

ENVIRONMENTAL, ACOUSTIC AND WATER QUALITY  
MONITORING  
FOR THE  
DEVELOPMENT OF THE ST. JOHN MARINA AND LONG-TERM  
MONITORING DURING OPERATIONS  
U.S. VIRGIN ISLANDS



PREPARED FOR

ST. JOHN MARINA  
THE YACHT CLUB AT SUMMERS END

PREPARED BY

BIOIMPACT, INC.  
P.O. BOX 132 KINGSHILL  
ST. CROIX, U.S. VIRGIN ISLANDS 00851  
[bioimpact@islands.vi](mailto:bioimpact@islands.vi), [Bioimpact.islands.vi@gmail.com](mailto:Bioimpact.islands.vi@gmail.com)

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## INTRODUCTION

The following is the proposed water quality and environmental monitoring program for the development of the St. John Marina in Coral Harbor, St. John, by the Summers End Group.

The proposed project involves direct impacts to the seabed through the installation pilings for the construction of a 144-slip marina. The marina has 44,316.7ft<sup>2</sup> of fixed docks and 28,274.4ft<sup>2</sup> of fixed finger piers, supported on 960 piles which will be driven (66 14" square concrete piles, 457 14" round concrete piles with steel shells and 437 18" round concrete piles with steel shells). The 14" square concrete piles are for 21 boat lifts which will be installed in the shoreward slips on the northern inner dock. The piles will first be driven with a vibratory hammer to set them in place and then an impact hammer will be used to seat the piles. It is estimated that each pile will require 200 strikes with the impact hammer and that 5 to 6 piles will be driven per day. This would result in 1000 to 1200 strikes a day. Pile driving should take approximately 192 days. A total of 12 moorings associated with the marina will be installed. The moorings will utilize helix anchoring systems with floated lines. No dredging or fill is proposed. Mangroves will be utilized to stabilize the shoreline and to create shoreline habitat.

In any marine construction, the potential for negative impacts to marine life and degradation of water quality exist. When sediments are suspended in the water column through bottom disturbance, these suspended sediments add to the turbidity of the water. The lowering of the transparency of seawater can greatly affect sessile marine organisms that rely on the transmission of the light for their existence. Settling sediments can also smother coral colonies and prevent larval sediment of reef organisms. There are coral colonized reefs close to the area which contain federally listed and federally nominated threatened and endangered species. Through careful planning and monitoring, such potential impacts can be minimized and abated.

Marine construction impacts the environment through the esonification of the water column through pile driving. The project is proposing impact pile driving therefore acoustic impacts will occur. In order to minimize acoustic impacts to species during any driving activities, bubble curtains will be installed and sea turtle and marine mammal monitoring will be implemented.

In order to help ensure that water quality is maintained this water quality monitoring program will be implemented during construction and throughout the operation of the marina. The monitoring plan will not only monitor potential construction impacts, but operational impacts throughout the life of the project. This plan will monitor turbidity and look at the effectiveness of the sedimentation control. If any degradation of water quality is detected immediate measures will be taken to abate those impacts. This plan will also monitor the benthic community adjacent to and within the potential impact area of the proposed project. The nearest ESA listed coral species which lie at the outer limits of Coral Harbor will be monitored throughout construction and operation of the marina.

YCSE is proposing to assist in the maintenance of BMPs which have been installed

throughout the watershed through federal and local grants and funding and is proposing to implement additional measures within their properties. To monitor the effectiveness of the BMPs and to monitor change within all of Coral Harbor this plan includes long term, Coral Harbor wide monitoring of water quality, sediments and the environment resources within the bay.

The purpose of this monitoring plan is to document any degradation in water quality or in the health of the benthic community and detail a course of action that can be immediately implemented to abate that degradation when negative changes are observed.

The monitoring program includes water quality monitoring, both during construction and long term, environmental monitoring of both benthic resources and monitoring for sea turtles and marine mammals during construction, and monitoring of sediment deposition and changes in sediment composition during construction and long term.

### **WATER QUALITY MONITORING**

Prior to the start of construction, a baseline of water quality conditions will be established. A total of 12 sampling location will be established in the project area and throughout the harbor. The monitoring samples will be placed in the areas most likely to be impacted by the project and to be impacted by upland runoff and other activities within the bay.

At each site, the turbidity expressed as NTUs, pH, dissolved oxygen, salinity and temperature will be sampled. Samples will be taken with a YSI multimeter which will be calibrated prior to sampling. The samples will be taken at a depth of 1 meter from the surface. Samples will be taken on a weekly basis for 2 months prior to the start of construction.

Baseline data will be used to compare with data collected during the construction project to help assess whether readings are a result of the construction project or are due to ambient conditions.

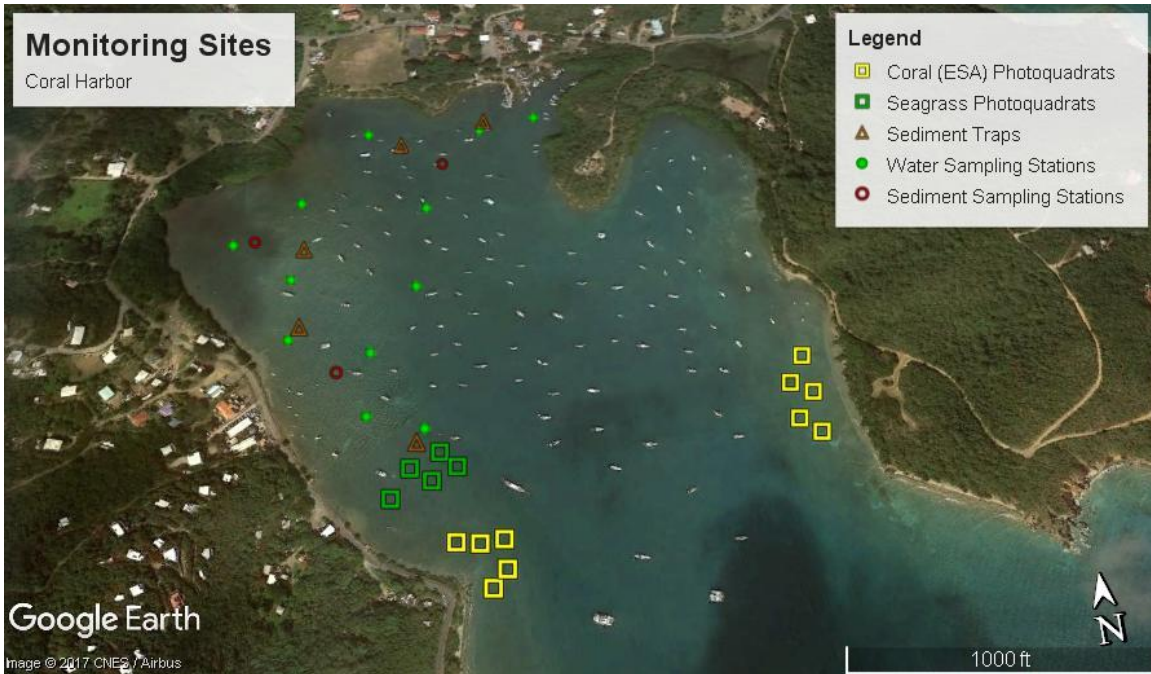


Figure 1: Water Quality and Environmental Monitoring Locations. The water sampling stations, proposed photoquadrats, sediment traps and sediment sampling stations are shown above.

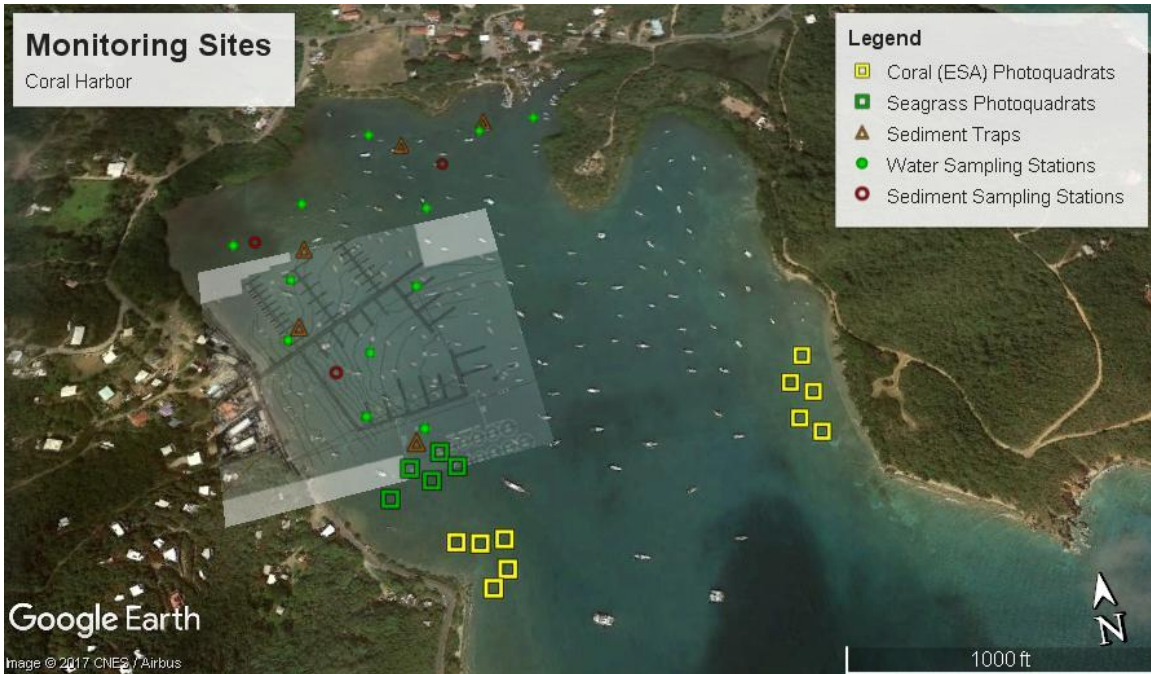


Figure 2. Sampling Stations in relationship with the marina.

**DURING CONSTRUCTION**

During construction 6 samples will be taken around the area of in-water work; these samples will be taken in a radial pattern around the area of work at a distance of 10

meters outside the turbidity booms. Samples will be taken 1 meter below the surface and will be analyzed a YSI Multi-meter for turbidity expressed as NTU, pH, dissolved oxygen, salinity and temperature. The other sampling points within the base will also be sampled

Baseline samples and samples remote from the construction activity will be utilized to determine if elevated readings are the result of sea conditions or the result of the construction activity.

Construction samples should be no more than 0.5NTU higher than the surrounding water quality.

Wind speed and direction, wave height and direction, and rainfall will be recorded at the time of sampling.

During construction if the water samples show NTUs readings in excess of 0.5NTU over background (as determined by remote samples), Department of Planning and Natural Resources (DPNR), the Division of Environmental Protection (DEP) U.S. Army Corps of Engineers (ACE), National Marine Fisheries Service (NMFS) and Summer's End Group (YCSE) will be notified, in writing. The baseline and remote samples will be utilized to determine if an increase in turbidity is a result of natural phenomena or if the monitoring sample is elevated above the ambient background as a result of the marina project. If it is determined that the elevated turbidity is the result of the marina project, the source of the problem will be identified and methods worked out to reduce suspended sediments. Someone must be on hand at the site at all times who has the authority to implement sediment control devices, so that problems can be solve or resolved by the monitor, Summer's End Group, DEP, COE, NMFS and DPNR.

If elevated readings are encountered the construction will stop and if any deficiencies in the deployed turbidity control are encountered they will need to be corrected. Construction may resume once turbidity has fallen to allowable levels. If there are no deficient in the deployed turbidity control, additional curtains will need to be or pile driving may need to be slowed or stopped. Work will have to stop until turbidities reach allowable levels before resuming. If the additional measures cannot be deployed which are adequate to control turbidity then in water work will have to be shut down every time readings become elevated over acceptable ranges and will only be able to resume once they have fallen back into acceptable ranges.

#### **POST CONSTRUCTION/LONG TERM**

Upon completion of construction sampling will continue on a weekly basis for two months and then will continue indefinitely throughout the life of the marina 4 times a year (quarterly) and after all rainfalls exceeding 1 inch as measured at the YCSE site. Reports will be delivered to the agencies after every quarterly sampling. Reports will document changes and if issues are seen that should be corrected.

#### **ENVIRONMENTAL MONITORING**

Fauna and flora that will be affected by the project shall be surveyed and monitored. They are the true indicators of the water's ability to sustain its existing residents.

Five permanently marked modified meter square photoquadrats will be established on the adjacent seagrass beds to the east which are within the area of potential impact of the construction project (Figure 1).

PVC stakes will be inserted into the substrate to serve as markers for the camera stand to insure the exact relocation of the photograph in repetitive samplings. Seagrass abundance and health will be assessed.

Ten coral quadrats will be established on the shallow reefs to the southeast of the project on the northern and southern sides of the harbor entrance. These will encompass ESA listed *Acropora*, *Orbicella* and *Dendrogyra* colonies located on these two shallow reefs.

The quadrats will be established and monitored monthly for a period of two months prior to the commencement of the project to establish a baseline.

#### DURING CONSTRUCTION

The photoquadrats will be monitored on a monthly basis during in-water work. All visible changes will be documented and reasons for these changes assessed. Photographs and detailed survey information containing the above listed parameters will be given to DPNR, DEP, ACE, NMFS and YCSE on a monthly basis.

#### POST CONSTRUCTION/ LONG TERM

Upon the completion of construction monitoring of the quadrat will continue for two months and then on a quarterly basis (4 times a year) for the duration of the monitoring program.

If at anytime any of the monitoring sites shows significant deterioration that does not appear to be natural phenomena, DPNR, DEP, ACE, NMFS and Summer's End Group will be immediately notified in order that remedial measures can be implemented to prevent future negative impacts. Within each quadrat the number and health of all benthic invertebrates such as sea cucumbers, anemones, urchins and mollusk will be assessed as part of the monitoring. If significant changes in numbers are noted the agencies will be immediately notified. If a deterioration of health of any of the organisms are noted the agencies will be notified immediately.

#### REPORTING OF DATA

In the event of any emergency or noted increase in any of the water quality parameters above the allowable limit, Summer's End Group, DPNR, NMFS ACE and DEP will be immediately notified by e-mail or by hand delivery. Weekly water quality reports will be delivered to the agencies. The photoquadrat reports will be delivered on a monthly basis to the agencies during construction and then on a quarterly basis. A report will be filed after the completion of all construction summarizing any impacts noted.



## ACOUSTIC IMPACTS

The project engineers have determined based on upland investigation and a review of the geology of the area that they will be able to use a vibratory hammer to set the piles, however it is probable that an impact hammer will be required to seat the piles. In order to minimize acoustic impacts to species during any driving activities, bubble curtains will be installed and sea turtle and marine mammal monitoring will be implemented. It is estimated that each pile will require 200 strikes with the impact hammer and that 5 to 6 piles should be driven per day. This would result in 1000 to 1200 strikes a day. Pile driving should take no more than 192 days.

US Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS), have developed threshold values, values that elicit some response from a target species, for making effect determinations for Endangered Species Act (ESA) listed species as follows:

- Detectability threshold (where the noise is detectable, but reactions are not observable).
- Alert and disturbance threshold (alert is where the noise has been identified by the target species, interest is shown; disturbance is where the target species shows avoidance of the noise by hiding, moving, or postponing feeding).
- Harassment/injury threshold (where the target species is actually injured).

NMFS's current thresholds for impulse noises (ex. impact pile driving) and non-impulse noises (ex. vibratory pile driving, dredging, etc.) for marine mammals are listed in the table below.

Criterion	Criterion Definition	Threshold
Level A	PTS (injury) conservatively based on TTS	190 dB <sub>rms</sub> for pinnipeds 180 dB <sub>rms</sub> for cetaceans
Level B	Behavioral disruption for <u>impulsive</u> noise (e.g., impact pile driving)	160 dB <sub>rms</sub>
Level B	Behavioral disruption for <u>non-pulse</u> noise (e.g., vibratory pile driving, drilling)	120* dB <sub>rms</sub>
<p>All decibels referenced to 1 micro Pascal (re: 1μPa). Note all thresholds are based off root mean square (rms) levels. * The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level.</p>		

Based on recommendations of the Fisheries Hydroacoustic Work Group (FHWG) in June of 2008, the current sound thresholds from impulse noises (such as pile driving) that cause injury to fish are:

- 206 dBPEAK
- 187 dB cSEL for fish > 2 grams
- 183 dB cSEL for fish < 2 grams

The threshold for behavioral impacts for all fish is 150 dBRMS (FHWG 2008).

The designation cSEL indicates the “sound exposure level in octave C”. The in-water sound energy from pile driving occurs at lower frequencies between 100 Hz and 1 kHz. Typical sound levels from a single strike on a pile or hammer can range from 208 dBPEAK to 220 dBPEAK (Reyff 2003). The in-water sound is affected by hammer equipment and material (steel), the size of the hammer, the geotechnical conditions (e.g. driving resistances), and the water depth. This level is within the range of NOAA’s predicted injury to whales and dolphins and injury to fish. If an attenuation system is used (e.g. bubble curtains or similar performing system), the in-water sounds produced by the hammer may be reduced.

Pile driving is required in order to seat the piles and it will create a significant sonification of the area. Bubble curtains will be installed around all pile driving.

## PROPOSED MINIMIZATION METHODS

The following measures will be implemented to minimize impacts to protected species of sea turtles, marine mammals and other marine organisms.

In order to minimize impacts on sea turtles and marine mammals a 500-meter protection zone will be established during pile driving.

Trained observers will be used to visually monitor the 500-meter safety zone for at least 30 minutes prior to beginning all noise creating in-water activities. A 500 meter safety zone includes all of Coral Harbor.

If at any time a sea turtle or marine mammal is observed in the safety zone the operation will be shut down until the animal has left the safety zone of its own volition.

Each time a pile driving hammer is started, dry-firing or ramping-up of the hammer will be conducted for at least 30 minutes to allow animals the opportunity to leave the area. Dry firing of a pile-driving hammer is a method of raising and dropping the hammer with no compression of the pistons, producing a lower-intensity sound than the full power of the hammer. Ramp-up involves slowly increasing the power of the hammer and noise produced over the ramp-up period. If bubble curtains will also be turned on at this time.

Observations for protected species will occur a throughout the day on all days when pile driving work is occurring to maintain watch for animals in the area. If at any time an animal is observed in the safety zone during the noise creating in-water activity, work shall cease until the animal has left the area of its own volition, or coordination with a DPNR representative has occurred, if the animal is injured. As part of the monitors job they will insure that all activities comply with NMFS's Sea Turtle and Smalltooth Sawfish Construction Conditions during all in-water work and that expanded safety zone monitoring is undertaken during pile-driving. NMFS's Sea Turtle and Smalltooth Sawfish Construction Conditions are attached herewith and are a part of the monitoring requirements.

Prior to the start of construction, a meeting will be held with all construction personal and these conditions will be explained and that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.



Records will be maintained of all sea turtle and marine mammal sightings in the area. This data will include; date and time, weather conditions, species identification if possible, approximate distance from the project area, direction and heading in relation to the project area, and behavioral observations. When animals are observed in the safety zone, additional information and corrective actions taken such as a shutdown of pile driving equipment, duration of the shut-down, behavior of the animal, and time spent in the safety zone will also be recorded. Reports will be provided to NMFS, ACE, and CZM on a monthly basis.

## SEDIMENT MONITORING

Five sediment traps will be placed through Coral Harbor in areas of potential sediment deposition. These will be double traps modeled after the methodology currently used the National Park Service in St. John with a cup at the sea floor (to catch moving existing sediment) and one located approximately 1 meter from the sea floor to catch newly introduced or in this case re-suspended or deposited sediment from the in-water work or runoff. The traps will be placed as shown in Figures 1. The traps will be deployed 2 months prior to the start of construction and will be sampled on a bi-weekly basis to establish a baseline to compare during project catchment.

## DURING CONSTRUCTION

Once in-water work begins traps will be sampled on a biweekly basis, to look for any increases. Trap yields within the construction area will be compare to those outside the immediate construction area to look for potential increases which maybe construction related or related to runoff from the project area.

Reports will be provided to NMFS, ACE, YCSE and CZM on a monthly basis. If yields are elevated above ambient catchment methods must be worked out to help abate the increase.

## POST CONSTRUCTON/ LONG TERM

Upon completion of the project sampling of the sediment traps will continue on a bi-weekly basis for a period of two months. The traps will be traded out for larger catchment traps and will be collected every quarter (4 times a year) to assess changes in deposition as a result of marine activity and from terrestrial sediment deposition. This information can be used to assess the success of the BMP within the watershed and can be used to help direct future improvements.

Reports will be provided to NMFS, ACE, DEP, CZM and YCSE on a quarterly basis.

## SEDIMENT SAMPLING

Three sediment collection locations have been identified within the bay. A set of samples will be collected prior to the beginning of construction an analyzed for grainsize, Total Petroleum Hydrocarbons (TPH), and heavy metals including lead and mercury. These will serve as a baseline of the current conditions. Samples will then be taken on a yearly basis to look at long term changes. Every 5 years samples will also be tested for Tributyltin (TBT) which can be found in bottom paints. No TBT was found in samples taken in 2017.

This information will be provided to the agencies on a yearly basis documenting the change. If degradation is found a meeting with the agencies should be held to determine steps that can abate or slow this impact.