



US Army Corps of Engineers®

Chicago District
Planning Branch
231 South La Salle Street
Suite 1500
Chicago, Illinois 60604
312-353-6400

Appendix D – 2015 Morgan Shoal Framework Plan

Draft Supplemental Environmental Assessment
Morgan Shoal Revetment Reconstruction (45th - 51st)

MARCH 2015



MORGAN





shoal { SHŌI }

A raised area of exposed bedrock under the surface of the water.

At Morgan Shoal, bedrock comes within a few feet of the water's surface. Bedrock near the shoreline limits traditional construction techniques, but also creates many recreational and interactive opportunities.

WHAT IS MORGAN

The Morgan Shoal Framework Plan provides an important link along the Lake Michigan waterfront, and creates an active and interesting place for people to visit and embrace the water through access, recreational opportunities and education.

Over the past 20 years the City of Chicago and the Chicago Park District have made significant improvements along the Lake Michigan shoreline. Led by the Burnham Park Framework Plan, much of the south lakefront now has increased park access, preserved views, new beaches, increased parkland, accommodations for a variety of activities, and an enhanced natural landscape character. In addition, the Chicago Shoreline Protection Program has improved almost the entire length of Chicago's Lake Michigan shoreline to protect Burnham Park and Lake Shore Drive from storms, flooding and erosion. The area of Burnham Park from 45th Street to 51st Street is one of the last remaining segments requiring shoreline protection.

As an integral part of the south lakefront communities, Burnham Park provides respite from busy city life and provides many recreational opportunities. While the park is a valuable amenity to local residents, it also serves neighborhoods much further north and south because of connections created by the lakefront trail and Lake Michigan access. The Morgan Shoal Framework Plan strengthens these connections by creating a series of destinations.



Just offshore along the Chicago lakefront is a rare underwater bedrock formation of dolomite limestone formed 300 million years ago. This formation, called Morgan Shoal, is one of a small handful in the area. As one of the shallowest, nearest to the shore and most accessible shoals, the Morgan

Shoal is also unique in that it is the location of one of Chicago's only remaining visible shipwrecks. The 1914 shipwreck of the Silver Spray, a 109-foot passenger steamer, is an historic artifact serving as an attraction for anyone out in the water. The ship's boiler, propeller and other artifacts still remain today and await underwater exploration! During low lake levels, there are even times when portions of the ship are visible from shore. Drawing on the unique geology, historic remnants and cultural community connection, the Morgan Shoal Framework Plan protects the shoal, focuses attention toward the water, and tells a story of the unique history of this piece of Burnham Park.



IS SHOALS?



TRANSFORM



Transforming a narrow strip of parkland into a rich and vibrant place for the community and wildlife alike, the Morgan Shoal Framework Plan builds upon the activities taking place there today and makes it a place for all to enjoy.

Used mainly as a north-south corridor for walkers, joggers and bikers, the narrow parkland and crumbling shoreline limit water access and other recreation in the park. A small existing pebble beach created by the waves washing up stones from the surrounding shoreline and shoal is used periodically for swimming and snorkeling. Picnickers use the open lawn, and anyone looking for a quiet respite can find a nook between the stones along the shoreline.

Habitat + Recreational Opportunities

The Morgan Shoal Framework Plan focuses attention toward the water to one of the area's most unique geologic features while increasing water and land based habitat and recreational opportunities. Increased parkland opens up space for native savanna / prairie landscape throughout, allows for a buffer along Lake Shore Drive, and creates a separation of paths for different activities. As part of previous Burnham Park projects, a harbor and sand beaches have been created nearby, opening up the opportunity for something completely different in this area. A pebble beach, centered on the shoal will serve as the main attraction of the project site, creating water access and a recreational amenity unique in Chicago.

PHOTO: DAN PETERMAN



What is a Pebble Beach?

A pebble beach is similar to a sandy beach except that the materials that make up the stretch of land above and below the waterline are small stones (rounded individual stones ranging in size from a fraction of an inch to nearly a foot in diameter). At Morgan Shoal, the stones will be roughly 3 inches in diameter, forming a beach that allows access to and from the lake. The force of waves move the stones around, slowly shifting the shape and size of the beach over time.

Much of what we see around Chicago was constructed in relatively recent history, but the story of Morgan Shoal starts much earlier.

The last glaciers receded from Chicago around 13,000 years ago, uncovering bedrock that was laid during the Cambrian Period 300 to 400 million years ago. Dolomite limestone, a type of sedimentary rock, was formed during this time period while Chicago was submerged by sea numerous times. Most of the Chicagoland area is covered by material left by the glaciers, but there are a few places where the bedrock is still visible such as at Morgan Shoal. The Cambrian Period was also known as the “Age of Trilobites,” and fossils of these creatures can be found under water out on the shoal.

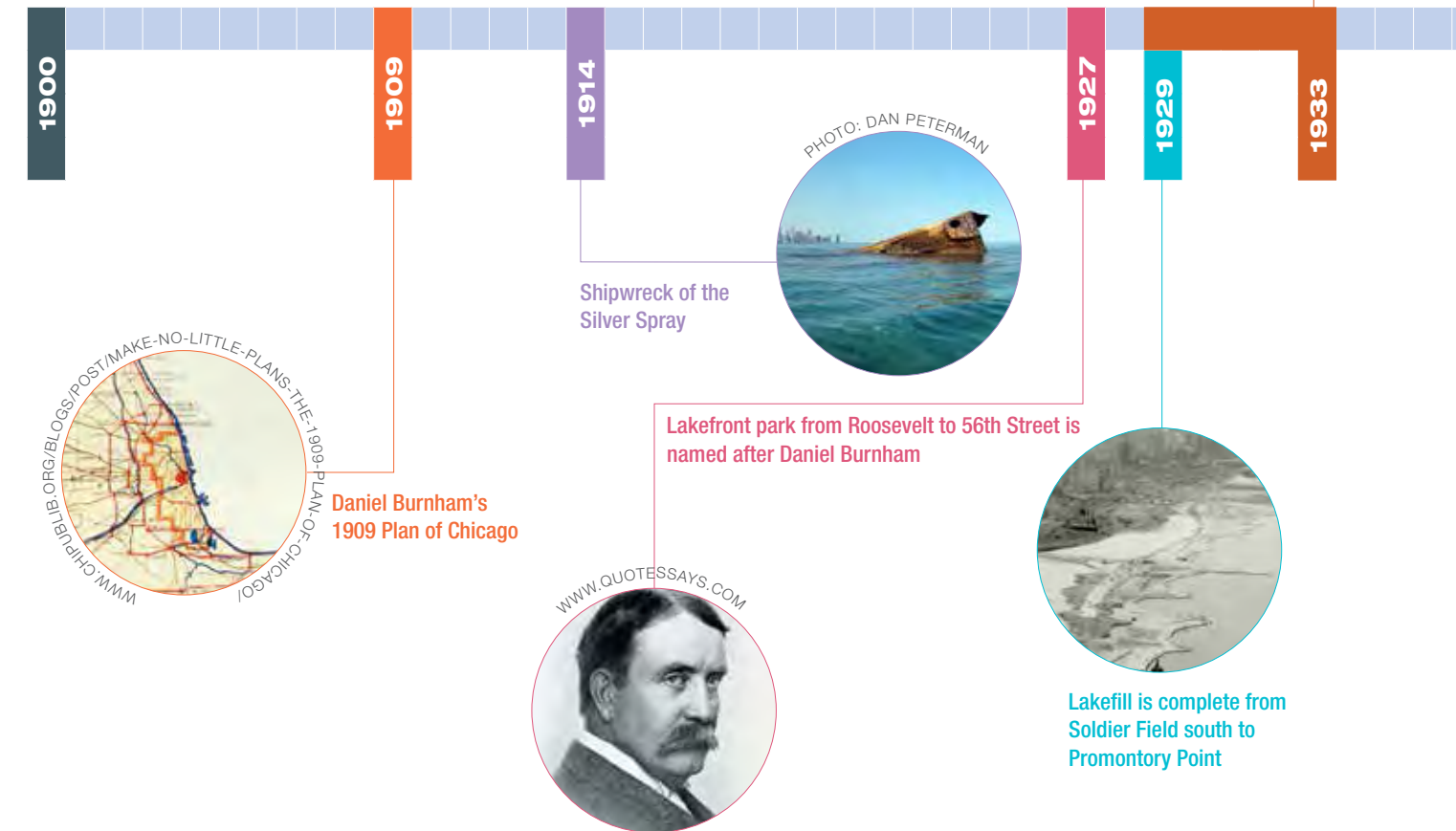
The majority of Burnham Park was created by lakefill placed in the 1920s as envisioned by Daniel Burnham’s 1909 Plan of Chicago. This lakefill provided open space to city residents and also served the function of protecting Lake Shore Drive from Lake Michigan. Today, the original stone and wood pile shoreline protection structures have failed. New long term solutions for shoreline protection need to be considered.

Decades of use, as well as damage from the October 2014 storm has left the Morgan Shoal area of Burnham Park in need of comprehensive improvement. Aside from the damaged shoreline, there are some distinct physical features that characterize the space and some that are key opportunities for change. Much of the area is flat and narrow, bound by Lake Shore Drive and Lake Michigan, but is contrasted by larger areas at the

north and south ends and a large hill at the 47th Street pedestrian bridge. Lawn covers most of the parkland, with isolated outcroppings of trees and a larger stand near the 51st Street pedestrian bridge. At 49th Street there is a small comfort station painted with murals that provides very few amenities to park visitors. Located across the Lakefront Trail from the pebble beach, it is an area frequented by locals.

As detailed in the timeline, many other projects have been implemented in the surrounding area including sand beaches, a playground, a harbor, parking access and large areas of landscape enhancements with ecological functions. The Morgan Shoal area of Burnham Park has the opportunity to build upon these amenities and larger landscape installations and make something special, drawing from the unique history and character of the area.

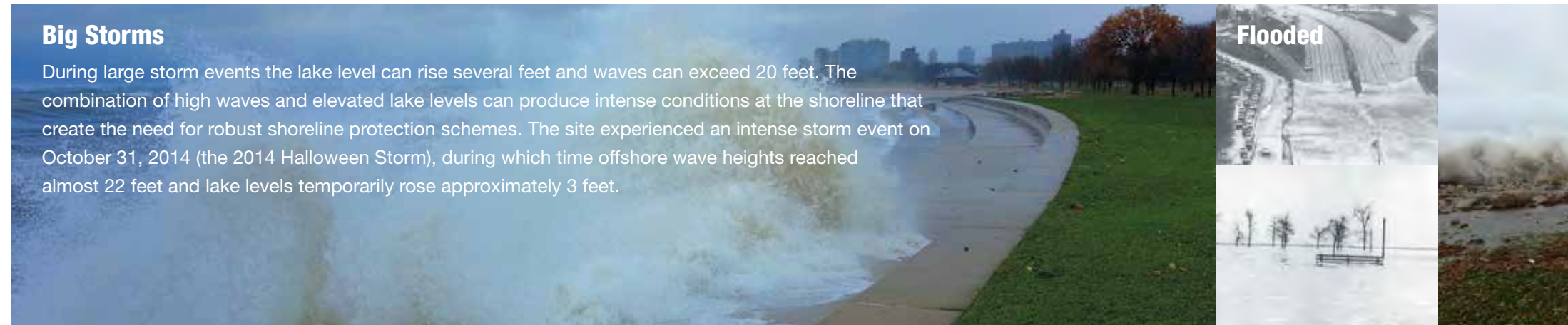
Burnham Park – Morgan Shoal Timeline



Big Storms

During large storm events the lake level can rise several feet and waves can exceed 20 feet. The combination of high waves and elevated lake levels can produce intense conditions at the shoreline that create the need for robust shoreline protection schemes. The site experienced an intense storm event on October 31, 2014 (the 2014 Halloween Storm), during which time offshore wave heights reached almost 22 feet and lake levels temporarily rose approximately 3 feet.

Flooded



The Century of Progress world's fair is held in Burnham Park and 49th Street comfort station is constructed



41st Street Beach



39th Street Parking with Runoff Bioretention Area



Morgan Shoal Framework Planning Process

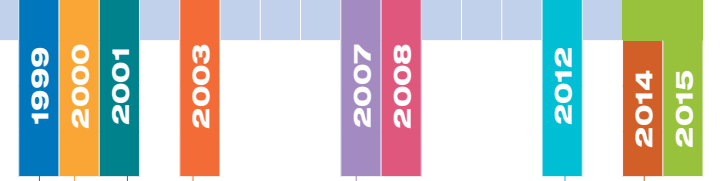
1955



South Lake Shore Drive built between 26th and 49th Street



Burnham Park Framework Plan



31st Street Beach



47th Street Boardwalk and Wildlife Refuge

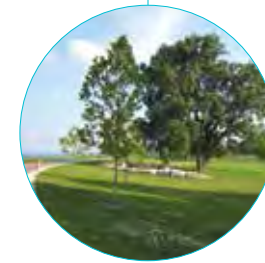
41st to 43rd Street Shoreline Protection



Rehabbed Model Yacht Basin



43rd to 45th Street Shoreline Protection, including new lakefront trail, landscaping and fishing offshore reefs



31st Street Harbor



Burnham Wildlife Corridor



63rd Street Dune Restoration

Existing



DISCOVERY

Community involvement from three public meetings generated valuable input that helped drive design ideas aimed at preserving the shoal, creating a more passive park experience, and providing viewing areas along the lake shore.

Meeting Input / Summary

- **October 2014** – Three initial concepts depicting variations for shoreline protection, lakefill, recreational opportunities and landscaping were brought to the first public meeting. Feedback from the community centered on preserving and embracing the shoal, minimizing over-development of recreational opportunities and enhancing wildlife habitat.
- **December 2014** – Two revised and refined concepts were brought to the second public meeting, showing less lakefill but still creating some additional usable parkland. Meeting attendees broke into three groups, giving feedback on the plans and various activities and program elements.

Representatives from each group presented their ideas back to the larger group for discussion. Desires to preserve the shoal and restore the pebble beach, while maintaining continuity with the rest of Burnham Park, and not over-designing or commercializing the area, were echoed throughout the meeting.

- **February 2015** – The final concept plan was presented at the third meeting, incorporating program elements recommended by the community back in December. Feedback from the community focused on getting the plan implemented, and organizing an advisory council.



PLAN

-6 Foot Contour, Low Water Datum

Morgan Shoal



Overlook with Telescope, Benches, Interpretive Signage and Wave Chime / Art Opportunity

Fitness Station

Art Opportunity

Project Boundary

Existing Shoreline

Sloped Stone Revetment

Picnic Areas

Lakefront Trail

Secondary Trail

Sloped Stone Revetment

Shipwreck of the Silver Spray

Stepped Stone Revetment

Lawn

Lawn

Stone Steps

Existing 47th St. Bridge

Native Savanna / Prairie Landscape

South Lake Shore Drive

Art Opportunity

CHICAGO

Fitness Station

E. 49TH ST.

PLAYGROUND

ATHLETIC FIELD





Legend

- Project Boundary
- Existing Shoreline
- Lawn
- Native Savanna / Prairie / Woodland Landscape
- Lakefront Trail
- Secondary Trail
- Overlook
- Picnic Area
- Fitness Station
- Art Opportunity
- Stepped Concrete Revetment
- Sloped Stone Revetment
- Stepped Stone Revetment
- Pebble Beach
- Topographic Contours

The Morgan Shoal Framework Plan includes a series of destinations along the length of the park catering to all types of park visitors.

An additional **7 acres of parkland** help to create a buffer between active park space and Lake Shore Drive, and opens up space for **recreation** previously unavailable. The addition of separate secondary paths help reduce traffic on the lakefront trail and allows for an alternative strolling experience. Large areas of natural savanna / prairie landscape transform the park into a wildlife haven and creates endless viewing and **learning opportunities**.

Park Ambiance

The new stone shoreline creates habitat for wildlife and an area of stepped stone and pebble beach provides **water access** to park visitors. Three overlooks showcase viewing opportunities and include interpretive elements giving greater meaning to the surrounding landscape. The undulating pathways, rolling landscape and nodes of activity through the park create a continuously changing experience, enticing visitors to come back again and again.

ENGAGE



1 OVERLOOK – Whether out over the water or on top of a hill, here you will find opportunities for photography, education and respite.



2 PICNICKING – What is better in the summer than making a trip to the lake and spending all day picnicking? Get set up at a table sited to maximize views and have access to some of the park's greatest features.



3 FISHING



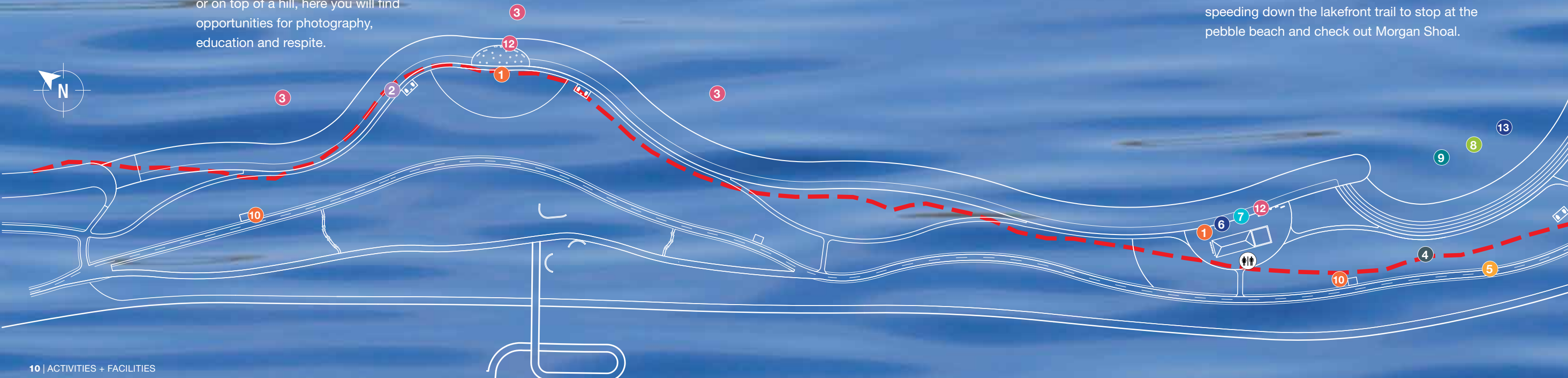
4 KITE FLYING



5 BIKING



6 BIKE FACILITIES – Take a break from speeding down the lakefront trail to stop at the pebble beach and check out Morgan Shoal.





7 COMFORT STATION



10 FITNESS STATIONS



13 KAYAKING



8 SNORKELING



11 SEATING



14 INTERPRETIVE ELEMENTS



9 SWIMMING – Hop in the water to explore the rocky bottom of the shoal and one of Chicago’s two visible shipwrecks.



12 TELESCOPE



15 WILDLIFE VIEWING – Look across the prairie and into the treetops to view a variety of birds and butterflies that change throughout the seasons. Learn to identify these native species with interactive exhibits and signage.



Activities + Facilities

Building upon the activities already available at the lakefront, the proposed Morgan Shoal Framework Plan offers more amenities and opportunities for varied experiences along this stretch.

In addition to biking and jogging along the lakefront trail, there will be fitness stations roughly every 1,000 feet with structures that mimic an obstacle course. Some open lawn areas are maintained for picnicking, kite flying or yoga while large swaths of savanna / prairie / woodland landscape create opportunities for bird watching, education and nature play. An amphitheater-like setting of stepped stones creates a path down to a new, larger pebble beach. This is an area where people can swim, kayak, snorkel and lounge by the shoal.

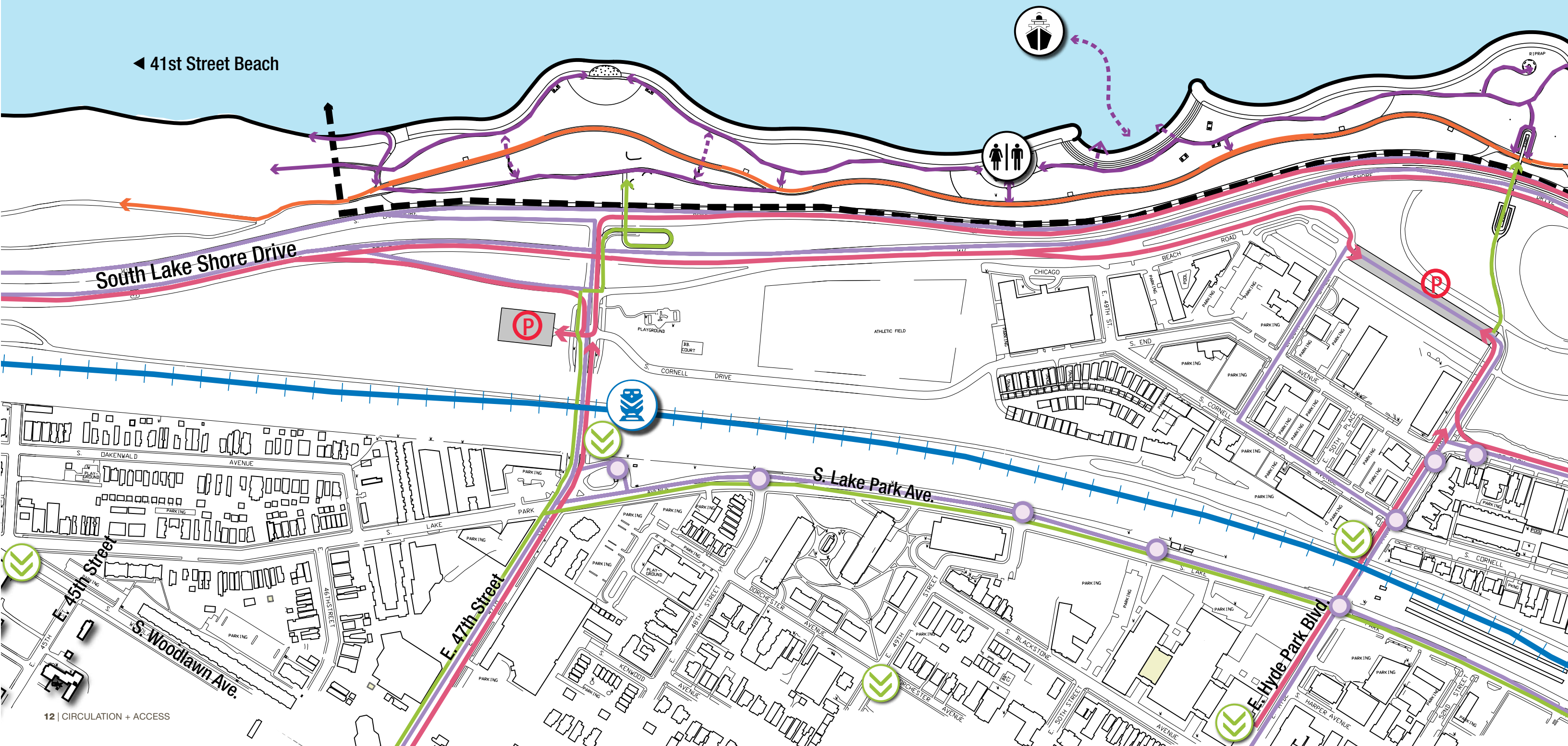
Amenities + Concessions

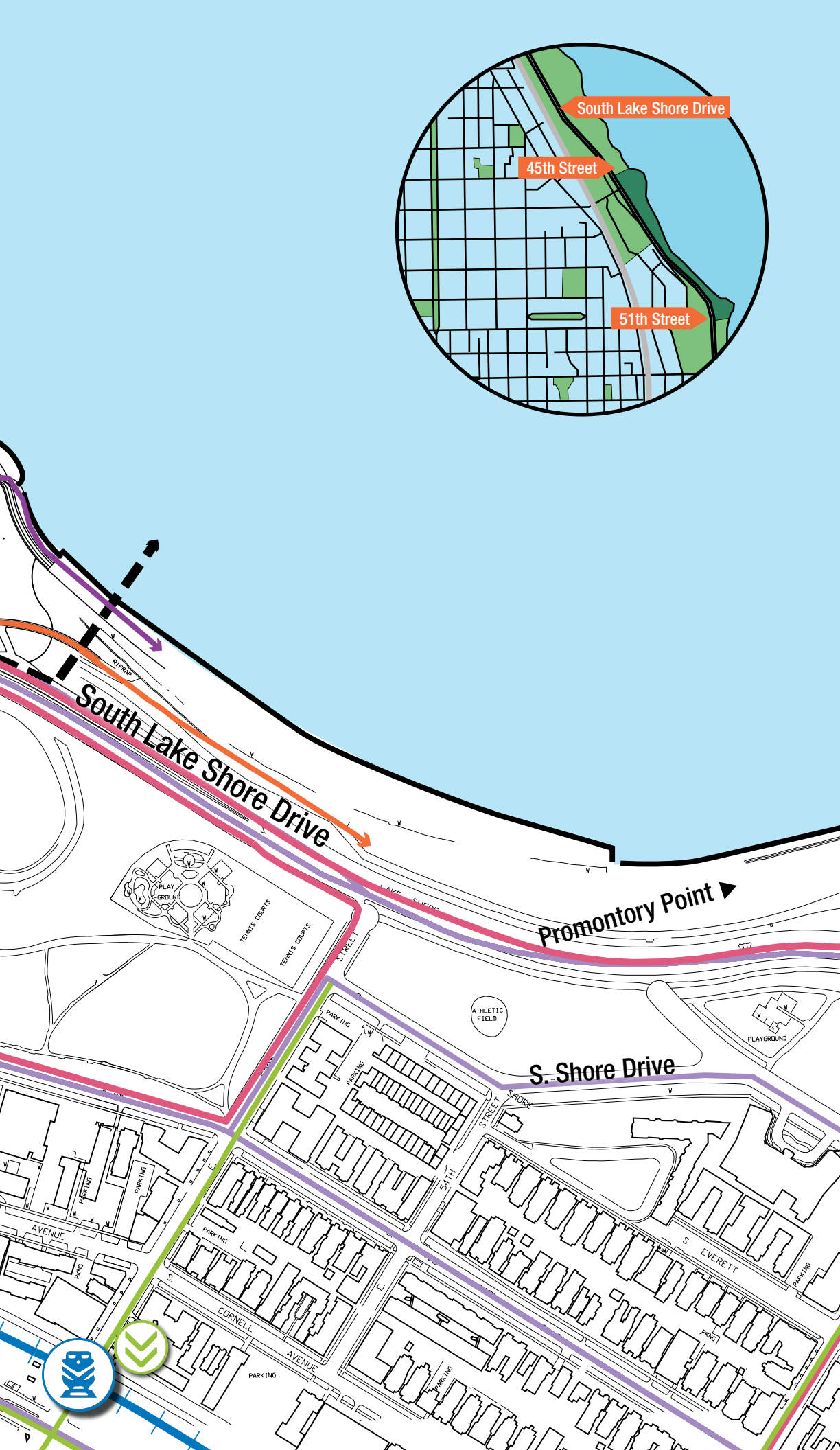
A new comfort station and plaza will be an incredible amenity to the Morgan Shoal area of Burnham Park. The existing facility, while painted with beautiful murals, is deteriorating and foreboding to enter. The new comfort station will include restrooms and additional space for concessions. Its adjacency to the pebble beach makes it a logical meeting place for families and the canopy will provide a great area for picnicking. Bike parking, with the possibility of having a bike service station, will be a hub for bikers on the lakefront trail. Space for vendors to pull-up and sell food or rent kayaks, etc., makes this a very flexible and dynamic place. With a focus on the shoal, interpretive elements will be integrated into the building design with more elements along the shoreline. Telescopes will be installed at the overlooks for visitors to view the shoal and city skyline. The addition of seating areas will make this a gathering space with opportunities to learn, relax and recreate.

ACCESS



◀ 41st Street Beach





- Legend**
- Project Boundary
 - Metra Rail
 - Major Road
 - Bus Route
 - Bike Route
 - Lakefront Trail
 - Secondary Trail
 - Exploration Path
 - Metra Station
 - Parking
 - Bus Stop
 - Restroom Facility
 - Shipwreck
 - Divvy Stations

Morgan Shoal is a key link in the lakefront park system and has strong connections to the community and Lake Michigan. This destination can be reached easily by bike, kayak or on foot from a variety of public transit and parking options nearby.

The area of Burnham Park is accessed primarily from the Lakefront Trail which traverses through the park and continues north and south for a total of 18.5 miles. Morgan Shoal is also accessed from the west by two pedestrian bridges over Lake Shore Drive, one at 47th Street and another at 51st Street. Parking, a CTA bus stop and designated bike routes are located within ¼ mile, and Metra Stations are located within ½ mile of each bridge. As part of the Morgan Shoal Framework Plan, the Lakefront Trail is moved further east from Lake Shore Drive with additional buffering from earthen berms and taller prairie plantings.

Supplementing the Lakefront Trail, a separate smaller paved path is created closer to shore that undulates through open lawn areas, as well as natural savanna / prairie landscape, giving a varied experience to anyone traveling along the path. This path connects lakefront features, allowing one to travel the entire length of the project site without having to cross the Lakefront Trail. All paved paths are ADA accessible. The remainder of the park is free to explore: climb on boulders, step down the stones to the pebble beach or run through the lawn. Exploration extends into the water for activities such as swimming, snorkeling and kayaking.



What is the Lake Michigan Water Trail?

The LMWT is a continuous water trail for human-powered watercraft (the traditional mode of travel in the Great Lakes for thousands of years) all the way around the lake. By providing water access, this plan helps to bring this activity back as part of the development of the longest, continuous loop, freshwater sea kayaking trail in the world.

Learning is an element that will be infused throughout Morgan Shoal. Key nodes for interpretive elements will be integrated into the overlooks at the north and south end of the park, as well as around the comfort station. While these elements could be signage, they could also be interactive, change with the seasons, be integrated into the building design or include a technology component.

Telescopes will be located at each of these nodes, allowing visitors to get a better view of the shoal, city to the north, and steel mills to the south. At the overlook near the 51st Street bridge there will also be a mounted set of binoculars to view birds and other wildlife in the surrounding lush planted landscape. These educational elements can tell stories of Morgan Shoal, the Silver Spray Shipwreck, native plantings, and key species such as the mudpuppy salamander.

An art element called a wave chime is another feature that brings awareness to the nearby shoal. Constructed within the overlook at 47th Street, the wave chime utilizes winds coming off the lake and varying levels of water created by waves through underground and underwater pipes to create sound. The soft sound coming from this structure offers an additional sensory perception and a destination for visitors to Lake Michigan.



Interpretive Elements



1914 Shipwreck of the Silver Spray

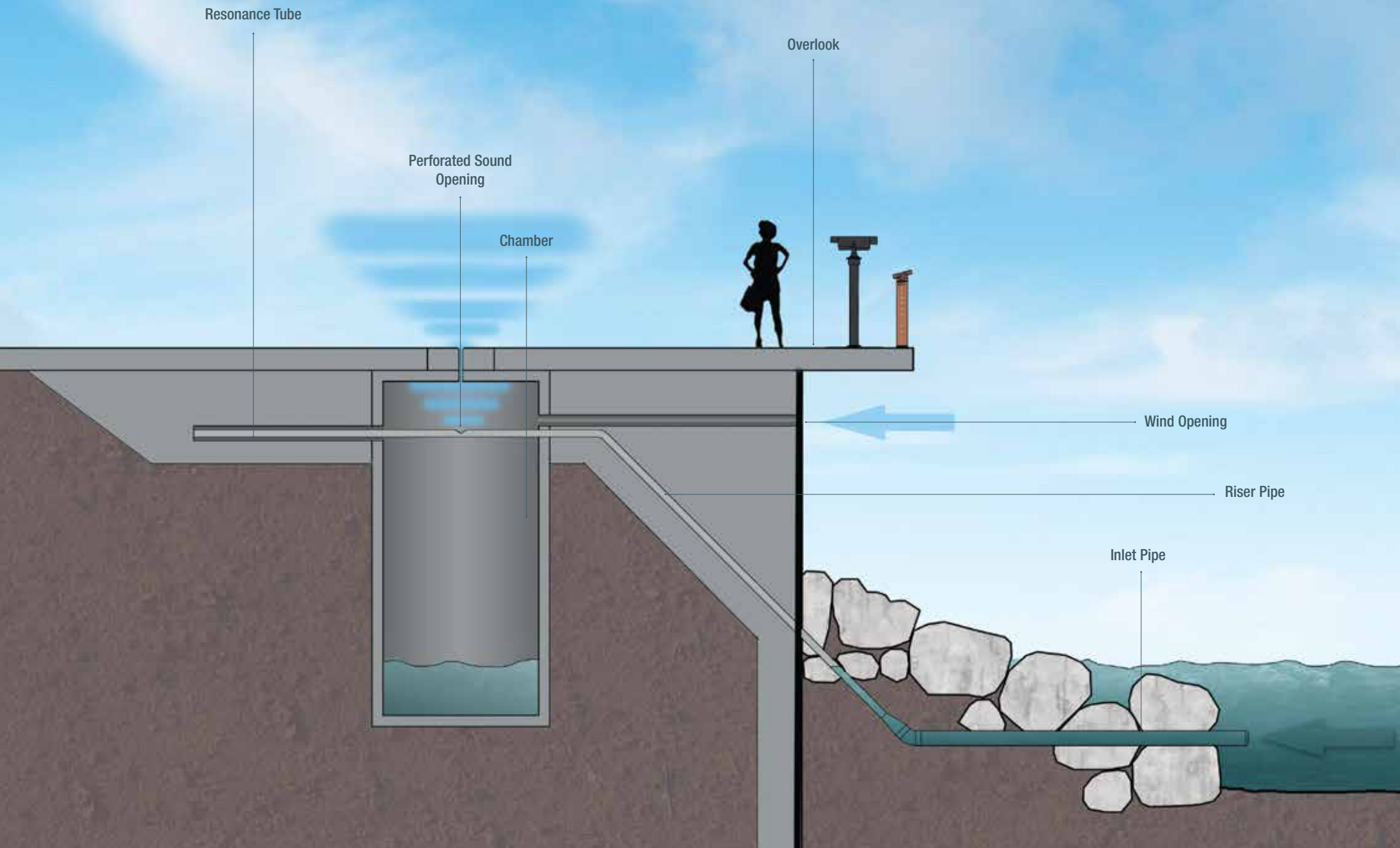
PHOTO: DAN PETERMAN

EDUCATION

Wave Chime:
Music from Wind + Waves



PHOTO: DAN PETERMAN



ECOLOGY

The main ecological community proposed at Morgan Shoal is a savanna / prairie.

The savannah / prairie landscape is primarily a grassland community with occasional trees with shrubs. Savanna is a fire-dependent community, meaning that prescribed fire serves as the primary management tool for maintaining an open canopy.

Total tree canopy generally ranges from 25-50% and consists of oak and hickory species. All oaks provide excellent wildlife benefits. Wood ducks, blue jays, thrushes, redheaded and red-bellied woodpeckers, yellow-shafted flickers, flying and red squirrels, eastern chipmunks, white-footed mice and many other animals feast on acorns each fall. Oak trees also make good den trees for cavity-dwelling birds and mammals.

Feasting on Foliage

A large number of insects feed on the wood, foliage, plant juices and other parts of hickories. Caterpillars of butterflies feed on these trees, as do caterpillars of many moths. Vertebrate animals also use shagbark hickory as a food source. The sweet edible nuts of shagbark hickory are an important source of food for the gray squirrel, red squirrel and eastern chipmunk. Among birds, species such as the ring-necked pheasant, blue jay and red-bellied woodpecker eat the nuts. Because hickory trees attract so many insects, they also attract many species of flycatchers, vireos, chickadees,



Papilio polyxenes (back swallowtail) is resting on Queen Anne's lace (*Daucus carota*)



Micropterus dolomieu (smallmouth bass)



Savanna / Prairie Landscape



PHOTO: DAN PETERMAN



PHOTO: ERIN HOKANSON

The *Bombus* species (bumblebee) is resting on a wingstem (*Verbesina alternifolia*) plant)

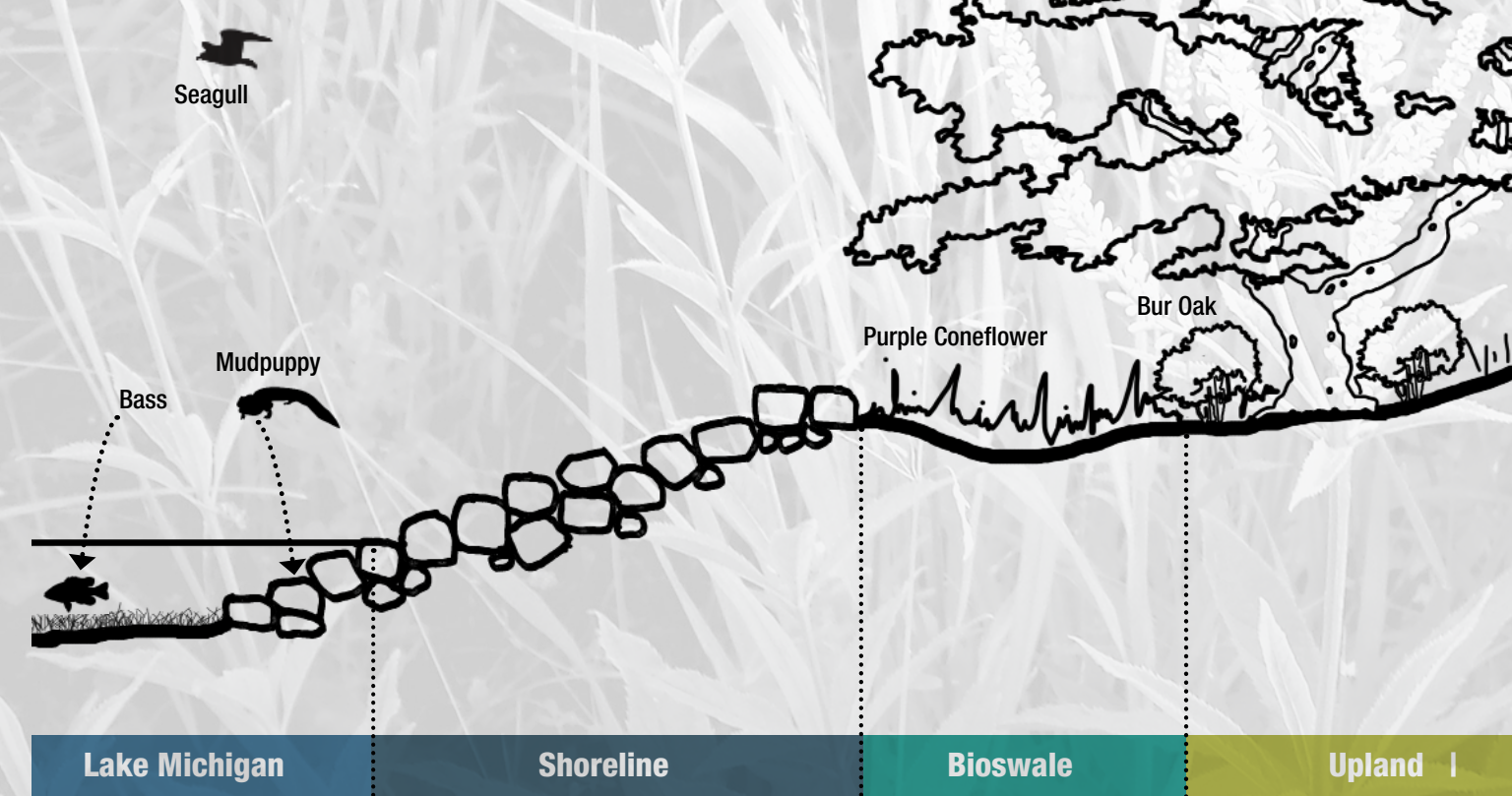
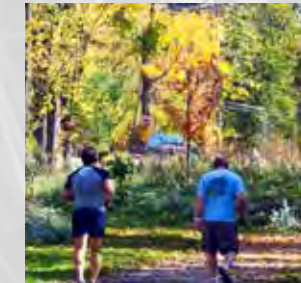
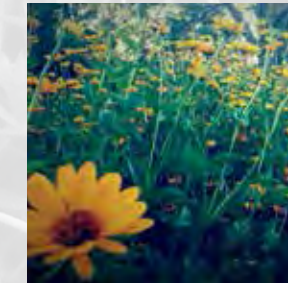
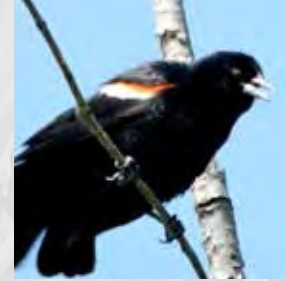
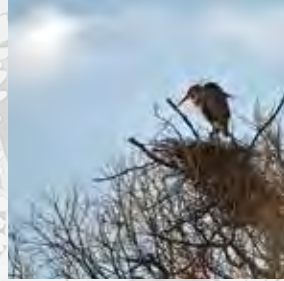


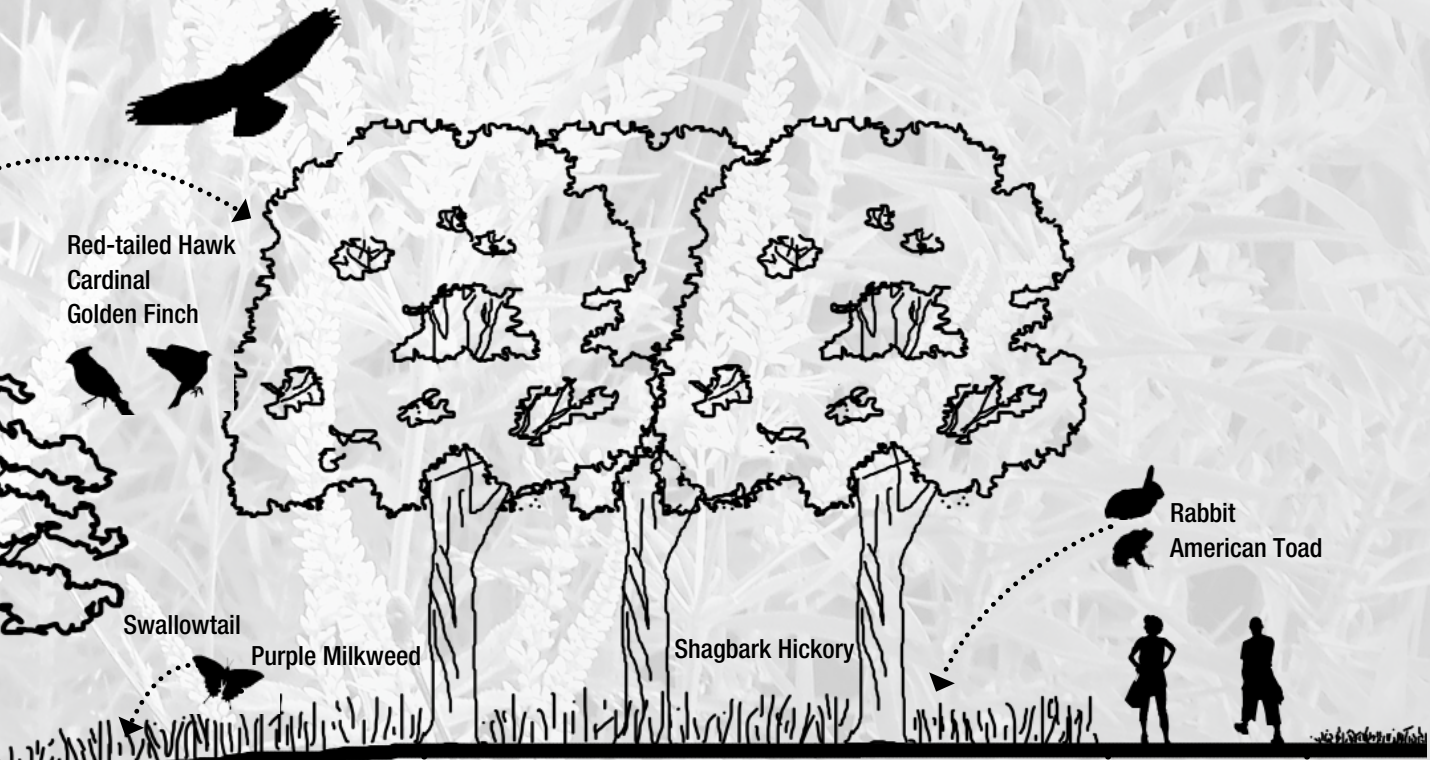
PHOTO: ERIN HOKANSON



Actias luna (luna moth) is resting on a white snakeroot (*Ageratina altissima*) leaf



Agelaius phoeniceus (red-winged blackbird)



Prairie | Savanna

Savanna | Woodland

Trail

Lawn

gnatcatchers, warblers and other insectivorous birds that prefer wooded habitats. The shagbark hickory's peeling bark creates crevices that provide protective cover for many insects, particularly during the winter. The bark crevices also provide summer roosting habitat for the endangered Indiana bat and the threatened northern long-eared bat, and nesting habitat for a small bird, the brown creeper.

Prairie + Woodland Species

Herbaceous species in a savanna include a mix of prairie and woodland species, and a few specialists that are only found in savannas. Grasses and forbs within the plant mix provide many ecological benefits including food and shelter for native butterflies, insects and birds. Plants such as purple milkweed and butterfly weed are excellent sources of nectar for many butterflies and are food for monarch butterflies. The pollen and nectar of flowering spurge attracts bees and small butterflies, including the endangered Karner blue. Wild bergamot is another important species included in the savanna / prairie landscape because the nectar of the flowers attracts long-tongued bees, bee flies, butterflies, skippers and hummingbird moths. The ruby-throated hummingbird also visits the flowers.

In addition to the savanna / prairie landscape, areas of open lawn are located in key areas of active recreation. Buffalo grass lawn mix, a slow growing lawn mix with a maximum height of 4-8" requiring little or no mowing and less than 1" of water per week, provides an alternative to traditional high-maintenance turf grass, such as Kentucky bluegrass, fescue and rye.

Aquatic Habitat

Placement of a stone revetment along the shore will provide increased habitat for macroinvertebrate and juvenile fish in the form of cavities and spaces of varying sizes formed by the irregularly stacked rocks.

The mudpuppy (*Necturus maculosus*), a totally aquatic nocturnal salamander on the Illinois Threatened Species list, inhabits rocky crevices nearshore. New potential habitat will be created for the mudpuppy by using stone revetments. Winter habitat for young salmonids is often rock crevices. Yellow perch, in the absence of rooted aquatic vegetation, prefer to spawn on rocky cobble versus sand in Lake Michigan. Aquatic fauna will benefit from the placement of a rocky revetment along the shoreline in the form of increased habitat in comparison to sandy bottom substrates alone.

PHOTO: NATIONAL PARKS SERVICE



What is a Mudpuppy?

Mudpuppies, also called waterdogs, are one of only a few salamanders that make noise. They get their name from the somewhat embellished notion that their squeaky vocalizations sound like a dog's bark.

Among the largest of the salamanders, mudpuppies can exceed 16 inches in length, and have an average lifespan of 11 years.

SOURCE: <http://animals.nationalgeographic.com/animals/amphibians/mudpuppy/>

PROTECT

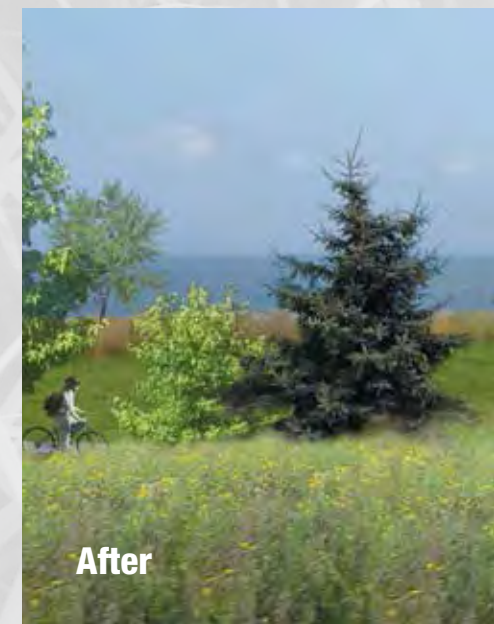
Chicago's shoreline protection was originally built between 1910 and 1931. Known as revetments, the existing shoreline protection is comprised of deteriorating wood pile cribs filled with stones in the shape of steps.

The Lake Michigan shoreline segment between 45th and 51st Streets is located adjacent to a geologic formation known as the Morgan Shoal, which is one of a series of rock outcrops found in this area of Lake Michigan. The presence of the shoal allows for consideration of **unique shoreline protection** measures, since the shallow offshore water depths reduce the incident wave conditions and the presence of shallow bedrock increases the difficulty and cost of driving sheetpile. The original revetment structures along this reach of the Chicago shoreline were constructed in 1925 and consisted of rock-filled parallel timber pile bulkheads. The area between 45th and 51st Streets has been subject to several partial rehabilitation efforts and enhancements over the course of its life. Currently, the structures are again in disrepair, having suffered deterioration from wave and ice impact, freeze-thaw cycles and lake-level change.

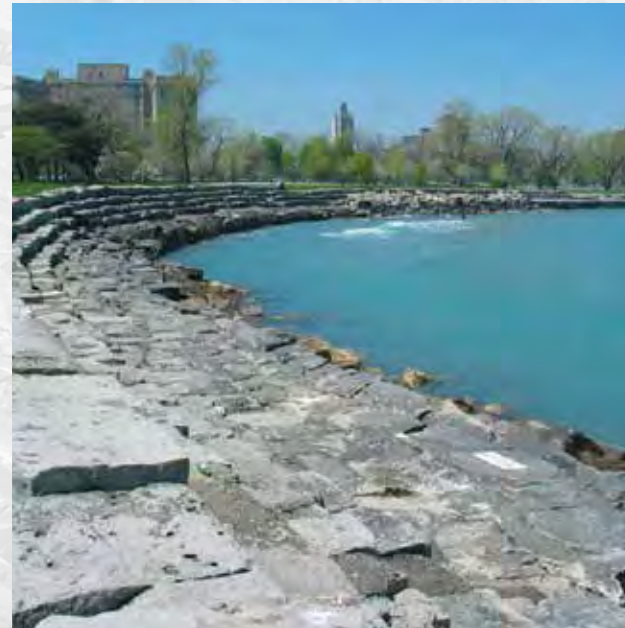
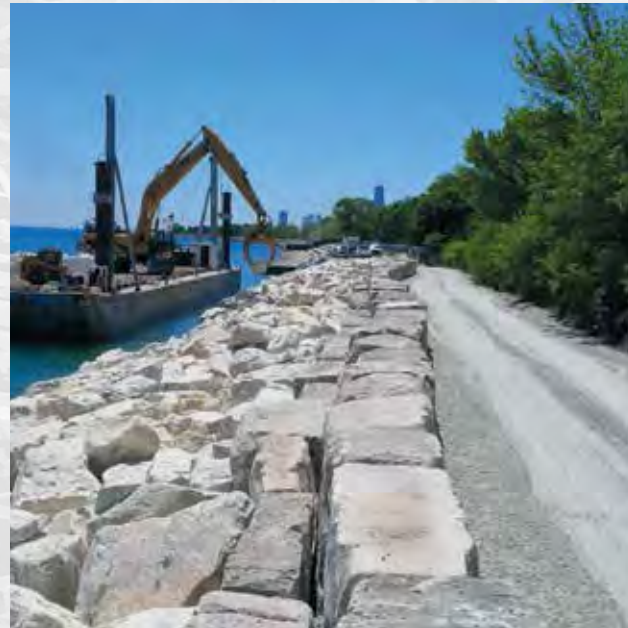
The modern standard for protecting Chicago's Lake Michigan shoreline is a stepped concrete revetment structure, which requires steel sheetpile to be driven deep into the ground. In the vicinity of Morgan Shoal, however, the top of bedrock is close to the surface, which limits the ability to drive sheetpile to the depth necessary to support this type of construction. Therefore, a stepped concrete revetment is not the preferred strategy in this area. Instead, the preferred shoreline protection scheme is a **rubblemound slope constructed**

with large quarried stone. To combat Lake Michigan's waves and storm surges, the top of the new rubblemound slope will be roughly three feet higher than the existing shoreline. This sloped rubblemound revetment will start at 45th Street and form the shoreline south to approximately 49th Street.

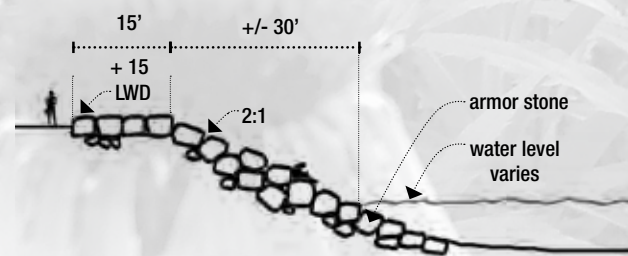
Starting at 49th Street, the shoreline will transition to a **stepped stone revetment with a pebble beach.** The stepped stone revetment also uses large quarried stone, but these stones must meet more stringent shape requirements in order to be laid in relatively flat planes that are easier for park visitors to traverse. The pebble beach acts as a type of **dynamic revetment**, which means that the pores between the small stones disrupt and dissipate the wave energy by adjusting shape in response to the prevailing wave conditions. The combined stepped stone revetment and pebble beach will provide this segment with adequate shoreline protection. This strategy is possible because the nearby shoal helps break waves and provides a degree of **natural shoreline protection.** The natural wave-breaking ability of the shoal also allows for the top of the stepped stone revetment to be a few feet lower than the adjacent rubblemound revetment sections, opening up views to the lake for car travelers on Lake Shore Drive.



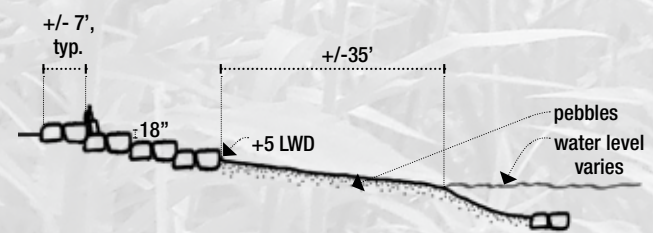
South of the pebble beach and stepped stone revetment, the rubblemound revetment will continue until the south side of the 51st Street bump-out. The final several hundred feet of shoreline will be a stepped concrete revetment, which will transition the shoreline protection measures to match up with the existing stepped concrete revetment to the south of the project site. The goal of the shoreline protection is to have a lifespan of a minimum of 75 years and is designed to meet the standards established by the United States Army Corps of Engineers.



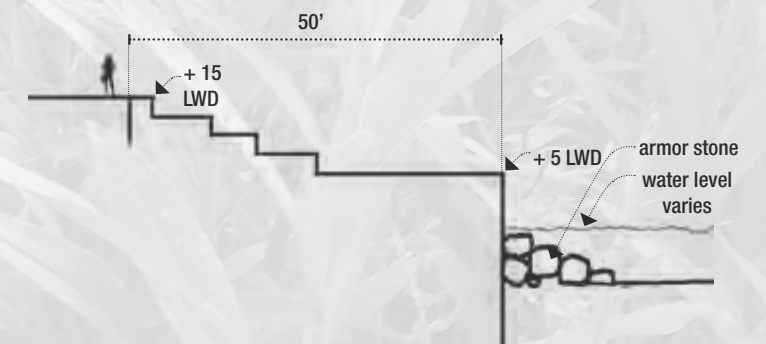
Sloped Stone Revetment



Stepped Stone Revetment



Stepped Concrete Revetment



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This report was prepared by the Chicago Park District under award number NA12NOS4190105 from NOAA's Office of Ocean and Coastal Resource Management, U.S. Department of Commerce. The statements, findings, conclusions and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA's Office of Ocean and Coastal Resource Management or the U.S. Department of Commerce.

SMITHGROUP JJR



REPORT DESIGN BY

