} \times 0.66 \text{ yds}}{3} = 385 \text{ yds}^3$

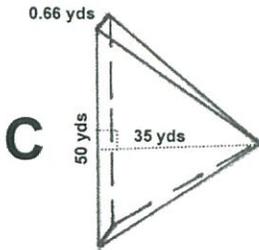
TOTAL:
 $1,684 \text{ yds}^3 \times 1.25 \text{ yds/ton} = 2,105 \text{ tons}$

$2,105 \text{ tons} \times 20\% \text{ overfill} = 421 \text{ tons}$

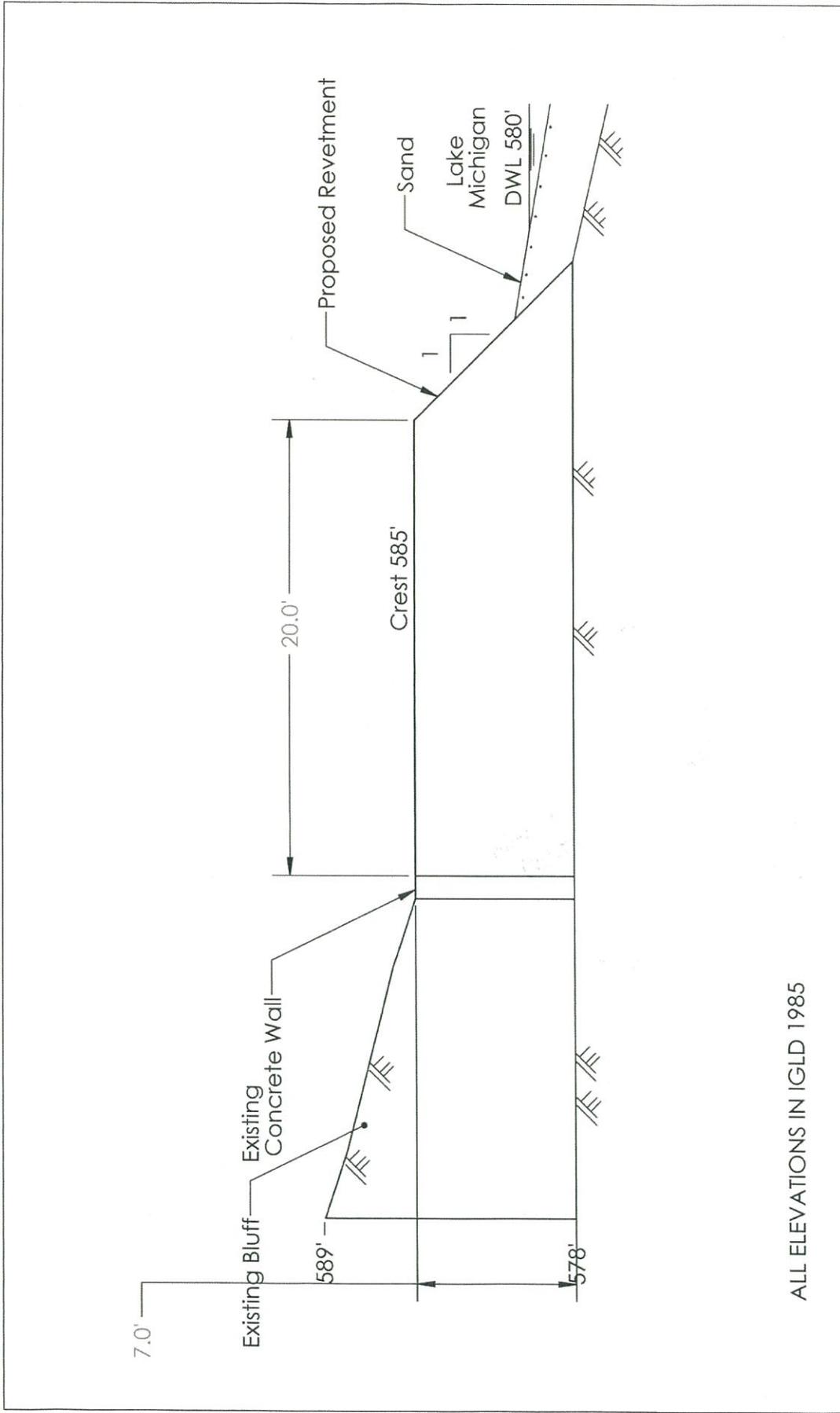
TOTAL:
 $2,105 \text{ tons} + 421 \text{ tons} = 2,526 \text{ tons}$



**2,550 Tons Clean Sand
To Be Placed**



	PROJECT NAME: KENTER/GRAHAM	
	Quarrystone Breakwater Island System	
	94 Mary Street, Winnetka, IL 60093	
	DATE: 03/19/2014	DRAWN BY:SN
	REVISED:	DRAWING NUMBER: 6
Shabica & Associates, Inc. 550 Frontage Rd, Ste. 3735, Northfield, IL 60093		
SAND CALCULATIONS		



ALL ELEVATIONS IN IGLD 1985



Project Location: 94 Mary Street, Winnetka, IL	
NAME MS	DATE 5/30/2014
DRAWN	REVISED
Checked	SN
DATE 6/02/2014	
COMMENTS: DIMENSIONS ARE IN INCHES TOLERANCES: +.5" -1.0" ALL ELEVATIONS IN IGLD1985	
SIZE A	Section EE Revetment
SCALE: 1"=6'	SHEET 1 OF 1

Shabica & Associates, Inc.
550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
www.shabica.com

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