Barkers Island Beach Restoration Project
Ten-Year Monitoring and Maintenance Plan

12 JULY 2019

PREPARED FOR:

City of Superior

Department of Parks, Recreation, and Forestry

and

Wisconsin Department of Natural Resources

St. Louis River Area of Concern Coordinator

PREPARED BY:

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Lake Superior Research Institute

University of Wisconsin-Superior

LSRI Lake Superior Research Institute Est. 1967

Acknowledgement of Receipt

I have read and been informed of the content, and responsibilities listed in the *Barkers Island Beach Restoration Project Ten-Year Monitoring and Maintenance Plan*. I have received a copy of the final plan dated 12 July 2019 and acknowledge our institutions responsibilities. I understand that maintenance of the project features after the warranty period ending July 12, 2021 will be performed in a good faith effort, according to the plan, and is not a contractual obligation.

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Aug 21, 2019

Linda Cadotte, Director of Parks, Recreation, and Forestry, City of Superior

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1 Introduction and Purpose

The Wisconsin Department of Natural Resources (WDNR) received Great Lakes Restoration Initiative (GLRI) funding from the United States Environmental Protection Agency (US EPA) to design and construct a beach restoration project in the City of Superior, Wisconsin's Barkers Island Inner beach. The WDNR partnered with the City of Superior's Parks, Recreation, and Forestry Department, who contracted with AMI Consulting Engineers (Superior, WI) in 2017 to develop the restoration design. A two-year warranty period is part of the construction. The City of Superior selected an implementation/construction contractor (hereafter referred to as "contractor") for restoration implementation via a competitive bid process, and construction began in the summer or fall of 2018.

The purpose of this plan is to provide a framework for the monitoring and maintenance that will take place after the construction phase has been completed. Following this plan will ensure the success of the Barkers Island Beach Restoration implementation, and verify the initial survival, function, and viability of green infrastructure and habitat plantings. Warranty period monitoring will be the responsibility of the Lake Superior Research Institute (LSRI; University of Wisconsin-Superior), while the contractor and City of Superior Parks, Recreation, and Forestry Department will be jointly responsible for warranty period site inspections and maintenance. After the warranty period, most of the monitoring and maintenance activities will fall under the responsibility of the City of Superior's Parks, Recreation, and Forestry Department. The establishment period may require more intense maintenance, inspection and monitoring to ensure that vegetation is given the best opportunity for successful establishment. While US EPA GLRI funding allows for a two-year warranty period, funding for monitoring and maintenance for the remaining eight years of this ten-year plan and thereafter will be the responsibility of the City of Superior's Parks, Recreation, and Forestry Department. Figure 1 outlines the long-term monitoring and maintenance timeline, applicable sections of this plan for each phase, and organization(s) responsible for each phase.

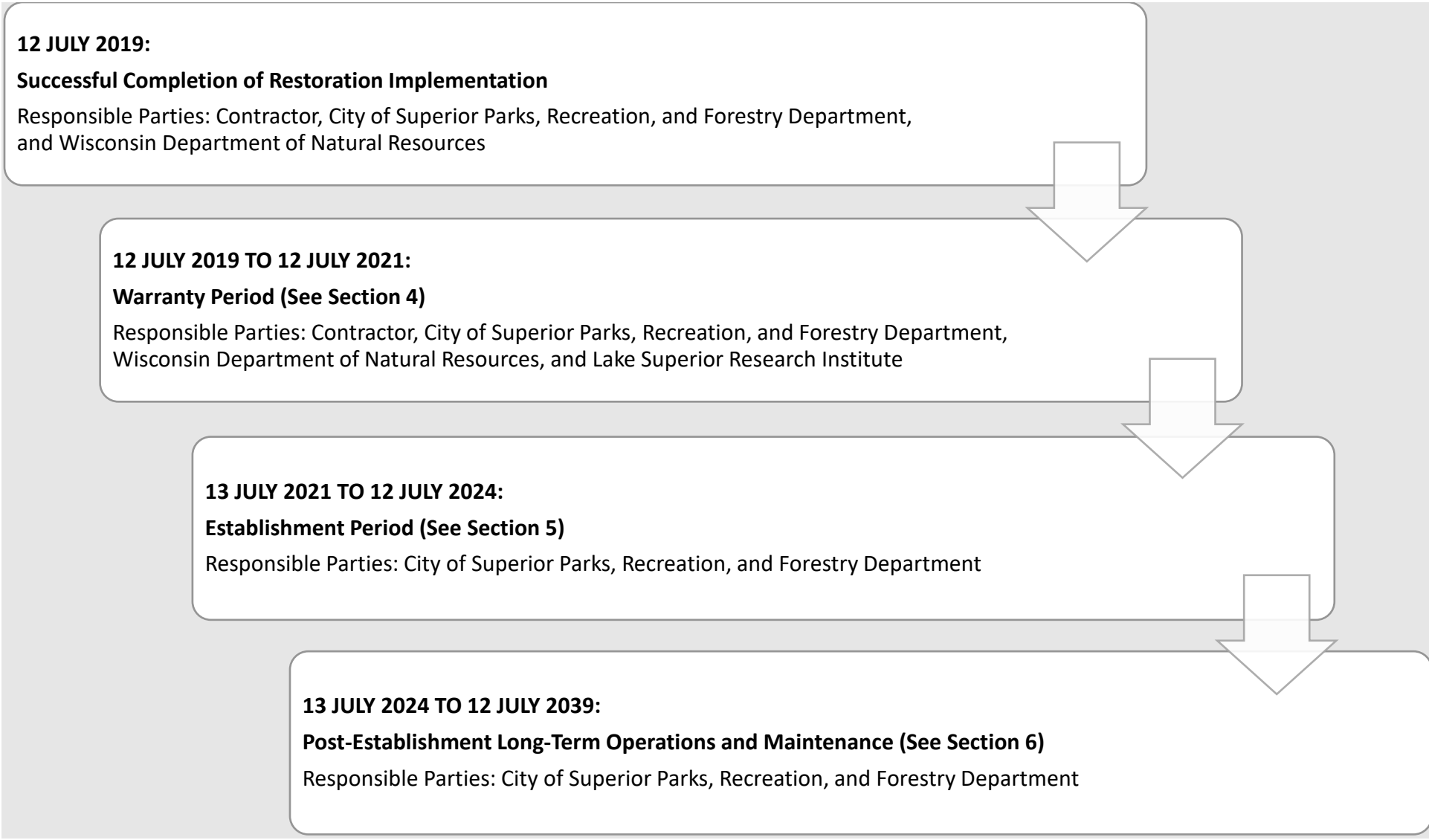

Figure 1. Timeline of Monitoring, Operations, and Maintenance Activities following Restoration Implementation at Barkers Island Beach and Responsible Parties Associated with each Phase.

2 Site and Project Area Description

Barkers Island is a small island located within the St. Louis River Area of Concern (SLR AOC), near Belknap Avenue and State Highway 53 in Superior, WI (Figure 1). The island is a predominant tourist attraction for the City of Superior due to its many recreational opportunities.

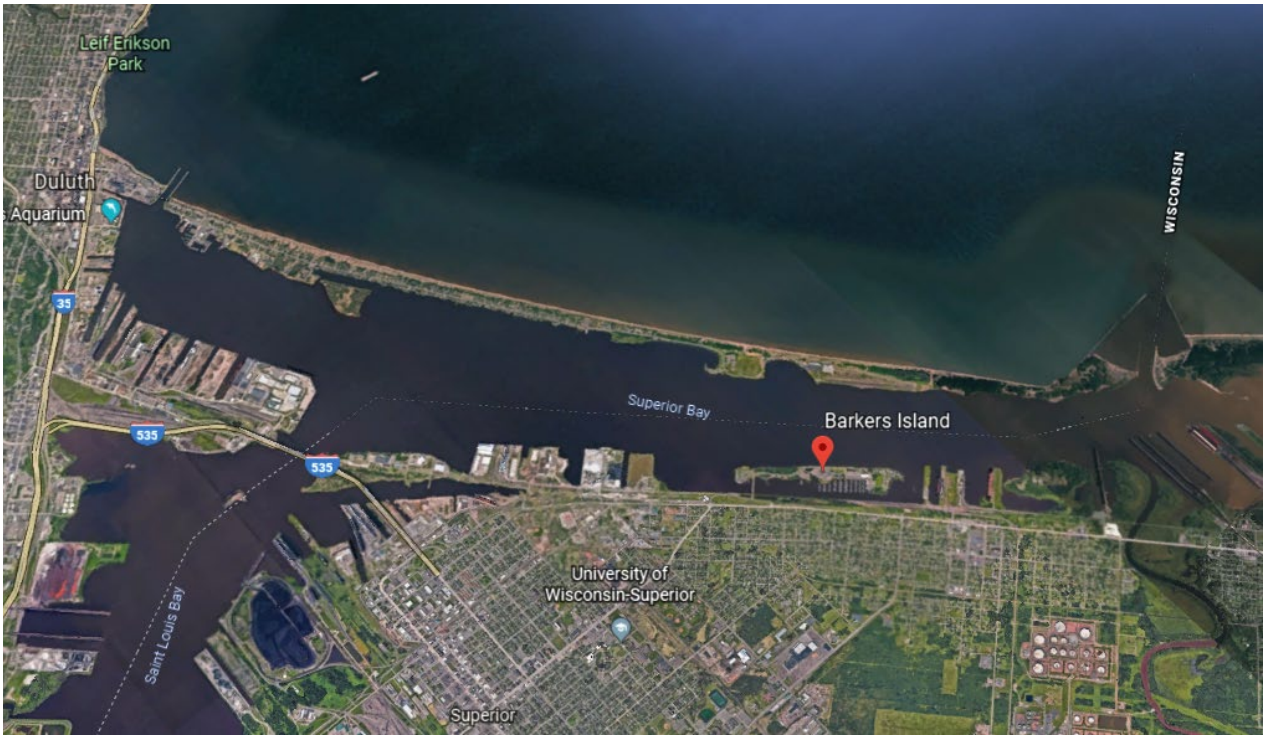

Figure 2. Barkers Island in Superior, WI. Image courtesy of Google Earth™.

The project area includes land owned by the City of Superior, and the project site encompasses an existing recreational beach, eight wetland areas, a walking/biking trial, and a fishing pier. The SLR AOC Remedial Action Plan (2017 draft) has a Beneficial Use Impairment (BUI) for beach closings and body contact restrictions (BUI 7), which includes a removal target aimed at *ensuring no water bodies within the AOC are included on the list of non-attaining waters due to controllable (human) sources of disease causing microorganisms or chemicals in the most recent State of Wisconsin and State of Minnesota 303(d) programs*. Due to its historic and current presence on the State of Wisconsin's 2018 303(d) List of Impaired Waters, specifically because of recreational restrictions as a result of pathogens (i.e., *Escherichia coli*), Barkers Island Beach restoration is listed as Project 7.02 in the 2017 SLR AOC Remedial Action Plan.

In a study that encompassed two beach seasons (2015 and 2016), 42% of the water samples collected from the Barkers Island Inner beach sampling location had *E. coli* concentrations that exceeded the federal standard for recreational waters (i.e., 235 MPN/100 mL). Results from quantitative polymerase chain reaction analysis indicate that there was a contribution of *E. coli* of human origin at the beach (Prihoda et al., 2017). Sources of *E. coli* identified during that study include storm water runoff, presence of standing water on the beach due to lack of infiltration, and persistent presence of nuisance waterfowl (Prihoda et al., 2017).

3 Restoration Goals and Objectives

The primary goal for restoration of Barkers Island Inner beach is to reduce the frequency of recreational restrictions (i.e., beach closures) caused by potentially pathogenic bacteria, such that the beach may be removed from the State of Wisconsin's 303(d) List of Impaired Waters. Successful implementation of this restoration will allow for completion of Project 7.02 in the SLR AOC Remedial Action Plan (2017), and bring the AOC one step closer to removal of BUI 7. A secondary goal of restoration is to improve water quality overall and to enhance access to the water, safety, and aesthetics.

The restoration goals will be achieved through design implementation and the following post-construction objectives: identify and mitigate sources of *E. coli* at the beach, ensure beach sand is dry and grade is properly maintained, deter presence of nuisance wildlife and waterfowl on and around the beach, and decrease the volume and overall impact of storm water runoff through wetland restoration and green infrastructure.

The City of Superior may also use the success of this restoration project to promote and help revitalize the public use of the waterfront.

4 Warranty Period Monitoring and Maintenance Requirements

Table 1 outlines the required monitoring and maintenance actions required during the two-year warranty period and project goal associated with each action. Completion of these actions ensures the success of the short-term goals and objectives of this restoration project. Monitoring methods, frequency of maintenance actions, and performance criteria are discussed in Sections 4.1 through 4.7.

Table 1. Monitoring and Maintenance Actions for Two Year Warranty Period.

Project Goal	Project Objective(s)	Maintenance or Monitoring Action or Evaluation
• **Reduce recreational restrictions (i.e., beach closures) due to *E. coli* concentration** • **Enhance aesthetics**	Identify sources of *E. coli* at the beach and other potential sources through monitoring and routine sanitary surveys	Intensive *E. coli* monitoring and water quality measurements at four sites in and around the beach, including completion of sanitary survey at the beach (BARK)
	Mitigate sources of *E. coli* at the beach by ensuring beach sand is dry, beach grade is maintained, and deter nuisance waterfowl/wildlife by reducing the amount of trash and debris on the beach	Beach grooming (including removal of nearshore algae and beach algae), ice protection, and beach nourishment Survey beach for elevation changes after significant storm surges
	Deter presence of waterfowl and other nuisance wildlife on and around the beach	Application of Flight Control Plus (goose deterrent) and maintenance of Bionic Scarecrow (waterfowl and gull deterrent)
	Mitigate sources of *E. coli* at the beach by decreasing the impact of storm water runoff	Monitoring establishment of plantings (tree, shrub, wetland plantings, and turf cover), non-

		native species removal and control, monitoring and repair of erosion and bare areas Protect plantings from wildlife or human damage Ensure quality of restored wetland areas though floristic quality assessment
	Deter nuisance waterfowl/wildlife by reducing the amount of trash and debris on the beach	Restroom maintenance, cleaning picnic tables and benches, maintenance of pet stations, and trash removal (including litter picking in the vegetative buffer)
	Reduce the amount of debris washing up on the beach	Manage debris and seaweed by annual hand raking of sediment within designated swim area
• **Reduce recreational restrictions (i.e., beach closures) due to *E. coli* concentration** • **Improve access to water** • **Enhance aesthetics**	Reduce the amount of storm water runoff and decrease impact (including reducing sediment load in storm water)	Maintenance and repair/replacement of green infrastructure, including boardwalk frame, cordwalk surface, pervious pavers
		Monitoring establishment of plantings (tree, shrub, wetland plantings, and turf cover), maintenance of tree, shrub, turf, and wetland plantings, non-native species removal and control, monitoring and repair of erosion and bare areas

4.1 Warranty Period Monitoring and Maintenance Schedule

Routine monitoring and maintenance requirements and the frequency at which they must be completed during the two-year warranty period, including responsible parties, are outlined in Table 2. Monthly meetings or calls will occur on the first Tuesday of each month (May through October) for the contractor (I.e., AMI Consulting Engineers, Stack Bros., Prairie Restoration) and the City of Superior's Parks, Recreation, and Forestry Department, and the Wisconsin DNR to communicate necessary maintenance needs and update parties involved on activities competed.

Monitoring will be conducted in and around the restored area to determine *E. coli* concentrations and overall floristic quality of the wetlands within the project area. Monitoring will be conducted by the Lake Superior Research Institute (University of Wisconsin-Superior).

Maintenance during the two-year warranty period will be the joint responsibility of the implementation contractor and the City of Superior's Parks, Recreation, and Forestry Department (through July 12, 2021).

Routine site inspections, which are the responsibility of the contractor, will ensure that the "as needed" maintenance activities are completed. Routine site inspection methods and frequency, as well as, monitoring and maintenance methods are outlined in Section 4 of this document.

Maintenance of plantings (trees, shrubs, wetland plugs, turf and shoreline seeding or mat) will be the responsibility of the contractor through July 12, 2021. This includes replacing plants that are warrantied from a nursery that do not survive the warranty period. The City of Superior will mow turf areas once established.

Table 2. Routine, Scheduled Monitoring and Maintenance Activities during the Warranty Period following Barkers Island Inner Beach Restoration.

Activity/Task	Description of Work	Frequency	Responsible Party
***E. coli* monitoring**	See Section 4.2.1 below	Twice weekly	Lake Superior Research Institute
Wetland monitoring	See Section 4.2.2 below	Annually during the growing season	Lake Superior Research Institute
Beach nourishment	Replacement of up to 150 cubic yards of coarse sand (if needed) to maintain established grade (gradual slope) and defined berm crest	Once during two-year warranty period	Contractor
Waterfowl management – application of goose deterrent on grassy areas	Flight Control Plus application	Twice per year, prior to pairing up (March – April) and after fledglings leave nest (mid-July) according to manufacture recommendations	Contractor
Repair/Replacement of Boardwalk (frames and other metals parts)	Replacement/repair due to vandalism and/or damage	As needed	Contractor (Frames and other metal parts have a lifetime manufacturer's warranty)
Repair/Replacement of cordwalk surface	Replacement/repair due to vandalism and/or damage	As needed	Contractor
Maintenance of pervious pavers	Clean porous areas using a vacuum truck or other approved method.	Twice per beach season	Contractor
Repair/Replacement of lighting along boardwalk, if needed	Replacement/repair due to vandalism and/or damage	As needed	Contractor
Maintenance of wetland areas, survival and establishment	Replacement of dead vegetation following one-year nursery warranty. Maintenance during warranty period (ending 3 July 2021). Install, apply or conduct protection of plantings from pests, wildlife and humans	Control as needed of non-native plants identified during pre-construction survey	Contractor (Wetland plugs have a one-year warranty from nursery)
Maintenance of shoreline vegetation, survival and establishment	Replacement of dead vegetation following one-year nursery warranty. Maintenance during warranty	As needed	Contractor

	period (ending 3 July 2021) Install, apply or conduct protection of plantings from pests, wildlife and humans. Control of invasive plants and weeds, water vegetation if rainfall is less than one inch per week, mulching as needed; clearing washed up logs or debris that may inhibit/damage vegetation in nearshore water		
Maintenance of lawn areas, survival and establishment	Replacement of dead/eroded sod/turf following one-year nursery warranty. Maintenance during warranty period (ending 3 July 2021)Install, apply or conduct protection of plantings from pests, wildlife and humans.	Treatment of perennial weeds as needed Repair of bare areas/erosion as needed	Contractor (Sod flats have a one-year warranty from nursery)
Maintenance of tree and shrub plantings, survival and establishment	Replacement of dead trees and shrubs following one-year nursery warranty. Maintenance during warranty period (ending 12 July 2021)Install, apply or conduct protection of plantings from pests, wildlife and humans.	Mulching and fertilizer application as needed Water if rainfall is less than one inch per week Pruning damaged limbs as needed	Contractor (Tree and shrub plantings have a one-year warranty from nursery)
Routine site inspection reports (Appendix 1)	See Section 4.3.1 below	Early spring, late spring, late summer, late fall	Contractor
Swimming area raking	In water hand raking of the swimming area sediment up to six feet of water Removal of debris and swimming hazards present in the sediment	Once at the beginning of the beach season	Contractor
Annual maintenance status report	One report issued per year which will detail the status of maintenance for which the contractor is responsible for. It will also include *E. coli* and wetland monitoring results.	At the end of each beach season	Contractor, Lake Superior Research Institute and the City of Superior
Beach grooming	Beach grooming done with a walk-behind groomer (SandMan 850) provided through grant funding	Minimum of once per week or as needed based on	City of Superior Parks, Recreation, and Forestry Department

		beach use and debris levels	
Vault toilet maintenance	Ensure water level is maintained to control odor and detract flies from laying eggs	Monthly or as needed	City of Superior Parks, Recreation, and Forestry Department
	Pumping	Annually at the end of the beach season or as needed based on use.	
	Winterization	Annually prior to freezing	
Restroom cleaning, cleaning picnic tables and benches, trash removal, and maintenance of pet stations	Ensure all areas are clean and cleared of trash	Twice weekly	City of Superior Parks, Recreation, and Forestry Department
Clean solar panels on boardwalk lights	Ensure solar panels on lights are clean and cleared of debris	Monthly	City of Superior Parks, Recreation, and Forestry Department
Beach ice protection	Install snow fence along the beach to protect the sand from erosion	November installation and April removal	City of Superior Parks, Recreation, and Forestry Department
Maintenance of beach buoy/marker boundaries	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend	City of Superior Parks, Recreation, and Forestry Department
Waterfowl management – application of "Bionic Scarecrow"	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend	City of Superior Parks, Recreation, Forestry

4.2 *Escherichia coli* and Wetland Vegetation Monitoring Methods

4.2.1 *E. coli* Monitoring and Sanitary Survey Methods

During CY2019 and CY2020 beach seasons (i.e., approximately the last weekend in May to the first weekend in September), surface water samples will be collected at the routine monitoring sample location (BARK, Figure 2) twice per week, as well as, from various locations within the immediate vicinity of the beach (locations identified in Figures 3 and 4). The fishing pier (BARK-FP), the causeway (BARK-CW) and Pickle Pond (BARK-PP) locations will also be monitored twice weekly throughout the two-year warranty period. The purpose of these surrounding samples will be for routine monitoring of *E. coli*, and identification of potential *E. coli* contributors that may be influencing the *E. coli* concentrations at the beach.

Figure 3. Rendering of Beach Restoration Design Showing *E. coli* Routine Monitoring Location (BARK) and Fishing Pier (BARK-FP) Monitoring Location.

Figure 4. Google Earth™ Image Showing Causeway (BARK-CW) and Pickle Pond (BARK-PP) *E. coli* Monitoring Locations.

E. coli monitoring methods will replicate those listed in the *Bacterial Source Tracking at Impaired Beaches in the St. Louis River Area of Concern* Quality Assurance Project Plan (Prihoda et al, 2015). Although samples will not be collected in association with significant rain events, rainfall data will be monitored closely throughout the two beach seasons. The rain event data for Barkers Island Inner will be obtained from historical weather data for the Duluth International Airport Station on Weather Underground website (https://www.wunderground.com/history/monthly/us/mn/duluth/KDLH/date). For water samples, collection procedures will follow the requirements described in Appendix E of the QAPP for the Wisconsin Beach

Monitoring Program (Dinsmore, 2012) and outlined in LSRI SOP *FS/38 – Collection of Water and Substrate Samples for Analysis of E. coli* (LSRI 2019).

4.2.1.1 Sampling Procedures and Requirements

Sample/Data collection will follow this general order:

1. Each *E. coli* sample (Figures 2 and 3) will be collected, at knee depth, immediately before the associated water quality measurements with minimal disturbance to the bottom substrate. Data recording forms for sample collection and water quality measurements must be filled out immediately on site.
2. At the at the routine monitoring sample location (BARK, Figure 2) a routine sanitary survey form (based upon US EPA-823-B-06-001, Office of Water, 2008) must be completed. The sanitary survey area will be defined as 100 m in either direction from the center of the routine monitoring location.

Samples will be collected in sterile, 1-L polypropylene (PP) sample containers. In order to avoid contamination of the sample containers and the sample itself, the following protocol must be followed:

- Do not uncap the sample bottle until just prior to sample collection.
- Do not touch the inside of the sample container.
- Do not rinse the sample container.
- Do not put the cap for the sample bottle on the ground while sampling.

Samples must be labeled in a consistent format such that each sample label is unique. Label information must include at a minimum: unique sample identification number, sample type, name of collector, date and time of collection, place of collection. Self-adhesive labels must be printed and affixed to the sample container prior to sample collection. Sampling procedures and field quality control (QC) sample requirements are listed in Table 3. All field duplicates should be collected simultaneously, whenever possible. All samples must be placed on wet ice in a cooler immediately after collection. Care must be taken to ensure that samples are not totally immersed in water from melted ice during transit or storage. The sample collection data will be recorded on a pre-printed datasheet. Sample custody must be documented on a Chain-of-Custody Form or other permanent record showing time of sample collection, sample holding method, date/time and condition upon arrival at analysis laboratory, and date/time and condition just prior to analysis. Samples will arrive at the analysis laboratory on the day of collection and be placed into a refrigerator at above freezing to 6°C until the time of analysis. *E. coli* analysis will routinely occur within six hours of collection but holding time will not exceed 24 hours after collection.

Table 3. Description of Sampling Procedures and Requirements for Intensive *E. coli* Monitoring during Warranty Period.

Analytical Parameter	Matrix	SOP	Sampling Procedure	No. Samples	Sample Vol.	Type of Container	Field QC Sample	Sample Handling and Storage
E. coli	Water	FS/38	Samples collected at knee depth from each sample point	280	1 L	Sterile, Polypropylene Plastic	Field Blank (1 sampling event per week); Field Duplicate (1 sampling event per week)	Place samples on ice in a cooler immediately following collection. Refrigerate samples for up to 24 hours prior to analysis.

4.2.1.2 Analytical Methods Requirements and Task Description

E. coli analysis must be conducted by a Milk, Food, and Water Laboratory as certified by the Wisconsin Department of Agriculture, Trade, and Consumer Protection. Sample analysis must follow LSRI SOP *SA/56 Detection and Enumeration of Total Coliforms and E. coli using I*DEXX's *Colilert™* (LSRI 2016) or another US EPA and WDNR approved method for beach monitoring sample analysis.

4.2.1.3 Quality Control Requirements

The QC requirements (activities, frequency, and procedure) for *E. coli* sample collection and analysis, including data quality indicators and corrective actions, during the two-year warranty period are outlined in Table 4.

Table 4. Sample Collection and Analysis Quality Control Methods for Intensive, Two-Year Warranty Period *E. coli* Monitoring.

QC Activity	Frequency	Method or Procedure	Acceptance Criteria (Data Quality Indicator)	Corrective Action
Method Blank	1 per sampling event	Sterilized harbor water analyzed using same analysis methods as samples.	Non-detect (Bias)	Flag data; Retrain analysts as needed.
Field Blank	1 sampling event per week	Sterilized DI water is poured into a sample bottle while in the field, transported to the LSRI Microbiology Lab, and analyzed.	Non-detect (Bias)	
Positive Control	Weekly	Sterilized DI water is spiked with *E. coli* and analyzed.	Positive: fluorescence	
Negative Control	Weekly	Sterilized DI water is spiked with non-coliform bacteria and analyzed.	Negative: No fluorescence	
IDEXX QC Standard	1 IDEXX-QC kit; 3 analyses monthly	Quantitative standard that consists of one non-coliform bacteria, one coliform (non-*E. coli*) bacteria, and one *E. coli* in certified concentrations.	Accuracy within limits set by manufacturer	
Laboratory Duplicate	1 per sampling event	Two representative aliquots from one homogenous sample are analyzed.	≤30% RPD* (Precision)	
Field Duplicate	1 sampling event per week	Two independent samples are collected simultaneously by one member of the sampling team, transported to the LSRI Microbiology Laboratory, and analyzed.	≤35% RPD* (Precision)	
QA Count	10% of the samples analyzed for season	A second microbiologist counts the number of positive wells on each IDEXX tray that has already been counted.	≤20% RPD* (Bias)	

*****Data not meeting this DQO will not be flagged or deemed invalid if the results of *E. coli* analysis were 10 MPN/100 mL or less, in which case very small, non-significant differences between biological measurements could cause the data to fall outside of the acceptance criteria.

The geometric mean and frequency of *E. coli* advisories (*E. coli* >235 MPN/100ML) at the center of beach location will be reported.

4.2.2 Floristic Quality Assessment Methods

The eight delineated wetland areas must be assessed pre- and post-implementation (2018 and 2021) following the WDNR *Timed-Meander Sampling Protocol for Wetland Floristic Quality Assessment* (https://dnr.wi.gov/topic/Wetlands/documents/TimedMeanderSamplingProtocol.pdf, accessed May 2018). This procedure is based upon the *Floristic Quality Assessment Methodology for Wisconsin* (Bernthal 2003), and according to WDNR, can be utilized for wetland restoration site monitoring. The pre-implementation FQA was conducted just prior to restoration implementation, on June 21, 2018. Additional planting is anticipated in spring 2019, therefore, a post-implementation assessment of invasive species will be conducted in 2019 late in the growing season (i.e., early September) just to ensure that the invasive species removed prior to putting in the new plantings have not re-established. The 2020 assessment of invasive species (e.g. early detection survey) will be conducted in late summer (i.e., late August – early September). The final FQA will be conducted in the mid-growing season at the final stage of the warranty period (June21-July 21, 2021)

Using the FQA method, assessment areas (AAs) composed of relatively homogenous vegetation will be defined, generally each of the eight delineated wetlands will comprise one AA unless conditions and features within a wetland necessitate multiple AAs. The defined AAs will be assigned a plant assemblage that matches the Natural Heritage Inventory community or National Vegetation Classification type. Each AA will be surveyed using a timed-meander method. The results from the timed-meander will include a list of all plant species present within each defined AA and estimate of percent areal cover for each species at the end of the defined search period. During the survey, all unknown, uncertain, or difficult-to-identify plant species will be collected for laboratory taxonomic identification. Notes on disturbance and other observations will be documented, and photos will be taken of each AA. The meander track will be recorded using a handheld GPS unit.

Wetland floristic quality will be determined using the *Weighted Mean C* metric (Bernthal et al. 2007). This method utilizes a Coefficient of Conservatism (C), which is a numerical score 0 – 10 assigned to plant species (Swink and Wilhelm 1994). Non-native species will be included in this calculation receiving a C-value of zero. Native species are assigned C values ranging from 0 (highly tolerant of disturbance) to 10 (highly intolerant of disturbance). The Weighted Mean C is an arithmetic mean where the C-value for each species (i) is multiplies by its proportional abundance (p) and divided by the sum of the proportional abundances:

$$w\bar{C} = \frac{\sum PiCi}{\sum Pi}$$

4.3 Maintenance Methods

4.3.1 Routine Site Inspections

Routine site inspections must be conducted and documented (Appendix 1) by the contractor during the two-year, post-implementation warranty period, and must include inspection of plant communities, constructed/engineered features of the restored area, vegetation establishment, presence of undesired weeds/plant species, issues with hydrology, and land use issues. Photographs of any issues discovered during inspections must be included in inspection reports. This includes photos before and immediately after maintenance issues have been resolved. Once construction is complete, routine site inspections should occur four times per year until the warranty period is complete:

- Early spring: Document any issues observed following ice-out, including loss of beach sand, shoreline erosion, presence of debris, and record any unscheduled repair/maintenance work needed.
- Late spring: Document issues observed with hydrology (standing water in non-wetland areas), presence of debris, and record any unscheduled repair/maintenance work needed prior to the beach season.
- Late summer: Document conditions of structures and constructed/engineered features of the restored area, identify weeds/undesired vegetation, document the establishment of native and non-native plant species, and record any unscheduled repair/maintenance work needed.
- Late fall: Determine what measures are needed to prevent issues identified in early spring and implement those measures, record any unscheduled repair/maintenance work needed.

Inspection and documentation (Appendix 1) of the condition of the boardwalk and solar lights will be completed by the contractor. Repair and or replacement of Boardwalk (cordwalk surface, frames, and other metals parts) will be performed by the contractor within three days after receiving notification by the City of Superior or when damage is identified by the contractor. Photographs of maintenance issues must be taken and submitted with the inspection form.

Maintenance of turf, which will be inspected during routine site inspections, will include reseeding and/or treatment of perennial weeds by the contractor as needed. Tree and shrub plantings will be inspected during routine site inspections. Mulching and fertilizer application will be completed by the contractor as needed. If rainfall is less than one inch per week, the contractor will water plantings.

Pervious pavers will be inspected during routine site inspections. Repair or replacement of the pervious pavers will be performed by the contractor within three days of receiving notification from the City of Superior or when damage is identified by the contractor.

4.4 Significant Storm Event Inspections

Within 24 hours of a significant storm (wind) event or rain event with greater than 1.5 inches of rainfall the contactor will inspect and document (Appendix 1) the condition of the restoration area. Alternatively, the City of Superior Director of Parks and Recreation will determine if an inspection is needed for a significant storm event and notify the contractor. Established grade (gradual slope) of the beach sand will be inspected. If significant loss of sand has occurred and established slope has deteriorated, the contractor will be responsible for providing beach nourishment. Beach nourishment frequency is limited to once during the warranty period.

Vegetative cover and condition of the restored area will be inspected, noting any erosion or bare areas, accumulation of storm water in graded areas, or other damage. The contractor will perform all necessary repairs to plantings, and erosion damage within three days after receiving notification or when damage is identified by the contractor, as part of the post-storm event visits. Tree and shrub plantings will be inspected and damaged limbs will be pruned as needed.

For each storm event inspection that occurs, photos of the restoration area and photos taken before and after any repair or maintenance activity is completed, will be included in the site inspection logs.

These inspections and necessary repairs are not limited to the beach season and may need to occur at any time during the open water season.

4.5 Routine Maintenance

Routine maintenance procedures associated with daily operations (e.g., mowing, cleaning, beach grooming trash removal, cleaning solar lights; Table 2) will be the responsibility of the City of Superior Dept. of Parks, Recreation and Forestry. Waterfowl management during the warranty period will be the responsibility of the City and contractor. The contractor will be responsible for the application of Flight Control Plus goose deterrent on grassy areas twice per beach season (Mid-July 2019, prior to pairing in April or May 2020, Mid July 2020, and prior to pairing in April or May 2021). The "Bionic Scarecrow" will be installed by the City of Superior Dept. of Parks, Recreation and Forestry prior to Memorial weekend and removed after Labor Day weekend. It will be inspected during the routine site inspections and the contractor will notify the City if repair is needed. Photos are required to be taken before and after any maintenance activity is completed and should be included in the Routine Site and Storm Event Inspection Log.

Maintenance of newly planted vegetation, to ensure survival and establishment is the responsibility of the contractor.

Using a vacuum truck or other method as approved in writing by the City of Superior's Environmental Services Department, the contractor will clean porous areas or pervious pavers a minimum of two times per beach season.

4.6 Warranty Period Performance Criteria and Evaluation Technique

Successful implementation of the beach restoration will be determined through a formal assessment process. Once data for the warranty period has been compiled and QC measures have been assessed, data will be compared to the available pre-restoration data. Performance criteria have been developed to assess the success of individual performance goals and are outlined in Table 5. Using the sanitary survey data and *E. coli* data from the sampling locations surrounding the beach (BARK-PP, PARK-CW and BARK-FP) to help determine any potential contributing sources of potential pathogens to the beach will be important as some sources may pose a greater human health risk than others. Assessing restoration success may not be as straightforward as one would hope and in some cases the professional judgement of involved parties (contractor, LSRI, WDNR, City of Superior Parks, Recreation, and Forestry Department) must be taken into consideration.

Table 5. Performance Goal Evaluation Tools and Performance Criteria for Barkers Island Beach Restoration.

Performance Goal	Evaluation Tool(s)	Performance Criteria
Reduction in beach closures due to *E. coli* concentration as compared to the previous five years (2019 – 2020 vs. 2014 – 2018).	Comparison of number of advisories and beach closures (using data from the Wisconsin Beach Health Website) before and after restoration	Reduction of advisory frequency
***E. coli* geometric mean aggregated by month is reduced from the historical three-year geometric mean for that month.**	Using data from the Wisconsin Beach Health Website, compare monthly *E. coli* geometric mean at Barkers Island (center beach point) to the previous three-year monthly geometric mean the pre-restoration routine monitoring location.	Reduction in aggregated monthly *E. coli* geometric mean as compared to pre-restoration data.

Overall increase in floristic quality of each of the three assessment areas (eight delineated wetlands) within the restoration area.	Floristic quality assessment using the timed-meander survey method.	Increase in Weighted Mean C value calculated for each defined wetland assessment area in 2020 as compared to 2018.
Reduction in occurrence of non-native (WDNR NR40 regulated) plant species in restored wetland areas.	Timed-meander survey method.	95% native species plant cover in all defined wetland assessment areas in 2020 as compared to 2018.
Survival and establishment of seeded turf.	Contractor routine site inspections.	100% established turf cover.
Survival and establishment of shoreline seed and mat.	Contractor routine site inspections.	70% established vegetative cover along the planted shoreline.
Survival and establishment of planted trees.	Contractor routine site inspections.	Planted tree mortality less than 10%. Mortality greater than 10% triggers replacement.
Survival and establishment of planted shrubs and wetland plugs.	Contractor routine site inspections.	Planted shrub mortality less than 25%. Mortality greater than 25% triggers replacement.
Reduction in waterfowl and assessing deterrent effectiveness.	Review duck and geese counts at center of beach location as compared to the previous five years Routine Sanitary Survey records (2019 – 2020 vs. 2014 – 2018).	Reduction in waterfowl counts in conjunction with reduction in *E. coli* exceedances.

4.7 Adaptive Management during Warranty Period

The contractor is required to provide a completion report to the City of Superior Parks, Recreation, and Forestry Department following implementation of the restoration design. The report must contain "as built" diagrams and is due by 01 December 2019.

In addition to completion of the site inspection logs (Appendix 1), at the end of the first warranty period year, the contractor must detail the maintenance activities that were conducted during the year. Issues encountered during maintenance events, as well as, corrective actions must be detailed in the report along with photographic documentation. Preliminary performance measures from *E. coli* and wetland monitoring must also be reported. Project partners and stakeholders will determine, along with the contractor and Lake Superior Research Institute, whether monitoring and maintenance operations/procedures need to be revised. Any other changes that need to be incorporated into the project monitoring and maintenance plan, including control of undesirable vegetation and necessary supplemental planting, will be made at the end of year one.

5 Establishment Period Monitoring and Maintenance

The establishment period is the post-implementation time frame, after the warranty period, during which increased maintenance may be necessary due to the sensitivity and vulnerability of the newly restored site.

The establishment period will begin after the US EPA GLRI funding period ends on 30 November 2020 and will last three years, ending on 30 November 2023.

Table 6 outlines the required monitoring and maintenance actions during the establishment period. Completion of these actions ensures the success of the goals and objectives of this restoration project. Methods, and performance criteria are discussed in Sections 4.3 through 4.7.

Once the warranty period ends, intensive monitoring for *E. coli* will not be conducted nor will formal floristic quality assessment of the delineated wetland areas. Routine *E. coli* monitoring, completed as part of the Wisconsin's implementation of the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act, which has historically been conducted by the Lake Superior Research Institute (University of Wisconsin-Superior), will continue. The data for the routine beach monitoring is reported on https://www.wibeaches.us and can be used by the City of Superior to determine whether the restoration goals are still being met in terms of *E. coli* concentration.

Maintenance during the establishment period will shift from the responsibility of the contractor to the responsibility of City of Superior's Parks, Recreation, and Forestry Department.

Maintenance of plantings (trees, shrubs, wetland plugs, turf and shoreline seeding or mat) will be the responsibility of the City of Superior's Parks, Recreation, and Forestry Department after July 12, 2021. This includes replacing plants that do not survive after the warranty period. The City of Superior will continue to mow turf areas once established and will continue to provide maintenance associated with daily operations and use of the beach, such as beach grooming, trash removal, cleaning of restrooms, and repairs (Table 6).

At the end of the establishment period, it is suggested that the City of Superior's Parks, Recreation, and Forestry Department submit a brief report to the residents of the City of Superior (and accessible via the City's website) which will detail the status of maintenance & monitoring activities they are conducting to maintain the restoration. This report may include an update on the survival, function, and viability of green infrastructure and habitat plantings as well as an update on the frequency of advisories and closures obtained from wi.beaches.us during the establishment period. The routine site inspection form (Appendix1) may be used by the City of Superior's Parks, Recreation, and Forestry Department to record results of suggested annual site inspection at the end of each beach season. The report will help the WDNR and the residents of Douglas County begin to determine if there has been successful establishment after the implementation of the beach restoration.

Table 6 Establishment Period Monitoring and Maintenance Operations and Frequency Provided by City of Superior Parks, Recreation, and Forestry Department.

Activity/Task	Description of Work	Frequency during Establishment Period
Beach nourishment	Replacement of up to 150 cubic yards of coarse sand (if needed) to maintain established grade (gradual slope) and defined berm crest	As needed. Assess need at beginning of year five (2024 beach season)
Waterfowl management – application of goose deterrent on grassy areas	Flight Control Plus application	Twice per year, prior to pairing up (March – April) and after

Activity/Task	Description of Work	Frequency during Establishment Period
		fledglings leave nest (mid-July) according to manufacture recommendations
Repair/Replacement of Boardwalk (frames and other metals parts)	Replacement/repair due to vandalism and/or damage	As needed
Repair/Replacement of cordwalk surface	Replacement/repair due to vandalism and/or damage	As needed
Maintenance of pervious pavers	Clean porous areas using a vacuum truck or other approved method.	Twice per beach season
Repair/Replacement of lighting along boardwalk, if needed	Replacement/repair due to vandalism and/or damage	As needed
Maintenance of wetland areas, survival and establishment	Maintenance of new vegetation, replacement of dead vegetation, removal of invasive species. Install fencing or other measures to protect plantings from pests, wildlife and humans.	Control as needed of non-native plants identified during pre-construction survey
Maintenance of shoreline vegetation, survival and establishment	Maintenance of new vegetation, replacement of dead vegetation, removal of invasive species. Install fencing or other measures to protect plantings from pests, wildlife and humans.	Control of invasive plants and weeds Water if rainfall is less than one inch per week Mulching as needed
Maintenance of lawn areas, survival and establishment	Replacement of dead/eroded sod/turf. Maintenance including mowing and watering as needed.	Treatment of perennial weeds as needed Repair of bare areas/erosion as needed
Maintenance of tree and shrub plantings, survival and establishment	Replacement of dead trees and shrubs. Maintenance during establishment period Install fencing or other measures to protect plantings from pests, wildlife and humans.	Mulching and fertilizer application as needed Water if rainfall is less than one inch per week Pruning damaged limbs as needed
Annual Site Inspection	Appendix 1	Annually at end of each beach season
5-year maintenance & monitoring status report (suggested)	One report issued to residents of the City of Superior (and accessible via the City's website) which will detail the status of maintenance & monitoring. It will also include *E. coli* results. Annual Site Inspection logs (Appendix 1)	Late Fall, At the end establishment period (2023)

Activity/Task	Description of Work	Frequency during Establishment Period
Beach grooming	Beach grooming done with a walk-behind groomer (SandMan 850) provided through grant funding	Once per week or as needed based on beach use and debris levels
Vault toilet maintenance	Ensure water level is maintained to control odor and detract flies from laying eggs	Monthly or as needed
	Pumping	Annually at the end of the beach season or as needed based on use.
	Winterization	Annually prior to freezing
Restroom cleaning, cleaning picnic tables and benches, trash removal, and maintenance of pet stations	Ensure all areas are clean and cleared of trash	Twice weekly
Clean solar panels on boardwalk lights	Ensure solar panels on lights are clean and cleared of debris	Monthly
Beach ice protection	Install snow fence along the beach to protect the sand from erosion	November installation and April removal
Maintenance of beach buoy/marker boundaries	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend
Waterfowl management – application of "Bionic Scarecrow"	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend

6 Long Term Operations & Maintenance

Long-term maintenance, in perpetuity, will continue to be the responsibility of the City of Superior's Parks, Recreation, and Forestry Department as long as the beach and restoration area is in use. The operations detailed in table 7 describe the activities in the for City of Superior Parks, Recreation, Forestry Department to follow once beach restoration has successfully been implemented and plantings have had a chance to establish. Completion of these actions ensures the success of the goals and objectives of this restoration project. It is suggested that the city inspect the site routinely to determine necessary maintenance of as needed activities detailed in table 7.

After 10 years (Dec. 31, 2029), it is suggested that the City of Superior's Parks, Recreation, and Forestry Department collaborate with WDNR and Douglas County Health Department to submit a brief final report of the restoration status to the public via the City's public website. This report would include a summary of the monitoring and maintenance activities the City conducted to maintain the restoration as well updates on the frequency of *E. coli* advisories. This report may also include an update of the survival, function, and viability of green infrastructure and habitat plantings as assessed though a final site inspection.

Table 7 Long Term Operations and Maintenance Operations and Frequency at which the City of Superior Parks, Recreation, and Forestry Department will perform the Activity

Activity/Task	Description of Work	Frequency during Long Term O&M
Routine site Inspection	Inspect site to determine needed November installation and April removal of Beach Ice Protection/Snow Fence Install snow fence along the beach to protect the sand from erosion	Annually
Beach nourishment	Replacement of up to 150 cubic yards of coarse sand (if needed) to maintain established grade (gradual slope) and defined berm crest	As needed. Assess need at beginning of year 10 (2029) beach season if has not been done.
Waterfowl management – application of goose deterrent on grassy areas	Flight Control Plus application	Twice per year, prior to pairing up (March – April) and after fledglings leave nest (mid-July) according to manufacture recommendations
Repair/Replacement of Boardwalk (frames and other metals parts)	Replacement/repair due to vandalism and/or damage	As needed
Repair/Replacement of cordwalk surface	Replacement/repair due to vandalism and/or damage	As needed
Maintenance of pervious pavers	Clean porous areas using a vacuum truck or other approved method.	As needed
Repair/Replacement of lighting along boardwalk, if needed	Replacement/repair due to vandalism and/or damage	As needed
Maintenance of wetland areas, lawn areas, shoreline vegetation, and tree and shrub plantings	Maintenance of vegetation: watering, trimming or mowing vegetation, removal of dead vegetation or weeds, removal of invasive or non-native species	As needed
10-year maintenance & monitoring status report (suggested)	Suggested Site Inspection, report issued to public which will detail the status of maintenance & monitoring, summary of *E. coli* results.	31 December 2029
Beach grooming	Beach grooming done with a walk-behind groomer (SandMan 850) provided through grant funding	Once per week or as needed based on beach use and debris levels
Vault toilet maintenance	Ensure water level is maintained to control odor and detract flies from laying eggs	Monthly or as needed

Activity/Task	Description of Work	Frequency during Long Term O&M
	Pumping	Annually at the end of the beach season or as needed based on use.
	Winterization	Annually prior to freezing
Restroom cleaning, cleaning picnic tables and benches, trash removal, and maintenance of pet stations	Ensure all areas are clean and cleared of trash	Twice weekly
Clean solar panels on boardwalk lights	Ensure solar panels on lights are clean and cleared of debris	Monthly
Maintenance of beach buoy/marker boundaries	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend
Waterfowl management – application of "Bionic Scarecrow"	Installation and removal	Installation prior to Memorial weekend and removal following Labor Day weekend

7 Summary

Following this monitoring and maintenance plan is vital to the success of the Barkers Island Beach Restotation Project. The plan provides a framework for the monitoring and maintenance procedures to take place during the warranty period, the establishment period and long term O&M. Verifying the initial survival and establishment of habitat plantings and the function, and the viability of green infrastructure will indicate early on, any problems that may prevent project success. Warranty period monitoring will be the responsibility of the Lake Superior Research Institute (LSRI; University of Wisconsin-Superior), while the contractor and City of Superior Parks, Recreation, and Forestry Department will be jointly responsible for warranty period site inspections and maintenance. Funding for long-term operation and maintenance will be the responsibility of the City of Superior's Parks, Recreation, and Forestry Department.

8 References

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Great Lakes Restoration Initiative (GLRI) Project Maintenance Framework (Draft November 2017)

National Engineering Handbook, Part 654, Chapter 16, (210-VI-August 2007)

APPENDIX 1: ROUTINE SITE AND STORM EVENT INSPECTION LOG

Project:	Barkers Island Beach Restoration	Client:	City of Superior Parks, Recreation, and Forestry Department
Consultant:		Phone:	
Contractor:		Phone:	
Date of Inspection:		Time of Inspection:	
Reason for Inspection (Circle):	Routine Inspection	OR	Storm Event Inspection
If Storm Event Inspection, Describe Event:	Precipitation in 24 Hours (in):		Wind Gusts (mph):

ALL DAMAGE AND OTHER MAINTENANCE ISSUES MUST BE PHOTOGRAPHICALLY DOCUMENTED
Description and Location of Damage, Foreign Materials, Debris: Photos taken? ☐ YES ☐ NO
Turf Cover and Condition: Photos taken? ☐ YES ☐ NO
Tree/Shrub Cover and Condition: Photos taken? ☐ YES ☐ NO
Non-Desirable Invasive Species Growth: Photos taken? ☐ YES ☐ NO
Erosion and Bare Areas: Photos taken? ☐ YES ☐ NO
General Condition of Finished Slopes/Beach Grade: Photos taken? ☐ YES ☐ NO

Project:	Barkers Island Beach Restoration	Client:	City of Superior Parks, Recreation, and Forestry Department
Consultant:		Phone:	
Contractor:		Phone:	
Date of Inspection:		Time of Inspection:	
Porous Paver: Photos taken? ☐ YES ☐ NO			
Vegetative Swale: Photos taken? ☐ YES ☐ NO			
Issues with Hydrology: Photos taken? ☐ YES ☐ NO			
Land Use Issues/Damage by Others: Photos taken? ☐ YES ☐ NO			
Describe Repair/Replacement Needs and Priorities:			
Estimated Cost of Repair and/or Removal:			
Describe Preventative Measures Needed:			

Project:	Barkers Island Beach Restoration	Client:	City of Superior Parks, Recreation, and Forestry Department
Consultant:		Phone:	
Contractor:		Phone:	
Date of Inspection:		Time of Inspection:	
Attach Inspection and Maintenance/Repair Activity Photos:			

Signature	Date

APPENDIX 2: Maintenance and Monitoring Schedule During Warranty Period, Establishment Period, and Operations Period, Organized by Responsible Party and Frequency

Maintenance and Monitoring Scheduled Activities During Warranty Period (01 May 2019 TO 12 July 2021) Organized by Responsible Party and Frequency

Responsible Party	Frequency	Activity/Task	M & M Plan Section for Reference
City of Superior Parks, Recreation, and Forestry Department	Twice weekly	Clean Restrooms, picnic tables and benches, Trash removal, and maintenance of pet stations	4.1 and 4.5
	Weekly	Mow established lawn areas	4.1 and 4.5
	Weekly	Groom beach with walk-behind groomer (SandMan 850) at least once per week or as needed based on beach use and debris levels	4.1 and 4.5
	Weekly; or as needed	Vault toilet maintenance; Ensure water level is maintained to control odor and detract flies from laying eggs	4.1 and 4.5
	Monthly	Ensure solar panels on lights are clean and cleared of debris	4.1 and 4.5
	Monthly; First Tuesday of month (May to October)	Call or meet on site to communicate maintenance needs and activities with involved parties	4.1
	Annually; Early Spring; April removal	Remove snow fence placed for protection from winter ice	4.1 and 4.5
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install beach buoy/marker boundaries	4.1 and 4.5
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install of “Bionic Scarecrow”prior to Memorial weekend for waterfowl management	4.1 and 4.5
	Annually; Early Fall: following Labor Day weekend	Remove beach buoy/marker boundaries	4.1 and 4.5
	Annually; Early Fall; following Labor Day	Pump vault toilets at the end of the beach season or as needed based on use.	4.1 and 4.5
	Annually; Early Fall; following Labor Day	Removal of “Bionic Scarecrow” at end of beach season following Labor Day weekend	4.1 and 4.5

	Annually; Mid Fall or prior to freezing	Winterize vault toilet	4.1 and 4.5
	Annually; Mid Fall	Annual maintenance status report; report issued to DNR detailing the status of maintenance responsible for.	4.7
	Annually; Early Fall or prior to freezing	Winterize vault toilet	4.1 and 4.5
	Annually; Late Fall; November installation	Install snow fence along the beach to protect the sand from erosion	4.1 and 4.5
Contractor	After all significant storm events	Inspect restoration area for damage within 24 hours of significant wind or rain storm and make repairs within 3 days.	4.4
	Weekly as needed; Water if rainfall is less than one inch per week	Water new plantings to ensure survival and establishment if rainfall is less than one inch per week; includes tree or shrub plantings, lawn/sod, wetland plantings, and shoreline plantings	4.1 and 4.5
	Monthly; First Tuesday of month (May to October)	Call or meet on site to communicate maintenance needs and activities with involved parties	4.1
	Annually; Early spring- First of four	Conduct routine site inspection and submit report to WDNR. Inspect "Bionic scarecrow" notify the City if repair is needed. Document any issues observed following ice-out, including loss of beach sand, shoreline erosion, presence of debris, and record any unscheduled repair/maintenance work needed.	4.3.1
	Annually; Early Spring or Mid Spring; First of two during beach season	Clean porous areas of pervious pavers using a vacuum truck or other approved method.	4.1 and 4.5
	Annually Early spring; First of two applications	Apply Flight Control Plus on grassy areas; for waterfowl management (First of two applications, prior to pairing)	4.1 and 4.5
	As needed; Per Site inspections	Replace/repair damaged boardwalk surface or other parts (Frames and other metal parts which have a lifetime manufacturer's warranty)	4.1 and 4.5
	As needed; Per Site inspections	Maintenance of lawn areas; Replace dead/eroded sod/turf following one-year nursery warranty. Maintain protection of plantings from pests, wildlife and humans. Treatment of perennial weeds	4.1 and 4.5
	As needed; per Site Inspections	Maintain shoreline vegetation during establishment period (ending Nov 30, 2020);	4.1 and 4.5

		Replace dead vegetation following one-year nursery warranty, maintain protection of plantings from pests, wildlife and humans, Control of invasive plants and weeds, Mulching as needed	
	As needed; per Site Inspections	Replace dead trees and shrubs following one-year nursery warranty. Maintain trees and shrub plantings during establishment period (ending Nov 30, 2020) Install, apply or conduct protection of plantings from pests, wildlife and humans, Apply mulch and/or fertilizer as needed, prune damaged limbs	4.1 and 4.5
	As needed; per Site Inspections	Repair/Replacement of lighting along boardwalk, if damaged	4.1 and 4.5
	As needed; per Site Inspections	Maintain wetland areas; Replace of dead vegetation following one-year nursery warranty. Maintenance during establishment period (ending Nov 30, 2020). Install, apply or conduct protection of plantings from pests, wildlife and humans, Control of non-native plants identified during pre-construction survey	4.1 and 4.5
	Annually; Late Spring; Second of Four	Conduct routine site inspection and submit report to WDNR. Inspect "Bionic scarecrow" notify the City if repair is needed. Document issues observed with hydrology (standing water in non-wetland areas), presence of debris, and record any unscheduled repair/maintenance work needed prior to the beach season.	4.3.1
	Annually; Late Spring; prior to Memorial Day	Rake in water swim area; Remove debris and swimming hazards present in the sediment via In water hand raking of the swimming area sediment up to six feet of water	4.1 and 4.5
	Once during two-year warranty period; As needed preferably Late Spring; Beginning of the 2020 beach season	Replacement of up to 150 cubic yards of coarse sand (if needed) to maintain established grade (gradual slope) and defined berm crest	4.1 and 4.5 4.1 and 4.5
	Annually; Mid Summer; Second of two cleanings	Clean porous areas of pervious pavers using a vacuum truck or other approved method.	4.1 and 4.5
	Annually; Mid Summer (mid-July)-Second of two	Apply Flight Control Plus on grassy areas; for waterfowl management (Second of two applications, after fledglings leave nest)	4.1 and 4.5

	applications during season		
	Annually; Late summer; Third or Four	Conduct routine site inspection and submit report to WDNR. Inspect "Bionic scarecrow" notify the City if repair is needed. Document conditions of structures and constructed/engineered features of the restored area, identify weeds/undesired vegetation, document the establishment of native and non-native plant species, and record any unscheduled repair/maintenance work needed.	4.3.1
	Annually; Early Fall or at the end of each beach season	Submit annual report to DNR detailing the status of maintenance activities for which the contractor is responsible for.	4.7
	Annually; Late fall; Last of Four	Conduct routine site inspection and submit report to WDNR. Inspect "Bionic scarecrow" notify the City if repair is needed. Determine what measures are needed to prevent issues identified in early spring and implement those measures, record any unscheduled repair/maintenance work needed.	4.3.1
Lake Superior Research Institute	Twice weekly; Memorial day to Labor day	*E. coli* monitoring	4.2.1
	Mid-summer; Annually during the growing season	Wetland monitoring	4.2.2
	Early Fall; Annually or at the end of each beach season	Submit annual report including *E. coli* and wetland monitoring results.	4.2.1, 4.2.2, 4.7

Operations and Maintenance Activities Scheduled During Establishment Period Organized by Responsible Party and Frequency (13 July 2021 to 12 July 2024)

Responsible Party	Frequency	Activity/Task	M & M Plan Section for Reference
City of Superior Parks, Recreation, and Forestry Department	Twice weekly	Clean Restrooms, picnic tables and benches, Trash removal, and maintenance of pet stations	5
	Weekly	Mow established lawn areas	5
	Weekly	Groom beach with walk-behind groomer (SandMan 850) at least once per week or as needed based on beach use and debris levels	5

	Weekly; or as needed	Vault toilet maintenance; Ensure water level is maintained to control odor and detract flies from laying eggs	5
	Weekly as needed; Water if rainfall is less than one inch per week	Water new plantings to ensure survival and establishment if rainfall is less than one inch per week; includes tree or shrub plantings, lawn/sod, wetland plantings, and shoreline plantings	5
	Monthly	Ensure solar panels on lights are clean and cleared of debris	5
	Annually; Early Spring; April removal	Remove snow fence placed for protection from winter ice	5
	Annually; Early Spring or Mid Spring; First of two during beach season	Clean porous areas of pervious pavers using a vacuum truck or other approved method.	5
	As needed; Early Spring Per suggested annual site inspections	Beach nourishment to maintain established grade (gradual slope) and defined berm crest of beach	5
	Annually Early spring; First of two applications	Apply Flight Control Plus on grassy areas; for waterfowl management (First of two applications, prior to pairing)	5
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install beach buoy/marker boundaries	5
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install of “Bionic Scarecrow” prior to Memorial weekend for waterfowl management	5
	Annually; Mid Summer (mid-July)- Second of two applications during season	Apply Flight Control Plus on grassy areas; for waterfowl management (Second of two applications, after fledglings leave nest)	5
	Annually; Mid Summer; Second of two cleanings	Clean porous areas of pervious pavers using a vacuum truck or other approved method.	5
	Annually; Early Fall: following Labor Day weekend	Remove beach buoy/marker boundaries	5
	Annually; Early Fall; following Labor Day	Pump vault toilets at the end of the beach season or as needed based on use.	5

	Annually; Early Fall; following Labor Day	Removal of "Bionic Scarecrow" at end of beach season following Labor Day weekend	5
	Annually; Mid Fall or prior to freezing	Winterize vault toilet	5
	Annually; Early Fall or prior to freezing	Winterize vault toilet	5
	Annually; Late Fall; November installation	Install snow fence along the beach to protect the sand from erosion	5
	Annually; Late Fall	Conduct annual site inspection update WDNR on the status of maintenance activities and restoration.	5
	As needed	Replace/repair damaged boardwalk surface (Frames and other metal parts which have a lifetime manufacturer's warranty)	5
	As needed	Repair/Replacement of lighting along boardwalk, if damaged	5
	As needed	Maintenance of lawn areas; Replace dead/eroded sod/turf following one-year nursery warranty. Install fencing to maintain protection of plantings from pests, wildlife and humans if needed. Treatment of perennial weeds	5
	As needed	Maintain shoreline vegetation; Replace dead vegetation. Maintain or install protection of plantings from pests, wildlife and humans, Control of invasive plants and weeds, Mulching as needed	5
	As needed	Replace dead trees and shrubs. Maintain tree and shrub plantings. Install, apply or conduct protection of plantings from pests, wildlife and humans, Apply mulch and/or fertilizer as needed, prune damaged limbs	5
	As needed	Maintain wetland areas; Replace of dead vegetation, Install, apply or conduct protection of plantings from pests, wildlife and humans, Control of non-native plants identified during pre-construction survey	5
	Once; Late Fall; At the end establishment period (2023)	One report issued to residents of the City of Superior (and accessible via the City's website) which will detail the status of maintenance & monitoring; including E. coli results and site Inspection results	5; Suggested

Long Term Operations and Maintenance Activities Organized by Responsible Party and Frequency (After 12 July 2024)

Responsible Party	Frequency	Activity/Task	M & M Plan Section for Reference
City of Superior Parks, Recreation, and Forestry Department	Twice weekly	Clean Restrooms, picnic tables and benches, Trash removal, and maintenance of pet stations	6
	Weekly	Mow established lawn areas	6
	Weekly	Groom beach with walk-behind groomer (SandMan 850) at least once per week or as needed based on beach use and debris levels	6
	Weekly; or as needed	Vault toilet maintenance; Ensure water level is maintained to control odor and detract flies from laying eggs	6
	Monthly	Ensure solar panels on lights are clean and cleared of debris	6
	Annually; Early Spring; April removal	If placed in fall, remove snow fence.	6
	As needed; suggested in Early Spring	Beach nourishment to maintain established grade (gradual slope) and defined berm crest of beach	6
	Annually Early spring; First of two applications	Apply Flight Control Plus on grassy areas; for waterfowl management (First of two applications, prior to pairing)	6
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install beach buoy/marker boundaries	6
	Annually; Late Spring; Before Memorial weekend (Beginning of beach season)	Install of “Bionic Scarecrow “prior to Memorial weekend for waterfowl management	6
	Annually; Mid Summer (mid-July)-Second of two applications during season	Apply Flight Control Plus on grassy areas; for waterfowl management (Second of two applications, after fledglings leave nest)	6
	Annually; Early Fall: following Labor Day weekend	Remove beach buoy/marker boundaries	6
	Annually; Early Fall; following Labor Day	Pump vault toilets at the end of the beach season or as needed based on use.	6
	Annually; Early Fall; following Labor Day	Removal of “Bionic Scarecrow” at end of beach season following Labor Day weekend	6

	Annually; Mid Fall or prior to freezing	Winterize vault toilet	6
	Annually; Late Fall; November installation if needed	Install snow fence along the beach to protect the sand from erosion	6
	As needed	Clean porous areas of pervious pavers using a vacuum truck or other approved method.	6
	As needed	Water plantings to if rainfall is less than one inch per week; includes tree or shrub plantings, lawn/sod, wetland plantings, and shoreline plantings	6
	As needed	Replace/repair damaged Boardwalk cordwalk surface (Frames and other metal parts which have a lifetime manufacturer's warranty)	6
	As needed	Repair/Replacement of lighting along boardwalk, if damaged	6
	As needed	Maintenance of lawn areas; Replace dead/eroded sod/turf following one-year nursery warranty. Install fencing to maintain protection of plantings from pests, wildlife and humans if needed. Treatment of perennial weeds	6
	As needed	Maintain shoreline vegetation; Replace dead vegetation. Maintain or install protection of plantings from pests, wildlife and humans, Control of invasive plants and weeds, Mulching as needed	6
	As needed	Replace dead trees and shrubs. Maintain trees and shrub plantings. Install, apply or conduct protection of plantings from pests, wildlife and humans, Apply mulch and/or fertilizer as needed, prune damaged limbs	6
	As needed	Maintain wetland areas; Replace of dead vegetation, Install, apply or conduct protection of plantings from pests, wildlife and humans, Control of non-native plants identified during pre-construction survey	6
	Annually; Late Fall	Conduct annual site inspection update WDNR on the status of maintenance activities and restoration.	6; Suggested
City of Superior Parks, Recreation, and Forestry	Once; 31 December 2029	Suggested Site Inspection, report issued to public which will detail the status of maintenance & monitoring, and success or restoration project	6; Suggested

Department with assistance from partners (WDNR, Douglas County Health, etc.)			

Barkers Island_Long Term MM Plan_12uly2019_

Final Audit Report 2019-08-26

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