U.S. et al. v. Beazer East, Inc.
Consent Decree Appendix A
Drayton Hall Restoration Project Statement of Work

BEAZER EAST, INC
FORMER KOPPERS SITE
CHARLESTON, SOUTH CAROLINA

DRAYTON HALL RESTORATION PROJECT STATEMENT OF WORK

FINAL
MAY 2018

Beazer East, Inc., Former Koppers Wood Treating Site-Charleston, South Carolina
Drayton Hall Restoration Project Statement of Work
FINAL
May 2018

1 INTRODUCTION

Beazer East, Inc. (Beazer) has reached a Natural Resource Damage (NRD) settlement with the Natural Resource Trustees (Trustees) regarding the former Koppers Company Wood Treating Site located on the Ashley River in Charleston, South Carolina (Site). As part of this settlement, Beazer will implement the Drayton Hall Restoration Project as described herein. Specifically, Beazer will reestablish the historical hydrology of an intertidal saltmarsh area located on the north side of the Ashley River (See Location Map) It is anticipated that this semi-impounded marsh area will benefit from the restored hydrologic connection with the Ashley River, thus enhancing habitat for juvenile and adult finfish, juvenile crabs, shorebirds, wading birds, migratory waterfowl, and avian marsh predators.

The Trustees have determined that if the restored hydrologic connections meet the performance criteria outlined in this statement of work, there is reasonable assurance of project success in the long-term, and that the ecological services needed to offset the service losses being credited to the Drayton Hall Restoration Project will be satisfied. The monitoring efforts detailed herein will provide the information necessary to determine this success.

To offset the remaining ecological liability, the Trustees will receive a one-time payment to be used to fund and implement additional ecological projects.

2 DRAYTON HALL PROJECT SITE DESCRIPTION

Historical maps of the Cooper and Ashley Rivers show extensive rice fields dating back to the 1700s. The mid-1800s saw a decline in the rice culture in South Carolina. This decline was accelerated by the Civil War, which contributed to a break down in the plantation system. Three hurricanes, occurring in 1898, 1910 and 1911, breached many of the rice dikes and effectively ended rice growing on the rivers. However, many old rice dikes are still present in the Ashley and Cooper Rivers and have varying impacts on normal tidal flow in and out of the marshes they enclose.

The Drayton Hall project site contains a relict dike. According to historical photography the current dike was built after 1939. Specifically, Mr. Floyd Whitfield, the previous owner thought it was built in the late 1940s by Williams Furniture Company as an impoundment for duck

hunting. However, conversations with Mr. George McDaniel, Director of the Drayton Hall National Historic Preservation Site, revealed that historical records show that there was also a rice dike in the same area in the late 1700s. The site is located on the north side of the Ashley River, directly across from Drayton Hall (see Location Map). The 1939 aerial photography shows the site before the current dike was built (Figure 1). Post-construction photography shows the dike with a parallel dredged canal on the inland side that was probably used as the fill source for the dike (Figure 2). Today, the historical channels are still evident on the river side and the inland side of the dike, but they appear to have silted in as a result of restricted tidal flow. The semi- impounded area enclosed by the current dike is approximately 67 acres. Current vegetation is a mixture of *Spartina alterniflora, Juncus roemerianus, Phragmites australis, Typha angustifolia,* and *Spartina cynosuroides* (Figure 3).

The current dike is broken on the western end. This area is probably where the water control trunk was located. Tidal flow comes in through this break and flows into the dredged canal. There is another break at the eastern end that was created during a previous marsh creation project. That marsh creation effort was performed for the North Charleston Sewer District as mitigation for marsh impacts during a sewer line construction project. The upland area was excavated to intertidal elevation and a connection to a tidal creek was made. Approximately 1.3 acres were excavated and planted in *Spartina alterniflora.* The substrate of this connection is unusual in that it is phosphate rock. The break in the dike primarily drains the marsh creation site and does not significantly connect with the channel coming from the break at the western end.

There is a third break located on the eastern end of the dike. This area is designated as Breach F (Figure 4). This break is fifteen to twenty feet wide and connects to one of the historical creeks. Observations made at high and low tide indicate that the water flow is coming and going from the creek connected to the river and also from the dredged channel flowing from the west. Very little water appears to flow to the created break on the eastern end of the dike. Breach F is the design template for the other breaches proposed in this statement of work.

Initial pedestrian surveys of the marsh enclosed by the existing dike have revealed stands of *Phragmites australis. Phragmites* is an exotic and invasive species that spreads rapidly and replaces the natural marsh vegetation. Control of this species through removal will be a part of the restoration effort described.

The National Trust for Historic Preservation owns the property and a significant acreage around the marsh. They have agreed to allow Beazer to create breaches in the dike, but desire to leave as much of the vegetation on the remaining dike as possible.

3 PROJECT IMPLEMENTATION REQUIREMENTS

The objective of the Drayton Hall Restoration Project is to restore the historical hydrology of this semi-impounded marsh and to enhance the ecological value of this wetland as benthic and salt marsh habitat. Beazer will breach the existing dike at the historical tidal creek locations and

reconnect the upper and lower segments of the creeks, as well as remove or reduce invasive species (*Phragmites australis*). Beazer will monitor water surface elevation, vegetation type, vegetation survival (in replanted areas), and channel depth for a period of 3 years. Reports will be submitted annually, in addition to a pre-construction, post-construction, and final report.

3.1 CONSTRUCTION REQUIREMENTS

3.1.1 Dike Breaching and Vegetation Replanting

Construction Mobilization for dike breaching shall mean when the equipment is onsite to commence activities described in 3.1.1. Construction Completion shall mean the activities described in 3.1.1 as related to dike breaching and replanting are complete.

A total of five new breaches (points A, B, C, D, and E) will be created in the dike (Figure 4). To construct the dike breaches, a barge-mounted or amphibious track hoe will enter the impoundment from the western end and travel in the dredged canal. The track hoe will travel to the location of proposed Breach A and begin excavation. The dike will be dug out fifteen to twenty feet wide with side slopes of approximately 3:1, and down to an elevation slightly above the surrounding marsh. The track hoe will then stand on the excavated dike area and reach into the historical channel between the Ashley River and the dike. A shallow excavation of the channel will be made out as far as the track hoe will reach. All spoil will be placed on the dike. The track hoe will then move back into the inside of the impoundment and dig the remaining portion of the dike out to an elevation approximately three feet below the surface of the marsh. The interior shelf will be breached to connect the inside dredged canal with the new dike breach. Figure 5 shows a typical completed dike breach detail. The track hoe will then move east to the site of the next proposed breach.

As mentioned above, all spoil will be placed on the existing dike. Coconut mat will be staked over the fresh spoil piles to minimize erosion back into the marsh. Any damage created by the track hoe activity in the inner marsh area will be leveled to original grade as the track hoe exits the area. Any disturbed marsh will be regraded and replanted with *Spartina alterniflora* on 2-3 foot centers during the growing season (March 15 – December 1). The dredged channels will be excavated with side slopes of approximately 3:1, depending on the stability of the substrate.

As-Built measurements of the dike channels will be documented and shared with the Trustees for approval before continuing with vegetation replanting.

3.1.2 Invasive Species Removal

"HABITAT", or other appropriate herbicide approved for aquatic use, will be sprayed on the *Phragmites* stands on two (2) separate occasions. The herbicide will be sprayed on the stands inside the dike from an airboat or helicopter (1) in the first spring (defined as March 1 – May 31) following issuance of the permits required by Section 3.1.3, with (2) a second application in the spring (defined as March 1 – May 31) following construction and after Trustee approval of the Post-Construction Report. A third treatment is possible for persistent stands larger than one (1) acre in size in the spring of the second year following Construction Completion. Applications

will be documented in Pre-Construction and Annual reports.

Beazer reserves the right to modify the exact methods for applying herbicide in consultation with the Trustees, based on ground conditions, availability of contractors and equipment, and other conditions that may become apparent in the field.

3.1.3 Regulatory Requirements

The regulatory branches of the South Carolina Department of Health and Environmental Control ("SCDHEC") and the US Army Corps of Engineers have been contacted concerning the basics of this project. Both agencies indicated that since the proposed project is designed to restore marsh function, they did not anticipate any problems with issuing permits for the activity. A Section 10 of the Rivers and Harbors Act of 1899 dredging permit application and a Section 404 of the Clean Water Act dredge and fill permit application will be required for the agencies to evaluate and permit the project. Wetland and critical line surveys will be required. The Trustees have completed an Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service for this project. The attached manatee guidelines (Appendix D) are to be followed during all project-related activities.

3.2 MONITORING REQUIREMENTS

A number of pre- and post-construction monitoring activities have been identified for the Drayton Hall Restoration Project. Monitoring will be conducted using both qualitative and quantitative field methods to determine progress toward achievement of the performance criteria. The nature and frequency of these activities, along with their corresponding reporting obligations are discussed below. The Trustees must be notified prior to each monitoring event to allow for their participation. The final locations for all tidal monitoring stations, channel depth/elevation monitoring stations, and the vegetation monitoring reference site described below will be established with the approval of the Trustees. Similarly, the inspection quadrants used for vegetation monitoring will be approved by any Trustee(s) present during a vegetation inspection.

3.2.1 Tidal Monitoring

Tidal monitoring in the marsh will be accomplished by the installation of water surface elevation (WSE) recording devices at eleven (11) tidal monitoring locations (10 tidal monitoring stations and one 1 reference station). The approximate locations of the tidal monitoring stations have been determined upon review of the light detecting and ranging (LIDAR) topographic survey of the marsh area (Appendix A-1), which was used to determine the location of the relict channels that historically extended into the marsh area behind the dike. Water elevation will be determined using an infrared beam projected from the instrument to the water surface through perforated PVC monitoring pipe installed for the duration of the monitoring effort in the marsh. Water surface elevations will be recorded every five (5) minutes for a 48-hour period according to the monitoring schedule presented below. The tidal monitoring stations will be evenly distributed across the site, with the final locations established by a registered surveyor, referenced to a USGS benchmark.

One set of five tidal monitoring stations will be placed parallel to the existing dike in the historical creek channel. The other set of five tidal monitoring stations will be placed between the dike and the upland edge of the marsh at various ground elevations to monitor tide height and duration.

A reference tidal monitoring station will be placed in close proximity to the diked area. It will be located outside of the diked area, referenced to the NOAA water level station (No. 8664841) at Magnolia Plantation in the Ashley River (Figure 6).

In addition to the tidal monitoring stations described above, two (2) WSE devices will be installed at two stations (Appendix A-2). One will be installed in the interior marsh midway between breach "B" and breach "C". The second WSE monitoring station will be installed in the Ashley River marsh. The WSE monitoring station on the Ashley River side of the existing dike will be placed opposite the interior WSE monitoring station and an equal distance from the dike as the interior WSE monitoring station. Following installation, these two (2) WSE monitoring stations will be monitored in accordance with the same schedule as that proposed for the eleven (11) tidal monitoring stations. Water surface elevations will be recorded by the remote instrument and their positions will be recorded by a registered surveyor and referenced to a USGS benchmark.

3.2.2 Vegetation Type Monitoring

Vegetation type monitoring in the marsh will be accomplished using high resolution multispectral satellite imagery and ground truthing. Vegetation signatures will be imported into a geographical information system (GIS) in order to calculate changes in acreage and species composition. The vegetation signatures will be identified as to particular species by pedestrian survey.

3.2.3 Replanting Vegetation Monitoring

3.2.3.1 Reference Site and Baseline Data

A reference site will be selected for the purpose of determining success criteria for the areas replanted with nursery-grown *Spartina alterniflora* as a result of impacts due to construction activities. The reference site will be located within the Ashley River Watershed, in close proximity to the areas being impacted, but not within the 67 acre project area. Conditions at the reference site will be very similar to the vegetation and elevation parameters found in the impacted areas prior to construction. Sample plots designed to cross-section the vegetation types along the tidal gradient will be established using the methodology described in 3.2.3.3. Vegetation parameters measured at each plot will include stem counts, average heights, and percent cover, by species. Percent cover will be estimated from an average of cross-sectional area of stems at the substrate and stem counts. The reference site data will be collected prior to any disturbance of the marsh areas. The vegetation composition and densities of the reference site will serve to provide a comparison for marsh restoration in all of the areas impacted during construction.

3.2.3.2 Survival of Planted Vegetation

For the purpose of survival monitoring, a sampling grid will be established within each of the replanted areas. During each inspection of the survival of planted vegetation, a 1-m² quadrat will be randomly placed within each of the sampling grids. The number of stems per species will be counted within each quadrat. Notes will also be made on any volunteer plant species present.

3.2.3.3 Vegetation Sampling

The same data collected at the reference site described above will also be collected at the marsh restoration areas in one 1-m² quadrat randomly located within the grids. To facilitate specimen counts, quadrats will be subdivided into 25 0.04-m² sub-quadrats. A sample of three randomly selected sub-quadrats will then be surveyed to provide count and density estimates. All surveys, after the initial survival surveys, will be conducted annually near the end of each growing season, during the month of November. Sampling will be conducted concurrently at the reference site and within the three quadrats for comparison.

3.2.4 Channel Depth/Elevation Monitoring

Channel depth and elevation monitoring will be measured in the restored historical channels and dike breaches. The monitoring effort will focus on the historical connection from the proposed dike breaches to the Ashley River. Two permanent monitoring stations will be placed in each channel at points identified using LIDAR data and ground truthing (Appendix B). These points will be areas that have the shallowest water depth in the channels or are choke points. The points will be located using a registered surveyor and elevations will be referenced to a USGS benchmark. Subsequent surveys will be used to physically measure the elevations in a like manner to track changes.

3.2.5 Monitoring Schedule

3.2.5.1 Pre-Construction

3.2.5.1.1 Tidal Monitoring

The ten tidal (10) monitoring stations and one (1) reference station will be installed, along with the two (2) WSE stations approximately ninety (90) days prior to construction mobilization, following the methodology described in 3.2.1. Two 48-hour monitoring events will be scheduled before construction at the eleven tidal monitoring stations and two WSE stations. One event will be scheduled to coincide with the spring tide for that period. Another event will occur at an average high tide. An average high tide will be defined as a tidal event with a predicted high tide of 5.8 feet +/- .5 feet and normal weather conditions to avoid impacts of strong winds and storm water runoff. The predicted high tide of 5.8 feet +/- .5 feet will be based on Charleston Harbor tide charts.

3.2.5.1.2 Vegetation Type Monitoring

High resolution multispectral satellite imagery will be obtained approximately sixty (60) days prior to construction. Pedestrian surveys to identify the species associated with the different imagery signatures will be accomplished at the same time following the methodology described in 3.2.3.3. The reference site will be identified and data collection of that site will occur in the same manner.

3.2.5.1.3 Channel Depth/Elevation Monitoring

A LIDAR survey was flown in May 2005 to determine pre- construction marsh and channel elevations. Locations of the channel monitoring points are detailed in Appendix B. A registered surveyor will physically locate these points in the channel and confirm the LIDAR elevations approximately sixty (60) days prior to Construction Mobilization.

3.2.5.2 Post-Construction

Post-construction monitoring will be performed within 30 days following Construction Completion. As-built measurements of the breach dimensions and contours of the channels will be collected by a registered surveyor. Vegetation monitoring will also be conducted to confirm that the areas impacted during construction were replanted with appropriate native vegetation on 2-3 foot centers. In addition, a preliminary evaluation of the ten (10) tidal monitoring stations and one (1) reference station, as well as WSE 1 and WSE 2 located within and outside the remnant dike between breach "B" and breach "C" will be conducted within 30 days of Construction Completion, following the same criteria as 3.2.4 but on two (2) normal tide cycles. These results will be included in the Post- Construction Report (described in 3.3.2).

3.2.5.3 Annual

3.2.5.3.1 Tidal Monitoring

Two tidal monitoring events will be performed at the ten (10) tidal monitoring stations, one (1) reference site, and at the two (2) WSE monitoring stations at 12, 24 and 36 months after construction activities are completed. The tidal events will include the spring tide and average high tide monitoring as detailed in Section 3.2.5.1.1.

3.2.5.3.2 Vegetation Type Monitoring

High-resolution multispectral satellite imagery and pedestrian surveys to determine species and changes in vegetation composition throughout the restored marsh will be performed at 12, 24 and 36 months after construction activities are complete. Data collection at the reference site will occur in the same manner.

3.2.5.3.2.1 Survival of Planted Vegetation

Survival of planted material will be evaluated at post- planting intervals of 90, 180, and 365 days.

3.2.5.3.2.2 Vegetation Sampling

An annual vegetation sampling and monitoring program will be conducted at post-planting intervals of 12, 24 and 36 months.

3.2.5.3.3 Channel Depth/Elevation Monitoring

A registered surveyor will measure the channel depth/elevation and contours at the channel monitoring stations and breach locations at 12, 24, and 36 months following Construction Completion.

3.3 REPORTING REQUIREMENTS

3.3.1 Pre-Construction Report

The Pre-Construction Report detailing the baseline vegetation stands, tidal elevations and durations, channel depth/elevation, and first *Phragmites* control application will be submitted at least thirty (30) days prior to Construction Mobilization. It will discuss and summarize the results of monitoring implemented in accordance with the requirements of Section 3.2.5.1 and provide raw data and field notes in an appendix or appendices.

3.3.2 Post-Construction Report

The Post-Construction Report will detail the breach locations, dimensions and contours, survival sampling of re-vegetated area, and preliminary WSE monitoring station results. This report will be submitted within sixty (60) days after Construction Completion. It will discuss and summarize the results of monitoring implemented in accordance with the requirements of Section 3.2.5.2 and provide raw data and field notes in an appendix or appendices.

3.3.3 Annual Report

Annual reports that include the results of the vegetation, tidal, survey work, and WSE monitoring stations will be submitted 15 and 27 months following Construction Completion. It will discuss and summarize the results of monitoring implemented in accordance with the requirements of Section 3.2.5.3, *Phragmites* control results, and provide raw data and field notes in an appendix or appendices.

3.3.4 Final Report

A Final Report will be submitted to the Trustees 39 months after Construction Completion and/or 90 days after any final corrective actions if necessary. The Final Report will review data for the entire monitoring period. It will discuss and summarize the monitoring results and will provide raw data and field notes in an appendix or appendices.

3.4 PERFORMANCE CRITERIA REQUIREMENTS

The Performance Criteria can also be viewed in table format in Appendix C.

3.4.1 Tidal Monitoring

Tidal monitoring will be performed at the ten (10) tidal monitoring locations for information only. The two (2) WSE monitoring stations will be monitored for the purpose of determining whether or not the project has successfully restored the historical hydrology within the semi-impounded wetland. The performance criterion for determining the success of this restoration will be as follows: within any one tidal cycle, the maximum high tide water surface elevation at the interior canal monitoring station (WSE 1) shall be equal to the maximum high tide water surface elevation at the Ashley River marsh monitoring station (WSE 2) (+ or – 0.1 feet to allow for equipment error and minor discrepancies). This performance criterion shall be met at the end of three (3) years.

3.4.2 Vegetation Type Monitoring

Monitoring will be performed to document the expansion or contraction of different vegetation types in the marsh enclosed by the existing dike. The Trustees have expressed concern over controlling the expansion of *Phragmites*. Beazer has agreed to conduct two (2) applications of the herbicide "HABITAT," or other appropriate herbicide approved for aquatic use, to the *Phragmites* stands enclosed by the existing dike. The criterion for success is the reduction of *Phragmites* stands to less than one contiguous acre throughout the 67 acre impoundment.

3.4.3 Construction Replanting Vegetation Monitoring

In those areas that are to be replanted with nursery-grown *Spartina* as a result of impacts due to construction activities, the performance criteria are as follows: (1) survival of at least 75% of the plants (planted on 2-3 foot centers) twelve (12) months after planting and (2) achieving stem densities in the replanted areas equal to or greater than 75% of that in the identified reference site at the end of three (3) years.

3.4.4 Channel Depth/Elevations

The purpose of the breach creations in the existing dike is to restore the historical channels from the Ashley River as open and free flowing, without substantial sediment buildup or evidence of closure. Two criteria will be evidence of success: (1) the breaches must be maintained as open and free flowing, and not obstructed for a period of three (3) years post construction, and (2) elevations at the channel monitoring points will have increased by no more than 0.5 feet (i.e. depth will have decreased by no more than 0.5 feet) at the end of three (3) years.

3.5 CORRECTIVE ACTION REQUIREMENTS

Beazer may undertake a Corrective Action at any time during the monitoring period if the Performance Criteria set forth in section 3.4 are not being met. Beazer will be required to undertake

Corrective Action if any of the performance criteria have not been met within the appropriate timeframe as described in above. Within 90 days of completing any approved Corrective Action, Beazer will submit a Final Report documenting the completed Corrective Action.

3.5.1 Tidal Monitoring

In the event that the hydrological performance criterion described in Section 3.4.1 is not met, Beazer will evaluate the situation and will present to the Trustees, for their approval, a Corrective Action. This Corrective Action may include, but not be limited to, dredging the tidal creek channel(s) or the installation of water control structures. Beazer will perform annual WSE monitoring for three years following the Corrective Action. Beazer will continue to submit annual reports during this time period. Beazer will not perform additional corrective actions at the end of the three-year monitoring period; however, Beazer will submit a Final Corrective Action Report 39 months after completion of the corrective action.

3.5.2 Vegetation Type Monitoring

Three performance criteria for vegetation type monitoring apply to the Drayton Hall Restoration Project. One criterion for success will be to reduce the stands of *Phragmites* in the semi-impounded wetland to less than one contiguous acre throughout the 67-acre impoundment. If this criterion for success is not achieved after two (2) applications of "HABITAT", or other appropriate herbicide approved for aquatic use, Beazer will spot treat areas greater than one acre a third time. Beazer will not guarantee results and the corrective action will be satisfied by this third application.

3.5.3 Replanting Vegetation Monitoring

Areas impacted by construction activities will be re-vegetated with nursery-grown Spartina plants, or other appropriate native vegetation. If either the plant survival or stem density criterion is not met within the appropriate timeframe as described in Section 3.4.3, Beazer will evaluate the situation and will present to the Trustees, for their approval, a Corrective Action. This activity may include but not be limited to replanting to achieve the target survival and stem density and/or amending the sediments or soils with organic material or slow-release inorganic fertilizer. Beazer will perform annual vegetation monitoring until the criterion is met or for three years following the Corrective Action, whichever comes first. Beazer will continue to submit annual reports during this time period. Beazer will not perform additional corrective actions at the end of the three-year monitoring period; however, Beazer will submit a Final Corrective Action Report 39 months after completion of the corrective action, or 90 days after the performance criterion is met, whichever comes first.

3.5.4 Channel Depth/Elevations

If at least three breach locations do not meet the success criteria detailed in Section 3.4.4, Beazer will present the Trustees with a corrective action to open the historical channels to the Ashley River and correspondingly extend the monitoring period for an additional three years. Beazer will continue to submit annual reports during this time period. There will be no further corrective action at the end of that additional three-year monitoring period; however, Beazer will submit a

Final Corrective Action Report 39 months after implementation of the corrective action.

Drayton Hall Restoration Project Schedule

ACTION	SCHEDULE
Pre-Construction Activities	
Beazer Designates Restoration Project Coordinator	Within 30 days of Effective Date of Consent Decree
Beazer submits timely, technically, and administratively complete applications for all Federal, State, and local permits	Within 45 days of Effective Date of Consent Decree
Install tidal monitoring stations	At least 60 days before Construction Mobilization
Install Water Surface Elevation stations	At least 60 days before Construction Mobilization
Conduct tidal/elevation monitoring protocol (2 48-hr periods)	At least 30 days before Construction Mobilization, but exact timing to be dictated by tides (1 Spring Tide, 1 avg High Tide)
Gather current imagery for vegetation type monitoring	At least 30 days before Construction Mobilization
Identify "Construction Replanting" reference sites and sample vegetation	At least 30 days before Construction Mobilization
Install Elevation Monitoring Stations (2)	At least 30 days before Construction Mobilization
Ground truth channel depth and elevation with ground survey	At least 30 days before Construction Mobilization
Apply herbicide to *Phragmites* stands as required in Section 3.1.2	During the first March 1 to May 31 period after issuance of the permits, but no later than 24 months after the Effective Date of the Consent Decree
Submit Pre-Construction Report	At least 30 days before Construction Mobilization
Construction Activities	
Commencement of Dike Breaching construction activities required by Section 3.1.1	Within 12 months of the issuance of the permits; and following Trustee approval of the Pre-Construction Report and first invasive species removal application, but no later than 24 months after the Effective Date of the Consent Decree
Completion of Dike Breaching construction activities required by Section 3.1.1	Within 120 days of Construction Mobilization
Document As-Built measurements of breaches/contours	Within 30 days of completion of dike breaching activities
Vegetation Replanting activities required by Section 3.1.1	Within the first growing season (March 15 – December 1) following Trustee approval of the As Built Measurements
Post-Construction Activities	
Apply herbicide to *Phragmites* stands as required in Section 3.1.2	During the first March 1 to May 31 period following Trustee approval of the Post-Construction Report
Conduct replanting monitoring and tidal/elevation monitoring protocol	Within 30 days of Construction Completion
Submit Post-Construction Report	Within 60 days of Construction Completion
Conduct Annual Monitoring protocol	At 12, 24, and 36 months post-Construction Completion
Submit Annual Monitoring Report	At 15 and 27 months post-Construction Completion
Submit Final Report	At 39 months post-Construction Completion, OR 90 days after Corrective Action

4 FINAL CERTIFICATION

Once the monitoring period is complete and the Final Report (or Final Corrective Action Report, if applicable) is submitted to the Trustees, the Lead Administrative Trustee will issue a Certification of Completion of the Beazer East, Inc, Former Koppers Site, Charleston South Carolina NRDA Restoration Project.

EXTERNAL SOURCES: USGS TOPO QUADS

Created By: Matthew T Zielke - gis@sabinc.net
Date Created: February 6, 2009
Copyright 2009 Sabine & Waters, Inc.
Environmental Land Management Consultants
P.O. Box 1072 Summerville, SC 29484
843.871.5383 (phone) 843.871.2050 (fax)
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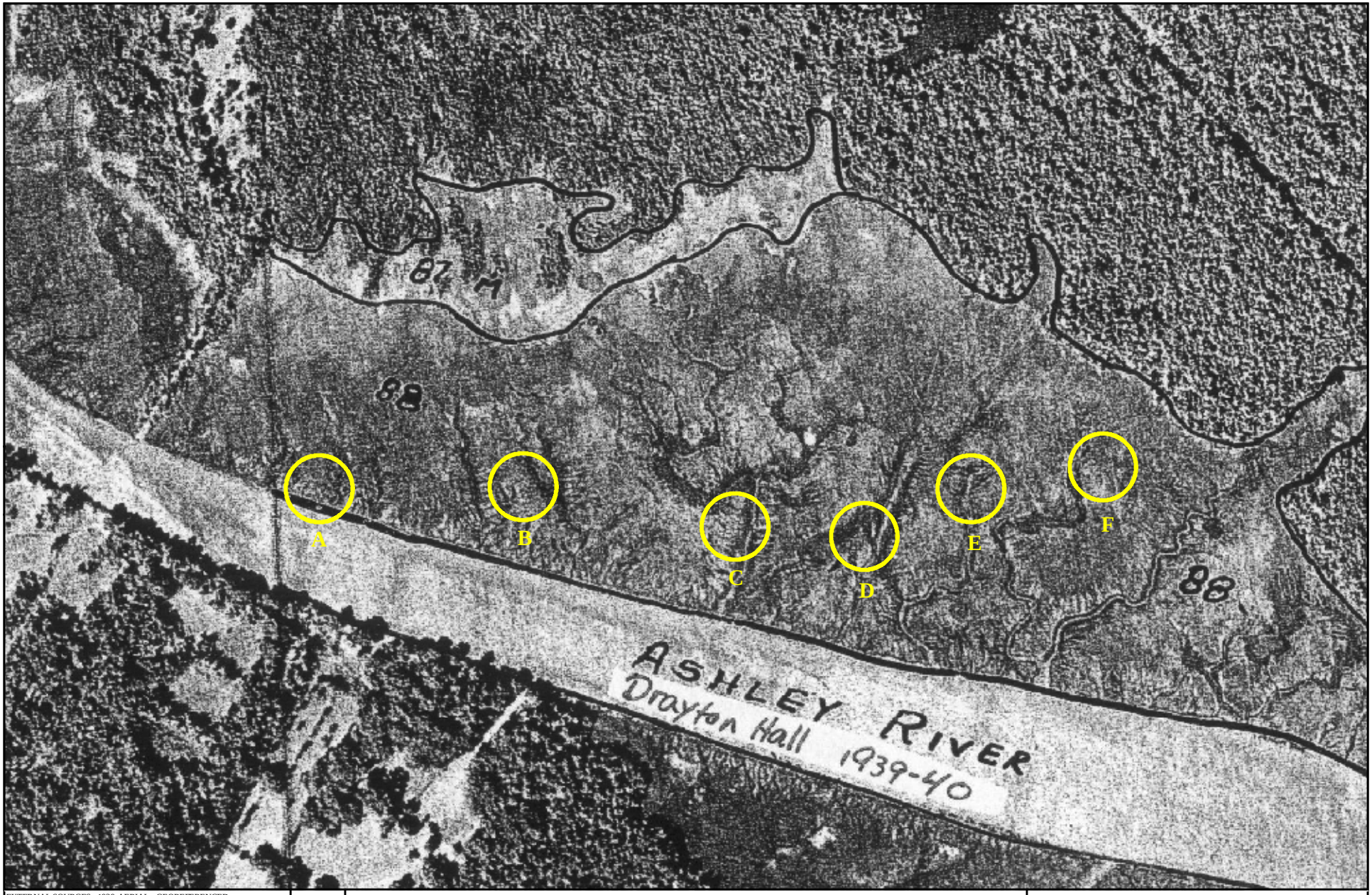
Disclaimer: This map is a graphic respresentation of data obtained from various sources. All efforts have been made to warrant the accuracy of this map. However, Sabine & Waters, Inc. disclaims all responsibility and liability for the use of this map.

LOCATION MAP
BEAZER - NRDA STRATEGY
CHARLESTON COUNTY, SC

0 2,700 5,400
Feet

LEGEND

▲ DRAYTON HALL



EXTERNAL SOURCES: 1939 AERIAL - GEOREFERENCED

Created By: Matthew T Zielke - gis@sabinc.net
Date Created: February 6, 2009

Environmental Land Management Consultants
P.O. Box 1072 Summerville, SC 29484
843.871.5383 (phone) 843.871.2050 (fax)
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N W E S

FIGURE 1 - 1939 AERIAL PHOTO
BEAZER - NRDA STRATEGY
CHARLESTON COUNTY, SC

0 450 900
Feet

LEGEND

BREACH LOCATIONS

EXTERNAL SOURCES: SCDNR 2006 INFRARED AERIAL

Created By: Stephen Bennett
Date Created: June 20, 2016
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R:\custdat\beazer\ nrda update 2016\ mapping\master.mxd

Sabine & Waters, Inc.
Environmental Land Management Consultants
P.O. Box 1072 Summerville, SC 29484
843.871.5383 (phone) 843.871.2050 (fax)
http://www.sabinc.net

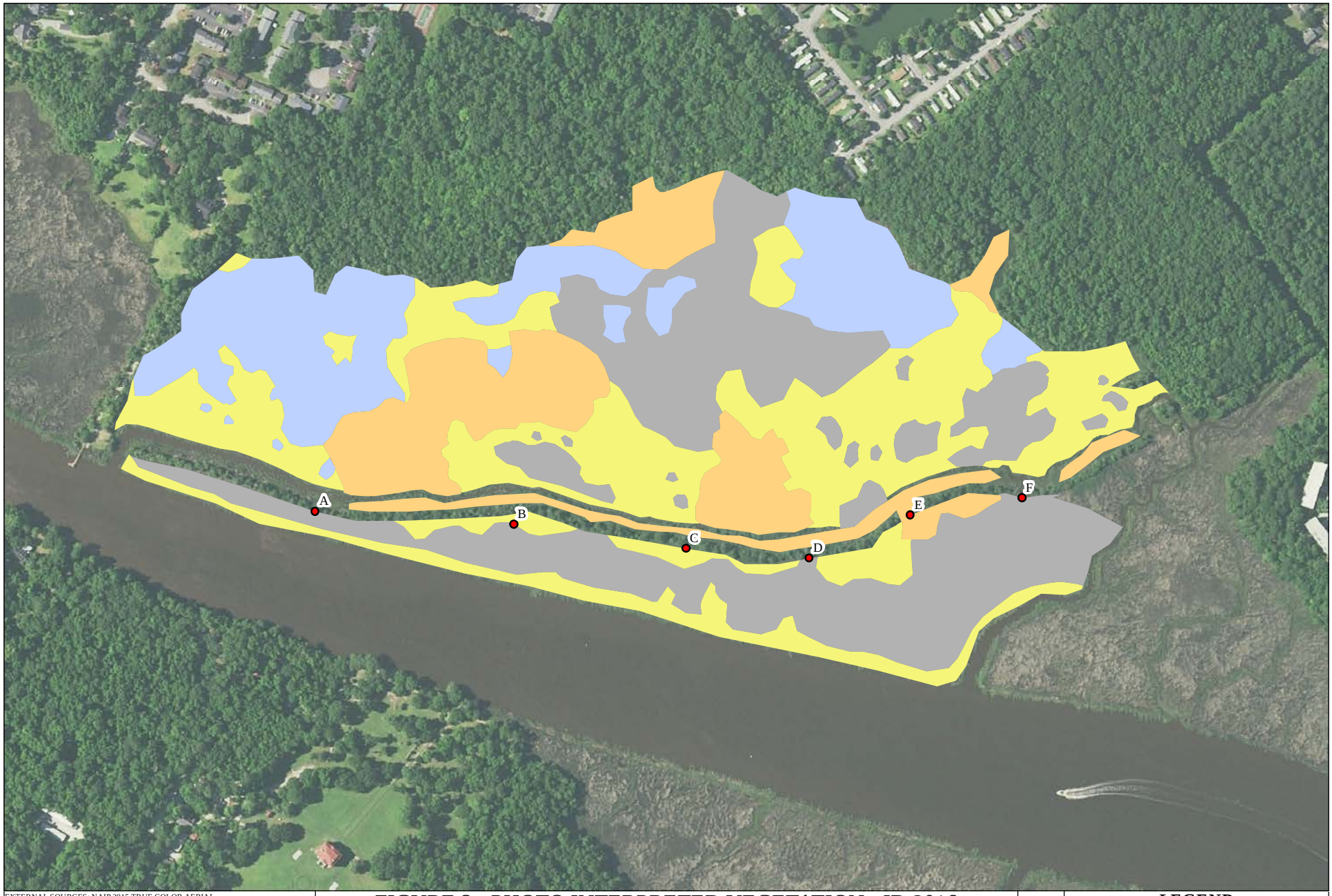
REVISED: 7/27/2016

FIGURE 2 - 2006 INFRARED AERIAL PHOTO
BEAZER - NRDA STRATEGY UPDATE
CHARLESTON COUNTY, SC

0 450 900
Feet

LEGEND

- BREACH LOCATIONS



EXTERNAL SOURCES: NAIP 2015 TRUE COLOR AERIAL

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Sabine & Waters, Inc.
Environmental Land Management Consultants
P.O. Box 1072 Summerville, SC 29484
843.871.5383 (phone) 843.871.2050 (fax)
http://www.sabinc.net

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REVISED: 7/27/2016

FIGURE 3 - PHOTO INTERPRETED VEGETATION - ID 2016
BEAZER - NRDA STRATEGY UPDATE
CHARLESTON COUNTY, SC

0 450 900
Feet

LEGEND

- BREACH LOCATIONS
- JUNCUS ROEMERIANUS: +/- 26 AC
- JUNCUS/SPARTINA MIX: +/- 16 AC
- PHRAGMITIES AUSTRALIS: +/- 15 AC
- SPARTINA ALTERNIFLORA: +/- 25 AC

EXTERNAL SOURCES: NAIP 2015 INFRARED AERIAL

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Sabine & Waters, Inc.
Environmental Land Management Consultants
P.O. Box 1072 Summerville, SC 29484
843.871.5383 (phone) 843.871.2050 (fax)
http://www.sabinc.net

REVISED: 7/27/2016

FIGURE 4 - 2015 TRUE COLOR AERIAL PHOTO
BEAZER - NRDA STRATEGY UPDATE
CHARLESTON COUNTY, SC

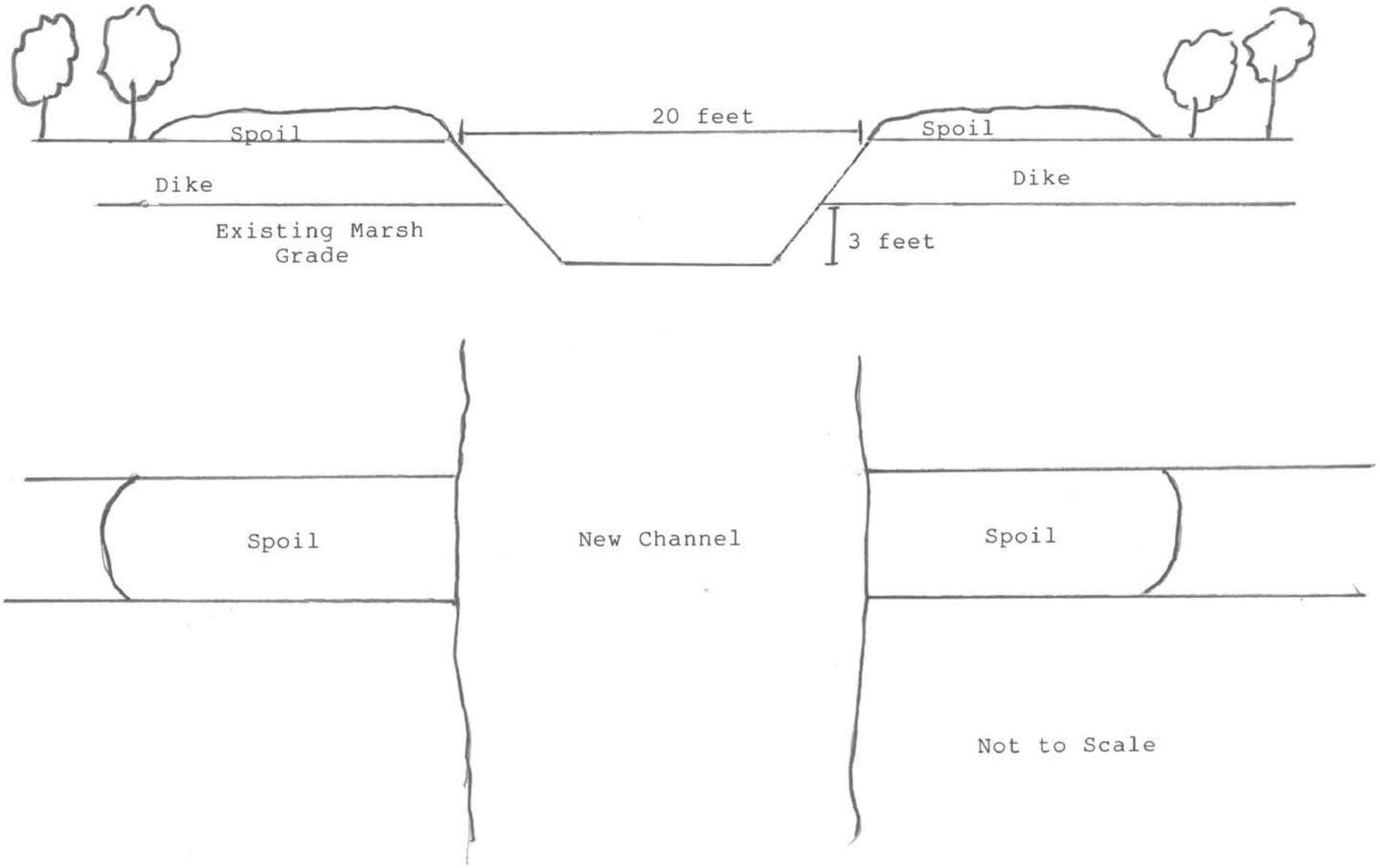
0 450 900
Feet

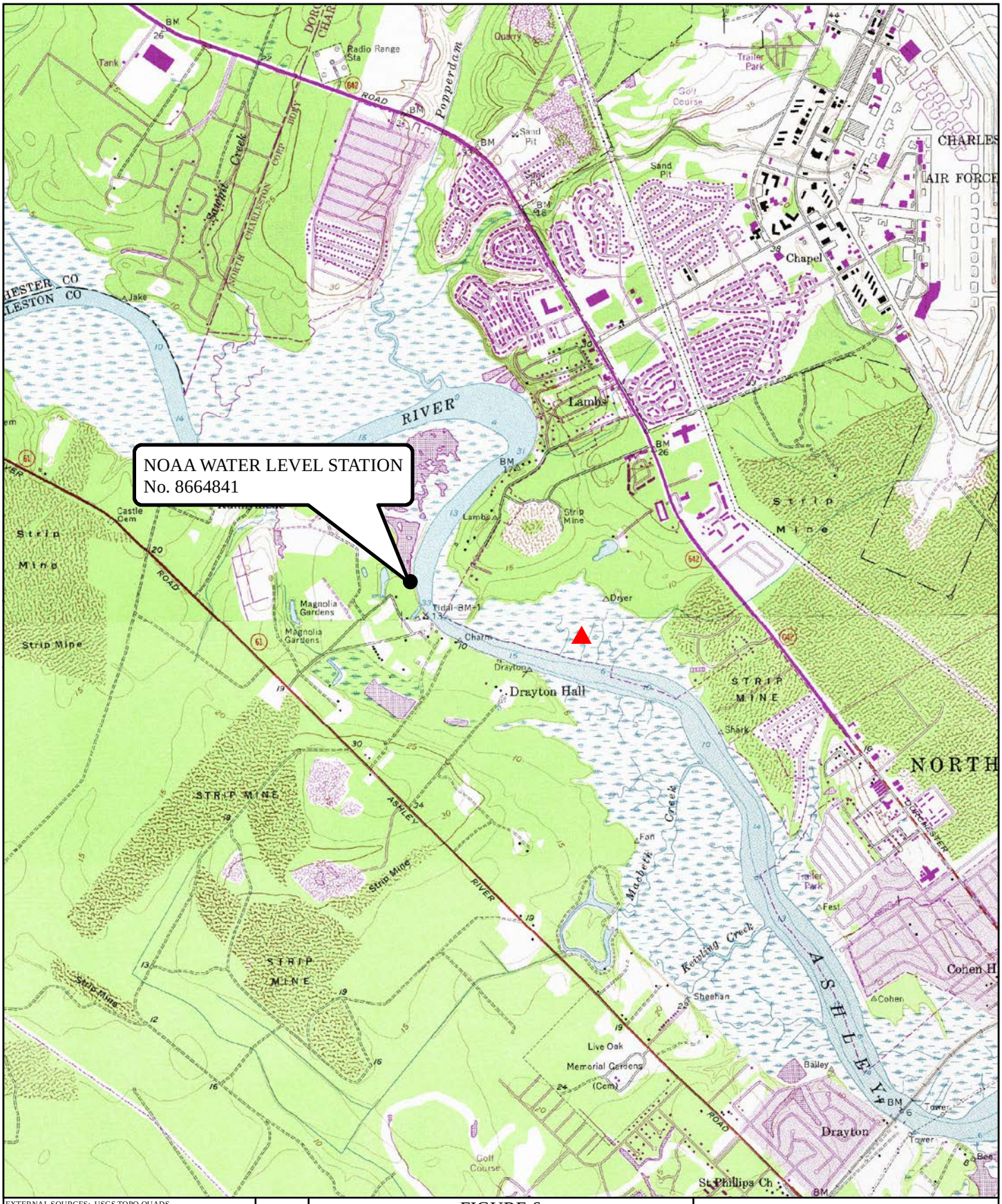
LEGEND

- BREACH LOCATIONS

TYPICAL BREACH DETAIL
Drayton Hall

FIGURE 5





EXTERNAL SOURCES: USGS TOPO QUADS

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FIGURE 6
NOAA WATER LEVEL STATION
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

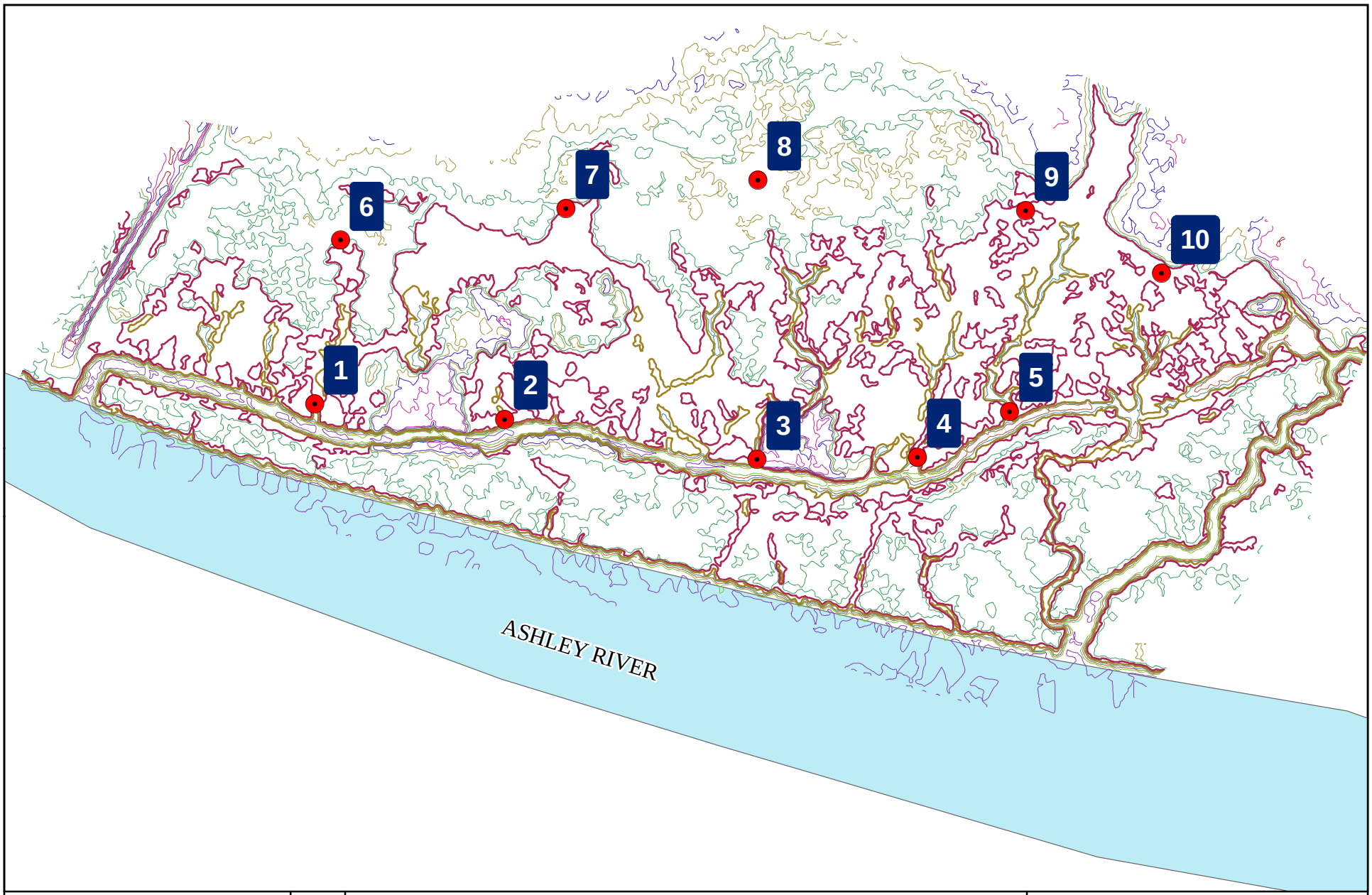
0 2,700 5,400
Feet

LEGEND

▲ DRAYTON HALL

Appendix 1 to

Drayton Hall Statement of Work



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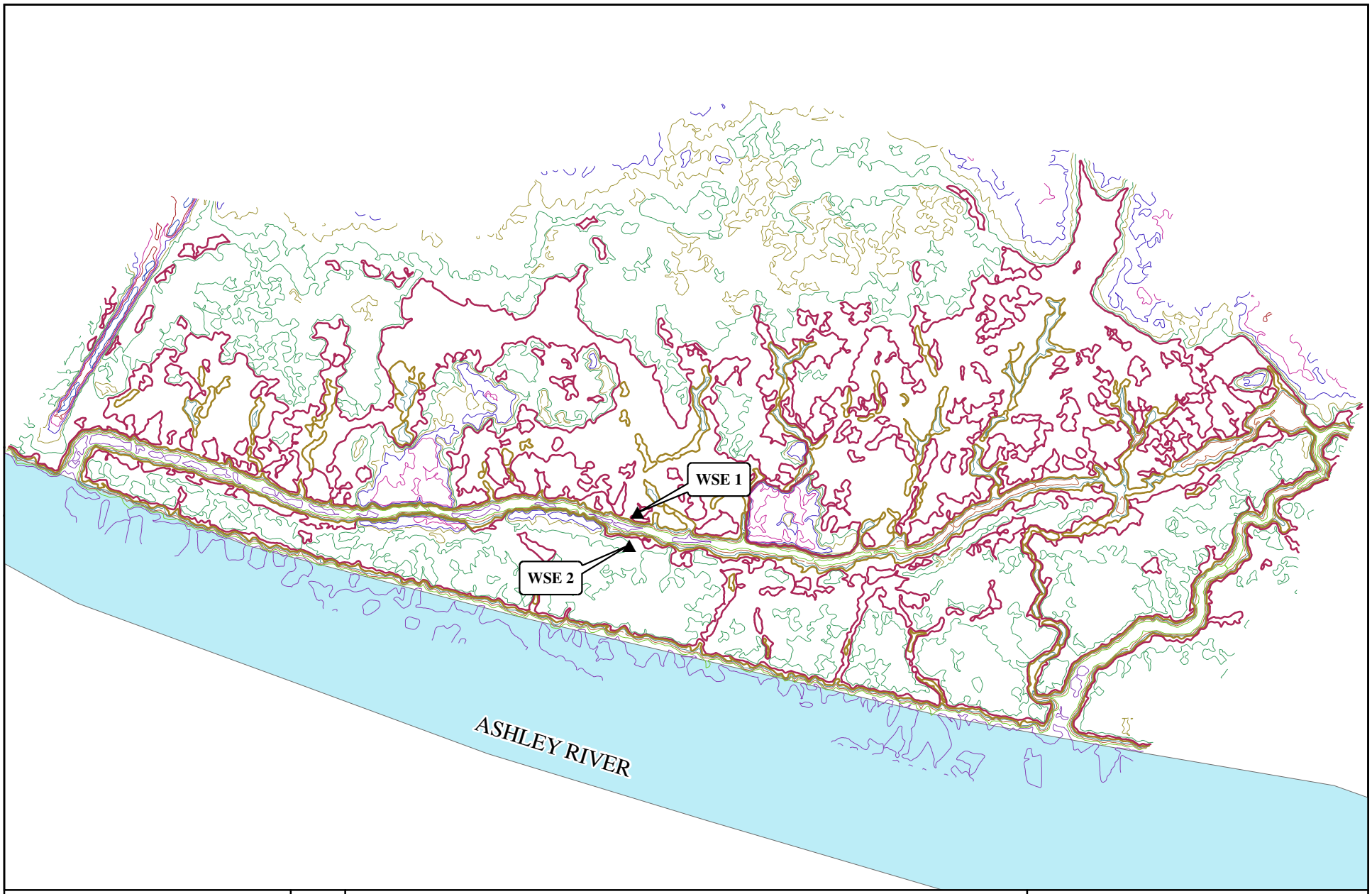
APPENDIX A-1
LIDAR AND TIDAL MONITORING STATIONS
PERFORMANCE CRITERIA AND MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 400 800
Feet

LEGEND

- MONITORING STATIONS
- -2 ft
- -1 ft
- 0 ft
- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 6 ft
- 7 ft
- 8 ft
- 9 ft



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N W E S

APPENDIX A-2
LIDAR AND WATER SURFACE ELAVATION (WSE) STATIONS PERFORMANCE CRITERIA AND MONITORING PLAN - NRDA CHARLESTON COUNTY, SC

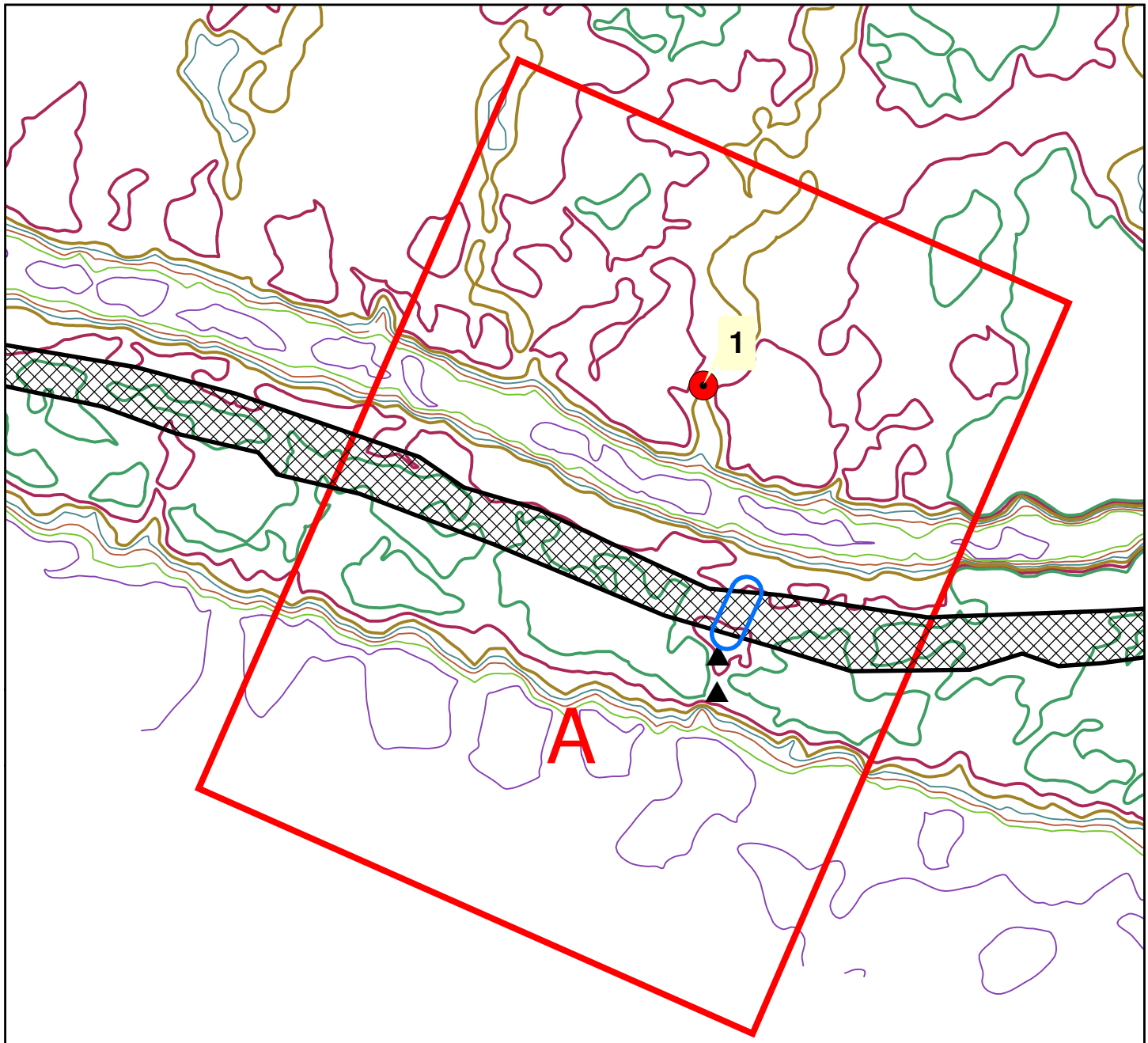
0 400 800
Feet

LEGEND

- WSE STATIONS
- -2 ft
- -1 ft
- 0 ft
- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 6 ft
- 7 ft
- 8 ft
- 9 ft

Appendix 2 to

Drayton Hall Statement of Work



LEGEND

- DIKE
- PROPOSED DIKE BREACH
- PROPOSED DIKE BREACHES & CHANNEL DETAIL
- TIDAL MONITORING STATIONS
- PROPOSED SCOUR MONITORING LOCATION
- -2 ft
- -1 ft
- 0 ft
- 1 ft
- 2 ft
- 3 ft
- 4 ft

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N W E S

APPENDIX B-1
CHANNEL AND SCOUR DETAIL
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 100 200
Feet

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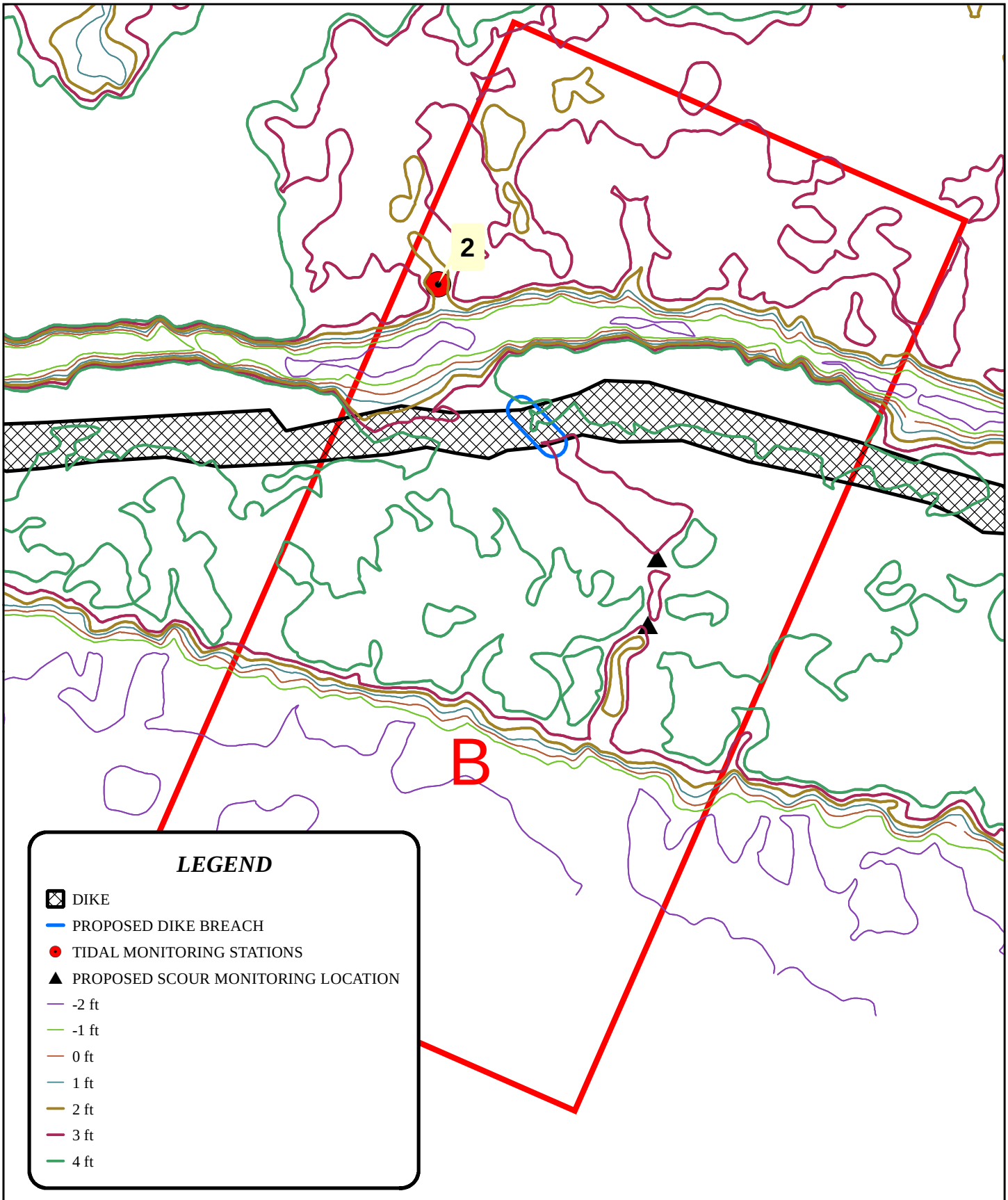

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N W E S

APPENDIX B-2
CHANNEL AND SCOUR DETAIL
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 100 200
Feet

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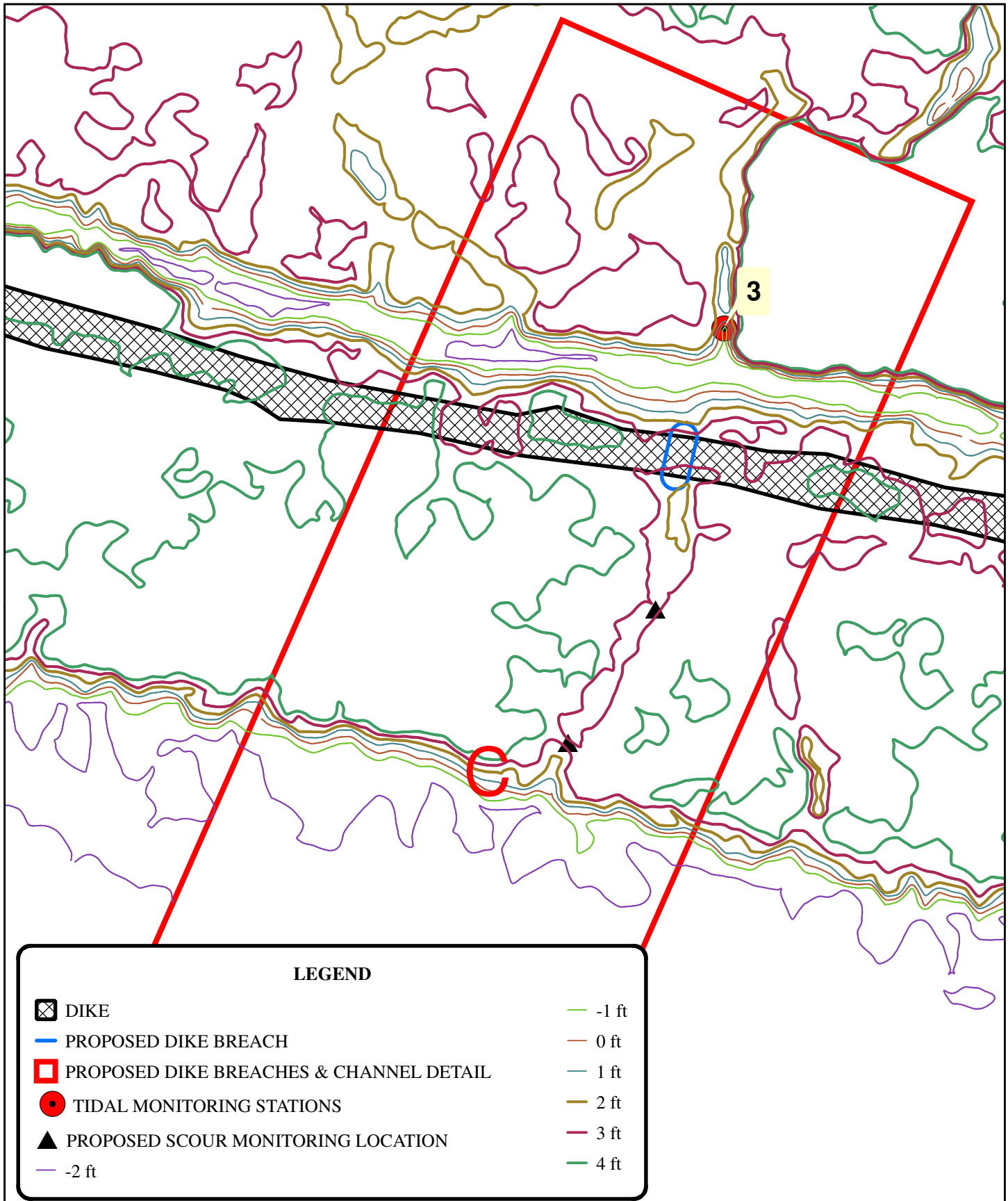

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N W E S

APPENDIX B-3
CHANNEL AND SCOUR DETAIL
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 100 200
Feet

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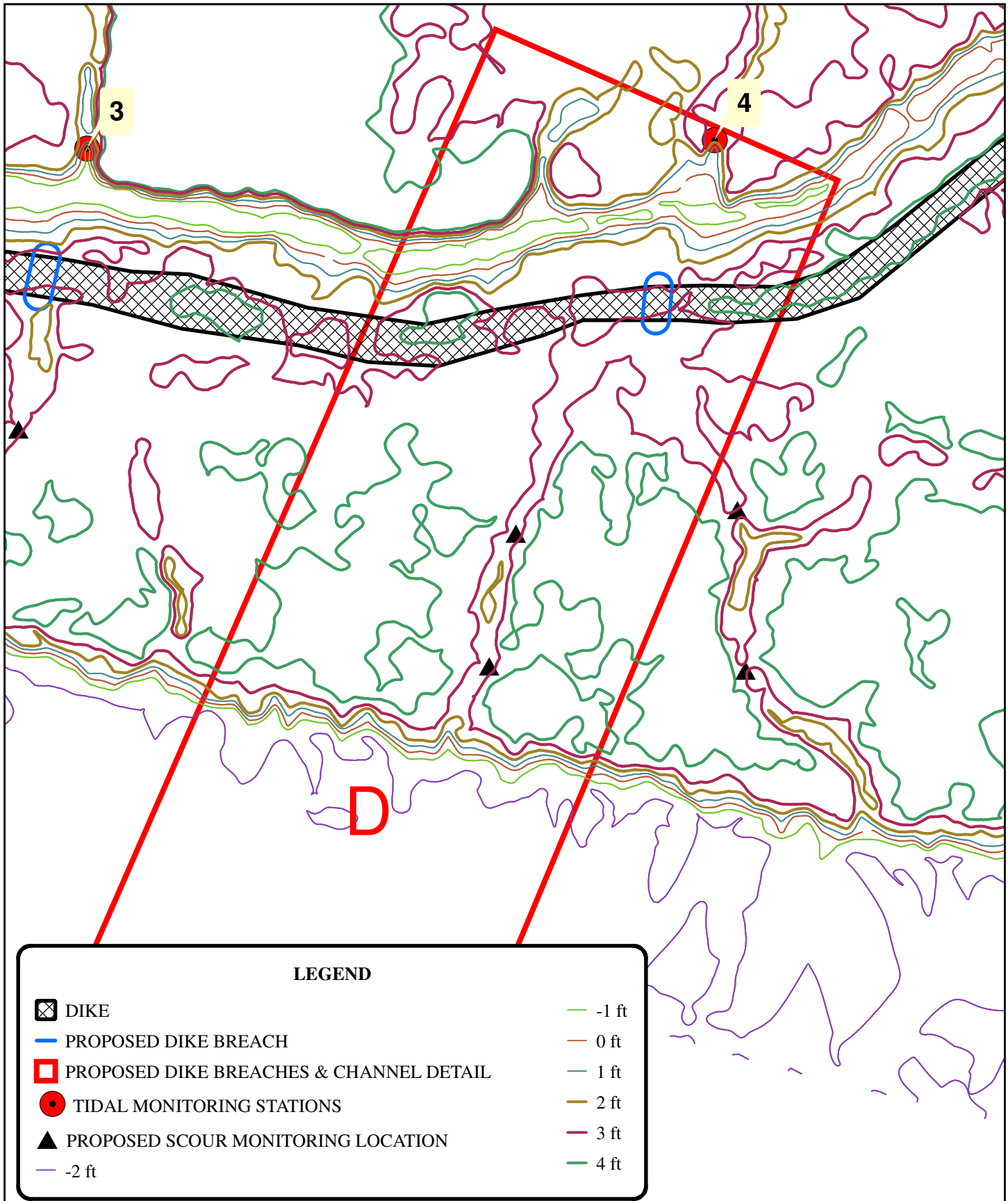

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APPENDIX B-4
CHANNEL AND SCOUR DETAIL
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 100 200
Feet

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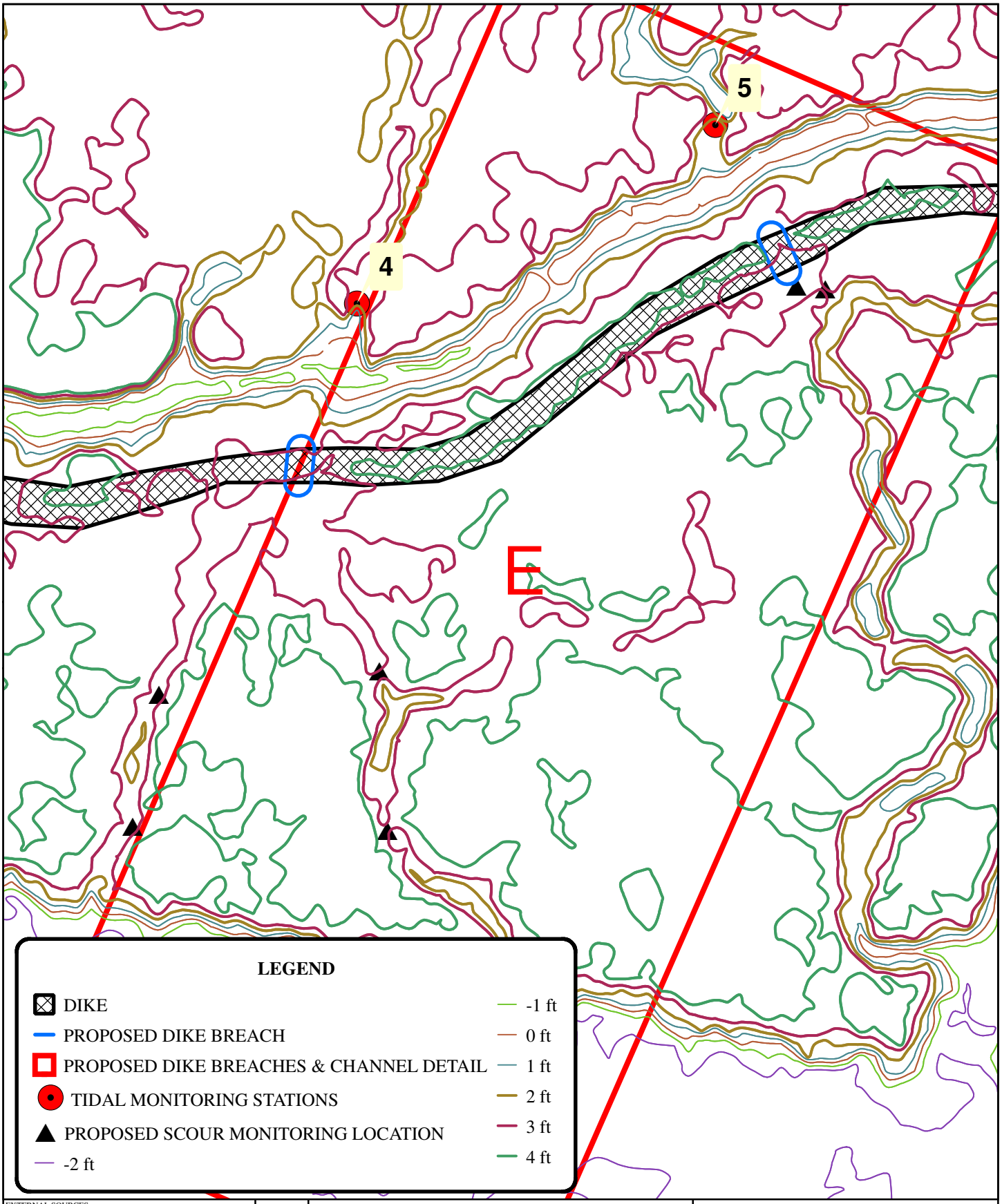

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N W E S

APPENDIX B-5
CHANNEL AND SCOUR DETAIL
PERFORMANCE CRITERIA AND
MONITORING PLAN - NRDA
CHARLESTON COUNTY, SC

0 100 200
Feet

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Appendix 3 to

Drayton Hall Statement of Work

Parameter		Method	Pre-Construction Monitoring	Post-Construction Monitoring (30 days)	Annual Monitoring (@+12, +24, +36 months)	Performance Criteria	Corrective Action
Tidal Monitoring	**Tidal Monitoring Stations** (Appendix A-1)	One set of five monitoring stations will be placed parallel to the existing dike in the historical creek. See 3.2.1	Two 48 hour monitoring events to be recorded. One event to take place during spring tide, one event to take place during average high tide. Data to be recorded every five minutes. See 3.2.5.1.1	Two 48 hour monitoring events to be recorded under normal tide cycles. Data to be recorded every five minutes. See 3.2.5.2	Two 48 hour monitoring periods to be annually recorded. One event to take place during spring tide, One event to take place during average high tide. Data recorded every five minutes. See 3.2.5.3.1	N/A	Corrective Action may include, but not be limited to, dredging the tidal creek channel(s) or the installation of water control structures. Beazer will perform and document annual WSE monitoring for (but no longer than) 36 months. See 3.5.1.
		The other set of monitoring stations will be placed between the dike and the upland edge of the marsh. See 3.2.1					
		1 reference site located outside the diked area. See 3.2.1					
	Water Surface Elevation (WSE) Monitoring Stations (Appendix A-2)	1 site located in the interior marsh between breach B and C. See 3.2.1				Maximum high tide WSE measurements at the two sites are equal (+ or - 0.1 ft). This shall be met at +36 months. See 3.4.1	
		1 site located in marsh on Ashley River side of dike, directly opposite interior site, spaced the same distance from the dike. See 3.2.1					

Parameter		Method	Pre-Construction Monitoring	Post-Construction Monitoring (30 days)	Annual Monitoring (@+12, +24, +36 months)	Performance Criteria	Corrective Action
Vegetation	**Vegetation - Macro**	Survey of species composition of entire 67 acres site through remote sensing and pedestrian survey. See 3.2.2	Imagery and pedestrian surveys completed 60 days prior to construction. See 3.2.5.1.2	No monitoring to be done at 30 days.	Imagery and pedestrian survey completed annually. See 3.2.5.3.2.	Reduction of Phragmites stands to less than one contiguous acre throughtout entire 67 acre impoundment. See 3.4.2.	If criterion for success is not met Beazer will spot treat areas greater than one acre a third time. Beazer will not guarantee results and the corrective action will be satisfied by this third application. See 3.5.2.
	Vegetation- Disturbed Construction Areas	**Vegetation Sampling**- Areas will be surveyed in one, 1-m^2 quadrat randomly located within the grids. To facilitate specimen counts, quadrats will be subdivided into 25, 0.04-m^2 sub-quadrats. A sample of three randomly selected sub-quadrats will then be surveyed to provide count and density estimates. Stem counts, average height, and % cover by species will be recorded. See 3.2.3.1 and 3.2.3.3	A reference site will be established and surveyed. See 3.2.5.1.2	No monitoring to be done at 30 days.	Monitoring will be completed at 12, 24, and 36 month intervals. See 3.2.5.3.2.2.	Stem densities in the replanted areas equal to or greater than 75% of that in the identified reference site at the end of three years. See 3.4.3.	If either the plant survival or stem density criterion is not met within the appropriate timeframe, Corrective Action may include but not be limited to replanting to achieve the target survival and stem density and/or amending the sediments or soils with organic material or slow-release inorganic fertilizer. Beazer will continue to submit annual reports during this time period but will not perform additional corrective actions at the end of the three-year monitoring period. See 3.5.3.
		Survival Sampling- A sampling grid will be established within each of the replanted areas. During each survival inspection, a 1-m^2 quadrat will be randomly placed within each of the sampling grids. The number of stems per species will be counted within each quadrat. See 3.2.3.2		Vegetation monitoring will be conducted to confirm that the areas impacted during construction were replanted with appropriate native vegetation on 2-3 foot centers. See 3.2.5.2.	Monitoring will be completed at 90, 180, and 365 day intervals. See 3.2.5.3.2.1.	Survival of at least 75% of the plants (planted on 2-3 foot centers) twelve months after planting. See 3.4.3.	

Parameter		Method	Pre-Construction Monitoring	Post-Construction Monitoring (30 days)	Annual Monitoring (@+12, +24, +36 months)	Performance Criteria	Corrective Action
Channel Depth/Elevation	**Exisiting Channels**- Depth/elevation channel at creeks between dike and Ashley River.	Depth/elevation of bottom of exisiting channels. Ten sites total, two sites in each of the 5 creeks. Located at the points with the shallowest water depths between the dike and the Ashley River. Measurements physically taken by registered surveyer. See 3.2.4	Surveyor will locate ten sites identifed by LIDAR and confirm depth/elevations 60 days prior to construction. See 3.2.5.1.3	As-built measurements of the breach dimensions and contours of the channels will be collected by a registered surveyer. See 1.5.2	A registered surveyor will measure the channel depth/elevation and contours at the channel monitoring stations and breach locations at 12, 24, and 36 months following construction activities. See 3.2.5.3.3	Elevations at the channel monitoring points will have increased by no more than 0.5 feet (i.e. depth will have decreased by no more than 0.5 feet) at the end of three (3) years. See 3.4.4	If at least three breach locations do not meet the success criteria detailed in Section 3.4.4, Beazer will present the Trustees with a corrective action to open the historical channels to the Ashley River and correspondingly extend the monitoring period for an additional three years. There will be no further corrective action at the end of that additional three-year monitoring period. See 3.5.4.
	Breach Locations- Depth/elevation of bottom of channel.	Depth/elevation of bottom of channels at breach locations. Also includes measurement of breach dimensions and contours. Measurements physically taken by registered surveyer. See 3.2.4	(Not Applicable)			The breaches must be maintained as open and free flowing, and not obstructed for a period of three years post construction. See 3.4.4.	

Appendix 4

Manatee Guidelines

To reduce potential construction-related impacts to the manatee to discountable and insignificant levels, the Service recommends implementing the *Standard Manatee Construction Conditions*, which are as follows:

The permittee will comply with the following manatee protection construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel must monitor water-related activities for the presence of manatee(s) during May 15 - October 15.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.

c. Any siltation barriers used during the project shall be made of material in which manatees cannot become entangled and must be properly secured, and regularly monitored to avoid manatee entrapment.

d. All vessels associated with the project shall operate at “no wake/idle” speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

e. If manatee(s) are seen within 100 yards of the active construction area all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet to a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.

f. Any collision with and/or injury to a manatee shall be reported immediately to Jim Valade of the U.S. Fish and Wildlife Service, North Florida Field Office, at (904) 731-3116.