



COUNTY COUNCIL OF BEAUFORT COUNTY

Beaufort County Zoning & Development

Multi Government Center • 100 Ribaut Road
Post Office Drawer 1228, Beaufort, SC 29901-1228
OFFICE (843) 255-2170
FAX (843) 255-9446

BEAUFORT COUNTY - ZONING BOARD OF APPEALS
APPLICATION FOR SPECIAL USE PERMIT

INSTRUCTIONS:

Please fill out this application form completely. Attach any pertinent materials that may help the board members to better understand your request, i.e. photos, maps, drawings, etc. Failure to follow these instructions may result in rejection of your application.

- 1. Property Owner Name: BAY POINT ISLAND LLC
Address: 611 BAY ST., BEAUFORT, SOUTH CAROLINA 29902
Home Phone: Work Phone: 843-524-7716
2. Applicant Name (if different): JOSH K. TILLER, PLA, ASLA (J.K. TILLER ASSOCIATES, INC.)
Address:
Home Phone: 843-815-4800 Work Phone:
3. Property Location: Tax District # Tax Map # Tax Parcel # Lot #
Street Address: 107 BAY POINT ISLAND DRIVE
4. Please state the reason for the Special Use Permit. (Attach additional sheets as needed):
ECOTOURISM- SEE ATTACHED SUBMITTAL PACKAGE
5. If request is for a non-conforming situation, please state how the nonconformities will be mitigated:
-NOT APPLICABLE-
6. Date the DRT granted approval/recommendations: PENDING THE MAY 5, 2020 SRT MEETING
7. Is the property restricted by recorded covenants that are contrary to or conflict with the requested permit activity?
( ) YES (X) NO

NOTE: THE BOARD MAY POSTPONE OR PROCEED TO DISPOSE OF THE MATTER ON THE AGENDA IN THE ABSENCE OF THE APPLICANT.

I hereby agree to abide by all conditions imposed by the County of Beaufort in the approval/disapproval of this appeal.

Signature of Applicant

JOSH K. TILLER, PLA, ASLA
Printed Name of Applicant

4/30/2020
Date



COUNTY COUNCIL OF BEAUFORT COUNTY  
**BEAUFORT COUNTY COMMUNITY  
DEVELOPMENT DIVISION**

Beaufort County Robert Smalls Complex  
Administration Building, 100 Ribaut Road, Room 115  
Post Office Drawer 1228, Beaufort SC 29901-1228  
Phone: (843) 255-2140 • FAX: (843) 255-9432

March 16, 2020

Mr. Art Krebs  
Luckett and Farley  
737 South 3rd Street  
Louisville, KY 40202

Dear Mr. Krebs:

We have reviewed the resubmitted documentation and the plan for Bay Point Island and have found that this information is in compliance with the definition of the Ecotourism use as provided in the Beaufort County Community Development Code. This decision is based upon the work and confirmation by Mr. Jon Bruno with the International Ecotourism Society that the proposal now complies with their standard and requirements for ecotourism. However, additional items and points of clarification should be added to the plan in regards to a summary of protection/management efforts for the various wildlife species on the island along with the full species list. We are requesting that this information be provided no later than March 27<sup>th</sup>.

This, in our opinion, alleviates the need for the continuation of the administrative appeal currently pending with the ZBOA and are requesting written confirmation of a withdrawal of that application/request if you all agree. This determination in no way should be construed as an approval of the use to be established on the island as that will still need Special Use review and approval by the ZBOA. In addition, additional information and documents may be requested as we continue to work through this issue.

I appreciate the cooperation by your team and look forward to our upcoming stakeholder meetings which are tentatively planned for the week of March 23<sup>rd</sup>.

If you have any questions, please contact me.

Sincerely,

Eric L. Greenway, AICP  
Community Development Department

cc: Hillary Austin, Zoning Administrator.

## **The International Ecotourism Society**

### **Bay Point Island Statement of Support**

**February 27, 2020**

Bay Point Island LLC has identified ecotourism as the type of tourism it most desires to implement, seeking thereby to preserve the natural resources of Bay Point Island while engendering respect for its culture and communities. The county of Beaufort, SC and the state of South Carolina have both moved to implement the principles of ecotourism to grow tourism revenue sustainably.

Bay Point Island LLC proposes to build an ecotourism lodging on a 50 acre portion of Bay Point Island, a private island it owns off the coast under the jurisdiction of Beaufort County, South Carolina.

Beaufort County allows certain development only as ecotourism under its rules, and uses our definition, that is, the definition of ecotourism of The International Ecotourism Society (TIES).

Having now had time to thoroughly study the plans, in consultation with several experts, and having visited Bay Point Island in the company of several sustainable development experts, further, having met extensively with and questioned the directors of this project, we can state definitively that the Bay Point Island development plan meets the definition of ecotourism as defined by TIES.

Ecotourism, as noted in both TIES' globally accepted definition and the Beaufort County code, does not preclude lodging. In fact, ecolodges and ecohotels and their amenities including wellness and food and beverage facilities are some of the key elements of ecotourism, especially in remote destinations, or in destinations where nature is fragile. Over 8% of TIES' global membership is comprised of lodging operators and owners, and in many cases it is their capacity that allows the possibility of ecotourism in surrounding areas.

We can also state that the directors of Bay Point Island have been completely transparent, and have offered any information we have requested readily.

As such, we would like to offer a point by point analysis of why the development plan for Bay Point Island, meets the definition of ecotourism.

#### **Analysis**

The primary definition of ecotourism is as follows:

“Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education” – TIES

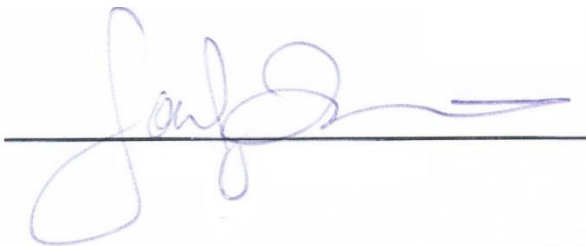
This definition is quoted by the New York Times, the Washington Post, USA Today, National Geographic, and the UN University. It is the most widely used globally because it is compact yet complete. It has guided implementation on every continent, including Antarctica, and in over 100 nations.

Under the Bay Point Plan, as it is being produced, there is a significant community education plan which offer free ecotourism certification education to any member of the county staff, the Gullah-Geechee community, the school system of Beaufort, and the tourism committee of Beaufort. Bay Point will also ensure that every employee that steps on Bay Point Island is fully certified by TIES, as will every director of Bay Point LLC. Further, Bay Point and TIES will hold community ecotourism workshops and custom workshops for county personnel. Bay Point Island will partner with local universities to assist ecotourism data gathering, and may locate an ecotourism institute on the property. Most importantly, Bay Point Island will educate each guest, expecting them to understand the importance of the local culture, and to foster strong cultural and environmental strength.

The economic effect of Bay Point Island will provide hundreds of direct jobs within the community, and hundreds more indirect jobs, all in a sustainable manner, with a fair wage and opportunities for education and growth. Bay Point Island has and will continue to cultivate relationships with locals to source local food, services, and ecotourism tours, providing jobs and revenue outside of guest spending which will benefit Beaufort as well. Through the mechanism of the Bay Point Foundation, which will enter full operation after the property is open and serving guests, Bay Point Island will donate to and support causes in the community.

Conservation of the Bay Point Island ecosystem is a key area in the Bay Point Island Plan. Each species has a support plan, and each species will be evaluated annually to assess success rates and numbers. No guests or employees will be allowed to adversely impact local fauna, and all employees will be trained in species habitats. Partnerships with local universities will ensure that student naturalists and conservationists are transparently assessing species health regularly.

For these reasons, it is our belief that Bay Point Island LLC intends to be a careful steward of Bay Point Island, and will, in partnership with Six Senses, interact with the community in a respectful and positive fashion. We look forward to seeing the growth and thriving of Loggerhead turtles, Sandpipers, and beautiful Live Oak trees, so iconic to South Carolina.



Jon Bruno, Executive Director, The International Ecotourism Society



Josh K. Tiller PLA,ASLA

## **Bay Point Species Conservation Outline**

**March 23, 2020**



Introduction and goals

Conservation and Management Strategy for Shorebirds

General Measures

Habitat Protection

Monitoring and Trend Analysis

Assessment

Species template

Data collection proposals

Guest management plan

Species BCC List

Map with IBA

## Introduction and goals

Bay Point Island is a part of the Atlantic Flyway, one of the most important migration paths for shorebirds in the United States. The Atlantic Flyway acts not only as a migration path, but as a wintering, moulting, and staging area for bird species of concern and critical species. "Though none of these endangered or threatened species are currently known to nest specifically on Bay Point Island, according to the USDI Fish and Wildlife Services, Official Species List (Attached), many bird species do interact with the islands around Bay Point Island. Piping Plovers *Charadrius melodus*, a threatened species, and American Oystercatchers, a bird of concern, among others, have been spotted around St. Helena, St. Philips, Fripp, and Hunting Islands.

As such, Bay Point Island LLC views the protection of the resources used by birds of every species as well as any other fauna, and the birds themselves, to be of critical importance to the proper maintenance of the island. It is the goal of the owners of Bay Point Island to duplicate the success they have had, in collaboration with SC DNR, with Loggerhead Turtles (See attached) with the shorebirds on the island, making sure that they are protected, that their habitats are secure and their ecosystems robust.

To this point, no definitive count of species population has been attempted for non-threatened species, but the plan is in place to change this by partnerships with local and regional naturalists, conservationists, and academic organizations. In the view of the owners of Bay Point Island, each species of shorebird, whether threatened or not, is an important and protected resident of the island, and has a right to the resources required to prosper.

Further, this initiative ties closely to education, since it is the plan to allow trained academics studying conservation and species propagation to study and assess the health of native species regularly, including implementation of conservation plans.

In addition, the ecotourism programs will include the opportunity for local children to be provided ecotour trips to the island and learn about the natural wonders of Bay Point Island and the best practices on conservation.

To do so, Bay Point LLC will partner specifically with universities and schools in the area and beyond. Each year Bay Point Foundation will allow scholars to access the protected areas which are usually off limits to guests, under a structured and managed visitors schedule, solely in order to verify that the habitats are thriving and healthy.

Initially, conservation best practices will dictate the management strategy, but over time, as species success rates are determined, additional strategies may be employed to make sure that each species which shares Bay Point Island has a strong chance to succeed.

Conservation and Management Strategy for Shorebirds

General Measures

- a. Educate all employees, contractors, and/or Island Guests of relevant rules and regulations that protect wildlife. Require certification of all employees and guides.
- b. Prohibit ANY physical interaction with birds (live or dead) or their parts (e.g., feathers) or nests unless activity is undertaken under the auspices of a certified professional.
- c. Provide enclosed solid waste receptacles at all guest areas to avoid unnecessary interaction and ingestion
- d. Minimize human presence near nesting birds
- e. Report any incidental take of a migratory bird to Resident Sustainability Director's office, who will then report such incidents to the South Carolina Department of Natural Resources.
- f. Prepare maintenance plans that outlines activities and schedules so that direct bird impacts do not occur.
- g. For temporary and permanent habitat restoration/enhancement, use only native and local (when possible) seed and plant stock.
- h. Prevent increase in lighting of native habitats during the bird breeding season.
- i. To the extent practicable, limit construction and maintenance activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.
- j. Restrict unauthorized access to natural areas adjacent to the project site by avoidance buffers to minimize foot traffic and off-road vehicle uses.

Habitat Protection

- a. Minimize habitat encroachment by clearly delineating and maintaining habitat boundaries (including staging areas).
- c. Maximize use of disturbed land for all project activities (i.e., siting and construction).
- d. Implement standard soil erosion and dust control measures.
  - i. Establish vegetation cover to stabilize soil
  - ii. Water bare soil to prevent wind erosion and dust issues

e. Schedule all vegetation removal, trimming, and grading of vegetated areas outside of the peak bird breeding season to the maximum extent practicable.

#### Interaction

Conduct assessments prior to scheduled activity to determine if active nests are present within the area of impact and buffer any nesting locations found during surveys.

1) Generally, the surveys should be conducted no more than five days prior to scheduled activity.

2) If active nests or breeding behavior (e.g., courtship, nest building, territorial defense, etc.) are detected during these surveys, no activities should be conducted until nestlings have fledged or the nest fails or breeding behaviors are no longer observed. If the activity must occur, establish a buffer zone around the nest and no activities will occur within that zone until nestlings have fledged and left the nest area.

f. Minimize collision risk with project infrastructure and vehicles.

g. Minimize collision risk with project infrastructure

h. Prevent the increase in noise above ambient levels during the nesting bird breeding season.

i. Prevent the introduction of chemicals contaminants into the environment.

j. Avoid contamination from runoff by limiting all equipment maintenance, staging laydown, and dispensing of fuel, oil, etc., to designated upland areas.

#### Monitoring and Trend Analysis

Initially, the plan is to perform synchronous complete counts of shore bird species each year in April every other year, the other year in December to obtain numbers, phenology and trends for top species.

Trends will be calculated and presented for the most common species. population. Species which only occur in low numbers or species which cannot be counted with sufficient representativeness will be excluded from the analyses, though every employee, contractor, or partner on the Island will be trained to take special care to recognize and record activities of birds of concern on the island. It is planned that sightings of activities of birds of concern be reported to the office of sustainability and to all partner NGOs through their preferred data gathering portals.



Analysis of trends will show which species are increasing, which species are stable and which species are decreasing.

#### Assessment

Assigned targets for birds on Bay Point Island, based on data collection partners, can be determined around the following metrics:

1. Stable or increasing numbers and distribution taking into account that abundance of species is in line with prevailing physiographic, geographic and climatic conditions.
2. Breeding success and survival determined by natural processes.
3. Breeding, feeding, moulting and roosting sites supporting a natural population.
4. Undisturbed connectivity between breeding, feeding, moulting and roosting sites.
5. Fluctuations in food stocks determined by natural processes.
6. Habitat, food stocks and connectivity between habitats supporting a favorable conservation status.
7. Managing invasive or predatory species

#### Data collection proposals

Bay Point Island proposes to collaborate with trained certified operators, academic institutions in the community and the regions, and NGOs focused on conservation and naturalists to gather conservation data, manage data, and make data available transparently to the community and the world. Through the Bay Point Island Foundation, partnerships for both on site counting, assessment, observation, and mitigation will take place in both the sustainable tourism areas and the protected areas of the Island.

The Bay Point Island Foundation proposes to make conservation data available through its website with each species counted and assessed annually represented by summarized population and health data per species, including, where possible, Atlantic Flyway shorebirds that may interact with the Island resources.

It is proposed that annual data collection will be assigned to certified operators and students who come to the Island through programs established with the Bay Point Island Foundation and their institutions, as well as partner NGOs. In addition, counting and assessment will be overseen and managed by the property sustainability manager.

Data collection will follow the a standardized platform, such as the Wadden Sea TMAP, where counts allow for habitat, nests, wintering, and resource use, as well as simple sightings. The data gathering will also follow established standards set by Audubon and Bird Life, and will focus on making those findings readily available to partners along the Atlantic Flyway.

#### Proposed Attributes and Ways in Which They Can Be Measured

Attribute	How attribute can be measured
abundance	complete counts, plot sampling, distance sampling, occupancy models
occurrence	plot sampling, occupancy models, indirect counts (hair traps, photo traps, etc.)
reproduction rate	complete counts or plot sampling to estimate: number of births/unit of time/average population
sex ratio	complete counts or plot sampling
survival rate	complete counts or plot sampling

How attribute could be measured complete counts, plot sampling, mark -recapture

#### Species template

Bay Point Island proposes to use the Audubon field guide as a model for species templates, adapted additionally for Bay Point Island resource use, for example:

#### Least Tern

*Sternula antillarum*

#### Conservation status

Several populations are endangered. On coasts, nesting areas often disturbed by beach-goers. On inland rivers, fluctuating water levels (from releases from major dams) often flood out nesting sites on sandbars.

Family: Gulls and Terns

#### Habitat

Sea beaches, bays, large rivers, salt flats. Along coast generally where sand beaches close to extensive shallow waters for feeding. Inland, found along rivers with broad exposed sandbars, lakes with salt flats nearby. In winter found along tropical coasts, sometimes well out to sea.

#### Feeding Behavior

Forages by flying over water, hovering, and plunging to catch prey just below water's surface. Sometimes dips down to take prey from surface of water or land, and may catch insects in flight.

#### Eggs

1-3, perhaps rarely more. Buff to pale green, blotched with black, brown, gray. Incubation is by both sexes; female may do more in early stages, male more later. In very hot weather, adult may dip into water and wet belly feathers to cool eggs. Incubation period 20-25 days. Young: Leave nest a few days after hatching, find places to hide nearby. Both parents feed young. Age at first flight about 19-20 days; young may remain with parents another 2-3 months. One brood per year, sometimes two in south.

#### Young

Leave nest a few days after hatching, find places to hide nearby. Both parents feed young. Age at first flight about 19-20 days; young may remain with parents another 2-3 months. One brood per year, sometimes two in south.

#### Diet

Fish, crustaceans, insects. Diet varies with season and location; mostly small fish, crustaceans, and insects, also some small mollusks and marine worms.

#### Nesting

Nests in colonies, sometimes in isolated pairs. In courtship, male (carrying fish in bill) flies upward, followed by female, then both glide down. On ground, displays include courtship feeding. Nest site is on open ground (or on gravel roof). Nest is shallow scrape, sometimes lined with pebbles, grass, debris.

<Possible example addendum>

BPI Resource Use: Unobserved

BPI Count: Unobserved

BPI 5 year progression: Unobserved

BPI Recommendation: None

### Guest Management Plan

The goal for Guest Management at Bay Point Island is to provide memorable Guest experiences reflecting the special qualities of the Island and the community, and to interpret those qualities, in a sustainable way, helping to conserve and enhance community resources for future generations. Such experiences will provide not only heightened Guest enjoyment, but will also increase awareness and understanding, thereby enhancing appreciation. Guest management therefore becomes a useful tool in the holistic management of the property, and should engender support for the Trust and its work. The key to sustainability requires an approach to management that embraces human and social values in harmony with the environment, and offers support to the wider communities and stakeholder interests.

The Guest experience begins before disembarking at the Bay Point Island entrance. Guest expectations are based on their understanding and knowledge of Bay Point Island, and the values they associate with the landscape. Expectations are also shaped through interaction with the BPI reception area, the employees, and through on site education. Marketing is a further crucial element that shapes Guest expectations, and which can be used to manage such expectations. In the spirit of an integrated approach, marketing is therefore a key component of this plan, even though it is dealt with under the separate education plan, attached to the wider proposal (see second submission)

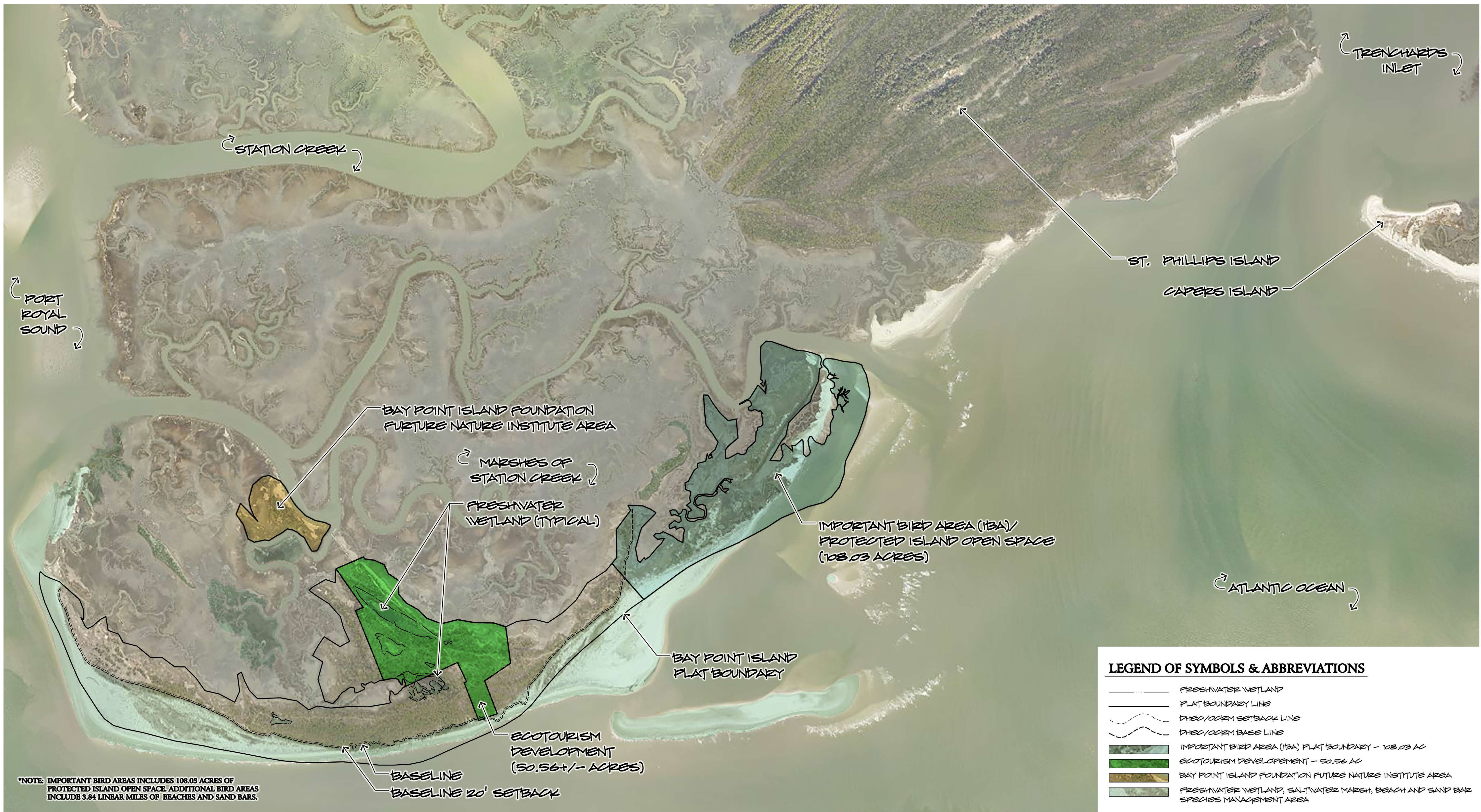
Guests can have a life changing experience on the Island. This would require that Guest time is used effectively to create opportunities for contemplation. An improved Guest experience would also require that all the supporting tourism infrastructure and facilities be in place and service standards are at the level required to support and enhance the Guest experience on the Island. Information about the Island, tour options and schedules are easily available and understandable. Guests will be offered a range of options for their visit to the Island. All the tours are well coordinated and supported by Guest management. All operators are certified. Continual monitoring and assessment take place, making it possible to plan ahead and adapt to changing Guest profiles and need in the context of effective conservation and ecotourism.

Interpretation and presentation of the full and varied narrative of Bay Point Island. This involves an improved offering of basic and expanded Guest information about the story of the Island and the wider area of Beaufort County on the ferries to prepare Guests for their arrival. Proposed educational programs that allow larger numbers of high school students to visit the Island, and the development of interpretative materials aimed at school students of different

ages. A partnership with local and regional NGOs and academic institutions will allow the possibility of internship programs and student research with the objective of strengthening understanding and appreciation of the Island. A diversified set of tour options, which includes interpretative routes focusing on the natural and cultural settings in Beaufort County, and the surrounding islands and areas.

Guest management on Bay Point Island will additionally require a different approach in certain areas of the Island, depending on their characteristics; the level of Guest use; the overall emphasis of management associated with distinct areas; which in turn will influence the activities that are appropriate. As of now, three Guest Management Zones are identified:

- The human habitat area - This is the area where guests will sleep, dine, interact with potential services. The area is roughly 50 acres and is the primary human habitat
- The sustainable guest interaction area – this is the area of managed interaction, with certified employees and operators able to assist guests with conservation objectives and activities.
- The Important Bird Area – this area is protected to guests and is allowed for buffered viewing only with certified professionals accompanying guests



\*NOTE: IMPORTANT BIRD AREAS INCLUDES 108.03 ACRES OF PROTECTED ISLAND OPEN SPACE. ADDITIONAL BIRD AREAS INCLUDE 3.84 LINEAR MILES OF BEACHES AND SAND BARS.

**LEGEND OF SYMBOLS & ABBREVIATIONS**

- FRESHWATER WETLAND
- FLAT BOUNDARY LINE
- DHEC/OCRM SETBACK LINE
- DHEC/OCRM BASE LINE
- IMPORTANT BIRD AREA (IBA) FLAT BOUNDARY - 108.03 AC
- ECOTOURISM DEVELOPMENT - 50.56 AC
- BAY POINT ISLAND FOUNDATION FUTURE NATURE INSTITUTE AREA
- FRESHWATER WETLAND, SALTWATER MARSH, BEACH AND SAND BAR SPECIES MANAGEMENT AREA

PREPARED FOR:  
BAY POINT ISLAND, LLC

PREPARED BY:  
**J. K. TILLER ASSOCIATES, INC.**  
LAND PLANNING | LANDSCAPE ARCHITECTURE  
181 BLUFFTON ROAD, SUITE 2203 | BLUFFTON, SC 29910  
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**Luckett & Farley**  
Architecture | Engineering | Interior Design

**ATM** DESIGN ENGINEERING CONSULTING  
APPLIED TECHNOLOGY & MANAGEMENT, INC.

**BAY POINT ISLAND FOUNDATION VICINITY MAP**  
BEAUFORT COUNTY, SOUTH CAROLINA



APRIL 29, 2020

GRAPHIC SCALE

NORTH

THIS IS A CONCEPTUAL PLAN AND IS SUBJECT TO CHANGE. ALL SURVEY INFORMATION AND SITE BOUNDARIES WERE COMPILED FROM A VARIETY OF UNVERIFIED SOURCES AT VARIOUS TIMES AND AS SUCH ARE INTENDED TO BE USED ONLY AS A GUIDE. ALL PROPERTY LINES, TRACT DIMENSIONS AND NARRATIVE DESCRIPTIONS ARE FOR GRAPHIC REPRESENTATION ONLY, AS AN AID TO SITE LOCATION AND POTENTIAL LAND USE, AND ARE NOT LEGAL REPRESENTATIONS AS TO FUTURE USES OR LOCATIONS. J. K. TILLER ASSOCIATES, INC. ASSUMES NO LIABILITY FOR ITS ACCURACY OR STATE OF COMPLETION, OR FOR ANY DECISIONS (REQUIRING ACCURACY) WHICH THE USER MAY MAKE BASED ON THIS INFORMATION.

# Bay Point Island SC DNR Loggerhead Turtle Monitoring Results

According to the South Carolina Ecological Services only one endangered species is found wholly or partial within our project habitat, The Loggerhead Sea Turtle (*Carreta carreta*)



## Sea Turtle Nest Monitoring System

Nesting News

### South Carolina DNR Sea Turtle Conservation Program

Bay Point Island

#### Beach Description



DNR

dunes.

Bay Point Island is a small barrier island on the north side of Port Royal Sound. The 4.8 km beach fronting the sound is backed by a wide dune field, while the ocean-facing beach is littered with fallen trees. Including side beaches, there are 4.8 km of accessible nesting habitat on this privately owned island. Nesting habitat is forming on the Port Royal Sound side of the island. There is one primitive cabin on the ocean facing section of Bay Point beach. During certain seasons of the year, huge mats of dead cord grass (*Spartina alterniflora*) wash ashore creating a thick rock line at the base of the dunes, sometimes preventing nesting turtles from accessing the dunes.



Year 2012

The data presented here should be considered preliminary in nature. All data, figures and maps on this website remain copyright of the project coordinators and may not be used or referenced without the explicit written consent of the data owners.

#### Summary What does this mean?

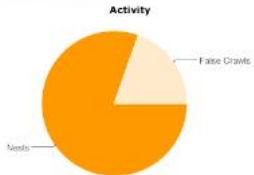
DNA Samples Assigned: 78 (95.1%)  
 Unique Females: 47 (analysis incomplete)  
 Nests: 82  
 In Situ: 82  
 Lost: 76 (92.6%)  
 Unknown: 6  
 False Crawls: 20

Estimated Eggs to Date: 60  
 Eggs Lost: 60 (100%)

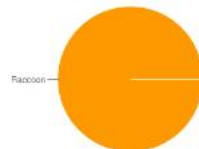
Mean Hatch Success: 0%  
 Mean Emergence Success: 0%  
 Beach Success: 80.3%

Last Updated: 2016-06-20 11:55:48 (1353.2 days ago)

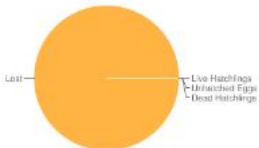
Hover mouse over each chart for a description.



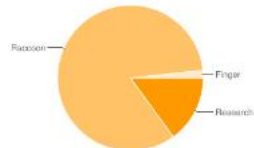
#### Significant Nest Losses



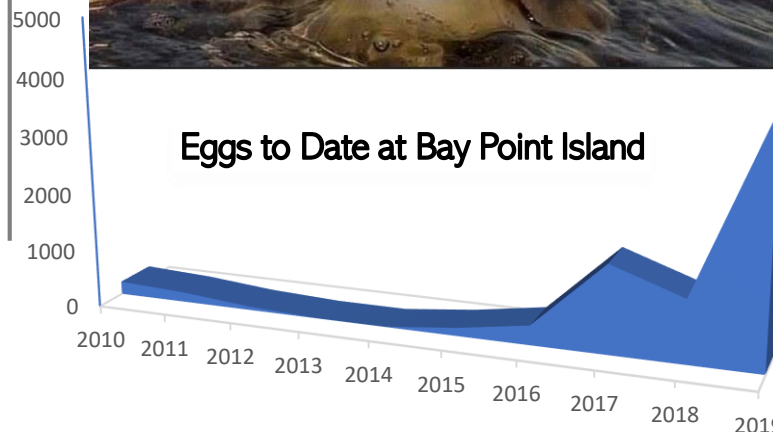
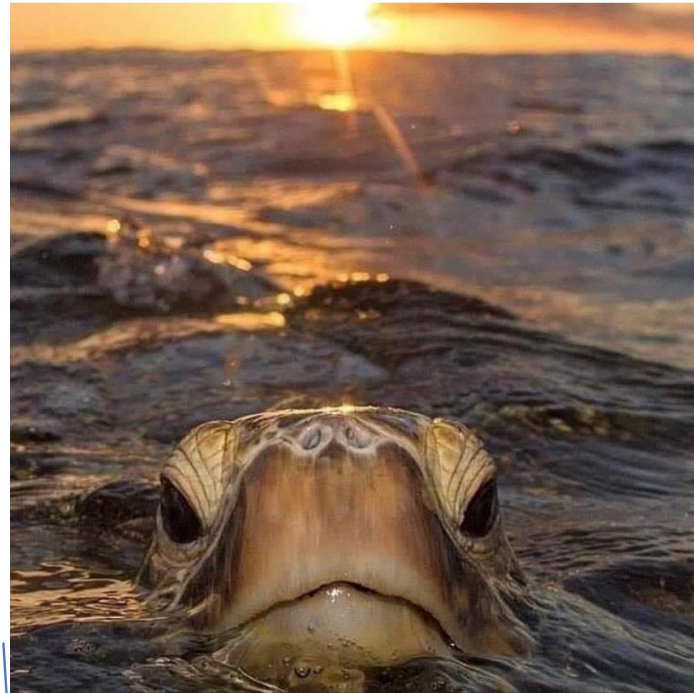
#### Egg Status



#### Egg Losses



Species	Nests	False Crawls
Loggerhead	82	7



There is no Conservation without Stewardship!



## Sea Turtle Nest Monitoring System

Nesting News

### South Carolina DNR Sea Turtle Conservation Program

Bay Point Island

#### Beach Description



DNR

dunes.



Year 2019

The data presented here should be considered preliminary in nature. All data, figures and maps on this website remain copyright of the project coordinators and may not be used or referenced without the explicit written consent of the data owners.

#### Summary What does this mean?

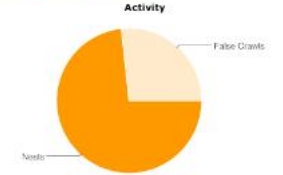
DNA Samples Assigned: 82 (76.6%)  
 Unique Females: 47 (analysis incomplete)  
 Nests: 107  
 In Situ: 105  
 Relocated: 2 (1.8%)  
 Inventoried: 40 (37.3%)  
 Lost: 58 (54.2%)  
 Unknown: 9  
 False Crawls: 39

Estimated Eggs to Date: 4191  
 Eggs Lost: 274 (6.5%)  
 Hatched Eggs: 2212  
 Emerged Hatchlings: 2085  
 Mean Clutch Count: 73.5 eggs (Relocated Only)

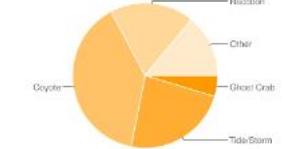
Mean Hatch Success: 30.4%  
 Mean Emergence Success: 19%  
 Nest Success: 30.4%  
 Beach Success: 73.2%

Last Updated: 2020-02-03 14:45:17 (30 days ago)

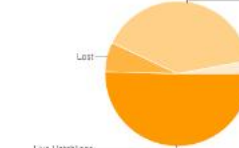
Hover mouse over each chart for a description.



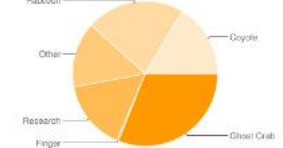
#### Significant Nest Losses



#### Egg Status



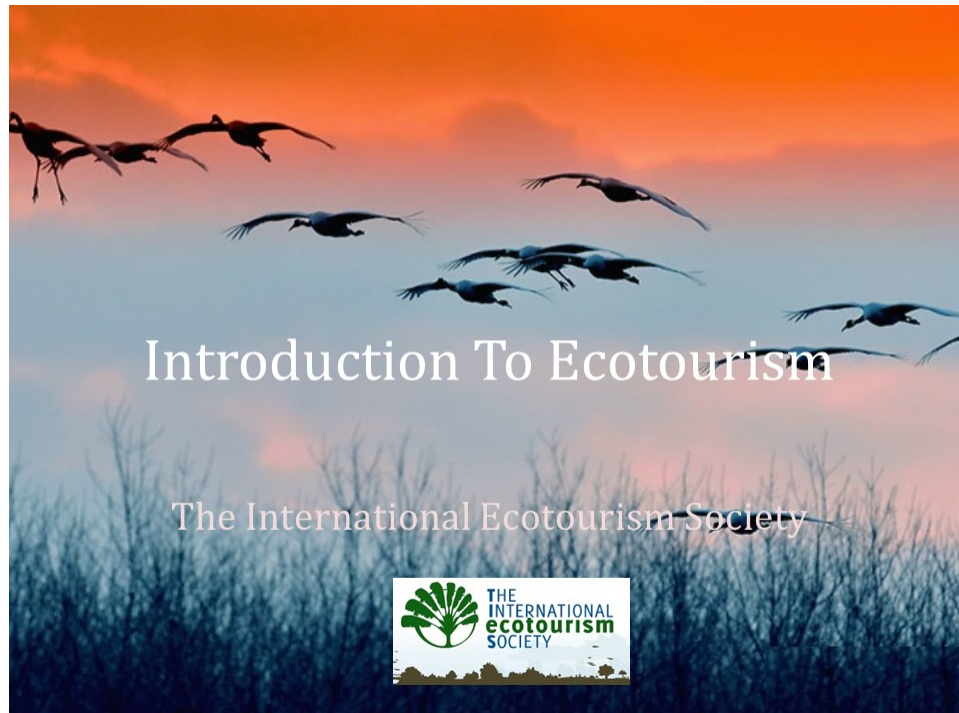
#### Egg Losses



Species	Nests	False Crawls
Loggerhead	107	39

## Bay Point Ecotourism Education Plan

March 7, 2020



Bay Point Island LLC has identified ecotourism as the type of tourism it most desires to implement, seeking thereby to preserve the natural resources of Bay Point Island while engendering respect for its culture and communities. The county of Beaufort, SC and the state of South Carolina have both moved to implement the principles of ecotourism to grow tourism revenue sustainably.

In tandem with this initiative, Bay Point Island LLC wishes to train and build capacity for implementation and management of ecotourism within its property and the surrounding areas, and to meaningfully and positively interact with the Beaufort community. As such, Bay Point Island LLC will offer one or more community ecotourism training workshops to the general community, and will offer customized workshops to specific persons, among them the directors of local and state policy and government, local tourism operators, members of local communities, community children, and client facing service providers of tourism services.

Bay Point LLC hopes to train these community members to the standard of ecotourism certification provided by The International Ecotourism Society (TIES). This training can include seminars, workshops, group classes, and online classes.



We believe that this will give Bay Point Island and Beaufort a solid grounding in ecotourism implementation and management and allow current initiatives to succeed now and maintain success over time.

Under the Bay Point Plan, as it is being produced, there is a significant community education plan which offer free of charge ecotourism certification education to any member of the county staff, the Gullah-Geechee community, the school system of Beaufort, and the tourism committee of Beaufort. Bay Point will also ensure that every employee that steps on Bay Point Island is fully certified by TIES, as will every director of Bay Point LLC. Further, Bay Point and TIES hopes to hold community ecotourism workshops and custom workshops for county personnel. Bay Point Island will seek partnerships with local universities to assist ecotourism data gathering and may locate an ecotourism institute on the property. Most importantly, Bay Point Island plans to educate each guest, expecting them to understand the importance of the local culture, and to foster strong cultural and environmental strength.

## **Bay Point Island Education Offerings**

### **Directors/Employees**

All Directors and employees of Bay Point LLC will be required to hold & maintain TIES core certification. In addition, all employees will be expected to be familiar with Island flora and fauna, their habitats, and their life patterns. New employees will immediately begin TIES core certification classes to be completed within a period of months.

Further, employees will receive training to understand how to introduce sustainability, a key ecotravelers metric, into all aspects of visitor response and marketing, to create a positive word of mouth for Bay Point Island, Six Senses, Beaufort County, and South Carolina. The courses to be used are curated and maintained by The International Ecotourism Society to the highest standards, updated frequently to the latest data, and delivered via asynchronous online platform designed to fit in with a professional schedule.

### **Guests**

All guests of Bay Point Island LLC will be introduced to a short introduction course on the principles of ecotourism for ecotravelers prepared especially for this purpose by TIES. In addition, all guests will be made aware (in advance before arriving to the ecotourism destination) of protected areas on Bay Point island so that they will not disturb or impact any Bay Point Island species. At all times guests will have access to a TIES certified professional employee who will be able to answer questions about ecotourism and wildlife habitats.

### **County Staff**

Any staff members of Beaufort County or the town of Beaufort, South Carolina may avail themselves of the TIES course "Introduction to Ecotourism" at any time. This is not being provided by Bay Point Island LLC but by The International Ecotourism Society itself.

**Beaufort County School Children**

Any child in any school in Beaufort County— whether public or private may avail themselves of the TIES course “Introduction to Ecotourism” at any time. This is not being sponsored by Bay Point LLC but by The International Ecotourism Society itself.

**The Gullah-Geechee Community**

Bay Point foundation will seek partnership with the Penn Center and will offer ties coursework to members of the Gullah-Geechee community and other members of the St Helena area community. The Bay Point foundation will further offer lectures on environmentalism, conservation, ecotourism, and cultural heritage at the Beaufort County Library system on a regular basis.

**Vendors**

Vendors to Bay Point Island will be encouraged to complete TIES course “Introduction to Ecotourism” to further their understanding of Bay Point Island’s operating principles, and to encourage respect and care for both the island and the community.

**Community Partners**

Bay Point Island is exploring partnering with the Penn Center to collaborate and offer specific cultural heritage classes and environmental heritage classes to the community and tours of the Penn center to guests.

**Academic Partners**

Bay Point Island will seek to partner with local universities to allow student naturalists, environmental scientists, and tourism students to participate in data gathering, ecotourism operation, sustainable practices, and habitat management under their ecotourism continuous programs.

**Periodic Seminars, Talks and Classes**

Bay Point Island plans to hold periodic seminars, talks, and workshops cultural heritage in the community and sustainable practices in partnership with the Beaufort County Library system, to invite community members to hear from naturalists, conservationists, ecotour providers, attraction owners, and sustainable organizations.

## **Six Senses Bay Point Island | Sustainability + Ecotourism Narrative**

This narrative is submitted to the Beaufort County Planning Department and Zoning Board of Appeals to describe the nature and scope of the development of a portion of Bay Point Island and how our requested use of “Ecotourism” meets the requirements as outlined in the Beaufort County Community Code.

The applicant, Bay Point Island LLC, is the owner of the island and requests the Ecotourism use to develop a Six Senses ecologically based travel destination. The Ecotourism site occupies nine (9) parcels of the fifty-one (51) total parcels located on Bay Point Island. These nine parcels include: R300 045 000 0013 0000; R300 045 000 0009 0000; R300 045 000 0011 0000; R300 045 000 0012 0000; R300 045 000 0044 0000; R300 045 000 0039 0000; R300 045 000 0040 0000; R300 045 000 0046 0000; and R300 045 000 0048 0000. These nine parcels have been combined through an exempt plat to create one proposed Ecotourism parcel equaling 50.56 Acres. The Bay Point Island is located generally north of Hilton Head Island, south of St. Helena Island, and southwest of St. Phillips Island. Bay Point is bounded on the North by Morse Island Creek; on the East by the Trenchard’s Inlet; on the South and Southeast by the Atlantic Ocean; and on the West by the Port Royal Sound.

### **DEFINING ECOTOURISM**

The International Ecotourism Society (TIES) is the oldest and largest ecotourism society in the world. TIES defines Ecotourism as “responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education”.

Ecotourism is about uniting conservation, communities, and sustainable travel. This means that those who implement, participate in and market ecotourism activities should adopt the following ecotourism principles:

- Minimize physical, social, behavioral, and psychological impacts.
- Build environmental and cultural awareness and respect.
- Provide positive experiences for both visitors and hosts.
- Provide direct financial benefits for conservation.
- Generate financial benefits for both local people and private industry.

- Deliver memorable interpretative experiences to visitors that help raise sensitivity to host countries' political, environmental, and social climates.
- Design, construct and operate low-impact facilities.
- Recognize the rights and spiritual beliefs of the Indigenous People in your community and work in partnership with them to create empowerment.

Offering market-linked long-term solutions, ecotourism provides effective economic incentives for conserving and enhancing bio-cultural diversity and helps protect the natural and cultural heritage of our beautiful planet.

By increasing local capacity building and employment opportunities, ecotourism is an effective vehicle for empowering local communities around the world to fight against poverty and to achieve sustainable development.

With an emphasis on enriching personal experiences and environmental awareness through interpretation, ecotourism promotes greater understanding and appreciation for nature, local society, and culture.

The following outlines how this application for a conditional approval of the Ecotourism use not only meets the standards of the Beaufort County Community Code for Ecotourism, but also meets the standard of TIES.

### **BAY POINT ISLAND BACKGROUND**

There is little positive evidence of prehistoric or historic settlement on Bay Point Island.

Bay Point Island was first granted during the Provincial period to a certain Richard Capers in 1735. The property was surveyed by John Fripp which constituted a plat that was certified on April 10, 1732. The property was owned by the Capers and later by William Chapman a tanner from Charlestown. After Chapman's death, his stepson, Richard Capers continued the tanning operation and ownership of the island. The island was used to run cattle for the operation. Capers later leased the island to James Dawkins of Jamaica for cattle operations, it was estimated.

Bay Point was first used as a military lookout for surprise attacks starting in the late 1600s. These watches guarded the entrance to the Port Royal Sound until they were abandoned before 1757.

In 1755, Richard Capers willed the island to his son Joseph and daughter Mary Adams. It's unknown when the island next changed hands. Joseph Jenkins, a planter on St. Helena, possessed the island before 1770, when he willed the island to his son, Joseph Jenkins, Jr. For a while, the Bay Point Island was known as Jenkins Island. In 1775, Jenkins Jr., a delegate to the first Provincial Congress and executive member of the Council of Safety, decided to erect new lookouts on the island. In 1776, all livestock and lookouts were removed from Bay Point, and most of all the other barrier islands of South Carolina, due to concerns of Brigadier General Howe that the enemy might take possession.

There is very little information on Bay Point Island after the Revolutionary War, other than map records. By the early 1800s, a small summer retreat was established at Bay Point after a yellow fever epidemic that hit Beaufort. By that time, the families of Thomas Chaplin, Elliots, Barnwells and others used the island as a retreat, indicating there were numerous permanent structures present. It was fondly known then as a typical Antebellum period retreat of a cluster of simple timber framed cottages as recorded by Union forces that took control of the island in 1861.

In the mid-1840s, William Elliot was known to host "incidents of Devil-fishing" in the mouth of the Port Royal Sound. The expeditions ended and began at Bay Point Island. The area around Bay Point had some of the best fishing in the area. In one of the devil-fish excursions, Elliot was joined by local planters, Rhett, Cuthbert, Barwell(s), Means, Heyward, and Mongin in which they landed seven devil-fish by harpoon, including one that measured seventeen feet across.

Prior to the Civil War, the island was known as a beach retreat. Dr. John Archibald Johnson recounts this fact and the sorrow felt by locals as the area transformed into a battlefield as locals fled the area to avoid the incoming invasion of the Union Army.

In the early part of 1861, Fort Beauregard was erected by the Confederate army on the south end of Bay Point Island. Fort Beauregard had four faces, with mounted guns; each faced looked on the water and each gun was mounted to view the water approach to the Broad and Beaufort Rivers. Fort Walker was erected on the north end of Hilton Head Island. The two forts

combined to guard the mouth of the Port Royal Sound. Soldiers sent to Bay Point for picket duty, coveted the opportunity, since the island was known locally as a “favorite seashore retreat of the citizens”. The island hosted up to 80 men for duty, with quarters and barracks for officers and men.

On November 5, 1861, the Union naval forces fired a shot at the fort and blew away the colors of the Beaufort Volunteers. Within days, Bay Point’s garrison was evacuated, as was Beaufort’s white population. The surrounding sea islands were soon abandoned by the plantation owners. Upon taking control of the fort, the Union army renamed it Fort Seward. By 1862, the fort was refitted, a dock and railway were erected at the south end of the main fort. A survey suggests Bay Point was considered for or had already become a coaling station. To the north, Station Creek was the anchorage for a floating naval machine shop. Fort Beauregard later disappeared into the Port Royal Sound in the late 19<sup>th</sup> or early 20<sup>th</sup> century.

After military occupation, Bay Point came under ownership of D. Scott Eddings in 1880. He later conveyed the property to Sula S. Brown, then S. W. Dingle acquired interest, but was unable to retain the property and was seized and sold to pay for delinquent taxes in 1888. It was at that time that A. E. Heighway purchased the property. In 1894, Virginia Broadwell purchased Bay Point from Heighway and later sold it to Edward T. Weeks at the end of the following year. The 20<sup>th</sup> century saw multiple changes in ownership and was absorbed into the McLeod Estates in 1963.

During the early 1920s, Bay Point Island regained its retreat status as a favorite destination for excursions. This included a Beaufort Gazette article describing a steamboat trip taken to the island for a party of young Beaufortonians. The island housed early “glamping” parties that would last a week or more. An old country house was also available for special events on the island.

## **CURRENT ENTITLEMENTS**

As recorded on October 20, 2010, Bay Point Island was purchased by Bay Point Island, LLC (Applicant) from Summit-Bay Pointe, Inc. A decade earlier, the island had been subdivided into 51 lots, including one 108.03 Acre “Community Area” for undeveloped open space. The remaining lots averaged about 5 acres per parcel for a single family development, as allowed

per the current ordinance. Bay Point Island is currently zoned Natural Preserve (T1) Zone, which allows the Ecotourism use on a conditional basis. In addition, Bay Point is governed by the Bay Point Island Declaration of Codes, Covenants, and Easements, which were recorded February 25, 2011.

**THE PROPOSAL FOR ECOTOURISM: Meeting the Standards outlined in the Beaufort County Community Code (4.1.330- Ecotourism)**

The applicant strongly believes that the most responsible way to preserve the unique environmental character of the island is as an ecologically based travel destination, as allowed under the Ecotourism special use.

This following will define the proposed concept plan's compliance with the Ecotourism use as outlined in the Community Development Code for Beaufort County. These requirements for Ecotourism use include the following (Including the applicant's responses to each Ecotourism requirement):

*4.1.330.A. Applications shall include a site plan whose design incorporates the building, structures, and amenities into the natural and scenic qualities of the area in a complimentary fashion.*

APPLICANT RESPONSE:

Please see the attached Bay Point Island Conceptual Plan: Ecotourism. As demonstrated, these small villas are pulled away from the shore line and tucked under the tree line. All structures are gently placed on the land in an effort to be nature blending and avoid impacting any existing specimen trees. The structures are modular and constructed on piles in order to have the smallest footprint possible and will be constructed off-site in order to ensure minimum disturbance to the site during the construction period. In addition, all existing roads will be utilized, any new pathways will be raised above the forest floors with minimal impact to the ground plane. Special care will be made to avoid removing any trees, including the need for field adjustments prior to erecting the buildings/boardwalks to avoid impacting trees.

*4.1.330.B. An operational plan shall indicate that this use will enhance the ecotourism experience of intended users in regard to the related wilderness setting, interpretive educational programs, wildlife viewing opportunities, outdoor activities, parks/protected areas, and/or cultural experiences.*

APPLICANT RESPONSE:

Introduction to Six Senses and Six Senses Sustainable Operations:

The proposed development on Bay Point Island would be operated by Six Senses. Six Senses is a global luxury ecological travel destination operated and based in Bangkok, Thailand. Their brand is deeply rooted in sustainability whereby it is part of their DNA and core to their reputation as a leader in sustainability and ecotourism.

Six Senses is a hotel operator with 16 ecological travel destinations in operation around the world. They are not a developer, rather they work in partnership with hotel owners via management contracts, to operate the property after development is complete. A management agreement is established for a duration between 30 and 60 years, demonstrating commitment to not only the owner, but also the local community. Unlike a franchise agreement, which allows an owner to use a hotel brand with minimal adherence to brand standards, a management agreement maintains that Six Senses has control over all aspects of the operation. As the Six Senses brand is truly built on a sustainable model this also requires that Six Senses work closely with the owner during the early stages of design and construction to ensure that the property will be able to perform sustainably during operations.

The strong company culture of Six Senses ensures that everyone is responsible and accountable for sustainability throughout the company, however it is led at the corporate level by a Vice President of Sustainability. Additionally, each property has their own dedicated Sustainability Manager who reports directly to both the on-site General Manager as well as the Vice President of Sustainability. Every property also has a Sustainability Team which is comprised of the General Manager as well as the head of each operational department (i.e. housekeeping, landscaping, engineering, etc.) which meet each month to ensure that all sustainable reporting, standards, goals and initiatives are on track.



## Six Senses Sustainable Development Approach

As each destination Six Senses operates in is different their success in sustainable operations relies on working with owners prior to the start of development to perform an Environmental Impact Assessment of the proposed site in order to determine ecologically sensitive environments which need to be taken into consideration in the master plan of the property. These effort have led to great outcomes for the local environment as they also indicate environments which are in need or rehabilitation and ecological stabilization. One example of this is Six Senses Zil Payson in the Seychelles. The proposed site for that ecological destination had been overrun with an invasive plant species, known as the Coco Plum. This invasive plant species decimated the native flora when removed a vital food source for the native fauna, essentially eliminating the biological diversity and habitability If local species. Six Senses and the owner brought in a renowned specialist in ecological restoration in the Seychelles and spent years on removing the invasive plant species and re-establishing native varieties prior to development. Now years in operation, the environmental restoration efforts have paid off yielding reintroduction of 3 critically endangered plant species restored, 4 endangered plant species and 12 vulnerable species. In addition, now that a food source has returned to the island rare native birds and turtles now returning to the island. This restoration work does not stop at the end of development, Six Senses has taken up the stewardship responsibility during operations even going so far as to engage the ecological specialist as a full time member of staff with a support team for his efforts.

These efforts to get involved so early in development further illustrate the lengths that Six Senses goes to create a strong foundation for ecotourism efforts and initiatives. Six Senses Bay Point Island has its own unique environmental challenges and a major focus of this development is to ensure that it not only have minimal negative impact, but that there be a focus on rehabilitating the flora that was damaged in recent hurricanes, stem shore erosion via dune restoration utilizing natural methods, address the challenges posed by sea level rise in building design, and continue to support the marine turtle protection program.

## Six Senses Sustainability Standards

The Six Senses commitment to sustainability goes far beyond company culture. In order to underpin that commitment the Six Senses group has in place a rigorous set of Sustainability

Standards which are mandatory for both development as well as for operations. They are managed throughout the life of the property starting in development. The Sustainability Standards cover the areas of energy, carbon, water, materials, consumables, supply chain, housekeeping, landscaping, engineering, employee training on sustainability, guest experiences, local community and local environment.

In development the Standards are audited for compliance at each major milestone of the project and in operations they are audited on an annual basis, with Sustainability Action Plans developed where needed to ensure the requirements are fulfilled. The Sustainability Standards and Sustainability Action Plans aren't just a set stagnate lists, they dynamic and underpinned by a significant amount of employee training on sustainability relative to both the Six Senses brand and their individual responsibility within their role, whether that be in housekeeping, engineering etc. Sustainable performance of each ecological destination property during operations is incentivized among the management level by allocating 10% of a managerial employee's annual bonus to that property's performance in sustainability for that year.

Six Senses Bay Point Island is not exempt and will be following these standards in both development as well as operations. In fact, the property will be exceeding these requirements as they seek LEED Silver Certification and to be self-sufficient in both power and water using renewable technologies. This would, clearly, set a new standard for future facilities seeking to call Beaufort County "home" in the future.

#### Six Senses Sustainable Performance Indicators and Reporting

Monthly reporting on Sustainability Performance Indicators (SPIs) is also core to the Six Senses Sustainability program. All properties a required to report the SPIs into a central database. These SPIs include energy, water, carbon and waste – much as what you would assume a sustainable operator to report on. However, in addition to that Six Senses believes in the power of sustainability to go beyond having a "less than" impact and strives to capture the positive impact of the Sustainability Program with SPIs that cover how much produce was harvested from on-site gardens, area of reef restored, turtle species recovered, etc. The positive impact approach is unique for a hotel operator and Six Senses is constantly pushing the boundary on what is possible when sustainability is leveraged for maximum benefit for all.

As soon as Six Senses Bay Point Island is operational it will have a Six Senses Sustainability Manager in place to ensure adherence to these Sustainable Performance Indicators and demonstrating all of the positive impacts of this property which will include (but is not limited to) zero single-use plastic, water recycling, solar power generation, flora restoration and fauna conservation.

Sharing of the island's sustainable practices is paramount. All sustainable technologies implemented at Bay Point Island will be showcased for educational programs in collaboration with universities and institutions as part of the educational programs. Technologies include the Island's solar power system, smart buildings, waste management, environmental stewardship, and others.

### Six Senses Earth Lab

Each Six Senses property also had a dedicated area known as the Earth Lab which is the physical heart of the properties' sustainability efforts. An Earth Lab hosts a variety of functions and also showcases our sustainability and ecotourism programs with guests and visitors. At its most basic these areas are used for waste reuse on-site efforts, organic garden support, and provides data on the properties daily energy, carbon, water and waste Sustainable Performance Indicators. The Earth Lab is where the Six Senses Water Bar is also located. Six Senses has been treating, purifying and bottling its own still and sparkling water on-site since 2004. This was initially established to reduce the carbon footprint of property operations associated with shipping water in from all over the world but also minimizes huge amounts of plastic waste that would otherwise be sent to landfill or recycling. The Water Bar is both a functional space, filling still and sparkling water, and also engaging for guests and visitors as it tells the story of the importance of water, the state of it today and the impact of plastic. Given the great success of eliminating a huge source of plastic from the operational waste stream through these efforts Six Senses has gone so far as to commit to eliminating ALL single-use plastics from operations by 2022.

The Six Senses Earth Lab is also a place which can host research areas to support our sustainable and ecotourism programs with strategic partners. Whether it be marine ecology, soil erosion, environmental restoration or even climate change the Earth Lab can also support these special uses for the benefit of not just the property but for the wider world. And that is the vision

for Six Senses Bay Point Island – to support not only the sustainable operations and ecotourism programs of the property but to contribute to the greater environment and community.

### Six Senses Ecotourism Codes of Conduct

Codes of Conduct are a critical component of Six Senses Sustainable operations in that they set the relationship between our guests and the environment and/or culture that they find themselves in. Examples of established Environmental Codes of Conduct within Six Senses includes Dolphin Watching, Turtle Hatching and Snorkeling in Coral Reefs. However, every property within Six Senses is unique and does require specific Codes of Conduct relative to the distinct environmental and cultural setting the property is located in.

At Six Senses Bay Point Island the Codes of Conduct will build environmental and cultural awareness and respect around the areas of the Important Bird Area located to the north-east of the property, turtle hatching on the beach, dune stabilization on the island, dolphin watching and Gullah heritage in the local community. These Codes of Conduct are shared with guests upon arrival as part of their Six Senses property orientation tour, in the Earth Lab or in our Six Senses Experiences programs which take small groups of 2-6 people on tours of the local community and/or environment.

### Six Senses Staff and Supply Chain

Six Senses operates in remote destinations around the world in a variety of cultures. The group relies heavily on local communities to support their operations as a critical component of success. We seek to source our employees from the destinations we operate in, as such Six Senses has robust training programs to empower their employees in not only skill sets relative to their daily role but also in areas such as English and also sustainability. At Six Senses Bay Point Island there will be 60-80 full-time jobs available where the Six Senses would seek to source talent directly from Beaufort County.

Equally important is engaging and partnering with local suppliers. While Six Senses Bay Point Island will have organic gardens on-site supporting operational demand it will never be enough to meet the property's operational needs. As such the Six Senses will be seeking to engage with local organic farmers and fisherman to supply the bulk of our operational needs. We also see

these relationships as potential Guest Experiences to share with our guests a see firsthand the craftsmanship, quality and work of our local partnerships in the community.

### Six Senses Sustainability Fund

Also unique for a hotel operator is that Six Senses has in place a Sustainability Fund at each property. This Sustainability Fund goes back out into the local community to be invested in social and environmental programs that benefit the destination where we operate. This Fund is comprised of 0.5% of revenues, 50% of Six Senses Water Sales, 100% of Soft Toy Sales and 100% of any Guest Donations into the Fund. These Sustainability Fund investments have benefited communities around the world supporting initiatives such as water purification plants in villages that do not have access to drinkable water and rely on water in plastic bottles in Thailand, marine conservation education programs for children in the Maldives, and coral reef restoration in Vietnam to name a few. These are just some of the positive outcomes of the Six Senses Sustainability Fund.

Strategic partnerships are also an important benefit of the Six Senses Sustainability Fund investments. While Six Senses does engage marine biologists, ecologist, permaculturists and the like as full -time staff on their properties, partnering with experts in the field of environmental and cultural conservation is critical to delivering sustainability programs with a high degree of integrity and rigor to local communities. These strategic partnerships also support Six Senses efforts in ecotourism in that they are environmentally and culturally conscious, benefit conservation efforts and are educational.

Six Senses Bay Point Island will have its own Sustainability Fund and seek to invest them with local strategic partners which are just as committed to environmental and cultural conservation as the property is.

(END OF 4.1.330.B RESPONSE)

*4.1.330.C. The maximum floor area ratio for each development shall be 0.1.*

APPLICANT RESPONSE:

The floor area ratio for the Bay Point Island Ecotourism property is .0407 (4.07%).

*4.1.330.D. An open space ratio of (at least) 85% shall be required for the entire property.*

APPLICANT RESPONSE:

The open space ratio for the entire Bay Point Island Ecotourism property is 92%.

*E. Impervious surface shall not exceed 8% for the entire property.*

APPLICANT RESPONSE:

The impervious surface for the entire Bay Point Island Ecotourism property is just under 8%, including all building footprints, building deck areas, boardwalks, and solar panel fields.

*4.1.330.F. There shall be a 3 acre minimum site size for this use.*

APPLICANT RESPONSE:

The acreage for the entire Bay Point Island Ecotourism property is 50.56 Acres.

*4.1.330.G. Lodgings are permitted with this use and include cabins, inns, B&Bs, historic properties, and small hotels. Hotel uses shall be limited to no more than 50 units per development, 8units per building, and a maximum height of 2 stories.*

APPLICANT RESPONSE:

There are 50 units planned for Six Senses Bay Point Island, none of which will exceed the 2 story height limit.

*4.1.330.H. Operators of ecotourism uses shall adhere to the stewardship, research, and education principles promoted by The Ecotourism Society (TES). [Though not noted in the Beaufort County Community Development Code, TES is now known as the International Ecotourism Society (TIES)]*

## APPLICANT RESPONSE:

### Six Senses Ecotourism Leadership

Ecotourism is now defined as “responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education” (TIES, 2015). Six Senses is a leader in ecotourism and has been from their very beginning. They are globally renowned for their efforts to where they are the only branded hotel operator that is allowed to operate in the Galapagos Islands. Every aspect of Six Senses Bay Point Island operations will exemplify the TIES Principals of Ecotourism, listed below for reference.

### Principles of Ecotourism

Ecotourism is about uniting conservation, communities, and sustainable travel. This means that those who implement, participate in and market ecotourism activities should adopt the following ecotourism principles:

- Minimize physical, social, behavioral, and psychological impacts.

Minimal impacts are ensured via Six Senses Sustainability Standards, Sustainable Performance Indicators and Ecotourism Codes of Conduct.

- Build environmental and cultural awareness and respect.

The Six Senses Sustainability Standards and Ecotourism Codes of Conduct ensure all guests and staff are both aware and respectful of the unique environment and culture at not only Bay Point Island but also Beaufort County.

- Provide positive experiences for both visitors and hosts.

Six Senses Bay Point Island Ecotourism Codes of Conduct, Earth Lab and Sustainability Fund ensure that guests, environment and community all benefit from the property's operations.

- Provide direct financial benefits for conservation. Generate financial benefits for both local people and private industry.

The Six Senses Bay Point Island Sustainability Fund, which is comprised of 0.5% of revenues, 50% of Six Senses Water Sales, 100% of Soft Toy Sales and 100% of Guest Donations will be invested directly into the local environment and community.

- Deliver memorable interpretative experiences to visitors that help raise sensitivity to host countries' political, environmental, and social climates.

Six Senses Bay Point Island Earth Lab, Ecotourism Codes of Conduct and Guest Experiences in the local community, culture and environment will be both memorable and educational.

- Design, construct and operate low-impact facilities.

The design, construction and operations of Six Senses Bay Point Island will not only be “low-impact” but seek to have a positive impact. The design itself is low-density and includes 50 small units on an island that is hundreds of acres in size. The property will be built to Six Senses Sustainability Standards on energy, carbon, water, materials and waste as well as seek LEED Silver Certification. The property will be constructed off-site to minimize site impacts as well as noise impacts to the surrounding flora and fauna. A solar power plant will also be constructed on the island so as to be self-sufficient. There are no roads as part of the development, only permeable paths on which bicycles and the occasional electric Club Car (employees only) will use to get around the island. Water will be recycled and waste water treated to the highest environmental standards on-island. There will also be a Six Senses Bay Point Island Earth Lab which will minimize any waste and seek to instead re-use the greatest extent possible. Extensive training is given to Six Senses employees on sustainability so as to ensure that all are responsible for ensuring high-efficiency and environmentally sensitive operations throughout the property's lifetime.

- Recognize the rights and spiritual beliefs of the Indigenous People in your community and work in partnership with them to create empowerment.

Six Senses Bay Point Island embraces diversity, culture, spiritual beliefs and Indigenous People.

As demonstrated Six Senses Bay Point Island Sustainability and Ecotourism approach goes beyond a corporate commitment and is reinforced through every aspect of the brand including the inclusion of sustainability requirements in the Management Agreement with owners,



dedicated resources of sustainability focused staff (VP Sustainability, Sustainability Managers), Sustainability Standards, Sustainability Performance Indicators and Reporting, Sustainable Development Approach, Earth Lab, Ecotourism Codes of Conduct and the Sustainability Fund.

## **CONCLUSION**

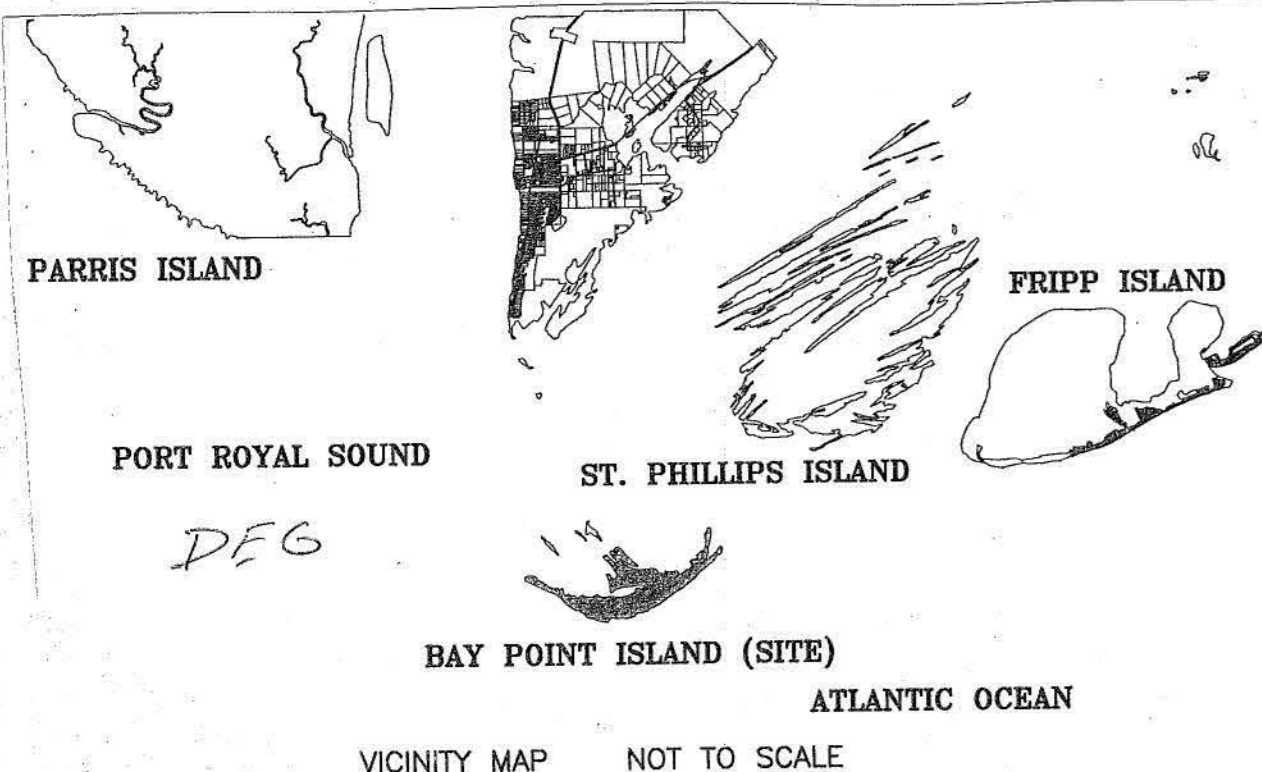
The applicant believes the foregoing narrative and analysis demonstrates that this Application is in conformance with the Beaufort County's Community Development Code criteria for a Concept Plan and Ecotourism special use to develop a Six Senses ecologically based travel destination. Accordingly, the Applicant respectfully requests that the Planning Staff and Zoning Board of Appeals review the application and supporting documentation and any testimony which will be entered into the record, find that the application meets the requirements for Concept Plan approval & Ecotourism special use, and recommends approval of this Application for Concept Plan and Ecotourism special use.

Respectfully re-submitted on behalf of the Applicant this 29 day of April, 2020.  
(Previously submitted December 13, 2020)

J.K. Tiller Associates, Inc.



Josh K. Tiller, PLA, ASLA



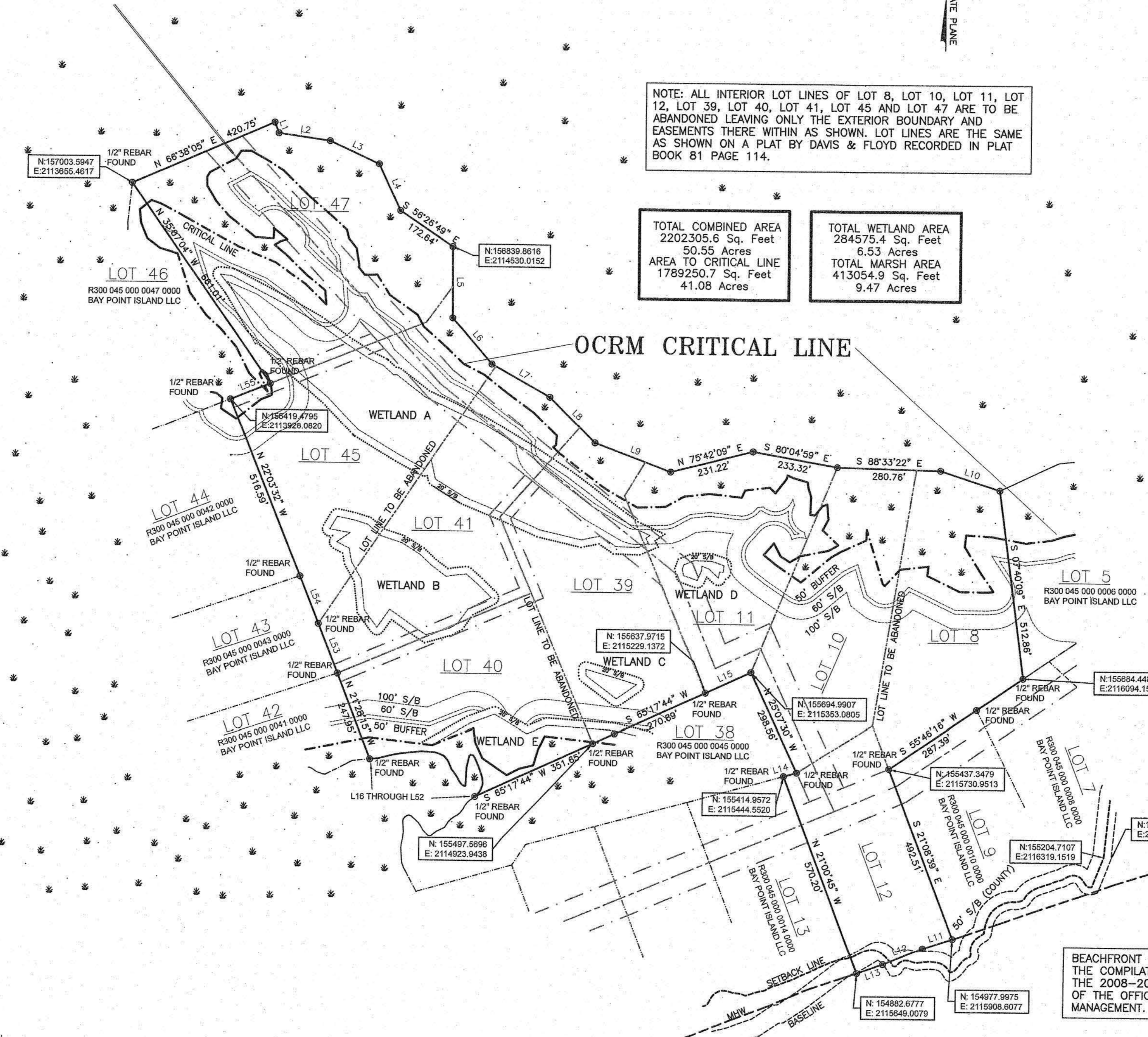
- NOTES:**
- THE BEARINGS SHOWN HEREON ARE MAGNETIC AND AS SUCH ARE SUBJECT TO LOCAL ATTRACTION.
  - THIS PLAT DOES NOT CERTIFY THE PRESENCE OR ABSENCE OF U.S. ARMY CORPS OF ENGINEERS JURISDICTIONAL WETLANDS.
  - METHOD OF AREA CALCULATION BASED ON COORDINATE METHOD.
  - LOCATION OF UNDERGROUND UTILITIES ARE FROM SURFACE INDICATIONS ONLY AND ARE NOT CERTIFIABLE.
  - THIS PLAT REPRESENTS A SURVEY BASED ON THE LISTED REFERENCES ONLY AND IS NOT THE RESULT OF A TITLE SEARCH.
  - CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
  - THE CERTIFIER HAS NOT INVESTIGATED OR BEEN INSTRUCTED TO INVESTIGATE THE EXISTENCE OR NONEXISTENCE OF ANY OVERLAY DISTRICTS, SUCH AS: AIRPORT, MILITARY, NOISE, CRASH POTENTIAL OR ENVIRONMENTAL ISSUES.
  - BEFORE ANY DESIGN WORK OR CONSTRUCTION ON THIS SITE IS STARTED FLOOD ZONE INFORMATION MUST BE VERIFIED BY PROPER BUILDING CODES OFFICIAL.
  - THIS PROPERTY APPEARS TO BE IN FLOOD ZONES "V9" (ELV. 14) AND "A9" (ELV. 14 & 15) AS DETERMINED BY FEMA FIRM PANEL NUMBER 450025 0155 E DATED 11/4/92
  - CONTOUR INTERVAL IS 1'.
  - VERTICAL DATUM IS 1988 NAVD.

- REFERENCES:**
- T.M.S. R300-045-000-0048-0000  
T.M.S. R300-045-000-0046-0000  
T.M.S. R300-045-000-0040-0000  
T.M.S. R300-045-000-0039-0000  
T.M.S. R300-045-000-0044-0000  
T.M.S. R300-045-000-0012-0000  
T.M.S. R300-045-000-0011-0000  
T.M.S. R300-045-000-0009-0000  
T.M.S. R300-045-000-0013-0000

2.) PLAT BY: DAVIS & FLOYD, INC.  
DATED: 9/1/98  
PLAT BOOK: 81 PG: 114  
RMC BEAUFORT COUNTY

THE PURPOSE OF THIS PLAT IS TO CONSOLIDATE LOT 8, LOT 10, LOT 11, LOT 12, LOT 39, LOT 40, LOT 41, LOT 45 AND LOT 47 AS SHOWN ON A PLAT BY DAVIS & FLOYD DATED 9/1/98 AND RECORDED IN PLAT BOOK 81 AT PAGE 114.

# MARSHES OF STATION CREEK



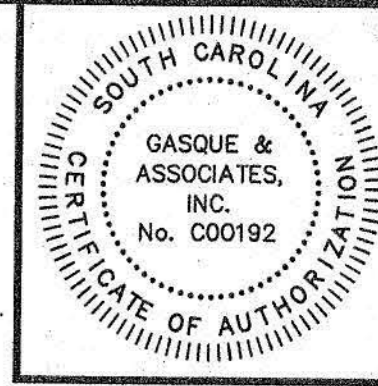
NOTE: ALL INTERIOR LOT LINES OF LOT 8, LOT 10, LOT 11, LOT 12, LOT 39, LOT 40, LOT 41, LOT 45 AND LOT 47 ARE TO BE ABANDONED LEAVING ONLY THE EXTERIOR BOUNDARY AND EASEMENTS THERE WITHIN AS SHOWN. LOT LINES ARE THE SAME AS SHOWN ON A PLAT BY DAVIS & FLOYD RECORDED IN PLAT BOOK 81 PAGE 114.

TOTAL COMBINED AREA  
2202305.6 Sq. Feet  
50.55 Acres  
AREA TO CRITICAL LINE  
1789250.7 Sq. Feet  
41.08 Acres

TOTAL WETLAND AREA  
284575.4 Sq. Feet  
6.53 Acres  
TOTAL MARSH AREA  
413054.9 Sq. Feet  
9.47 Acres

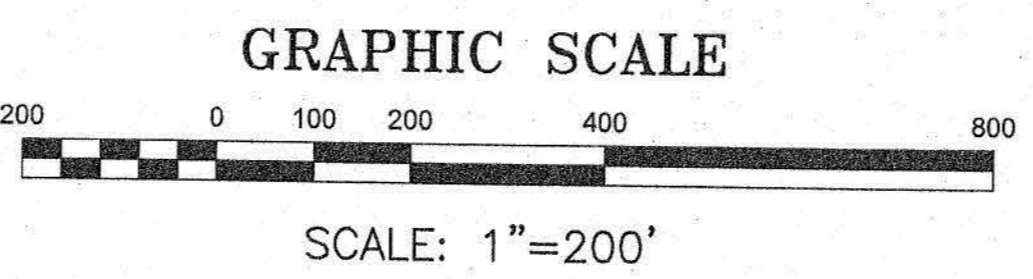
**LEGEND OF SYMBOLS & ABBREVIATIONS**

- APPROXIMATE MEAN HIGH WATER LINE (MHW)
- PROPERTY LINE
- ABUTTING LOT LINE
- DHEC/OCRM SETBACK LINE
- DHEC/OCRM BASE LINE
- DHEC/OCRM CRITICAL LINE
- INTERIOR LOT LINE TO BE ABANDONED



LINE	BEARING	DISTANCE
L1	S 21°38'19" E	30.72'
L2	S 81°57'17" E	140.90'
L3	S 63°32'47" E	148.07'
L4	S 25°05'25" E	138.70'
L5	S 00°24'12" E	193.85'
L6	S 41°09'22" E	163.75'
L7	S 60°59'31" E	181.03'
L8	S 45°22'04" E	174.97'
L9	S 69°41'59" E	220.62'
L10	S 72°02'26" E	170.56'
L11	S 72°06'44" W	85.15'
L12	S 67°43'15" W	116.45'
L13	S 70°32'31" W	75.10'
L14	N 74°35'59" E	35.61'
L15	S 65°17'44" W	138.43'
L16	N 47°17'35" E	15.38'
L17	N 32°43'42" E	6.50'
L18	N 26°50'49" E	4.10'
L19	N 17°34'48" E	14.47'
L20	N 01°05'28" E	6.43'
L21	N 09°20'49" W	13.35'
L22	N 18°42'49" W	26.99'
L23	N 22°18'56" W	10.68'
L24	N 24°14'26" W	17.54'
L25	N 35°09'51" W	7.85'
L26	N 72°48'32" W	7.12'
L27	S 42°17'51" W	5.42'
L28	S 14°33'15" W	8.54'
L29	S 12°42'33" W	22.27'
L30	S 04°02'01" W	7.77'
L31	S 03°00'59" W	42.24'
L32	S 64°35'17" W	2.14'
L33	N 70°59'05" W	4.41'
L34	N 54°25'11" W	5.56'
L35	N 38°09'51" W	9.11'
L36	N 27°48'32" W	13.42'
L37	N 34°51'23" W	16.34'
L38	N 36°43'19" W	10.89'
L39	N 23°31'57" W	19.96'
L40	N 27°13'49" W	4.91'
L41	N 40°21'35" W	14.02'
L42	N 58°54'00" W	6.13'
L43	N 67°54'13" W	14.61'
L44	N 75°50'11" W	11.43'
L45	N 87°23'09" W	33.90'
L46	S 83°35'49" W	53.65'
L47	S 80°41'34" W	10.79'
L48	S 79°57'39" W	11.35'
L49	S 76°14'23" W	44.07'
L50	S 83°58'17" W	21.88'
L51	N 21°49'01" W	143.59'
L52	N 21°49'01" W	138.26'
L53	N 68°01'35" E	116.10'

## BAY POINT ISLAND ATLANTIC OCEAN



**LOT CONSOLIDATION OF  
LOT 8, LOT 10, LOT 11, LOT 12, LOT 39  
LOT 40, LOT 41, LOT 45 & LOT 47  
BEING A PORTION OF BAY POINT ISLAND  
PREPARED FOR  
LUCKETT & FARLEY DEVELOPMENT  
BAY POINT ISLAND  
BEAUFORT COUNTY-SOUTH CAROLINA**

DATE: 11/21/19

SCALE: 1"=200'

**GASQUE & ASSOCIATES INC.**  
LAND SURVEYORS PLANNERS  
28 PROFESSIONAL VILLAGE CIRCLE, BEAUFORT, S.C.  
P.O. BOX 1363, BEAUFORT, S.C.  
(843) 522-1798

I, David E. Gasque, a Registered Professional Land Surveyor in the State of South Carolina, certify to client(s) shown hereon that to the best of my knowledge, information and belief, the survey shown hereon was made in accordance with the requirements of the minimum standards manual for the practice of land surveying in South Carolina, and meets or exceeds the requirements for a CLASS C survey as specified therein, also there are no encroachments or projections other than shown. This survey is not valid unless it bears the original signature and has an embossed seal.

David E. Gasque, R.L.S.  
S.C. Registration Number 10506

BEAUFORT COUNTY SC-ROD  
BK 153 Pg 39  
INST# 2019066467 RPT#956612  
DATE: 12/10/2019 04:11:21 PM  
REC.FEE#: 525.00  
CO#0.00 ST#0.00 TR#0.00

ENEMPT  
This plat of property is exempt from having to obtain a subdivision approval under the provision of the Beaufort County Community Development Code as provided for in Division 7-2 Section 7-2-70 (b)(3).  
Certified by: *H. H. H. H.*  
Date: 12-09-2019

THIS PLAT IS COPYRIGHTED AND IS ONLY INTENDED FOR THE USE OF THE ENTITY OR PERSON(S) SHOWN HERE ON.

## DEVELOPMENT SUMMARY

AREA	ACRES	PARCEL %
TOTAL PARCEL ACRES	+/-50.56	100
BASE SITE AREA*	+/-41.03	100
BUILDING AREA	+/-1.67	+/-4.07**
BUILDING DECK	+/-0.74	+/-1.487
SOLAR AREA	+/-0.52	+/-1.267
BOARDWALK AREA	+/-0.35	+/-0.853
OPEN SPACE AREA	+/-37.75	+/-92.00

LODGING UNITS: 50 UNITS (1.22 UNITS/ACRE)

\*NOTE: BASE SITE AREA EXCLUDES MARSH ACREAGE IN FLAT; BASE SITE AREA USED TO DETERMINE % CALCULATIONS  
 \*\*NOTE: LESS THAN THE 10% MAX. FLOOR AREA RATIO PERMITTED BY THE ECOTOURISM USE (SEE 4.1.330 - ECOTOURISM)

## NATURAL RESOURCES

AREA	PRE-DEV. AC	POST DEV. AC	% PRESERVED
UPLAND (MATURE)	+/-20.1	+/-16.8	+/-84 *
MARITIME	+/-13.5	+/-12.7	+/-94 *
WETLAND	+/-6.6	+/-6.6	+/-100

\*NOTE: PERCENT OF PRESERVED EXISTING FOREST EXCEEDS REQUIRED PERCENTAGE FOR T1 AND T2 DEVELOPMENT (SEE TABLE 5.11.90.A: EXISTING FOREST PRESERVATION)

## BAY POINT ISLAND ECOTOURISM\*

### ECOTOURISM ACTIVITIES AND PROGRAMS

TIES Ecotourism Principals, Self-sufficient operations, LEED Certification, Six Senses Sustainability Standards;

Ongoing stewardship and post-hurricane storm environmental clean ups and restoration;

Education + Engagement with guests throughout stay on local environmental + cultural aspects;

Environmental Codes of Conduct for Guests, Visitors, and Hosts;

Six Senses Sustainability Fund investing 0.5% of revenues back into our local community and environment for the benefit of all;

On-site Sustainable Education Programs for Younger Guests, Schools, and Community Members;

Environmental and/or cultural programs within the local community;

Sustainability tour offerings around Bay Point Island and St. Helena to local organic farms, sustainable, cultural, wellness focused destinations within the community and/or strategic partner focused activities;

Partnerships with community groups, environmental groups, and/or research institutions;

Avoid development and operations in the Important Bird Area (IBA) located on the north-east end of the Island;

Conservation Programs- Bird Conservation, Turtle Protection, Dune Protection, Dolphin Watching;

Bird Habitat conservation;

Ongoing Wetland stewardship;

Beach clean-ups;

Dune Preservation via planting of sea oats and other stabilizing vegetation while minimizing human traffic.

\*NOTE: DEFINED AS "RESPONSIBLE TRAVEL TO NATURAL AREAS THAT CONSERVES THE ENVIRONMENT, SUSTAINS THE WELL-BEING OF THE LOCAL PEOPLE, AND INVOLVES INTERPRETATION AND EDUCATION". EDUCATION IS MEANT TO BE INCLUSIVE OF BOTH STAFF AND GUESTS. (As defined by The International Ecotourism Society)



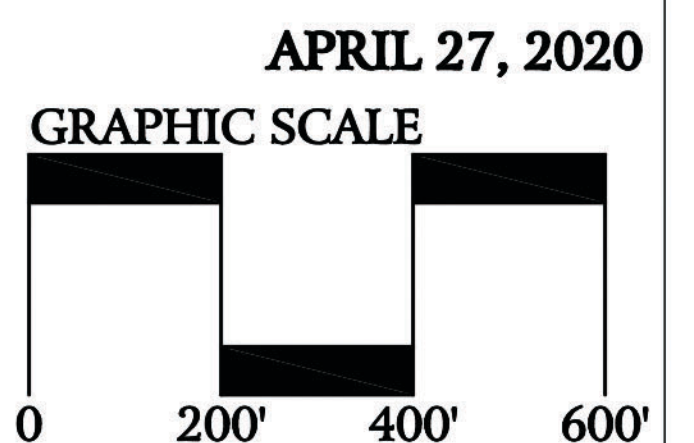
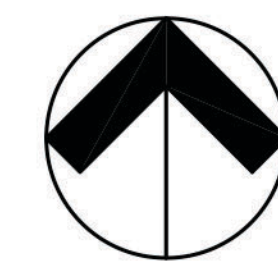
PREPARED FOR:  
BAY POINT ISLAND, LLC

PREPARED BY:  
J. K. TILLER ASSOCIATES, INC.  
LAND PLANNING | LANDSCAPE ARCHITECTURE  
181 BLUFFTON ROAD, SUITE F203 | BLUFFTON, SC 29910  
Voice 843.815.4800 | tiller@tiller.com | Fax 843.815.4802

Luckett & Farley  
Architecture | Engineering | Interior Design

RETTEW  
SM

BAY POINT ISLAND  
ECOTOURISM CONCEPT PLAN  
BEAUFORT COUNTY, SOUTH CAROLINA



## Josh Tiller

---

**From:** Asher Howell <asher@newkirkenv.com>  
**Sent:** Tuesday, December 17, 2019 3:40 PM  
**To:** Art Krebs  
**Cc:** Josh Tiller  
**Subject:** FW: Bay Point JD- SAC-2016-01428 (correct email)  
**Attachments:** Bay Point 11-18-19.pdf

Gentlemen,

This is the new email system the corps is trying in order to expedite the JD process. This letter is intended to take the place of the older hard copy letter that you typically see. If for some reason it is not satisfactory, let me know and I can request the hard copy.

Asher

-----Original Message-----

From: Sanders, Tracy D CIV USARMY CESAC (US) <Tracy.D.Sanders@usace.army.mil>  
Sent: Tuesday, December 17, 2019 3:28 PM  
To: Asher Howell <asher@newkirkenv.com>  
Subject: Bay Point JD- SAC-2016-01428 (correct email)

Asher,

This is in response to your request for an Approved Jurisdictional Determination (SAC-2016-01428) received in our office on August 24, 2016, and considered complete on November 18, 2019, for a 116.35- acre site (project limits) located on Bay Point Island on the Atlantic Ocean and the Port Royal Sound in Beaufort County, South Carolina (Latitude: 32.2599°, Longitude: -80.6289°).

Based on a review of the information you submitted and a site visit, the delineated boundaries depicted on the attached survey plat prepared by Gasque and Associates dated October 12, 2016, and revised on November 13, 2019, are a reasonable representation of the aquatic resources located onsite.

This information is sufficient for planning and permitting purposes with our office. Unless otherwise requested, no further correspondence will be forthcoming regarding this request.

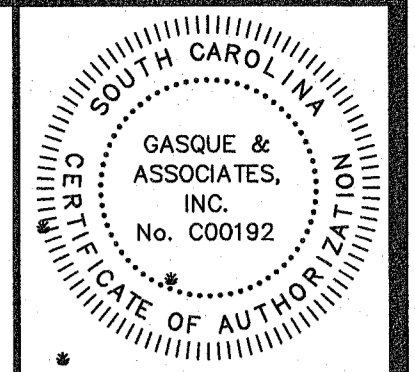
In all future correspondence, please refer to file number SAC-2016-01428. If you have any questions, please contact me at (843) 329-8190, or by email at Tracy.s.sanders@usace.army.mil.

Sincerely,

Tracy Dotolo Sanders  
Biologist  
U.S. Army Corps of Engineers  
Charleston District  
843-329-8190 (ph)  
843-329-2332 (fax)

THIS PLAT IS COPYRIGHTED AND IS ONLY INTENDED FOR THE USE OF THE ENTITY OR PERSON(S) SHOWN HEREON.

**GASQUE & ASSOCIATES INC.**  
**LAND SURVEYORS PLANNERS**  
 28 PROFESSIONAL VILLAGE CIRCLE, BEAUFORT, S.C.  
 P.O. BOX 1363, BEAUFORT, S.C.  
 (843) 522-1798



- NOTES:**
- 1.) THE BEARINGS SHOWN HEREON ARE MAGNETIC AND AS SUCH ARE SUBJECT TO LOCAL ATTRACTION.
  - 2.) THIS PLAT DOES NOT CERTIFY THE PRESENCE OR ABSENCE OF U.S. ARMY CORPS OF ENGINEERS JURISDICTIONAL WETLANDS.
  - 3.) METHOD OF AREA CALCULATION BASED ON COORDINATE METHOD.
  - 4.) LOCATION OF UNDERGROUND UTILITIES ARE FROM SURFACE INDICATIONS ONLY AND ARE NOT CERTIFIABLE.
  - 5.) THIS PLAT REPRESENTS A SURVEY BASED ON THE LISTED REFERENCES ONLY AND IS NOT THE RESULT OF A TITLE SEARCH.
  - 6.) CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
  - 7.) THE CERTIFIER HAS NOT INVESTIGATED OR BEEN INSTRUCTED TO INVESTIGATE THE EXISTENCE OR NONEXISTENCE OF ANY OVERLAY DISTRICTS, SUCH AS; AIRPORT, MILITARY, NOISE, CRASH POTENTIAL OR ENVIRONMENTAL ISSUES.
  - 8.) BEFORE ANY DESIGN WORK OR CONSTRUCTION ON THIS SITE IS STARTED FLOOD ZONE INFORMATION MUST BE VERIFIED BY PROPER BUILDING CODES OFFICIAL.
  - 9.) THIS PROPERTY APPEARS TO BE IN FLOOD ZONES "V9" (ELV. 14) AND "A9" (ELV. 14 & 15) AS DETERMINED BY FEMA FIRM PANEL NUMBER 450025 0155 E DATED 11/4/92
  - 10.) CONTOUR INTERVAL IS 1'.
  - 11.) VERTICAL DATUM IS 1988 NAVD.

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
LWF1	S72°38'22"W	64.48'	LWF31	S46°06'52"E	30.18'	LWF61	S01°38'01"E	16.87'	LWF91	S59°34'21"W	36.67'	LWF121	N 68°21'02" W	21.66'
LWF2	N27°15'02"E	9.90'	LWF32	S58°24'26"E	22.34'	LWF62	S53°16'34"E	103.10'	LWF92	N48°12'08"W	24.82'	LWF122	S 02°57'56" W	11.46'
LWF3	N24°43'27"W	41.44'	LWF33	N87°35'03"E	79.52'	LWF63	N54°32'06"E	67.26'	LWF93	S 64°47'13" E	63.76'	LWF123	S 22°57'00" W	29.77'
LWF4	S73°33'55"E	1.43'	LWF34	N35°12'13"W	35.43'	LWF64	N73°03'00"W	57.30'	LWF94	S 67°55'04" E	46.40'	LWF124	N 70°52'37" W	39.22'
LWF5	N45°56'35"E	29.94'	LWF35	S28°00'21"E	38.15'	LWF65	N74°39'53"W	86.16'	LWF95	S 59°13'46" E	161.44'	LWF125	N 10°04'11" W	17.60'
LWF6	S03°08'22"W	31.86'	LWF36	N72°35'37"W	76.64'	LWF66	N12°17'21"W	54.09'	LWF96	S 57°25'48" E	57.05'	LWF126	S 63°24'34" W	70.43'
LWF7	S73°26'43"E	55.49'	LWF37	N62°24'43"W	57.99'	LWF67	S35°05'44"W	31.35'	LWF97	S 57°15'46" E	55.55'	LWF127	S 35°41'51" W	50.14'
LWF8	S89°25'57"E	59.06'	LWF38	N40°13'36"E	31.80'	LWF68	N61°46'59"W	78.92'	LWF98	S 53°46'41" E	74.33'	LWF128	S 59°31'40" W	22.16'
LWF9	S55°03'20"E	64.72'	LWF39	S63°49'25"E	33.16'	LWF69	N59°14'55"W	130.70'	LWF99	S 52°02'46" E	58.75'	LWF129	S 73°52'46" W	68.56'
LWF10	S72°41'37"E	43.35'	LWF40	S59°49'23"E	61.61'	LWF70	N43°54'49"W	120.75'	LWF100	S 53°43'36" E	45.96'	LWF130	N 57°44'46" W	23.43'
LWF11	N32°14'07"E	36.36'	LWF41	S42°22'28"E	36.46'	LWF71	N50°28'12"W	144.50'	LWF101	S 54°13'06" E	52.00'	LWF131	N 55°12'00" W	96.26'
LWF12	S27°08'26"E	15.14'	LWF42	S82°49'27"E	74.92'	LWF72	N43°58'35"W	133.67'	LWF102	S 65°50'18" E	47.15'	LWF132	S 54°54'10" W	60.07'
LWF13	S73°52'00"E	83.22'	LWF43	N61°45'27"E	55.98'	LWF73	N30°41'16"W	120.48'	LWF103	S 55°14'32" W	13.58'	LWF133	N 36°36'31" W	57.94'
LWF14	S09°19'45"W	20.00'	LWF44	N09°58'54"W	4.64'	LWF74	N37°45'15"W	48.95'	LWF104	S 26°49'44" E	15.13'	LWF134	N 30°03'38" W	53.74'
LWF15	S73°34'25"W	30.00'	LWF45	N41°26'34"W	30.78'	LWF75	S83°23'02"E	29.34'	LWF105	S 66°22'38" W	29.04'	LWF135	N 11°06'18" W	37.20'
LWF16	S86°49'53"W	83.37'	LWF46	S79°48'31"E	28.59'	LWF76	S62°45'22"E	170.88'	LWF106	N 88°29'05" W	62.23'	LWF136	N 63°02'56" W	38.19'
LWF17	N87°49'12"W	20.29'	LWF47	N53°23'58"E	27.05'	LWF77	S60°24'38"E	99.09'	LWF107	N 55°51'10" W	49.73'	LWF137	N 55°33'53" E	44.21'
LWF18	N84°58'41"W	84.67'	LWF48	N43°58'32"W	31.25'	LWF78	S54°48'13"E	92.87'	LWF108	S 78°20'41" W	53.99'	LWF138	N 80°02'20" W	56.49'
LWF19	S68°45'21"W	75.49'	LWF49	S67°30'43"E	80.82'	LWF79	S58°11'18"E	76.02'	LWF109	N 77°16'45" W	117.13'	LWF139	N 31°01'32" E	40.15'
LWF20	N08°26'13"W	49.45'	LWF50	N60°36'22"E	51.22'	LWF80	S65°19'25"E	41.99'	LWF110	N 66°07'43" W	84.56'	LWF140	N 78°23'00" E	45.06'
LWF21	N32°24'33"E	70.45'	LWF51	N27°13'00"W	59.54'	LWF81	S48°03'51"E	37.08'	LWF111	N 67°58'50" W	137.17'	LWF141	S 73°32'04" E	39.48'
LWF22	S63°50'11"E	123.36'	LWF52	N45°22'03"W	72.54'	LWF82	N88°12'18"E	8.97'	LWF112	N 58°45'07" W	93.39'	LWF142	S 70°17'22" E	59.05'
LWF23	N20°13'40"E	32.33'	LWF53	N44°47'56"W	99.33'	LWF83	S52°54'37"E	99.19'	LWF113	N 19°17'26" E	12.61'	LWF143	S 50°16'54" E	48.37'
LWF24	N52°52'19"W	53.07'	LWF54	N77°14'13"W	92.31'	LWF84	S65°45'23"E	57.40'	LWF114	N 67°21'20" E	29.40'	LWF144	S 72°07'22" E	59.05'
LWF25	N03°48'49"W	55.78'	LWF55	N86°22'37"W	98.54'	LWF85	S40°03'28"W	34.71'	LWF115	S 88°53'05" E	47.84'	LWF145	S 58°27'09" E	57.99'
LWF26	N65°17'24"W	18.90'	LWF56	N86°12'18"W	84.08'	LWF86	S13°25'16"W	83.10'	LWF116	S 71°51'42" E	35.69'	LWF146	S 47°25'47" E	44.21'
LWF27	N17°42'39"E	60.68'	LWF57	S66°54'43"W	61.05'	LWF87	S40°04'57"E	89.82'	LWF117	S 04°05'51" W	17.91'	LWF147	S 53°53'47" E	49.18'
LWF28	N62°43'43"E	21.99'	LWF58	N59°31'08"W	101.80'	LWF88	N20°58'09"W	47.81'	LWF118	N 89°35'51" W	10.82'	LWF148	N 82°50'50" E	55.02'
LWF29	S18°11'45"E	83.85'	LWF59	S69°33'30"W	71.18'	LWF89	N62°03'59"E	29.27'	LWF119	S 10°03'05" W	16.63'	LWF149	S 48°58'10" E	40.77'
LWF30	N65°03'51"E	52.81'	LWF60	S59°38'18"W	119.18'	LWF90	S64°17'52"E	26.94'	LWF120	N 47°14'01" W	34.85'	LWF150	S 46°04'26" E	53.47'

WETLAND A	4.34 AC
WETLAND B	1.48 AC
WETLAND C	0.10 AC
WETLAND D	0.08 AC
WETLAND E	2.14 AC
WETLAND F	0.02 AC
WETLAND G	0.40 AC
WETLAND H	0.04 AC
TOTAL WETLAND	8.60 AC
TOTAL AREA WITHIN PROJECT LIMITS	116.35 AC

DHEC-OCRM CRITICAL LINE

THE AREA SHOWN ON THIS PLAT IS A REPRESENTATION OF DEPARTMENT PERMIT AUTHORITY ON THE SUBJECT PROPERTY. CRITICAL AREAS BY THEIR NATURE ARE DYNAMIC AND SUBJECT TO CHANGE OVER TIME. BY DELINEATING THE PERMIT AUTHORITY OF THE DEPARTMENT, THE DEPARTMENT IN NO WAY WAIVES ITS RIGHT TO ASSERT PERMIT JURISDICTION AT ANY TIME IN ANY CRITICAL AREA ON THE SUBJECT PROPERTY, WHETHER SHOWN HEREON OR NOT.

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
 THE CRITICAL LINE SHOWN ON THIS PLAT IS VALID FOR FIVE YEARS FROM THE DATE OF THIS SIGNATURE, SUBJECT TO THE CAUTIONARY LANGUAGE ABOVE.

MARSHES OF STATION CREEK

WETLAND H  
 1582.36 Sq. Feet  
 0.04 Acres

WETLAND G  
 17556.46 Sq. Feet  
 0.40 Acres

I, David E. Gasque, a Registered Professional Land Surveyor in the State of South Carolina, certify to client(s) shown hereon that to the best of my knowledge, information and belief, the survey shown hereon was made in accordance with the requirements of the minimum standards manual for the practice of land surveying in South Carolina, and meets or exceeds the requirements for a CLASS survey as specified therein, also there are no encroachments or projections other than shown. This survey is not valid unless it bears the original signature and has an embossed seal.

David E. Gasque, R.L.S.  
 S.C. Registration Number 10506

WETLAND B  
 64350.2 Sq. Feet  
 1.48 Acres

WETLAND C  
 4524.26 Sq. Feet  
 0.10 Acres

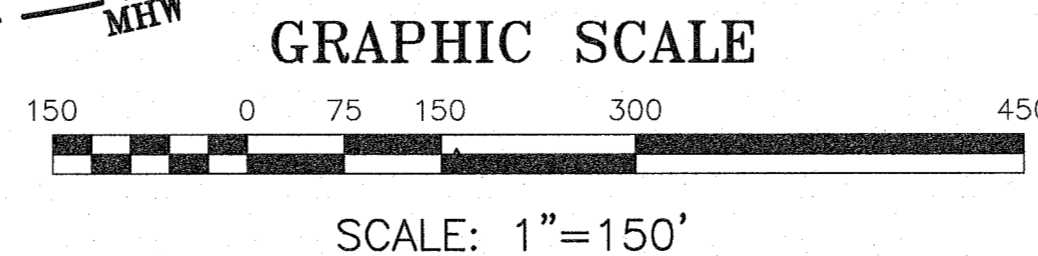
WETLAND D  
 3556.7 Sq. Feet  
 0.08 Acres

WETLAND E  
 93340.29 Sq. Feet  
 2.14 Acres

WETLAND F  
 750.86 Sq. Feet  
 0.02 Acres

**BAY POINT ISLAND**  
 APPROXIMATE AREA  
 9988172.5 Sq. Feet  
 229.30 Acres  
 AREA WITHIN PROJECT LIMITS  
 5068218.1 Sq. Feet  
 116.35 Acres

**WETLAND SURVEY OF A PORTION OF BAY POINT ISLAND PREPARED FOR BAY POINT ISLAND, LLC. BAY POINT ISLAND BEAUFORT COUNTY-SOUTH CAROLINA**



DATE: 10/12/16  
 DATE: 11/13/19-UPDATED

SCALE: 1"=150'





ATLANTIC OCEAN

Please note, this forest community approximation is for preliminary planning purposes only. This approximation was conducted using aerial photos and LIDAR data. Newkirk Forestry and Land Management, LLC strongly recommends field verification prior to beginning any site work or making any legal reliance on this



**Legend**

**Name**

-  Maritime Forest
-  Mixed Upland, Mature
-  wetlands
-  Project\_Boundary

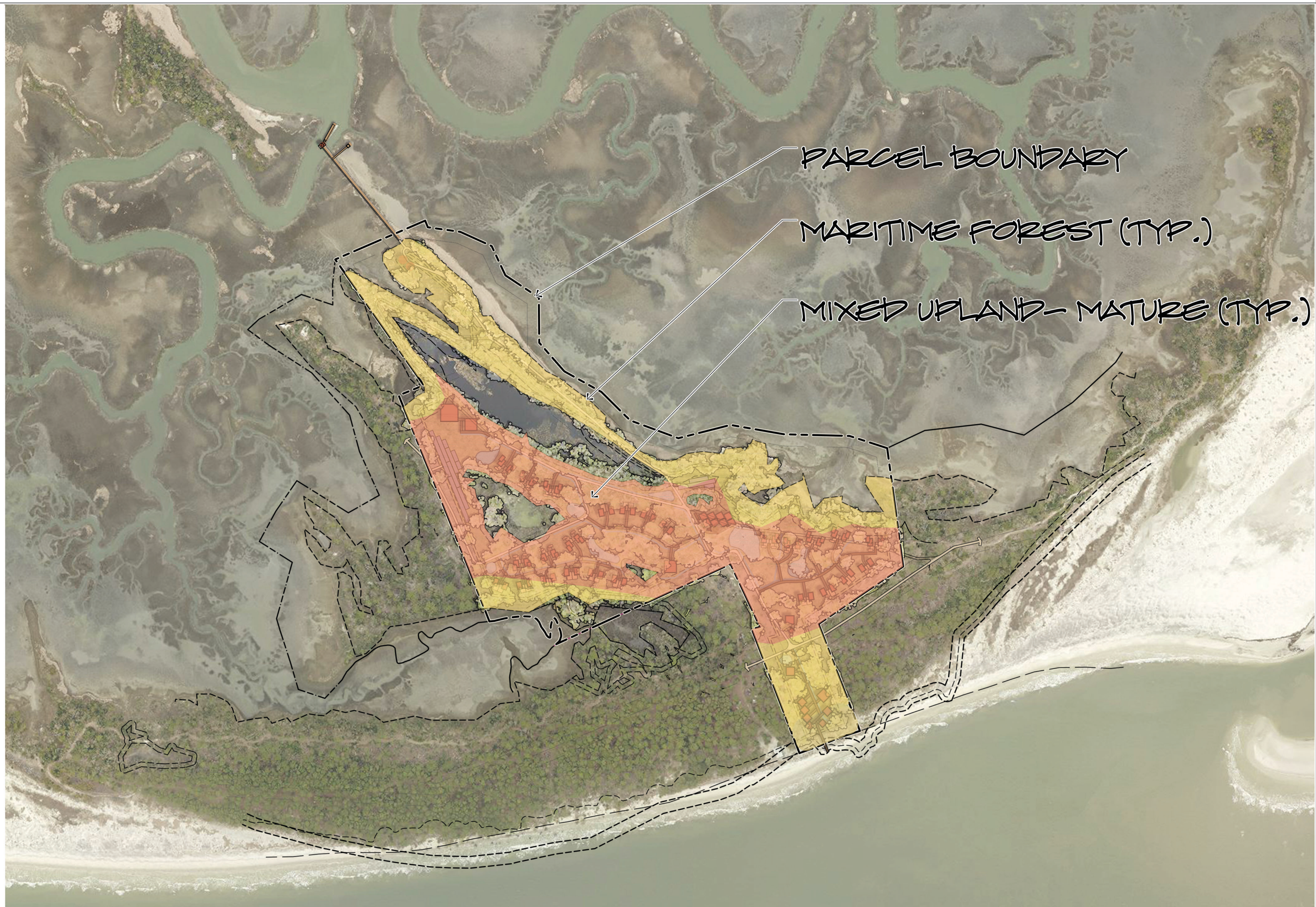
Forest Community Approximation

Date: 11/22/2019

Created by: Mac Baughman

# Bay Point Beaufort, County





PARCEL BOUNDARY

MARITIME FOREST (TYP.)

MIXED UPLAND - MATURE (TYP.)

PREPARED FOR:  
BAY POINT ISLAND, LLC

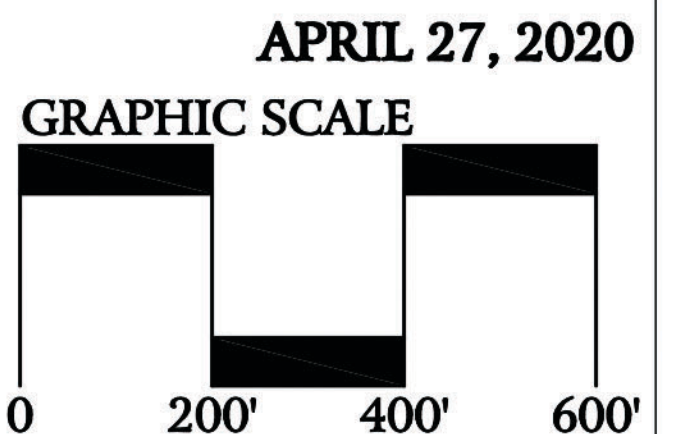
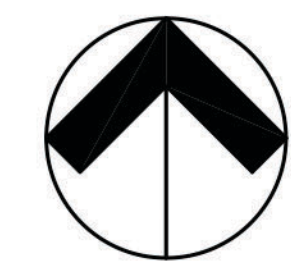


PREPARED BY:  
**J. K. TILLER ASSOCIATES, INC.**  
LAND PLANNING LANDSCAPE ARCHITECTURE  
181 BLUFFTON ROAD, SUITE F203 BLUFFTON, SC 29910  
Voice 843.815.4800 jktille@jktiller.com Fax 843.815.4802

**Luckett & Farley**  
Architecture | Engineering | Interior Design

**RETTEW**  
SM

**BAY POINT ISLAND**  
**FOREST TYPE AREAS**  
BEAUFORT COUNTY, SOUTH CAROLINA



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**COUNTY COUNCIL OF BEAUFORT COUNTY  
COMMUNITY DEVELOPMENT DEPARTMENT**

Multi Government Center, 100 Ribaut Road, Room 115  
P.O. Drawer 1228, Beaufort, SC 29901-1228  
Phone: (843) 255-2140 // FAX: (843) 255-9432

December 19, 2019

Josh K. Tiller, PLA, ASLA  
J.K. Tiller Associates, Inc.  
181 Bluffton Road, Suite F203  
Bluffton, SC 29910

RE: Bay Point Island – Archaeological Review

Dear Mr. Tiller:

I am writing in response to your request for an archaeological review, as required in Section 5.10.100 of the Beaufort County Community Development Code, for the above referenced project.

An extensive examination of existing documentation has been conducted. The documents examined include the website portal used by professional archaeologists in the State of South Carolina, [SC ArchSite](#), which is authored and maintained by the South Carolina Institute of Archaeology and Anthropology (SCIAA) and the South Carolina Department of Archives and History (SCDAH) to store the presence and extent of archaeological sites and above-ground historic structures; copies of the records of all the archaeological properties listed in the National Register of Historic Places in Beaufort County; and all other documentation maintained by the Beaufort County Planning Department regarding archaeological and historic resources.

Based on our records, it is the opinion of the Planning Office that any proposed development will have no effect on any archaeological resources listed in, or eligible for listing in, the National Register of Historic Places. Therefore I am authorized by the Planning Director to issue you an Archaeological Permit of Approval. **I remind you that this does not relieve you of your responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended, and that if any state or federal permits are required for this project the permitting agency may require an archaeological survey.**

We request that you cease work to notify this office immediately if archaeological or paleontological materials are encountered prior to or during construction. Archaeological remains consist of any materials one hundred years or older made, or altered, by man which remain from past historic or prehistoric times. Examples include pottery fragments, metal, wood, arrowheads, stone implements or tools, human burials, historic docks, structure, or non-recent vessel remains. Paleontological remains consist of animal remains, original or fossilized, such as teeth, tusks, bone, or entire skeleton.

If I can be of further assistance please contact our office at (843) 255-2140.

Sincerely,

Robert Merchant, AICP  
Assistant Director





# LADY'S ISLAND – ST. HELENA FIRE DISTRICT

237 SEA ISLAND PARKWAY  
BEAUFORT, SOUTH CAROLINA 29907  
PHONE: 843-525-7692 FAX: 843-525-7689



BRUCE KLINE, CHIEF

MELINDA ELLIS, CHAIRWOMEN

## **Art Krebs**

LUCKETT & FARLEY DEVELOPMENT LLC  
Vice President of Operations

RE: Bay Point Development

Dear Mr. Krebs,

Please allow this letter to serve as confirmation that Lady's Island-St. Helena Fire District has reviewed and will accept the Six Senses Fire and Life Safety Standards as an acceptable base line for your project.

The Lady's Island-St. Helena Fire District's Fire Marshal will require and ensure all applicable Fire Codes and NFPA standards are followed. We are prepared and must be involved in all site plan approval. We also respectfully request to be part of the team to review and approve all construction plans (buildings and systems) initially, and throughout the completion of this project.

The remote location, accessibility and the delay for all emergency services to this development concerns us greatly. Additionally, we are concerned with the reliability of the water system, electrical system and the remote monitoring of all fire and life safety systems.

The Lady's Island-St. Helena Fire District reserves the right to require additional fire safety systems and procedures. We will justify any and all additional requirements, ensuring they are in the best interest of all who may visit or work on the island.

We look forward to working with your development team. Together we can create a Fire and Life Safety Plan that will provide the best safety possible to all guest, employees and firefighters.

If we can be of any assistance, please don't hesitate to call.

Professionally,

A handwritten signature in blue ink that reads "Bruce A. Kline".

Bruce A. Kline  
Fire Chief

# UTILITY SUMMARY

## SANITARY SEWER FEASIBILITY NOTES

1. THIS PLAN IS INTENDED TO SUPPLEMENT AND APPEND PREVIOUS FEASIBILITY REPORTS PREPARED FOR THIS PROJECT.
2. IT IS THE INTENT OF THE DEVELOPER TO PURSUE A DECENTRALIZED SEWER TREATMENT SYSTEM WITH LAND APPLICATION OF EFFLUENT. THIS PLAN SHOWS THAT A TRADITIONAL SEPTIC DISPOSAL CAN BE PROVIDED IN THE CASE THAT THE DECENTRALIZED SYSTEM IS NOT APPROVED.
3. METHANE FROM SANITARY SEWER TREATMENT MAY BE HARVESTED FOR USE IN BACKUP GENERATORS OR OTHER SITE NEEDS.
4. PRELIMINARY GEOTECHNICAL INVESTIGATIONS HAVE INDICATED THAT THE AREAS SHOWN ARE FEASIBLE FOR SEPTIC FIELDS. ADDITIONAL SITE SPECIFIC TESTING OF SOILS PERFORMED BY A QUALIFIED GEOTECHNICAL ENGINEER AND/OR SOIL CLASSIFIER MUST BE PERFORMED DURING THE DESIGN PROCESS TO VERIFY LOADING RATES AND SIZES

## WATER FEASIBILITY NOTES

1. RAINFALL COLLECTION CISTERNS WILL PROVIDE UP TO 1/3 OF WATER DEMAND.
2. REUSE OF SANITARY EFFLUENT WILL PROVIDE UP TO 1/3 OF WATER DEMANDS
3. REMAINING WATER TO BE PROVIDED BY NEW WELL.
4. REVERSE OSMOSIS WILL BE UTILIZED FOR CENTRAL WATER TREATMENT. INDIVIDUAL FILTERS AND ULTRAVIOLET DEINFECTION WILL BE PROVIDED ON CISTERNS.

## STORMWATER MANAGEMENT FEASIBILITY NOTES

1. STORMWATER WILL BE MANAGED IN ACCORDANCE WITH BEAUFORT COUNTY REQUIREMENTS.
2. RATE, VOLUME, AND WATER QUALITY WILL BE MANAGED THROUGH THE USE OF BASINS AND INTERCONNECTING BIOFILTRATION SWALES.

## STORMWATER MANAGEMENT FEASIBILITY NOTES

1. ELECTRIC WILL BE SUPPLIED THROUGH SOLAR PANEL FIELDS WITH BATTERY STORAGE FACILITIES.
2. BACKUP PROPANE OR METHANE GENERATORS WILL BE PROVIDED.

## UTILITY OPERATION AND MAINTENANCE NOTES

1. ALL UTILITIES WILL BE OWNED AND MAINTAINED PRIVATELY.
2. APPROPRIATELY TRAINED OPERATORS AND TECHNICIANS WILL BE HIRED TO OPERATE AND MAINTAIN ALL FACILITIES.
3. BONDING AND ASSURANCES WILL BE POSTED TO GUARANTEE OPERATION AND MAINTENANCE OF UTILITIES.



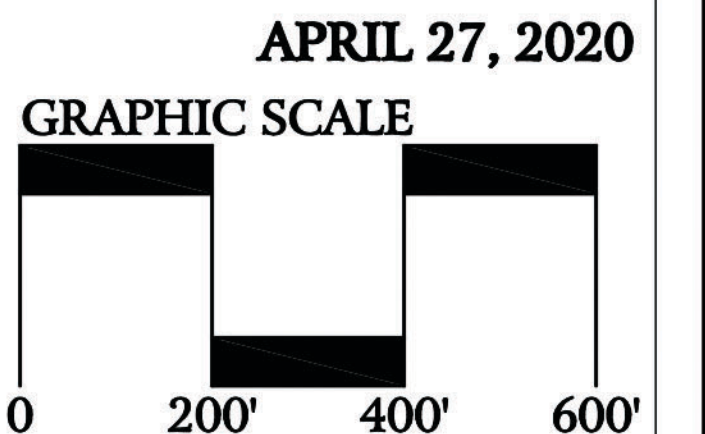
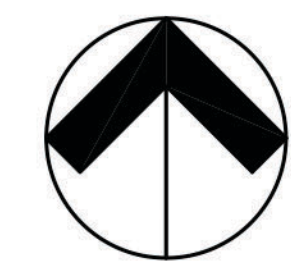
PREPARED FOR:  
BAY POINT ISLAND, LLC

PREPARED BY:  
J. K. TILLER ASSOCIATES, INC.  
LAND PLANNING | LANDSCAPE ARCHITECTURE  
181 BLUFFTON ROAD, SUITE F203 | BLUFFTON, SC 29910  
Voice 843.815.4800 | tiller@jtiller.com | Fax 843.815.4802

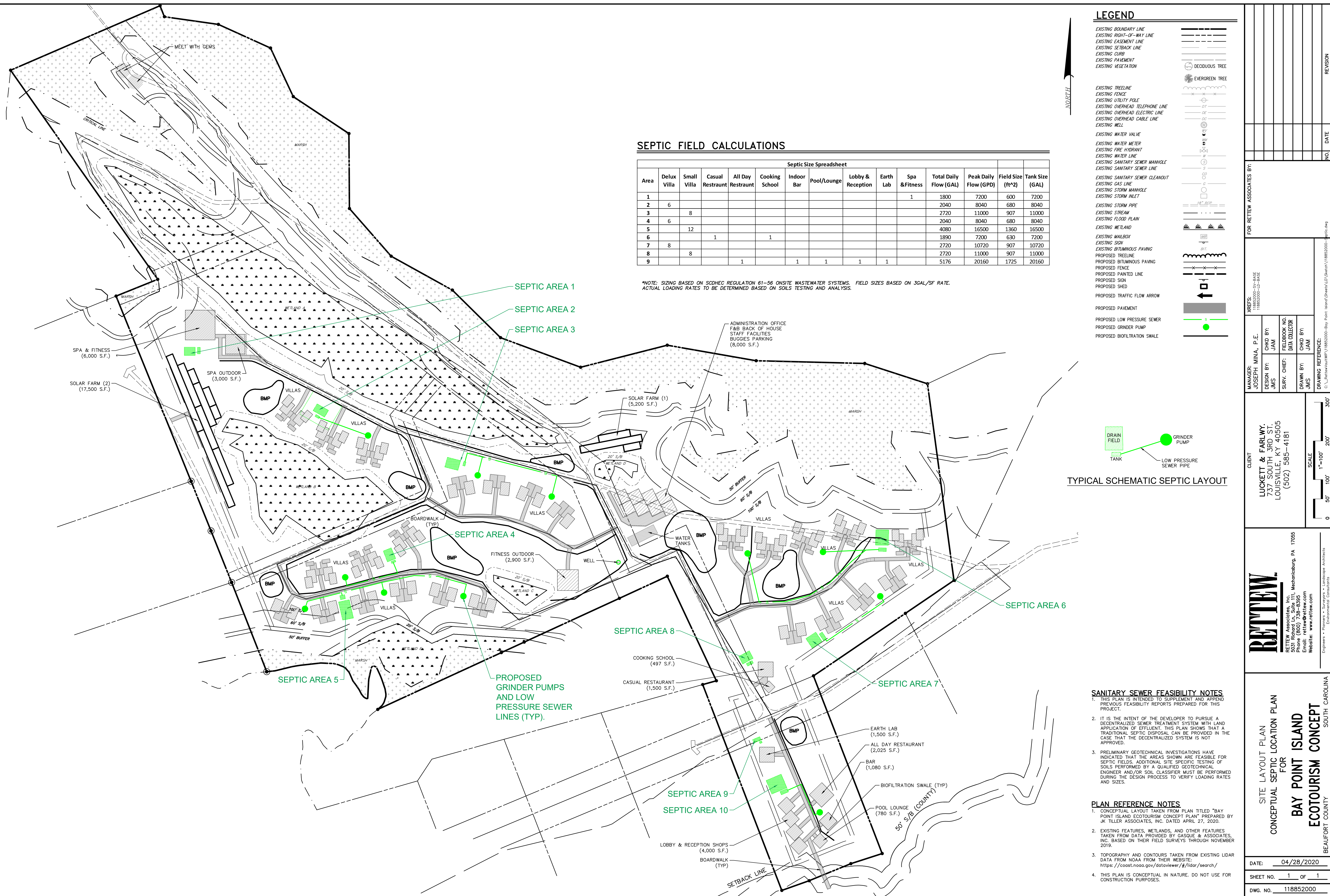
**Luckett & Farley**  
Architecture | Engineering | Interior Design

**RETTEW**  
SM

**BAY POINT ISLAND**  
**ECOTOURISM UTILITY PLAN**  
BEAUFORT COUNTY, SOUTH CAROLINA



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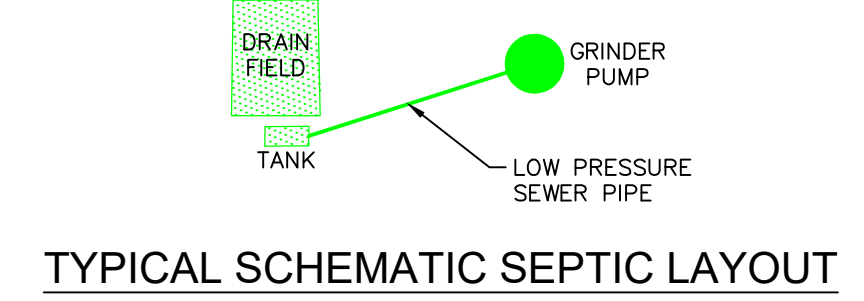
**SEPTIC FIELD CALCULATIONS**

Septic Size Spreadsheet														
Area	Delux Villa	Small Villa	Casual Restraunt	All Day Restraunt	Cooking School	Indoor Bar	Pool/Lounge	Lobby & Reception	Earth Lab	Spa & Fitness	Total Daily Flow (GAL)	Peak Daily Flow (GPD)	Field Size (ft <sup>2</sup> )	Tank Size (GAL)
1										1	1800	7200	600	7200
2	6										2040	8040	680	8040
3		8									2720	11000	907	11000
4	6										2040	8040	680	8040
5		12									4080	16500	1360	16500
6			1		1						1890	7200	630	7200
7	8										2720	10720	907	10720
8		8									2720	11000	907	11000
9				1							5176	20160	1725	20160

\*NOTE: SIZING BASED ON SCDHEC REGULATION 61-56 ONSITE WASTEWATER SYSTEMS. FIELD SIZES BASED ON 3GAL/SF RATE. ACTUAL LOADING RATES TO BE DETERMINED BASED ON SOILS TESTING AND ANALYSIS.

**LEGEND**

- EXISTING BOUNDARY LINE
- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- EXISTING SETBACK LINE
- EXISTING CURB
- EXISTING PAVEMENT
- EXISTING VEGETATION
- DECIDUOUS TREE
- EVERGREEN TREE
- EXISTING TREELINE
- EXISTING FENCE
- EXISTING UTILITY POLE
- EXISTING OVERHEAD TELEPHONE LINE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING OVERHEAD CABLE LINE
- EXISTING WELL
- EXISTING WATER VALVE
- EXISTING WATER METER
- EXISTING FIRE HYDRANT
- EXISTING WATER LINE
- EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER LINE
- EXISTING SANITARY SEWER CLEANOUT
- EXISTING GAS LINE
- EXISTING STORM MANHOLE
- EXISTING STORM INLET
- EXISTING STORM PIPE
- EXISTING STREAM
- EXISTING FLOOD PLAIN
- EXISTING WETLAND
- EXISTING MAILBOX
- EXISTING SIGN
- EXISTING BITUMINOUS PAVING
- PROPOSED TREELINE
- PROPOSED BITUMINOUS PAVING
- PROPOSED FENCE
- PROPOSED PAINTED LINE
- PROPOSED SIGN
- PROPOSED SHED
- PROPOSED TRAFFIC FLOW ARROW
- PROPOSED PAVEMENT
- PROPOSED LOW PRESSURE SEWER
- PROPOSED GRINDER PUMP
- PROPOSED BIOFILTRATION SWALE



**SANITARY SEWER FEASIBILITY NOTES**

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- PRELIMINARY GEOTECHNICAL INVESTIGATIONS HAVE INDICATED THAT THE AREAS SHOWN ARE FEASIBLE FOR SEPTIC FIELDS. ADDITIONAL SITE SPECIFIC TESTING OF SOILS PERFORMED BY A QUALIFIED GEOTECHNICAL ENGINEER AND/OR SOIL CLASSIFIER MUST BE PERFORMED DURING THE DESIGN PROCESS TO VERIFY LOADING RATES AND SIZES.

**PLAN REFERENCE NOTES**

- CONCEPTUAL LAYOUT TAKEN FROM PLAN TITLED "BAY POINT ISLAND ECOTOURISM CONCEPT PLAN" PREPARED BY JK TILLER ASSOCIATES, INC. DATED APRIL 27, 2020.
- EXISTING FEATURES, WETLANDS, AND OTHER FEATURES TAKEN FROM DATA PROVIDED BY GASQUE & ASSOCIATES, INC. BASED ON THEIR FIELD SURVEYS THROUGH NOVEMBER 2019.
- TOPOGRAPHY AND CONTOURS TAKEN FROM EXISTING LIDAR DATA FROM NOAA FROM THEIR WEBSITE: <https://coast.noaa.gov/dataviewer/#/lidar/search/>
- THIS PLAN IS CONCEPTUAL IN NATURE. DO NOT USE FOR CONSTRUCTION PURPOSES.

FOR RETTEW ASSOCIATES BY:

MANAGER: JOSEPH MINA, P.E.  
 DESIGN BY: JMS  
 SURV. CHIEF: JMS  
 DRAWN BY: JMS

CLIENT: LUCKETT & FARLWY  
 737 SOUTH 3RD ST.  
 LOUISVILLE, KY 40505  
 (502) 565-4181

RETTEW Associates, Inc.  
 118852000-PA 17055  
 Phone: (800) 728-8395  
 Email: [rettew@rettew.com](mailto:rettew@rettew.com)  
 Website: [www.rettew.com](http://www.rettew.com)

DATE: 04/28/2020  
 SHEET NO. 1 OF 1  
 DWG. NO. 118852000

SITE LAYOUT PLAN  
 CONCEPTUAL SEPTIC LOCATION PLAN  
 FOR  
**BAY POINT ISLAND  
 ECOTOURISM CONCEPT**  
 SOUTH CAROLINA  
 BEAUFORT COUNTY

SCALE: 1"=100'  
 0 50' 100' 200' 300'

NO. DATE REVISION

**UTILITY CONCEPTS AND FEASIBILITY  
EXECUTIVE SUMMARY**

**FOR**

**BAY POINT ISLAND**

**IN**

**BEAUFORT COUNTY**

**SOUTH CAROLINA**

**March 2020  
Rev May 1, 2020**

Prepared for:

LUCKETT & FARLEY  
737 South Third Street  
Louisville, KY 40202

Project No.118852000

Prepared by:  
RETTEW Associates, Inc.  
5031 Richard Lane, Suite 111  
Mechanicsburg, PA 17055  
(800) 738-8395

## INTRODUCTION

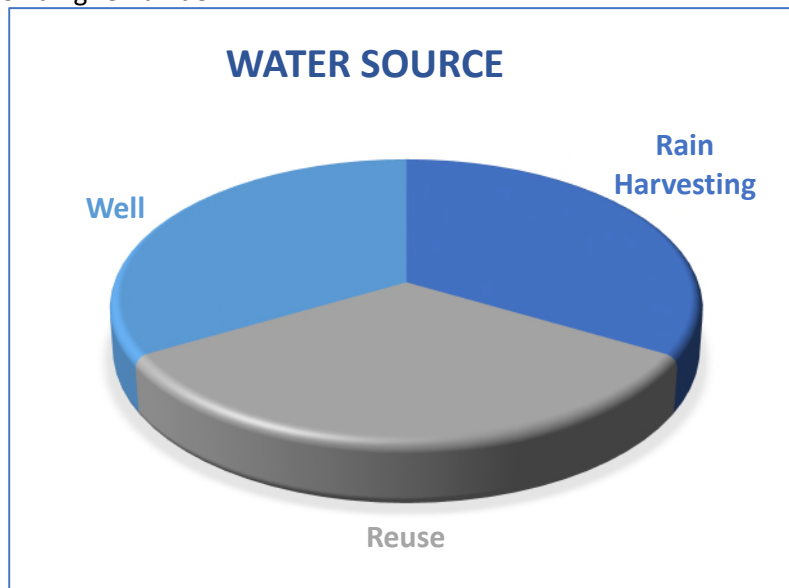
The owners of Bay Point Island are preparing plans to develop the island for high end ECO tourism. RETTEW Associates, Inc. (RETTEW) has prepared this summary of previously prepared documents and presentations to outline the conceptual plan for site utilities including Power, Potable & Fire Suppression Water, Wastewater, Stormwater Management, and Solid Waste. Additional information further detailing some of the concepts is included in the Appendix

### 1.0 POWER

- Estimated Power Demand = 0.782 kW
- Proposed Solar Energy Power Plant with rooftop panels and solar panel field sized for a total of 1.0 MW will provide power for the development
- Additional layers of redundancy will be provided by utility scale energy storage (batteries) and propane/methane generators for backup power if needed.
- Fuel for generators may be augmented through methane production generated from composting of wastewater sludge and organic waste if suitable volume of waste gas is able to be produced.
- References relating to Methane generation using waste:
  - [“Anaerobic Digestion of Solid Waste and Sewage Sludge to Methane: A Current Report on Solid Waste Management,” 1975.](#)
  - <https://www.dartmouth.edu/~cushman/courses/engs37/AnaerobicDigestion.pdf>
  - <https://archive.epa.gov/climatechange/kids/solutions/technologies/methane.html>
  - <https://www.wri.org/blog/2017/03/wastewater-best-hidden-energy-source-youve-never-heard>

### 2.0 WATER

- Estimated Water Demand
  - Potable - 40,000 gallons per day
  - Fire Suppression – 60,000 gallons
- Proposed Water Source
  - Rainwater Harvesting, Sanitary Sewer Effluent reuse, (up to 1/3 each), with Well providing remainder



- Rainwater Harvesting information
  - <https://www.clemson.edu/cafls/research/sustainableag/pdfs/rainwater%20harvesting.pdf>
- Proposed Storage Tanks 200,000 gallons total to provide daily plus backup storage
  - Underground - 100,000 gallons
  - Above Ground Cisterns
    - 3,000 gallon tanks for villas (25 total)
    - 5,000 gallon tanks for other uses (5 total)

### 3.0 WASTEWATER

- Estimated Wastewater Demand = 30,000 GPD
- Treatment is feasible through traditional Septic Disposal (See Plan)
  - Approximately ten (10) tanks with disposal fields throughout the site.
  - Final locations based on soils testing and loading rates.
  - Grinder pumps will be used to pump to tanks where gravity is insufficient.
- Decentralized system with reuse and land application of effluent will be pursued with DHEC as an alternate method of disposal.

### 4.0 STORMWATER MANAGEMENT

- Proposed Stormwater Management will fully comply with all Beaufort County regulations and requirements including:
  - Rate Reduction
  - Water Quality Treatment
  - Volume Reduction
  - Effective Impervious Calculations
  - Any other requirements in place at time of submission of development plans
- Proposed SWM Best Management Practices will include a combination of the following:
  - Traditional Ponds and SWM Basins.
  - Biofiltration facilities including Raingardens, Bio-Swales.
  - Rainwater Harvesting – collected in cisterns located throughout the development
  - Proprietary systems may be used such as engineered wetlands/filtration, inlet inserts, and specialized media for treatment from various vendors
  - Example Devices taken from County BMP Manual:

Activity: Wet Detention Basin



Activity: Bio-retention



## **5.0 SOLID WASTE**

- Estimated Waste Generation = 700 lb/day
- Proposed collection in traditional containers and bins with a central dumpster(s) for storage
- Dumpsters will be 2-6 yards with wheels and hauled off site 3 times daily on the shift change trips.
- Waste reduction of up to 45% through appropriate management of waste
  - Organic waste from restaurants and landscape waste will be composted.
  - Elimination where possible and reuse of plastics
  - All unnecessary packaging will be removed prior to shipping to island
  - Potential to reduce load to 385lb/day

## **6.0 OPERATIONS AND MAINTAINENCE**

- All utilities will be owned and maintained privately.
- Appropriately trained Operators and Technicians will be hired to operate and maintain all facilities.
- Bonding and assurances will be posted to guarantee operation and maintenance of utilities.

**APPENDIX**  
**SUPPLEMENTARY INFORMATION**



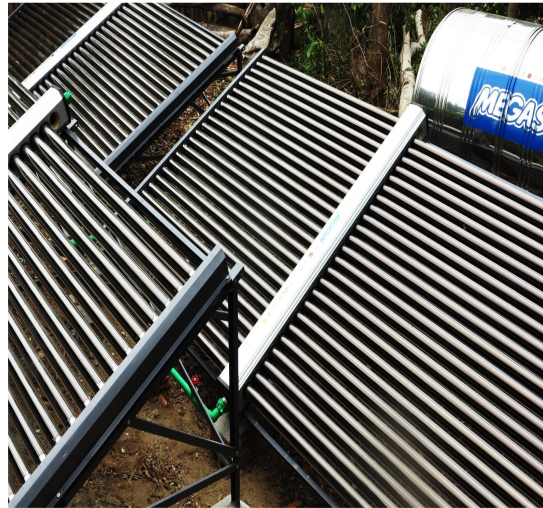
# **SIX SENSES INFORMATIONAL SLIDES**

## Six Senses Sustainable Operations – Beyond Earth Lab

### Renewable Energy – Seeking Net Zero

Renewable energy should be integrated throughout the ENTIRE property. However, the Earth Lab is a good place to showcase the technology with Guests, Hosts + Local Community.

- Solar Hot Water
- Solar Photovoltaic Energy
- Wind Turbines
- Biomass Plants
- Etc.



**Example:** Six Senses Ninh Van Bay – Solar Hot Water Heaters

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## SIX SENSES BAY POINT ISLAND –NATURAL PRESERVE ECOTOURISM APPROACH

### BEYOND THE BUILDING BASICS

- Solar Energy
- On-site Water Treatment
- Six Senses Design Standards
- LEED Certification
- Off-site Construction
  - Minimizes embodied energy
  - Ensures high quality of product
  - Can be designed for high resource efficiency and sustainable materiality
  - Minimizes construction waste
  - Minimizes negative impact of construction on-site as well as the duration of construction



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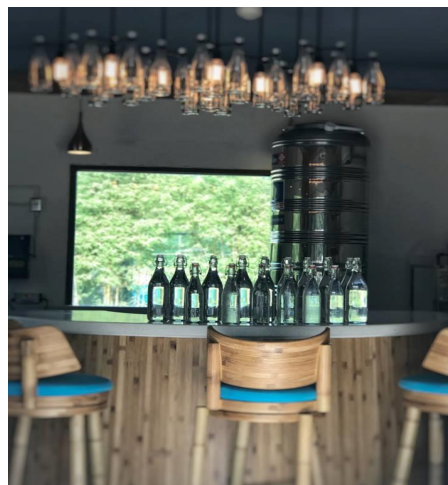


## Six Senses Sustainable Operations – Earth Lab

### SIX SENSES WATER PLANT + BAR

Six Senses does **NOT** import bottled water of any kind. On-site provisions are integrated into the Earth Lab.

- Conditioned Space
- Adequate for hygienic processing and bottling
- Additional space for water bar and educational facilities



**Example:** Six Senses Yao Noi – Six Senses Water plant transformed into a Water Bar

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SIX SENSES EARTH LAB IMPACT



45 percent of solid waste was diverted from Landfills in 2017

Solid waste diverted from landfills

No small feat when one considers that the locations Six Senses operates don't have municipal infrastructure for recycling

537,928 lbs of organic waste composted and used on-site for gardens and landscaping, 2018



Six Senses Sustainable Operations – Earth Lab  
ORGANIC WASTE - MATERIAL REUSE

- Collection, separation + measurement of all solid waste generated on property
- There are a variety of ways to compost and reuse organic waste including:
  - Vermiculture
  - Hot Compost
  - Lazy Compost
  - Eco Digester
  - Effective Microorganisms
- Six Senses properties generate significant amounts of organic material waste. It's suggested that more than one approach is adopted for optimizing operations



Example: Six Senses Zighy Bay – Worm Villa, Six Senses Laamu Hot Compost



Six Senses Sustainable Operations – Earth Lab  
SOLID "WASTE" - MATERIAL REUSE

- Collection, separation + measurement of all solid waste generated on property
- If local recycling options are available materials shall be sent to those outlets
- If no local recycling options exist then the following are on-site recycling/reuse options that must be incorporated into the programming:
  - Glass Crushing Machine
  - Plastic Shredder + Molder
  - Wood Workstation
  - BioChar Oven
- Suggest that this area be opened up to support local community with their own waste material reuse/rework initiatives to minimize local pollution



Example: (Clockwise) Six Senses Nihn Van Bay Alembic, Six Senses Laamu Bio-Char and Towel Planters



## **Clemson Rainwater Harvesting**

<https://www.clemson.edu/cafls/research/sustainableag/pdfs/rainwater%20harvesting.pdf>

## Rainwater Harvesting System

---



Nic Koontz, Biosystems Engineering undergraduate, worked at the Student Organic Farm for over two years. For his Senior Capstone Design class (BE 416), he decided that he wanted to build a rainwater harvesting system for the farm. He and two

classmates, Hunter Hicks and Bryan Kohart, approached Dr. Geoff Zehnder, Clemson University Sustainable Agriculture Program Coordinator, with their ideas and shortly thereafter began work.

For the project, these students designed and installed a rainwater harvesting system for the CFL building that will allow for the collection of a maximum of 1500 gallons of water at a time. The collected water is intended to be used for the produce washable and the irrigation of the landscape around the building. Approximately 80,000 gallons of water will come through the system in an average year. The 1500 gallon tank is conservatively sized and can meet the intended irrigation needs through a three week drought when utilizing drip or point irrigation.

The system has a small pump outfitted with a pressure tank, pressure switch, and float switch to effectively and economically distribute the collected water to where it will be used/needed. The system is currently installed and functioning. This rainwater harvesting system will help to make the CFL more sustainable and demonstrate rainwater collection and utilization techniques for small farmers and homeowners.

The following pages provide operating instructions and a parts manual for the rainwater harvesting system...

# Calhoun Fields Learning Lab Rainwater Harvesting System



## Operating Instructions & Parts Manual

**Designed and Installed by Senior Biosystems Engineering Students**

**Nicolas Koontz  
Bryan Kohart  
Hunter Hicks**

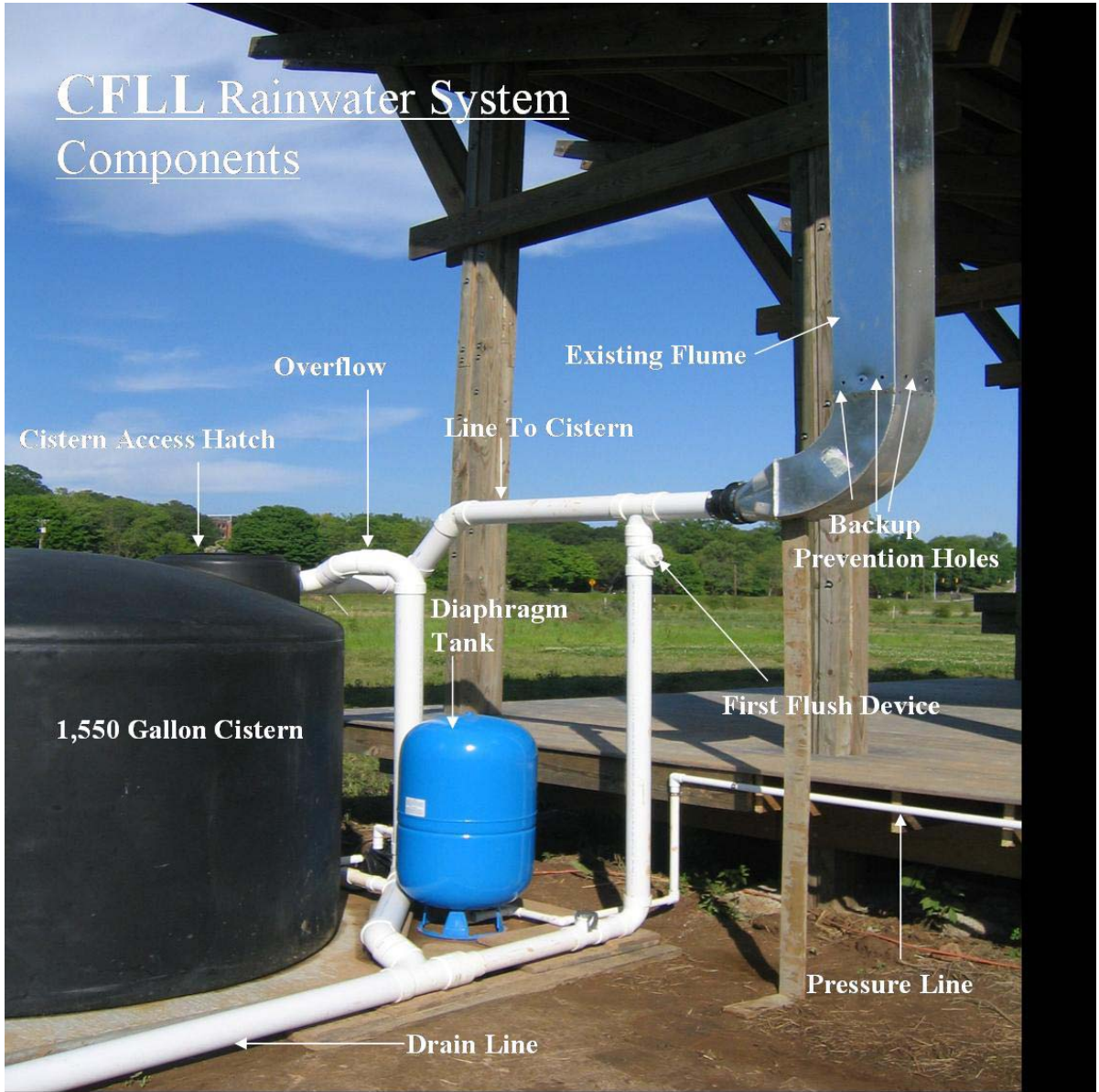
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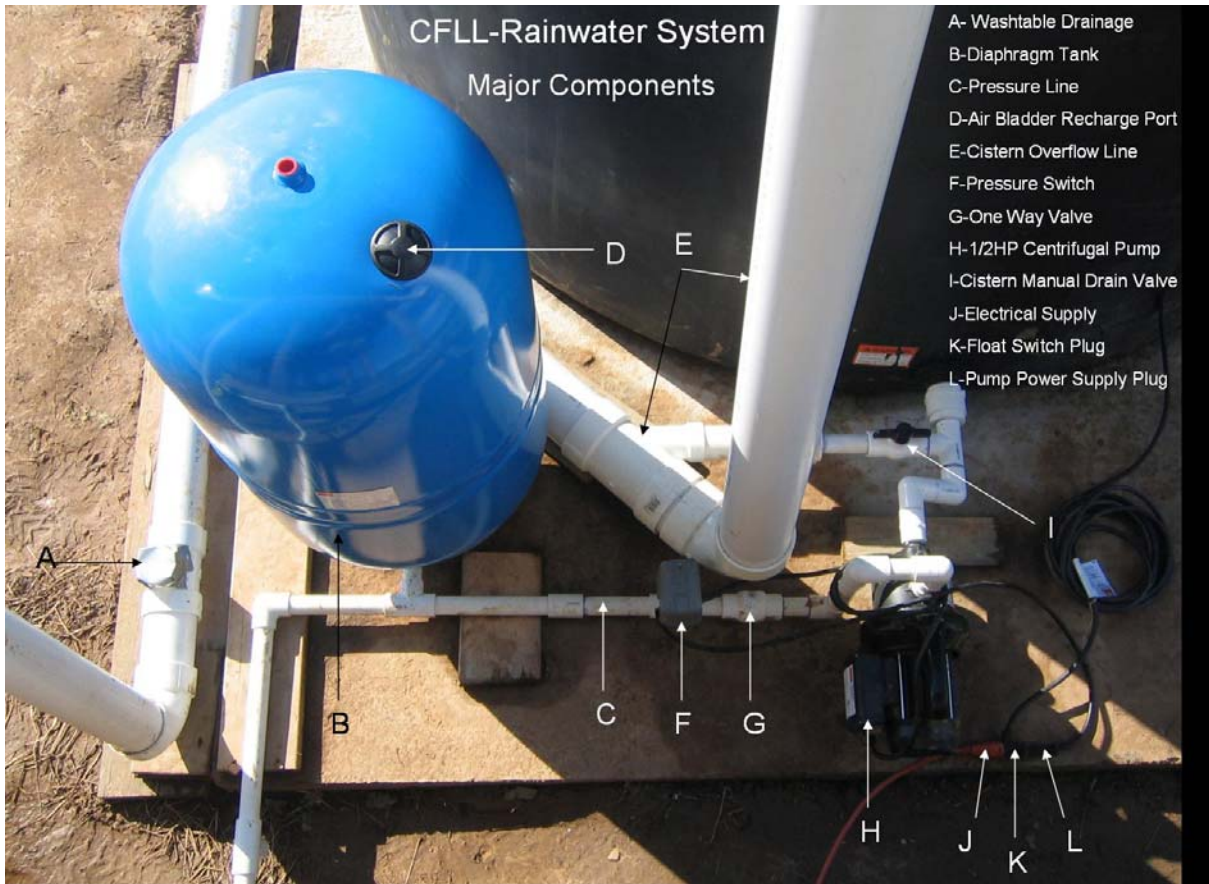
**Table of Contents**

System Diagrams.....	3-5
Components and Functions.....	6
Operating Instructions.....	7
System Capacity.....	8
Recommendations & Maintenance.....	9
Safety & Troubleshooting.....	10
Water Flowchart & Calculations.....	11-12









## Components

Parts	Make	Model	Price	Source
.5 HP Centrifugal Pump	Dayton	3YU60	\$130	Grainger
One-Way Valve	PVC		\$5	Any home store
Diaphragm Tank	Dayton	4MY61	\$250	Grainger
Cistern	-----	1550gal Polyethylene Water Tank	\$700	Watertanks.com
Float Switch	Dayton	3BY76	\$105	Grainger
Pressure Switch 30-50 PSI	Square-D	9013FSG-2J21	\$20	Grainger
First Flush Device	FloTrue	K300-W-M	\$30	FloTrue

### Component Function

-1/2 Horsepower Centrifugal Utility Pump provides the system pressure and flow for use of the water

-One Way Valve allows the pressure line to remain pressurized after the pump is off

-Diaphragm Tank allows for storage of pressurized water to prevent pump from cycling too often and extend pump life

-Cistern can store enough water for irrigating the area around the building for a three week drought

-Float Switch prevents pump from running the cistern dry which would damage pump

-Pressure Switch allows for on demand use of the system where the user does not have to turn the pump on and off

-First Flush Device allows for the first 35 gallons going directly to the drain line and cleaning the roof of debris to improve stored water quality

## **Operating Instructions**

-For filling the tank and valve/wash table usage:

1. Access the first flush ball and spring by unscrewing the plate covering the access port. Make adjustment to the first flush valve to allow some water to enter the ball by rotating the plastic pieces covering the screens in the top of the ball. The amount of water flushed will decrease as the screen area covered by the plastic increases. Replace the plate covering the access port and screw hand tight.
2. Close the manual drain valve located near the tank outlet port. Also check that the pressure line drain plug and pump drain and fill plugs are in place.
3. Turn pump on (red switch on back of pump).
4. Use water as needed by opening the valves (valve knob will be vertical when open) located on the side of the building.

-For draining the tank:

1. Turn all valves located on the side of the building to the closed position (horizontal).
2. Turn the pump off (red switch on back of pump).
3. Open the tank drain valve located near the tank outlet port.

-For draining the pressure line:

1. Open the garden hose valve.
2. Remove pressure line drain plug.
3. Remove pump drain plug located below pump inlet.

## System Capacity

### Pump

The pump will flow a maximum of ~3.7 GPM at 40 psi. The pump is setup to operate between 40-60 psi.

### Cistern-Storage Tank

The tank has a maximum capacity of 1550 gallons. Due to the location of the outlet port and float switches, the maximum usable capacity is ~1350 gallons. The water usage/storage data is tabulated in Table 1.

Table 1

## 1 Year Results Average Rainfall

<u>Month</u>	<u>Average Rainfall (inches)</u>	<u>Total Collected (gallons)</u>	<u>Usage (gallons)</u>	<u>Amount of Water Stored @ End of Month (gallons)</u>	<u>Lost Water (gallons)</u>
January	5.00	5984	0	0	4434
February	4.90	5864	0	0	5864
March	5.60	6702	2,000	1550	4702
April	4.3	5146	2,000	1550	3146
May	4.1	4907	2,000	1550	2907
June	3.9	4667	2,000	1550	2667
July	5.0	5984	2,000	1550	3984
August	4.8	5744	2,000	1550	3744
September	3.5	4189	2,000	1550	2189
October	3.7	4428	2,000	1550	2428
November	3.6	4308	2,000	1550	2,308
December	5.1	6103	0	0	6103
Totals	53.50	64025	18000		44475

\*Rainfall Data from <http://www.worldclimate.com> derived from NCDC Cooperative Stations (1911-1995)

The table indicates, there approximately 44,475 gallons of surplus water each year. This water will be directly dumped on the ground through the drainage system. Table 1 assumes that no water will be stored during the winter months.

## **Recommendations & Maintenance**

### **Pump and Accessories:**

1. The pump and pressure switch must be protected from wet weather. Some type of cover is suggested for these items.
2. The water entering the pump should not exceed 90 degrees Fahrenheit and should not drop below 32 degrees Fahrenheit. A roof over the tank may need to be erected to prevent direct sunlight from raising the tank temperature drastically during the summer months.
3. Do not run pump with the manual cistern drain valve open.
4. When draining the tank and pressure lines for winter, the pump must also be drained through the two plugs on pump housing.
5. The pressure switch should turn the pump on at 40 psi and off at 60 psi (use mounted pressure gauge for reference). If it fails to meet these requirements, unscrew the pressure switch cover and adjust the two nuts according to the instructions found on the underside of the switch cover.
6. The pump, pressure switch, and float switch should be hardwired as soon as possible.
7. Periodically check diaphragm tank pre-charge pressure with a standard tire pressure gauge. The pressure should read ~38 psi. If it differs from this value, refer to the owner's manual.

### **Cistern**

1. The tank should be cleaned regularly (skim surface with a fine mesh net to remove debris that may collect). The bottom of the tank may also need to be cleaned periodically. A regular visual inspection through the access port will determine the amount of cleaning that needs to be done.
2. Periodically visually inspect the float switches located on the bottom of the tank near the outlet to make sure they are secured to the cement block. If they are not secured, tie them down in a way that will turn the pump off before the water level reaches the outlet port. This is accomplished by entering the tank after it has been drained. Secure the float cords to the cement block so that the floats will float at the same level. Next hold them both vertical and mimic the action of a falling water level. There will be an audible click at roughly 20 degrees below horizontal. Adjust the height of the floats such that the click is heard before the bottom of the floats reaches the tank outlet port.

### **PVC Pipe**

1. Weekly visually inspect and repair any leaks.
2. The system must be drained during freezing weather. First disconnect the power from the pump and accessories. Unscrew the drain plug located just off of the pad in the pressure line and open the hose line valve. Drain the vertical section of pipe from the pump outlet by draining the pump. The drainage lines will drain themselves.
3. If water in bottom of flume elbow begins to alter water quality, drill small hole in bottom of flume elbow to drain out onto ground

## **Safety**

1. Do not go into tank without supervision and use caution when in tank to avoid drowning
2. Disconnect power supply before servicing system
3. Make sure manual cistern drain valve is closed when system is powered
4. Plug in float switch as indicated in diagram, between electrical supply and pump cord
5. In case of large storm, take ball/spring out of first flush
6. If water begins to collect up the flume, drill more drain holes
7. Do not attempt to raise line pressure above 60 psi. Serious injury could result.

## **Troubleshooting**

### No water out of hose

1. Make sure all electronics are plugged in and in correct configuration
2. Make sure manual cistern drain valve is closed
3. Make sure there is water above the float switch

### Pump switch clicks on and off

1. Follow direction on underside of cap to adjust pressure switch on/off pressures

### Water will not go to tank

1. Make sure first flush device is working properly
2. Close manual cistern drain valve
3. Tank may be full

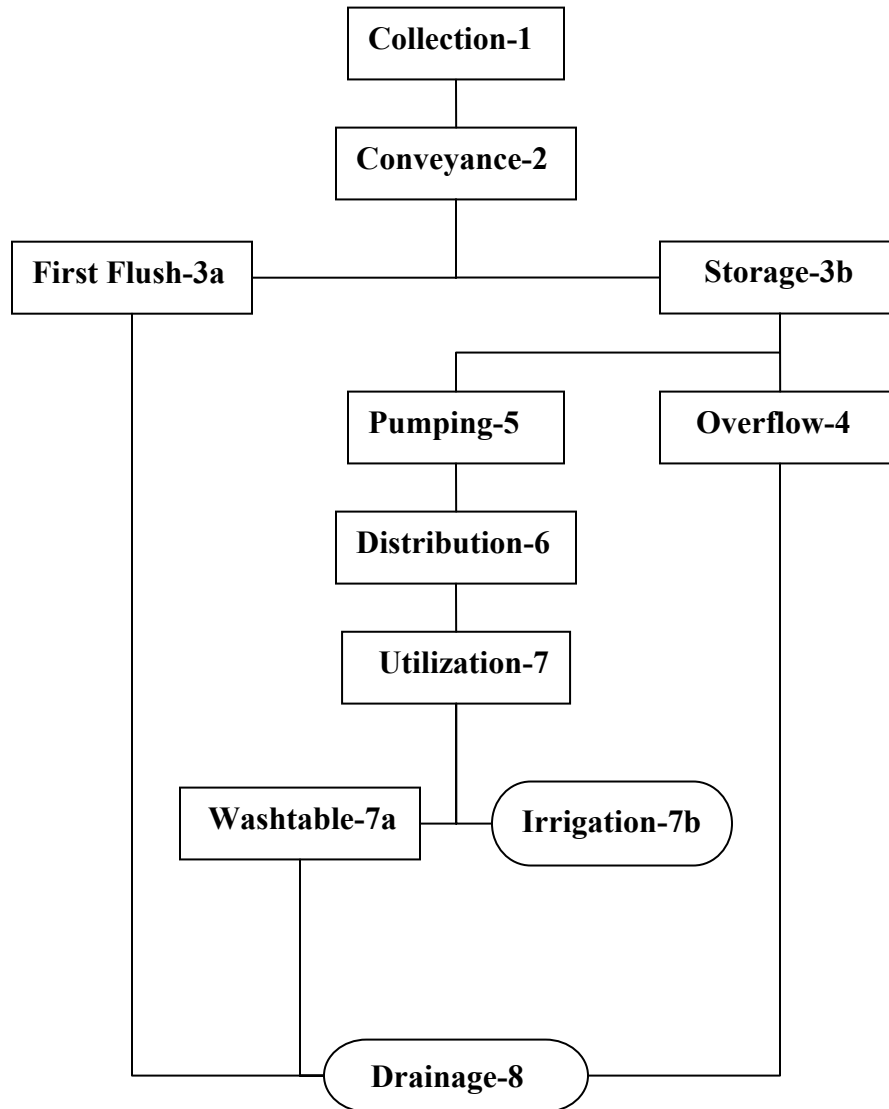
### Water is leaking

1. Wait until area is dry and then apply silicon caulk

### Drainage Problems

1. Reroute corrugated drain line to new area
2. Trench hard line to nearby creek
3. Check for obstructions in drain line

## CFLL Rainwater Harvesting System Flowchart of Water





## Related Calculations/Considerations

### **1-Collection:**

How much volume for year will be coming through the system? Distribution throughout the year?

### **2-Conveyance:**

Can Flumes handle volume? Will grate/funnel work? Required fittings? Redo existing flume.

### **3a-First Flush:**

How much flush is appropriate? Setup orientation of First Flush device

### **3b-Storage:**

How big based on needs? Foundation for tank

### **4-Overflow:**

Setup of overflows to drainage

### **5-Pumping:**

Type, capacity, price, specs of pump based on use needs

### **6-Distribution:**

Setup of system after pump, Create possibilities for wash-table and irrigation that will be convenient for installation

### **7a-Washtable:**

Volumetric needs, continuous or on-demand, tie table drain to system drainage

### **7b-Irrigation:**

Vegetation type, rough area, plant needs, get through drought time, possibly xeriscaping

### **8-Drainage:**

Drain to where, what type of drainage can overflow be routed to irrigation for ground dispersal? Must go away from building, tank, and refrigerator

# **EPA METHANE PRODUCTION INFORMATION**

**“Anaerobic Digestion of Solid Waste and Sewage Sludge to Methane:  
A Current Report on Solid Waste Management,” 1975.**

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and sewage sludge to methane

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An environmental protection publication in the solid waste management series (SW-159). Mention of commercial products does not constitute endorsement by the U.S. Government. Editing and technical content of this report were accomplished by the Systems Management Division of the Office of Solid Waste Management Programs.

Single copies of this publication are available from Solid Waste Information, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

# ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE TO METHANE

By Steven J. Hitte\*

## Objectives

The primary objective of this report is to evaluate the potential for processing organic wastes (solid waste and sewage sludge) using a controlled anaerobic digestion process for the purpose of producing methane. Controlled anaerobic digestion is a biological process whereby organic matter decomposes in a regulated oxygen-deficient environment. This report is intended: (1) to present a way in which the national energy shortage can be reduced by producing methane from anaerobic digestion of municipal solid waste and sewage sludge; (2) to compare and describe this biological process with other resource recovery concepts; (3) to summarize the current research being performed in anaerobic digestion; (4) to present an estimated cost analysis of a 1,000-ton-per-day (TPD) solid waste and sludge digestion facility.

## Energy Demand

Anaerobic digestion for the conversion of waste materials to methane is one possible means to offset the increasing shortage of natural gas. The total United States energy demand in 1972 was approximately 72 quadrillion ( $10^{15}$ ) Btu and is projected to exceed 96 quadrillion Btu by 1980. Natural gas (methane) supplies 32 percent of this total energy demand (23 quadrillion Btu).<sup>1, P. 2</sup> Yet the nation's reserves of energy, particularly natural gas, will be able to provide only a decreasing fraction of projected energy supplies. New developments in technology can help to develop new supplies of energy. Production of natural gas through anaerobic digestion of solid waste and sewage sludge is one such new technology that can increase the nation's supply of energy.

## Potential Market

The potential market for a process which converts solid waste and sludge to methane is significant. There is a potential market for over 200 1,000-TPD solid-waste and sludge-to-methane facilities

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\* Mr. Hitte is a mechanical engineer in the Systems Management Division of EPA's Office of Solid Waste Management Programs.

in the urban areas of the United States. With the current municipal solid waste generation rate of 3 to 5 pounds per person per day and a sewage sludge generation rate of 0.3 to 0.5 pounds per person per day, a population of approximately 500,000 could provide enough waste to supply one 1,000-TPD facility. According to the 1970 United States Census, there were 26 cities in the country with populations in excess of one-half million. More significantly, there are 65 Standard Metropolitan Statistical Areas (SMSAs) in the United States with populations in excess of 500,000. The aggregate population of these SMSAs is in excess of 100 million, half of the nation's population.

Bioconversion of solid waste and sewage sludge is one energy conversion option. Based on data from bench-scale experiments, a 1,000-TPD bioconversion facility could produce approximately 3.6 million cubic feet of methane per day based on a conservative value of 1.8 cubic feet of methane generated per pound of municipal solid waste and sewage sludge.<sup>2, P.82</sup> The 65 SMSAs with populations in excess of 500,000 therefore have a potential for methane production in excess of 720 million cubic feet per day. Based on figures published in the 1973 edition of Browns Directory of North American Gas Companies, this process, if implemented in those 65 SMSAs, could supply a small, supplementary percentage of the total natural gas consumed in the United States. In addition, animal, crop, and some industrial wastes represent the potential of an additional 13 billion cubic feet per day of methane (20 percent of the natural gas demand), although the economics of collection and transportation may restrict their use.<sup>3, P.7</sup> These wastes are not considered to be a viable potential for purposes of this paper.

On a local basis, natural gas produced from municipal solid waste can supply higher percentages of total gas consumption. For example, if all the waste in the Cleveland SMSA (Cuyahoga County) (1970 population: 2,064,000) could be utilized, 5.3 billion cubic feet per year of methane could be produced, approximately 2.8 percent of Cleveland's natural gas demands.\*

These projections show that methane produced from solid waste can contribute as a supplemental source of energy. This comes at a time when energy shortages and rising solid waste disposal costs are forcing many major communities to reevaluate their refuse disposal practices.

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\* The natural gas sales volume of the Cleveland Division of the East Ohio Gas Company in 1973 was 190 billion cubic feet. The population of Cleveland in 1970 was 751,000. The potential for gas production from wastes in the City of Cleveland is 1.9 billion cubic feet per year, approximately 1 percent of Cleveland's natural gas demands.<sup>2, P.126</sup>

## Energy Products from Resource Recovery Concepts

Municipal solid waste is one raw material currently being discarded that can be "mined" for its energy content. Presently, many different approaches to recovering this energy are being examined. Included in these resource recovery concepts are: (1) shredded and classified solid waste as a supplemental fuel, (2) pyrolysis, (3) waterwall incineration, (4) hydrogasification, (5) methane production. All of these technologies enable solid waste to be converted into a number of energy forms, including solid, liquid, and gaseous fuels, and steam and electricity; they also offer the opportunity of front-end recovery of valuable materials.

To be marketable, these energy products must be produced at a cost competitive with the fossil fuels they supplement or replace. This cost is indirectly related to the energy recovery yield of the system. The equation for this yield is as follows:

$$E_{RY} = \frac{E_O - E_C}{E_A}$$

Where  $E_{RY}$  = percent of energy recovery yield  
 $E_O$  = usable energy out of the system measured in Btu  
 $E_C$  = total energy consumed by the system, measured in Btu  
 $E_A$  = energy available in solid waste based on 4,500 Btu/  
pound of waste

For most of these systems, the energy recovery yield ranges from 20 to 30 percent.

Anaerobic digestion is the only known process that produces an energy form (methane gas) in large quantities that can be used directly by the consumer for home heating, cooking, and other such purposes.\* When the gas produced is cleansed to pipeline quality (1,000 Btu per cubic foot), it could be easily marketed because it can be injected directly into a local utility pipeline system. The indications from a telephone survey are that utilities are very positive about purchasing even small quantities of this high Btu gas, as long as the price is competitive with other sources of gas.

### Current Research

Presently, there are a number of groups studying the bioconversion process. Dr. Perry McCarty, Stanford University, and Dr. Clarence Goluecke, University of California in Berkeley, are two such researchers

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\* All other energy recovery processes require conversion to steam or electricity.

who have performed studies in bioconversion of organic waste to methane. Much of their work has been published in scientific journals and proceedings from various conferences.<sup>4,p.1,58</sup> Dr. John Pfeffer, University of Illinois, has also done substantial research in the temperature ranges and the various dewatering processes to increase the efficiency of this process. The Dynatech Corporation, Cambridge, Massachusetts, has concluded a paper study on the economics of the anaerobic digestion process. Computer models were designed to incorporate all parameters of this process to determine the economy of scale.<sup>2,p.11</sup>

In Franklin, Ohio, research work is underway to investigate the feasibility of combining solid waste with sewage sludge, having the mixture digested and capturing the energy value through the production of methane for use as a fuel. In this process, wet-processing may be advantageous because small particle sizes and large quantities of water are needed to create optimum conditions for decomposition. This work is being done in conjunction with a project funded formerly by EPA with the Black Clawson Company.<sup>5</sup>

Dr. S. Ghosh and Dr. D. Klass, Institute of Gas Technology, have performed various experiments on varying the particle size of the solid waste fed into a digester to increase gas production. Their findings indicate that the finer the particle size, the higher the gas yield.<sup>3,p.7</sup>

The engineering department at the University of Arizona has performed bench-scale work (100 gallons) on digesting combined raw sewage and solid waste. Scaled-up work for a 20,000 gallon in-ground digester heated by solar energy has recently been completed. The cleaned methane will be used for local needs with the remaining CO<sub>2</sub> supporting a greenhouse and the residue acting as a soil conditioner.<sup>6</sup>

In the summer of 1975, the Energy Research and Development Administration (ERDA) awarded a multimillion dollar contract to construct and demonstrate the feasibility of producing methane gas from the solid waste stream. This will be a four-year study incorporating a design capacity of 50 to 100 TPD.

Other industries and universities are studying this process and dispersing their findings through conferences and publications. With all this interest in waste digestion, the near future might provide some sound conclusions and technology on whether this process is viable.

### Biological Process

Anaerobic digestion of complex organic wastes is a two-stage process (Figure 1). In the first stage, the acid-forming bacteria act upon complex organics and change the form of complex fats, proteins, and carbohydrates to simple soluble organic materials, commonly known



as organic or volatile acids. The second stage involves the fermentation or gas-generation phase which produces the desired methane gas. In this step, the methane-forming bacteria use the organic acids produced in the first stage as substrate and produce the end products: carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ) and traces of hydrogen sulfide ( $\text{H}_2\text{S}$ ). The quantities of these off-gases can vary but the mixture consists of roughly 50 percent  $\text{CO}_2$  and 50 percent  $\text{CH}_4$ .

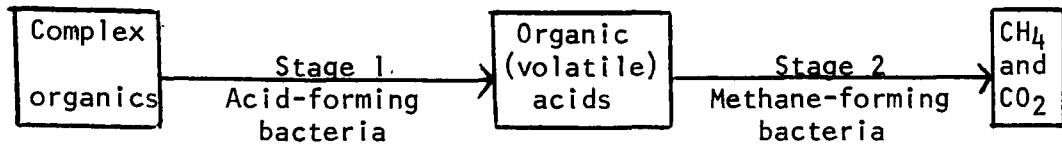


Figure 1. This diagram illustrates anaerobic digestion of complex organics, which are defined as large molecular chain structures containing carbon, hydrogen, glucose, cellulose, etc.

### Parameters Controlling Methane Production

To attain continuous digestion, a proper balance between the acid-forming bacteria and the methane-forming bacteria is required. Optimum levels of five environmental parameters are essential to the establishment and maintenance of this balance; these parameters are: temperature, anaerobiosis, pH, nutrients, and toxicity of input.

Temperature is an important operational parameter in an anaerobic digestion process. As temperature increases, biological reactions proceed much faster, and this results in more efficient operation and lower retention-time requirements which may vary from 4 to 30 days. Two temperature levels have been established: in the mesophilic level, the temperatures range from 30 to 45°C; in the thermophilic level they range from 45 to 60°C. Although rates of reaction in the thermophilic level are much faster due to increased bacteria formation than those in the mesophilic level, the economics of most sewage sludge digestion systems have indicated operation in the mesophilic level.\*

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\* Much controversy over the temperature levels has been voiced by various researchers. The debate is over the efficiency and economy of operating a digester at these temperature levels. Some bench-scale experiments have been performed varying the temperature and monitoring the gas produced with the retention time, but results are not consistent and may not be applicable to a full-scale system.

Another environmental requirement for anaerobic digestion is the maintenance of anaerobic conditions (anaerobiosis) in the digester. The methane formers are strict anaerobes and even small amounts of oxygen can be quite detrimental to them. This necessitates a closed digestion tank which excludes oxygen while also facilitating collection of the methane produced.

The third environmental requirement for optimum operation is proper pH control. Anaerobic digestion can proceed quite well under slightly acidic conditions, with a pH varying from 6.7 to 7.0.<sup>7, p.11</sup> Beyond these limits, anaerobic digestion proceeds with decreasing efficiency. Under more acidic conditions, a pH of 6.2 or lower, waste stabilization ceases. Control of pH is exercised by the addition of an alkali [sodium bicarbonate ( $\text{Na}(\text{CO}_2)_2$ )], which has recently been found to control pH better than lime.

The bacteria responsible for waste fermentation in the anaerobic process require nitrogen, phosphorus, and other materials for optimum growth. Therefore, another important environmental condition is the presence of the required nutrients in adequate quantities. These nutrients are measured against a carbon-nitrogen (C-N) ratio. The C-N ratio of solid waste is not sufficient for maximum digestion, hence the addition of sewage sludge, which adds nitrogen to create a more favorable ratio, is necessary.

For successful anaerobic treatment, the fifth environmental parameter, that of toxicity of input, must be at the level where the waste is free from toxic materials. These inhibitory materials range from inorganic salts to toxic organic compounds. Control of toxicity can be achieved by removal of toxic materials by chemical precipitation within the digester and by dilution of the waste stream below the toxic threshold of the toxicity-causing material by such means as increasing the moisture content of the slurry.

Once these five parameters have been established and maintained at their optimum levels, then production of gas should occur naturally. The methane remaining after gas cleansing has a heating value of 1,000 Btu per cubic foot. This is pipeline quality and acceptable from a gas company's viewpoint.

### Process Description (Conceptual Discussion)

As devised by the researchers on their bench-scale experiments, the physical apparatus for producing methane gas from municipal solid waste and sewage sludge could be divided into four areas of operation (Figure 2): (1) waste handling and mixing, (2) digestion, (3) gas treatment, (4) effluent disposal.

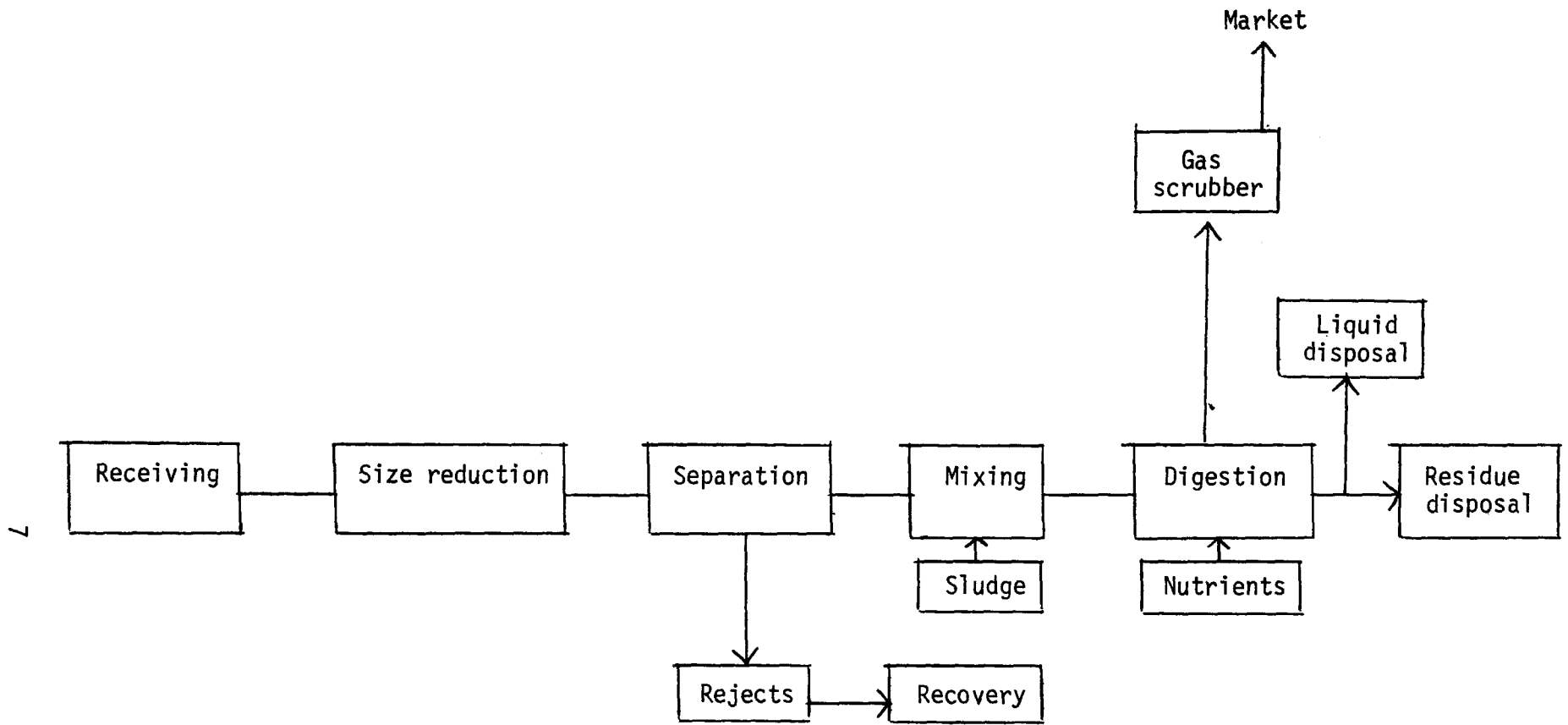


Figure 2: This diagram shows areas of operation in the anaerobic digestion of municipal solid waste and sewage sludge.

The municipal solid waste, after being deposited on the tipping floor, would be shredded for ease in materials handling. The shredding operation would fulfill two primary functions: it would allow for efficient separation of the organic material from the inorganic, nondigestible matter (metal cans, bottles, etc.) found in municipal waste; and it would reduce the feed to a homogeneous size, which would be more readily digested.

Separation systems based on two different principles are currently being developed; these are the dry and wet separation processes. The dry separation process is being demonstrated in St. Louis and the wet separation process in the City of Franklin, Ohio.<sup>8,5</sup> Both processes provide a waste stream with a high concentration of organic matter relatively free of metals, glass, and grit. In a dry separation process, the shredded material is air classified during which the organic materials are separated and recovered as the lighter fraction. The light organic material then would be shredded in a secondary shredder and conveyed pneumatically to a storage silo where it would be finally ready for digestion. In the wet system, the shredded waste would be fed into a hydropulper to be mixed with a large amount of water. This process is similar to that of a kitchen sink disposal unit. Fibrous materials are recovered as a dilute aqueous stream which would be conveyed pneumatically to a storage silo where it would be finally ready for digestion.

Before the waste material enters the digester, it must be mixed with nutrients (sewage sludge) and other chemicals (lime, sodium bicarbonate, phosphorus) necessary for the digester operation. At this stage, animal or agricultural wastes could be blended into the slurry if these were part of a locality's waste stream. Each digester would be maintained at constant pressure and temperature and would be provided with a means for continuously stirring the contents.\* Stirring allows uniform digestion of the material to proceed in two stages as described in a previous section. The products of digestion consist of two streams. One stream would be composed of methane and carbon dioxide in equal volumes, and the other would be residue that must be disposed of appropriately.

The methane produced from the digester would contain carbon dioxide and traces of hydrogen sulfide. These two acid gases must be removed before the methane is sold. This could be accomplished via one of a number of gas-cleansing processes. These are the molecular sieve, Selexol,<sup>†</sup> and diglycolamine processes. All three systems are designed to remove large concentrations of carbon dioxide (50 percent for digester gas).

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\* Ten 60,000 cubic feet digesters would be needed for a 1,000-TPD plant.

<sup>†</sup> Selexol is a registered trademark of Allied Chemical Corporation.

The final operation, the effluent disposal, would be best carried out by separating the solids from the liquid and returning the liquid to the sewage treatment plant for subsequent treatment and final discharge. The solids, in the form of the moist sludge obtained from various dewatering processes such as vacuum filtration, centrifuging, and heat drying, could then be disposed of or utilized. Various methods could be used: incineration, landfilling, use as a soil conditioner, reclamation of strip mines, or compression to form fiberboard. This sludge, whose volume would be only 20 percent of the incoming solid waste, would have a heating value of 4,000 Btu per pound (25 percent solid) and could be burned to generate usable steam.

### Benefits

The potential benefits resulting from the anaerobic digestion of solid waste are: (1) energy recovery in the form of methane gas to be used directly in home heating and cooking, (2) reduction of the municipal solid waste disposal problem on a large scale, (3) reduction of the sewage sludge disposal problem, (4) materials recovery from the sale of ferrous metals and other secondary materials (Figure 3).

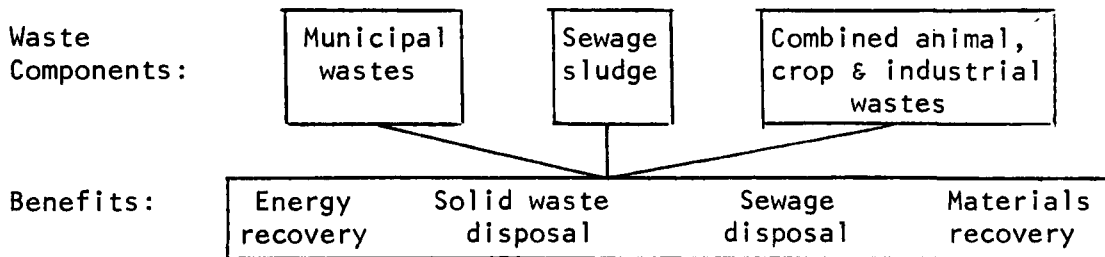


Figure 3. A simplified block diagram illustrates the waste stream components and associated benefits resulting from the anaerobic digestion of organic materials.

### Projected Economics of a Conceptual System

The economics of an anaerobic digester plant can only be estimated since the process has not been demonstrated on a full scale (1,000 TPD). The following capital and operating costs are based on a study done in July 1974 by the Dynatech Corporation, Cambridge, Massachusetts.<sup>2, p. 81</sup> Annual capital cost figures are based on typical 20-year, 6-percent financing. It would not be advisable to assume that these figures are automatically applicable to all parts of the United States without a prior study of pertinent factors such as site costs, labor and material costs, product marketability, plant size, etc.

The capital and operating costs per ton and revenues per ton of the plant for a 1,000-TPD plant, processing wastes 310 days per year, producing gas 365 days per year have been projected (Table 1). If a municipality pays \$13 per ton or more to dispose of its solid waste and sewage sludge, serious consideration should be given to implementation of the anerobic digestion process should full-scale systems be proven technically feasible.

TABLE 1  
PROJECTED ECONOMICS OF 1,000-TPD BIOCONVERSION PLANT

Costs	Costs/Ton
Capital including amortization*	\$ 3.60
Operating <sup>+</sup>	7.10
Residue disposal <sup>‡</sup>	<u>2.30</u>
Total	\$13.00
Revenues	Revenues/Ton
Sale of natural gas <sup>§</sup>	\$3.60
Sale of ferrous metal <sup>¶</sup>	2.70
Credit for sludge disposal**	<u>1.90</u>
Total	\$8.20

\* Plant cost: \$22 million, 20 years, 6 percent municipal bonds; includes design, site, equipment, and construction costs.

+ Includes supplies, chemicals, maintenance, utilities, labor overhead, taxes; no detailed breakdown is available.

‡ Sanitary landfill (SLF) at \$5 per ton of digester residue, heavies from air classifier, and waste water.

§ Sell at \$1 per mcf (\$1/MMBtu).

¶ Sell at \$40 per ton.

\*\* SLF at \$5 per ton.

## Environmental Impact

The greatest advantage of an anaerobic digestion system is its positive environmental impact. Solid waste which would normally be disposed of in a land disposal site can now be converted into a useful product (gas) with no adverse impact on the environment. Because of the absence of air pollutants and with proper control of the effluent and residue, there will be no adverse environmental effect from the operation of such a solid waste conversion plant. The positive contributions of this system in the elimination of the land disposal of wastes and in the recovery of valuable materials and fuel make this an environmentally desirable approach to solid waste management.

## Disadvantages

Because anaerobic digestion of waste materials has not been demonstrated on a large scale, there is considerable risk that the system will not perform as predicted. The potential exists that the digesters will sour from time to time. This potential is supported by the experience of operating sewage sludge digesters where the biological process occasionally is inhibited. The addition of air-classified organic solid waste to sewage sludge in a digester should maintain the proper chemical balance so as not to inhibit this biological decomposition of the waste materials. As other resource recovery concepts, the process is also capital-cost intensive. Other drawbacks are that it initially has relatively low gasification rates over a period of time (retention time in days) as compared to other resource recovery concepts and that the construction of a 1,000-TPD plant would cover significant acreage (12 acres) if land was at a premium. If a full-scale system was implemented, almost all of these disadvantages could be overcome by experience.

## Summary

In summary, the anaerobic digestion process if developed to applicable technology stages could:

- maximize the conversion of municipal solid waste and sewage sludge into a usable fuel;
- facilitate recovery of materials;
- handle other wastes mixed with the municipal solid waste and sewage sludge such as animal, crop, and some industrial wastes;
- operate without causing pollution to the air.

So far, the only drawback to implementing an anaerobic digestion system for a community is the initial capital investment to construct such a facility. The existing technology for the various system components such as the shredder, digestion tank, and gas cleansing unit are available and operating today but all these components must still be joined together into a fluent, functioning system for solid waste and sewage sludge. Until this is done, the anaerobic digestion process will remain dormant.



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