

WETLANDS AND SUBAQUEOUS LANDS SECTION PERMIT APPLICATION FORM

**For Subaqueous Lands, Wetlands, Marina and
401 Water Quality Certification Projects**

**State of Delaware
Department of Natural Resources and Environmental Control
Division of Water**

Wetlands and Subaqueous Lands Section



APPLICATION FOR APPROVAL OF
SUBAQUEOUS LANDS, WETLANDS, MARINA
AND WATER QUALITY CERTIFICATION PROJECTS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**Application Instructions:**

1. Complete each section of this basic application and appropriate appendices as thoroughly and accurately as possible. Incomplete or inaccurate applications will be returned.
2. All applications must be accompanied by a scaled plan view and cross-section view plans that show the location and design details for the proposed project. Full construction plans must be submitted for major projects.
3. All applications must have an original signature page and proof of ownership or permitted land use agreement.
4. Submit an original and two (2) additional copies of the application (total of 3) with the appropriate application fee and public notice fee* (prepared in separate checks) to:

**Department of Natural Resources and Environmental Control
Wetlands and Subaqueous Lands Section
89 Kings Highway
Dover, Delaware 19901**

*Application and public notice fees are non-refundable regardless of the Permit decision or application status.

5. No construction may begin at the project site before written approval has been received from this office.

Helpful Information:

1. Tax Parcel Information:

New Castle County	(302) 395-5400
Kent County	(302) 736-2010
Sussex County	(302) 855-7878
2. Recorder of Deeds:

New Castle County	(302) 571-7550
Kent County	(302) 744-2314
Sussex County	(302) 855-7785
3. A separate application and/or approval may be required through the Army Corps of Engineers. Applicants are strongly encouraged to contact the Corps for a determination of their permitting requirements. For more information, contact the Philadelphia District Regulator of the Day at (215) 656-6728 or visit their website at: <http://www.nap.usace.army.mil/Missions/Regulatory.aspx>.
4. For questions about this application or the Wetlands and Subaqueous Lands Section, contact us at (302) 739-9943 or visit our website at: <http://www.dnrec.delaware.gov/wr/Services/Pages/WetlandsAndSubaqueousLands.aspx>. Office hours are Monday through Friday 8:00 AM to 4:30 PM, except on State Holidays.

APPLICANT'S REVIEW BEFORE MAILING

DID YOU COMPLETE THE FOLLOWING?

- | | | |
|-------------------|-----|--|
| <u> </u> | Yes | BASIC APPLICATION |
| <u> </u> | Yes | SIGNATURE PAGE (Page 3) |
| <u> </u> | Yes | APPLICABLE APPENDICES |
| <u> </u> | Yes | SCALED PLAN VIEW |
| <u> </u> | Yes | SCALED CROSS-SECTION OR ELEVATION VIEW PLANS |
| <u> </u> | Yes | VICINITY MAP |
| <u> </u> | Yes | COPY OF THE PROPERTY DEED & SURVEY |
| <u> </u> | Yes | THREE (3) COMPLETE COPIES OF THE APPLICATION PACKET |
| <u> </u> | Yes | APPROPRIATE APPLICATION FEE & PUBLIC NOTICE FEE
(Separate checks made payable to the State of Delaware) |

Submit 3 complete copies of the application packet to:

**Department of Natural Resources and Environmental Control
Wetlands and Subaqueous Lands Section
89 Kings Highway
Dover, Delaware 19901**

Before signing and mailing your application packet, please read the following:

The Department requests that the contractor or party who will perform the construction of your proposed project, if other than the applicant, sign the application signature page along with the applicant in the spaces provided. When the application is signed by the contractor as well as the applicant, the Department will issue the Permit to both parties. For Leases, the contractor will receive a separate construction authorization that will make them subject to all of the terms and conditions of the Lease relating to the construction

Section 1: Applicant Identification

- | | |
|---|--|
| 1. Applicant's Name: <u>Ed Farley</u>
Mailing Address: <u>114 S Washington St, Suite 201, Easton, MD 21601</u>

_____ | Telephone #: <u>734-395-9301</u>
Fax #: <u>N/A</u>
E-mail: <u>efarley@ducks.org</u> |
| 2. Consultant's Name: <u>Ducks Unlimited Inc.</u>
Mailing Address: <u>114 S Washington St, Suite 201, Easton, MD 21601</u>

_____ | Company Name: <u>Ducks Unlimited Inc.</u>
Telephone #: <u>734-395-9301</u>
Fax #: <u>N/A</u>
E-mail: <u>efarley@ducks.org</u> |
| 3. Contractor's Name: <u>TBD</u>
Mailing Address: _____

_____ | Company Name: _____
Telephone #: _____
Fax #: _____
E-mail: _____ |

Section 2: Project Description

4. Check those that apply:
 New Project/addition to existing project? Repair/Replace existing structure? (If checked, must answer #16)

5. Project Purpose (attach additional sheets as necessary):
The purpose of this project is to install a coastal wetland restoration structure that will help eliminate some of the wave and wind energy. The goal of this structure is to save what little is left of the islands growing vegetation behind the proposed structure and ideally help them rebuild by trapping sediment behind the structure to rebuild marsh where it is currently deteriorating rapidly.

6. Check each Appendix that is enclosed with this application:

A. Boat Docking Facilities	G. Bulkheads	N. Preliminary Marina Checklist
B. Boat Ramps	H. Fill	O. Marinas
C. Road Crossings	I. Rip-Rap Sills and Revetments	P. Stormwater Management
D. Channel Modifications/Dams	J. Vegetative Stabilization	Q. Ponds and Impoundments
E. Utility Crossings <input checked="" type="checkbox"/>	K. Jetties, Groins, Breakwaters	R. Maintenance Dredging
F. Intake or Outfall Structures <input checked="" type="checkbox"/>	M. Activities in State Wetlands	S. New Dredging

Section 3: Project Location

7. Project Site Address: 2591 Whitehall Neck Rd, Smyrna, DE 19977

- County: N.C. Kent Sussex
 Site owner name (if different from applicant): USFWS
 Address of site owner: 2591 Whitehall Neck Rd, Smyrna, DE 19977

8. Driving Directions: Turn off of state Rt 9 onto Whitehall Neck Rd, continue onto Refuge Entrance Road, take a left onto Dutch Neck Rd and the project site will be on your right in approximately 0.5 miles.
 (Attach a vicinity map identifying road names and the project location)

9. Tax Parcel ID Number: 77681 Subdivision Name: N/A

WSLS Use Only: Permit #s: _____

Type SP SL SU WE WQ LA SA MP WA

Corps Permit: SPGP 18 20 Nationwide Permit #: _____ Individual Permit # _____

Received Date: _____ Project Scientist: _____

Fee Received? Yes No Amt: \$ _____ Receipt #: _____

Public Notice #: _____ Public Notice Dates: ON _____ OFF _____

Section 3: Project Location (Continued)

10. Name of waterbody at Project Location: Money Marsh/ Duck Creek waterbody is a tributary to: Leipsic River/ Delaware Bay

11. Is the waterbody: Tidal Non-tidal Waterbody width at mean low or ordinary high water 3800 feet

12. Is the project: On public subaqueous lands? On private subaqueous lands?*
 In State-regulated wetlands? In Federally-regulated wetlands?

*If the project is on private subaqueous lands, provide the name of the subaqueous lands owner:

(Written permission from the private subaqueous lands owner must be included with this application)

13. Present Zoning: Agricultural Residential Commercial Industrial Other

Section 4: Miscellaneous

14. A. List the names and complete mailing addresses of the immediately adjoining property owners on all sides of the project (attach additional sheets as necessary):

N/A

B. For wetlands and marina projects, list the names and complete mailing addresses of property owners within a 1,000 foot radius of the project (attach additional sheets as necessary):

N/A

15. Provide the names of DNREC and/or Army Corps of Engineers representatives whom you have discussed the project with:

A. Have you had a State Jurisdictional Determination performed on the property? Yes No

B. Has the project been reviewed in a monthly Joint Permit Processing Meeting? Yes No

*If yes, what was the date of the meeting? _____

16. Are there existing structures or fill at the project site in subaqueous lands? Yes No

*If yes, provide the permit and/or lease number(s):

*If no, were structures and/or fill in place prior to 1969? Yes No

17. Have you applied for or obtained a Federal permit from the Army Corps of Engineers?

No Pending Issued Denied Date: _____

Type of Permit: NW 27 Federal Permit or ID #: _____

18. Have you applied for permits from other Sections within DNREC?

No Pending Issued Denied Date: _____ Permit or ID #: _____

Type of permit (circle all that apply): Septic Well NPDES Storm Water

Other: _____

Section 5: Signature Page

19. Agent Authorization:

If you choose to complete this section, all future correspondence to the Department may be signed by the duly authorized agent. In addition, the agent will become the primary point of contact for all correspondence from the Department.

I do not wish to authorize an agent to act on my behalf

I wish to authorize an agent as indicated below

I, _____, hereby designate and authorize _____
 (Name of Applicant) (Name of Agent)

to act on my behalf in the processing of this application and to furnish any additional information requested by the Department.

Authorized Agent's Name: _____ Telephone #: _____
 Mailing Address: _____ Fax #: _____
 _____ E-mail: _____

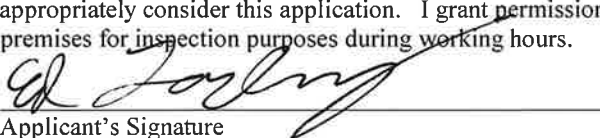
20. Agent's Signature:

I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application.

 Agent's Signature _____
 Date

21. Applicant's Signature:

I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge and that I am required to inform the Department of any changes or updates to the information provided in this application. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application. I grant permission to authorized Department representatives to enter upon the premises for inspection purposes during working hours.


 Applicant's Signature 11/6/23
 Date

EJ Farley
 Print Name

22. Contractor's Signature:

I hereby certify that the information on this form and on the attached plans are true and accurate to the best of my knowledge, and that I am required to inform the Department of any changes or updates to the information provided in this application. I further understand that the Department may request information in addition to that set forth herein if deemed necessary to appropriately consider this application.

 Contractor's Name _____
 Date

 Print Name

Bombay Hook, Money Marsh Restoration, Kent County, Delaware

The rapid degradation of coastal wetlands within the Delaware Estuary (Estuary) is well documented. A 2012 report by the Partnership of the Delaware Estuary (PDE) estimated that between 1996 and 2006, the rate of loss was approximately one acre per day, with the expectation of that rate increasing due to climate change and SLR. In 2010, another paper by PDE projected the future acreage of tidal wetlands will decrease by approximately two-thirds of its current (2006) acreage by 2100.

The following sections will provide the purpose and project description, current site conditions and how the site will be modified by the proposed project, structures and fill materials to be installed, type and quantity of materials to be used (i.e., square ft of coverage and cubic yards of fill material and/or structures below ordinary/mean high water), area of excavation or dredging, volumes of material to be removed and location of dredged material disposal or use, work methods and type of equipment to be used, phasing of activities, pollution control methods and mitigation activities proposed to compensate for resource impacts, erosion and silt control methods that will be used to prevent water quality impacts, and where applicable, alternatives considered to avoid regulated areas. The wetland enhancement project should increase habitat heterogeneity, improve native wetland plant communities, and increase the resilience of the marsh to climate change.

Project Description and Purpose, Current Site Conditions, Proposed Site Changes

BOMBAY HOOK NATIONAL WILDLIFE REFUGE

Bombay Hook NWR is in Kent County, Delaware and encompasses one of the largest remaining tidal wetland complexes in the Mid-Atlantic region. These marshes provide a buffer to nearby communities and agricultural areas and economic studies show that Refuge visitors contribute millions of dollars to the local economy annually. Although not spared entirely, much of the marsh at Bombay Hook NWR has not been subjected to the extent of anthropomorphic alterations (grid-ditching, impounding, channel construction, etc.) that is seen in other tidal wetlands in the Estuary. Despite this, marshes at Bombay Hook NWR have experienced substantial losses in the past century. The greatest acreage losses (~50% of total) are in interior marsh areas where large open-water pools have formed — the largest of which being Money Marsh. Concern surrounding observed marsh loss at Bombay Hook NWR has spurred several research efforts at the Refuge to better understand the underlying causes and drivers of these changes. The specific cause of marsh loss at the Refuge is currently unknown and it is likely that the cause is a combination of many factors.

Considering the economic and ecological value of the marshes at Bombay Hook NWR, the extent of past marsh loss is cause for concern, and thus the USFWS and its partners have considered multiple approaches to curtail future losses and regain marsh where feasible. Although research has yet to reveal the specific cause of marsh loss at the Refuge, it is understood that, as interior pools expand, wind and wave energy forces are amplified and are undoubtedly contributing to the continued conversion of vegetated marsh areas to mud flats and open water. The proposed project is an example of a novel approach intended to address these factors in Money Marsh. The specific project objective is to strategically anchor a series of natural woody materials such as logs and slash material across approximately 1,000 linear feet of the mudflats and former vegetated areas of Money Marsh which will:

1. Reduce wind and wave energy, thereby limiting these forces as drivers of continued marsh loss and improving resilience of important nearby onshore habitats (Sheariness Impoundment).
2. Encourage trapping of sediment surrounding woody structures which will build marsh platform elevations, improve the marshes' ability to keep pace with SLR, and promote re-establishment of marsh vegetation communities in an anticipated 30-acre area.
3. Foster information sharing among project partners to build capacity and know-how that will expand conservation approaches and accelerate delivery of coastal and tidal habitat conservation in the Mid-Atlantic region.

Although Ducks Unlimited (DU) and USFWS have a longstanding partnership working to conserve important wetland habitats at Bombay Hook NWR, previous projects have focused on non-tidal wetland habitats. Once implemented, our projects will lead to enhancement and/or restoration of coastal marsh habitat by increasing resiliency from impacts of SLR, large storm events, and other ecosystem stressors. Our projects will aid in the advancement of improved benefits that healthy coastal ecosystems provide. The habitat conserved through this implementation will provide and protect critical breeding and migration areas for waterfowl, waterbirds, shorebirds, and numerous upland bird species.

Structures and fill materials to be installed, and quantity to be used

The only permanent structure that will be installed in this project will be a 1,000 linear foot long structure with a 50-foot diameter circle of logs placed at the end of the structure out in the marsh. The structure will be comprised of logs that are already cut and on-site with an average diameter of 12-20 inches and an average length of 20 feet. These logs will be driven into the mud in two rows, ten feet apart. The energy side logs will be driven in a minimum of 10 feet into the mud at a 60-degree angle. On the accretion side, the logs will be driven a minimum of 8 feet vertically into the mud. The two rows will be attached to each other using hitch lags and synthetic rope (or engineer-approved substitute). The rope will need a working/safe load of a minimum of 528 pounds. The area in between these two rows of logs will be filled with other woody material such as extra logs and slash material. This structure is designed to minimize wind and water erosion on the islands behind it and will allow for sediment to be trapped behind the structure to rebuild the existing islands in the marsh. This structure will be visible above the mean high tide level in the marsh as it is designed to slow wave and wind erosion behind the structure while accreting sediment and regrowing marsh.

To limit erosion at the outer end of the structure, the last 150 feet of the structure shall be tapered vertically and horizontally. The heights of the timber piles will be lowered by 6 inches with five piles at each interval height. The width between each row of piles shall be reduced by one foot with each six-inch reduction in pile height. At the very outer end of the structure, a log circle will be placed with a diameter of 50 feet. Within the circle, piles are to be placed randomly to disrupt wave energy.

Navigational risks in this area are limited for several reasons. First, the project area is on a National Wildlife Refuge with limited public access. Secondly, the area is shallow enough to limit navigation in current conditions. Despite the limited navigational risk, we will install

warning signs will be placed at the start and end of the structure, as well as at least once every 500 linear feet.

Area of excavation or dredging, volume of material to be removed, location of dredged material placement

The total area of disturbance will be approximately 9.3 acres. This includes the area that structure will be installed in. No material is being removed or dredged out.

Work methods and type of equipment used

DU will hire a local contractor to complete the proposed construction. Equipment will include heavy machinery such as barges, piling drivers, and excavators to move the logs. DU staff will provide construction management and oversee all work to ensure Ducks Unlimited Standard Construction specifications are followed.

A temporary marsh access route will be established to stage the logs beside the project area and provide access for the heavy machinery to stage and load logs onto the barge to minimize wetland impacts, timber matting (or similar) will be placed along marsh access road to provide a stable surface and facilitate access; thickness will vary based on marsh conditions. Following construction, the timber matting will be removed.

Planned sequence of activities

CONSTRUCTION SEQUENCE

THE CONTRACTOR SHALL FOLLOW THE SEQUENCING PLAN DESCRIBED BELOW.
ANY CHANGES WILL NEED
WRITTEN ENGINEER'S APPROVAL.

1. SCHEDULE PRE-CONSTRUCTION MEETING BEFORE STARTING AUTHORIZED ACTIVITIES.
2. NOTIFY SEDIMENT CONTROL INSPECTOR 24 HOURS PRIOR TO THE START OF CONSTRUCTION.
3. RANGE AND ELEVATION MARKERS SHALL BE INSTALLED FOR CONTROL OF BREAKWATER LOCATION.
4. A RECORD OF PILE LENGTHS INSTALLED SHALL BE MAINTAINED.
5. WORK SHALL PROGRESS FROM SOUTH TO NORTH.
6. NOTIFY SEDIMENT CONTROL INSPECTOR OF PROJECT COMPLETION.

NOTE: NOTIFY THE SEDIMENT CONTROL INSPECTOR TO OBTAIN DIRECTION AS TO ANY SEDIMENT AND EROSION CONTROL CONCERNS THAT ARISE.

Pollution control methods used to prevent water quality impacts

DU will work with the contractor hired to eliminate any further marsh degradation and will limit disturbed area to a minimum. DU will also make sure the contractor uses best sediment and erosion control practices to keep sediment from eroding into the waterway. Timber matting will be used in areas to prevent long-term damage to the marsh and surrounding area where the logs will be loaded onto the barge.

Alternatives considered to avoid regulated areas; if no feasible alternatives exist, explain how the project will minimize impacts

This project is a wetland enhancement, and as such, it necessarily occurs within wetland boundaries. This project is designed to enhance wetland function overall by restoring historic conditions to the best extent possible. The designs and construction sequence also minimize potential negative impacts due to disturbance. The DU hired contractor will follow Invasive Species Best Management Practices, which includes the stipulation that all earthmoving equipment will be cleaned prior to mobilization to and from the restoration site to prevent possible contamination. Inspection and maintenance of erosion and sediment controls will be performed regularly.



DUCKS UNLIMITED 7322 Newman Boulevard, Building 2, Suite 200, Dexter, MI 48130 (734) 623-2000 www.ducks.org

State of Delaware
Department of Natural Resources and Environmental Control
Wetland and Subaqueous Lands Section
89 Kings Highway
Dover, DE 19901

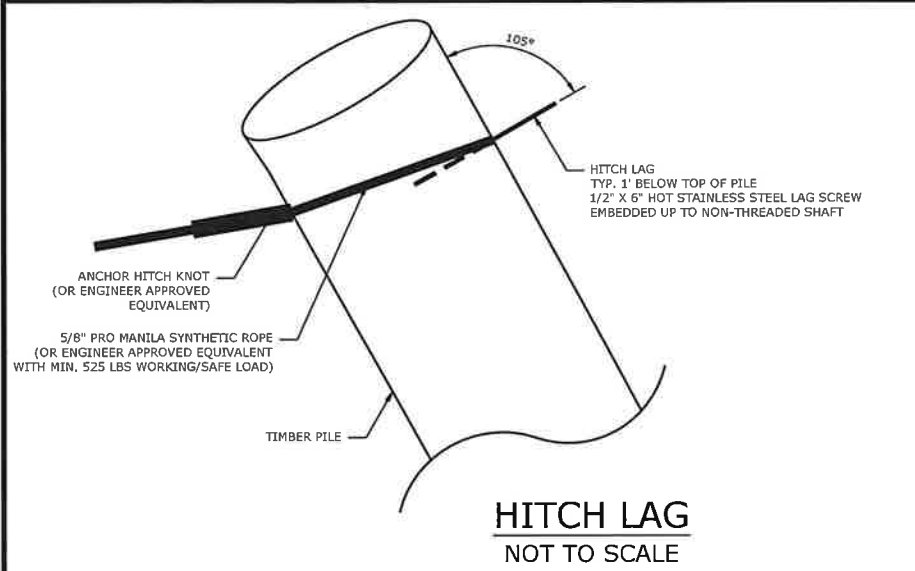


Dear Wetlands and Subaqueous Lands Section,

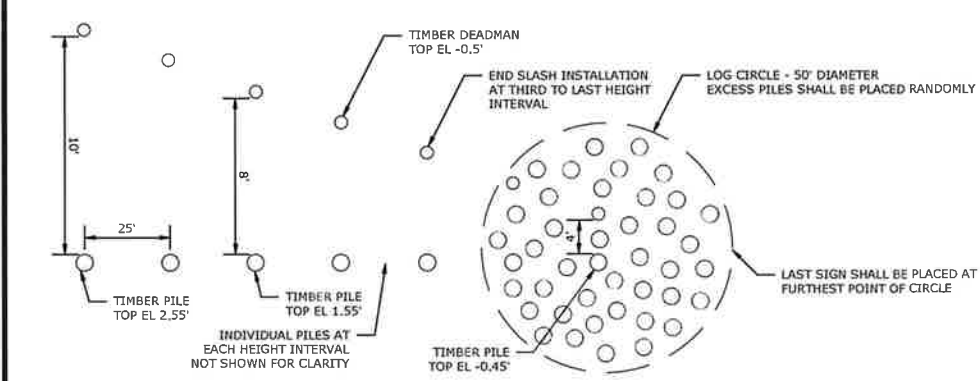
I am writing to submit a permit request for a Ducks Unlimited project at Bombay Hook National Wildlife Refuge. The project is located at 39.272798°, -75.469109° off Whitehall Neck Road. We will be installing a rack trap wetland restoration structure in a portion of Money Marsh. The project area is currently mud flat, but historically, it was salt marsh. Approximately 500 linear feet of rack trap structure will be built using natural woody debris. The purpose of the structure is to trap sediment on the back side using nature-based solutions, which will allow the salt marsh to recolonize on the trapped sediment. Additionally, the rack trap will help to reduce wind and wave energy that is exacerbating marsh loss in this area. The structure will occupy approximately 10,000 square feet of the mudflat. This wetland restoration has been designed to benefit native wildlife species, as well as to improve water quality and environmental resilience. There will be no active long-term management required. A barge and pile-driving equipment will be used during construction, which will occur over the course of roughly one month. A detailed plan is included with this letter and permit application. Please contact me at efarley@ducks.org or 734-395-9301 for payment of the permit application fees.

Thank you for your time,
Ed Farley
Ducks Unlimited
Manager of Conservation Programs

C:\Users\lenderman\Documents\CAD_Drawing\102-1 Money Marsh\102-1 Money Marsh\CAD_Drawing\102-1 Money Marsh\DETAIL SHEET 1.dwg, 9/25/2023 5:09 PM, Lauren Lenderman, DETAIL SHEET 1, None

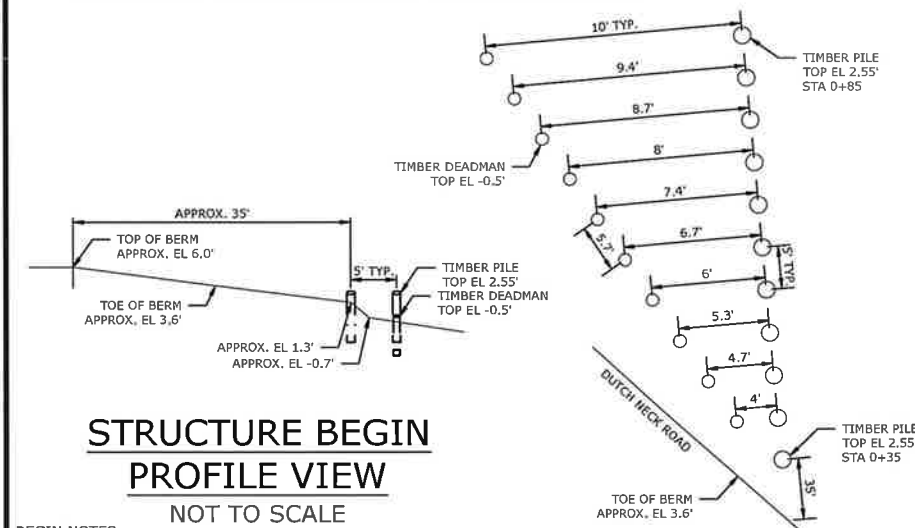


HITCH LAG
NOT TO SCALE



STRUCTURE END TOP VIEW
NOT TO SCALE

- END NOTES:**
1. THE LAST 150' OF THE STRUCTURE FROM STA 18+70 TO 20+20 SHALL BE TAPERED VERTICALLY AND HORIZONTALLY.
 2. THE HEIGHTS OF THE TIMBER PILES SHALL BE LOWERED BY 0.5' WITH 5 PILES AT EACH INTERVAL HEIGHT, ENDING AT EL -0.45'.
 3. TIMBER PILES SHALL KEEP THE CONSISTENT 5' SEPARATION BETWEEN EACH 3 PILES AT THE VARYING HEIGHTS.
 4. THE WIDTH OF THE STRUCTURE SHALL BE TAPERED BY THE DEADMEN MOVING TOWARDS THE PILES BY 1' WITH EACH TIMBER PILE HEIGHT CHANGE.
 5. THE TOP EL OF THE DEADMEN SHALL NOT CHANGE.
 6. LOGS WITHIN LOG CIRCLE SHALL BE KEPT AT A MINIMUM OF 3' APART, BE DRIVEN TO A TOP EL BETWEEN EL 0.0' AND 1.0' AND HAVE A MINIMUM 2:1 RATIO OF HEIGHT BELOW THE EXISTING GROUND VS. HEIGHT ABOVE EXISTING GROUND.



STRUCTURE BEGIN PROFILE VIEW
NOT TO SCALE

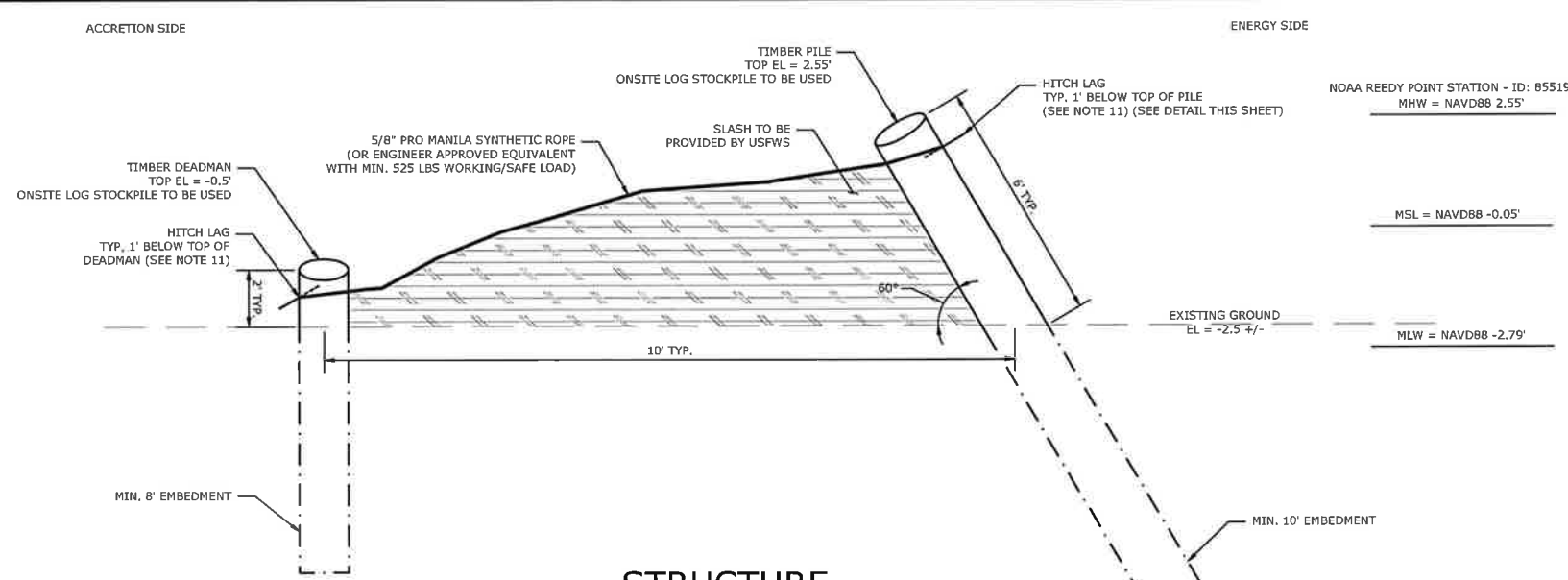
- BEGIN NOTES:**
1. THE FIRST 50' OF THE STRUCTURE FROM STA 0+35 TO 0+85 SHALL BE TAPERED HORIZONTALLY.



STRUCTURE BEGIN TOP VIEW
NOT TO SCALE

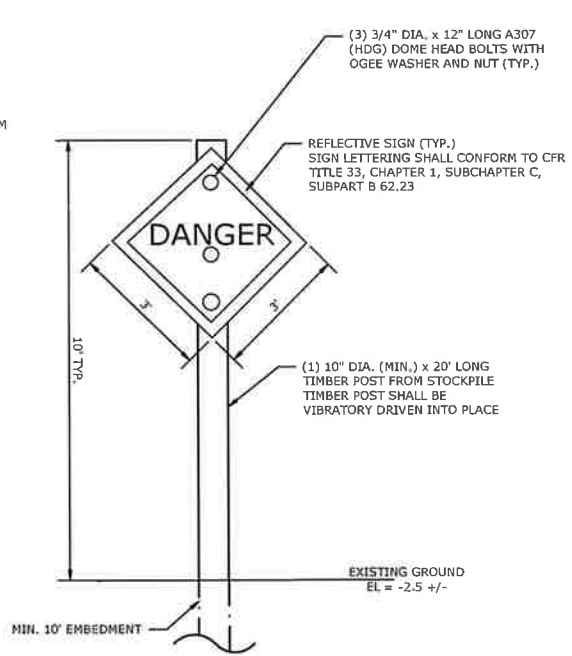
NOTICE: Construction site safety is the sole responsibility of the contractor. Ducks Unlimited, Inc. shall not assume any responsibility for the safety of the work performed, persons engaged in the work, nearby structures, or of other persons on-site.

This material, data and information is the property of Ducks Unlimited, Inc. It may not be used or reproduced for any purpose without the prior written consent of an authorized agent of Ducks Unlimited, Inc. Ducks Unlimited, Inc. makes no representation or warranty of any kind regarding this material, data and information, including, but not limited to, the accuracy of the material, data and information or its suitability for any purpose. All use of the material, data and information is at the users sole risk. By using any of this material, data and information, user agrees that Ducks Unlimited, Inc. is not responsible for their use of the material, data and information or the results thereof.



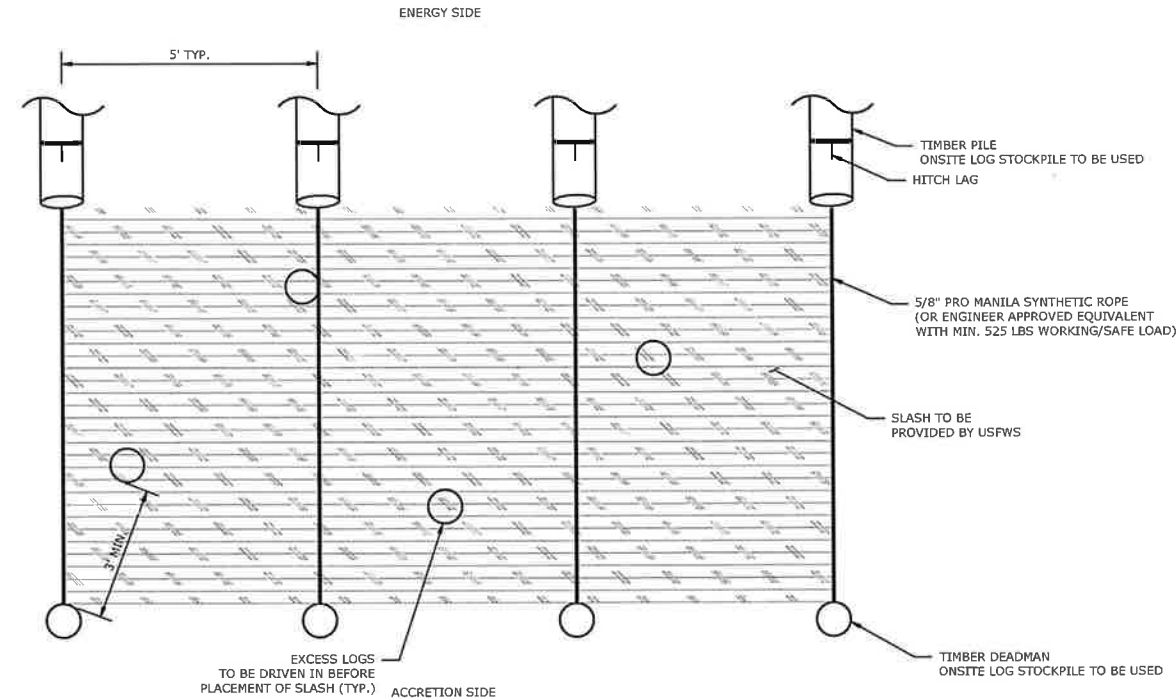
STRUCTURE SECTION VIEW
NOT TO SCALE

- STRUCTURE NOTES:**
1. ONSITE LOG STOCKPILE CONSISTS OF APPROXIMATELY 1,000 LOGS VARYING FROM 9-18" IN DIAMETER, AND AN AVERAGE 20' IN LENGTH
 2. LOGS BELOW THE AVERAGE 14" DIAMETER SHALL BE USED AS DEADMEN AS DEPICTED IN THE DETAIL.
 3. LOGS ABOVE THE AVERAGE 14" DIAMETER SHALL BE USED AS PILES AS DEPICTED IN THE DETAIL. MINIMUM AVG. DIAMETER FOR PILES IS 12".
 4. ALL LOGS SHOULD BE INSPECTED FOR ROT OR SEVERE DEFORMITY THAT COULD IMPEDE INSTALLATION PRIOR TO INSTALLATION. THE CONTRACTOR SHALL USE BEST JUDGEMENT TO DETERMINE WHETHER A LOG IS STILL VIABLE FOR USE.
 5. ANY LOGS DEEMED UNSUITABLE FOR USE DUE TO ROT SHALL BE DISPOSED OF PROPERLY OFFSITE.
 6. ALL TIMBER DEADMEN, TIMBER PILES, SIGNAGE PILING, AND EXCESS LOGS SHALL BE INSTALLED USING VIBRATORY PILE DRIVING.
 7. TOP EL OF TIMBER PILE SHALL HAVE A +/- 0.3' TOLERANCE
 8. TIMBER PILE DRIVEN ANGLE SHALL HAVE A +/- 5° TOLERANCE
 9. SLASH SHALL BE DEFINED AS AND INCLUDE ALL WOOD WITH AN AVERAGE DIAMETER AT BREST HEIGHT OF LESS THAN 6 INCHES, AND MAY INCLUDE LEAVES AND CONIFER NEEDLES. SLASH TYPICALLY INCLUDES CONIFER TREES, BRANCHES OR BRUSH. SLASH SHALL BE ANCHORED AS NOTED IN DETAIL. ALL LOGS AND SLASH WILL BE PROVIDED BY USFWS.
 10. SLASH SHALL BE PACKED SECURELY AND ANY LOOSE BRUSH SHORTER THAN THE SPECIFIED PILE SEPARATION DISTANCE SHALL BE TIED TOGETHER USING 1/2" COIR ROPE OR ENGINEER APPROVED EQUIVALENT. CONTRACTOR MAY NEED TO ADJUST VOLUME OF SLASH AND CONNECTIONS DURING CONSTRUCTION BASED ON FIELD CONDITIONS. ANY CHANGES WILL NEED TO BE REVIEWED AND APPROVED BY THE ENGINEER.
 11. HITCH LAG DISTANCE FROM THE TOP OF PILE/DEADMAN SHOULD BE ADJUSTED IN THE FIELD BASED ON THE HEIGHT OF THE SLASH. THE ROPE SHOULD BE IN CONTACT WITH THE SLASH AND HAVE NO SLACK IN THE ROPE.
 12. IN THE EVENT THAT THE CONTRACTOR REACHES A POINT OF REFUSAL FOR A TIMBER PILE, THE CONTRACTOR SHALL CONTACT THE ENGINEER IMMEDIATELY BEFORE CONTINUING.
 13. EXCESS LOGS SHALL BE DEFINED AS AND INCLUDE ALL LOGS DEEMED UNSUITABLE FOR USE DUE TO DEFORMITY AND ANY PORTIONS OF DEADMEN OR PILES THAT WILL NOT BE USED AS SUCH. EXCESS LOGS SHALL BE KEPT AT A MINIMUM DISTANCE OF 3' FROM ALL DEADMEN, PILES, AND OTHER EXCESS LOGS.
 14. PILES SHALL BE CUT TO APPROPRIATE LENGTHS AFTER DRIVING IN THE EVENT THAT DIFFERING SOIL CONDITIONS ARE ENCOUNTERED. CONTRACTOR MAY CHOOSE TO DRIVE THE TIMBER PILES AND DEADMEN TO THE DEPTHS AND ELEVATIONS SHOWN AND CUT OFF EXCESS LENGTH WITH EXCESS PIECES DRIVEN SEPARATELY AS SHOWN. ALTERNATIVELY, CONTRACTOR MAY DRIVE PILES DEEPER TO ELIMINATE NEED TO CUT OFF EXCESS LENGTH.



DAY BEACON (TYP)
NOT TO SCALE

- NOTES:**
1. TOTAL NUMBER OF DAY BEACONS TO BE INSTALLED ARE TO BE DETERMINED IN THE FIELD BASED ON PHASING.
 2. DAY BEACONS ARE TO BE LOCATED AT THE STARTING AND ENDING POINTS OF THE STRUCTURE AND AT LEAST ONCE EVERY 500' DURING ALL PHASES.



STRUCTURE TOP VIEW
NOT TO SCALE

FOR PERMIT

GREAT LAKES/ATLANTIC REGIONAL OFFICE
7322 NEWMAN BOULEVARD, BLDG. 2
DEXTER, MICHIGAN 48130
(734) 623-2000 www.ducks.org

DUCKS UNLIMITED

DETAILS
MONEY MARSH COASTAL RESTORATION
BOMBAY HOOK NWR
KENT COUNTY, DELAWARE

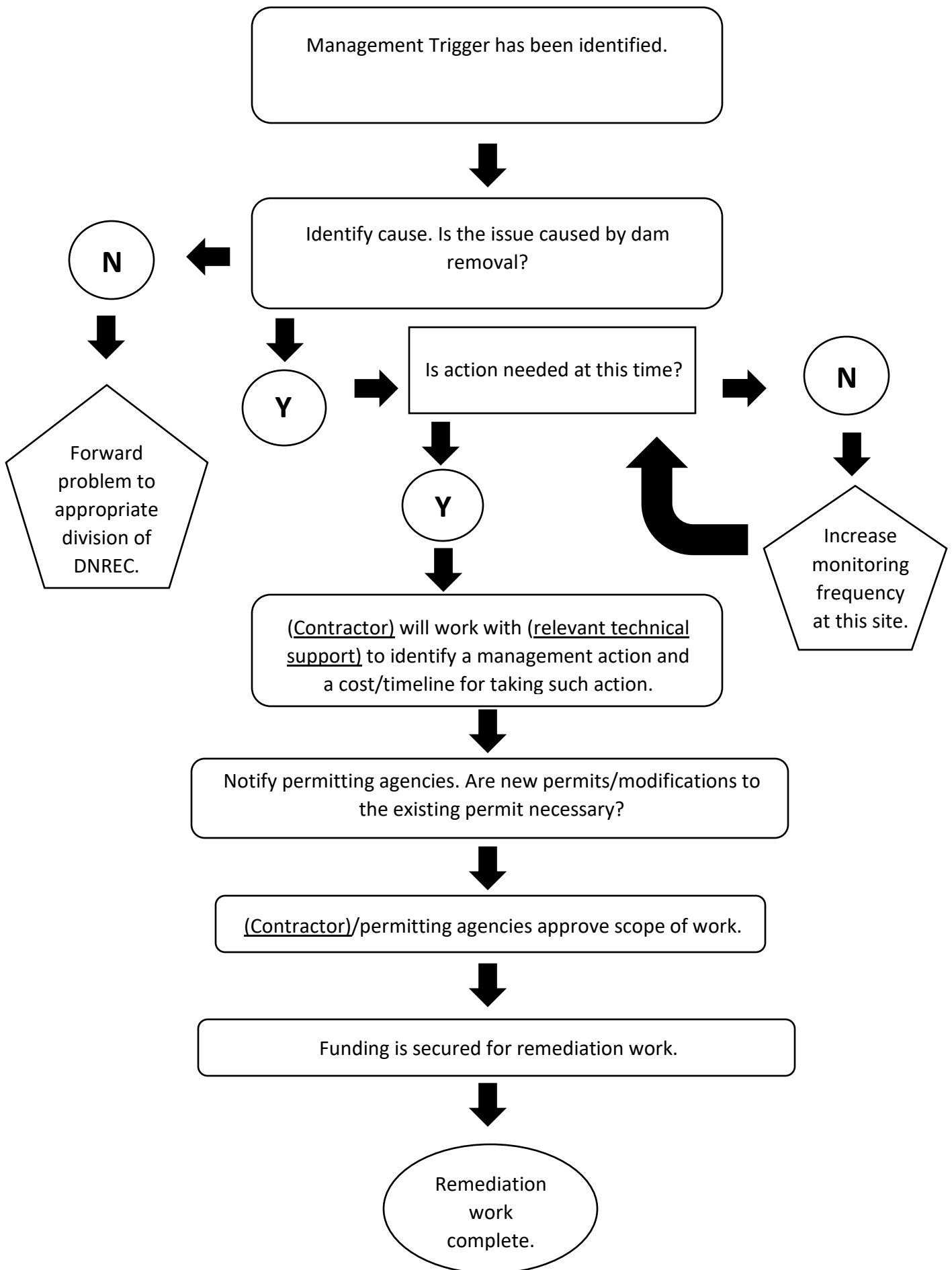
Revision	Sheet	Revisions	Date	By

CAD FILE:
DE-102-1 Money Marsh.dwg
DESIGNED BY: LL
DRAWN BY: JP
SURVEYED BY: JP
BIOLOGIST: EF
DATE:
9/25/23
PROJECT NUMBER:
US-DE-102-1
C301

NOT FOR CONSTRUCTION

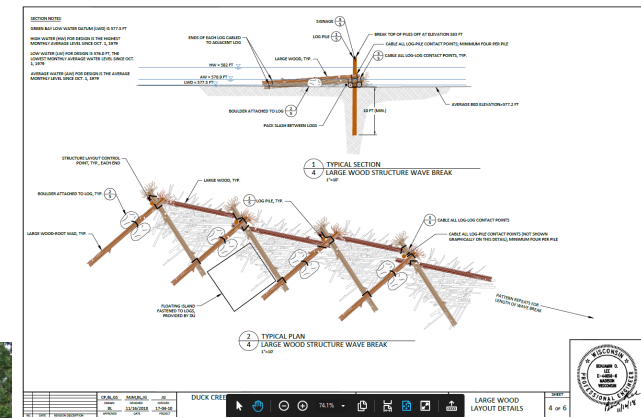
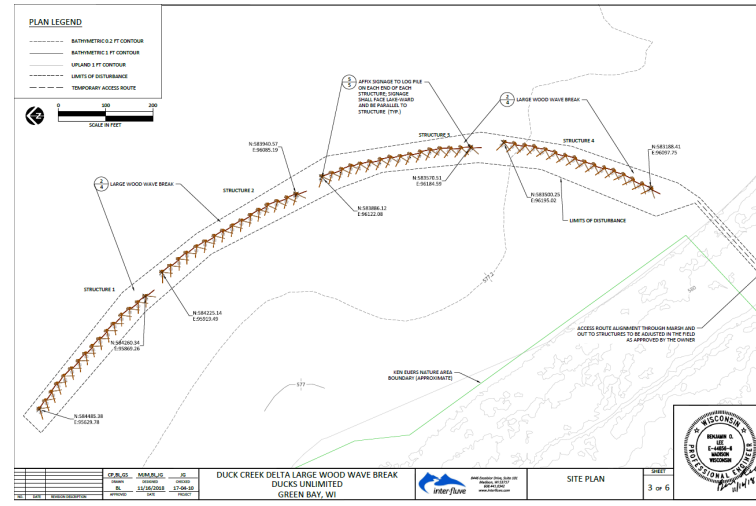
Table 1. Management Triggers in Areas of Concern

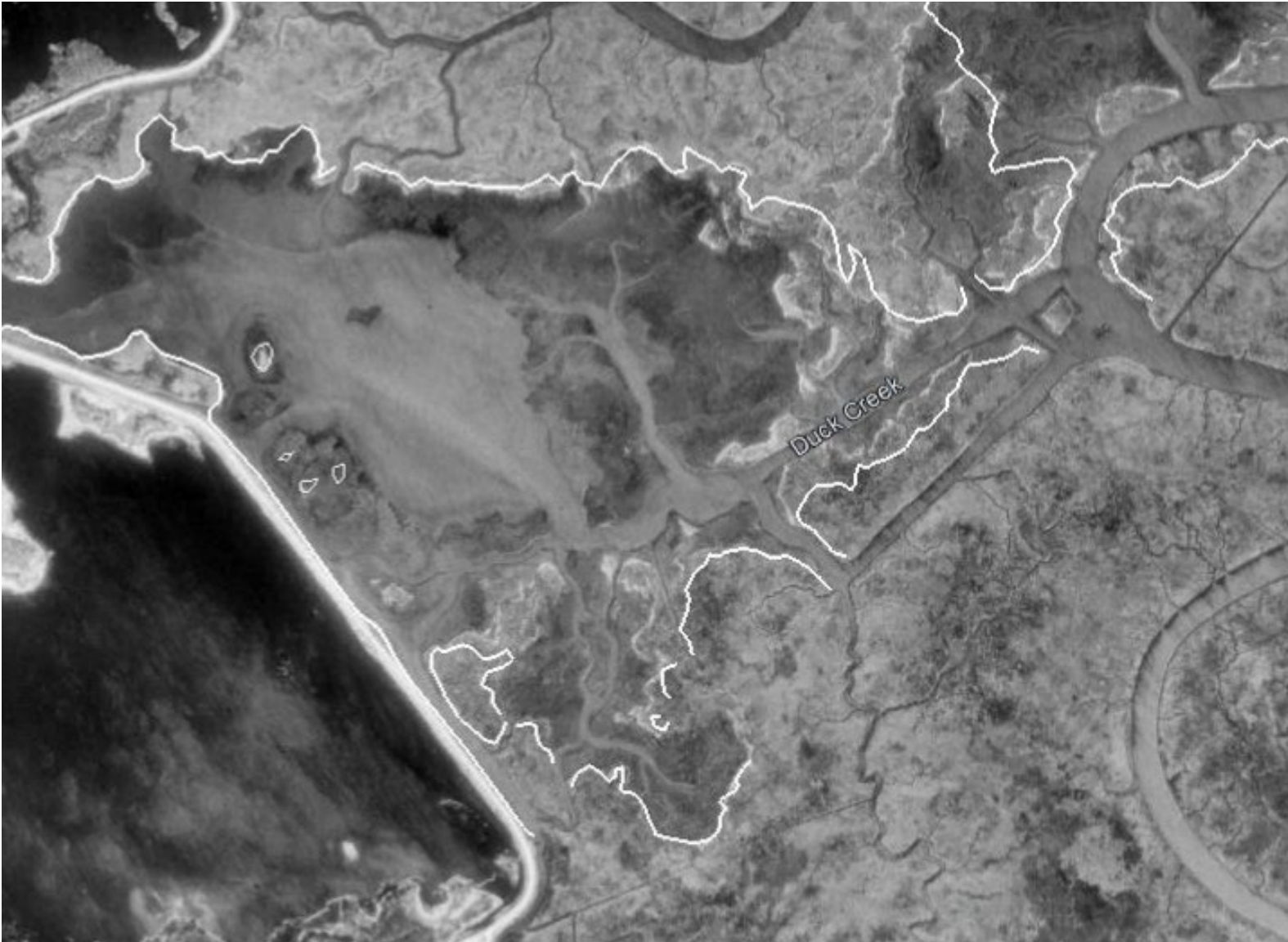
Category of Concern	Monitoring Methods	Management Trigger	Expected Timeframe for Decision-Making	Potential Management Action
<p>Timber deadmen and piles becoming unanchored post-construction</p>	<p>USFWS staff from Bombay Hook NWR will be responsible for monitoring the structure after construction. A visual inspection from Dutch Neck Road will be required after each storm with moderate to heavy wind and wave action.</p> <p>NOAA requires annual monitoring of essential fish habitat, which may include visual inspections, review of satellite imagery, or LiDAR imaging. These techniques can be used to assess the structure and marsh behind it in comparison to sea level.</p>	<p>Timber deadmen and/or piles are seen out of place, as compared to location immediately following construction.</p>	<p>A decision must be made on action within 6 months of inspection of a timber pile increase in height greater than approximately 2 feet and an approximate 1-foot increase in height for a timber deadmen. If a timber deadman or pile is seen completely unanchored and/or floating, immediate action must be taken.</p>	<p>In the case of an unanchored and/or floating timber deadman or pile, the item must be immediately retrieved and disposed of properly offsite. Inspection of the remaining structure shall follow. Where a timber deadman or pile has risen above the forementioned heights, depending on the condition of the timber, it can either be removed and disposed of properly offsite or anchored via other means such as concrete blocks.</p>



Bombay Hook NWR Wave Attenuation

- Loop Canal, DE
- Botanical Gardens, De
- Mispillion River, DE
- Duck Creek Delta, WI





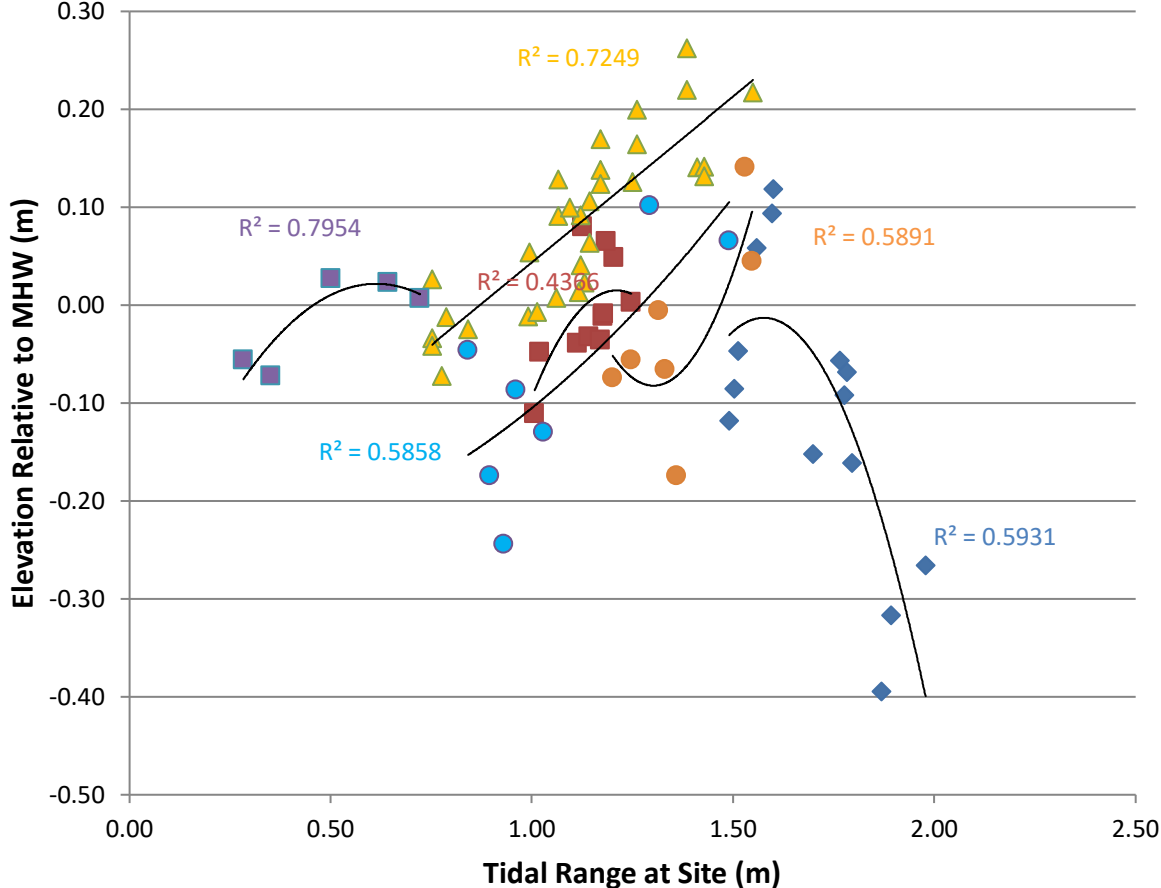
03-1991 AP
with 07-2006
marsh edge
line



03-1991 AP
with 06-2018
marsh edge
line

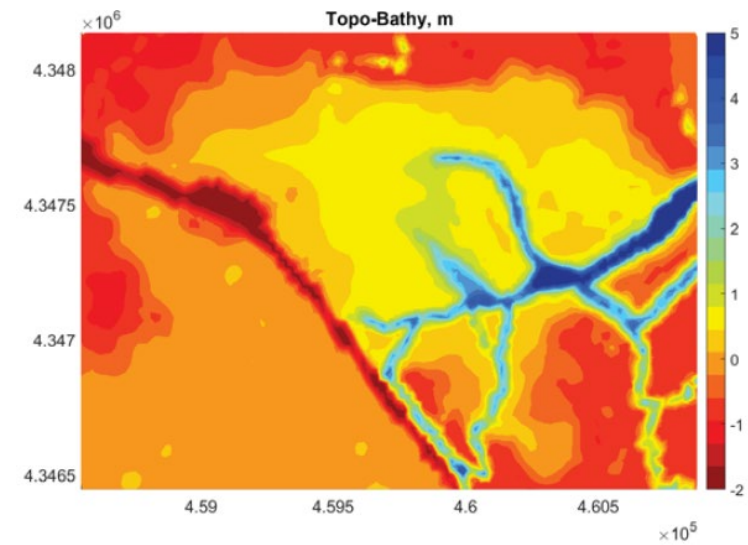
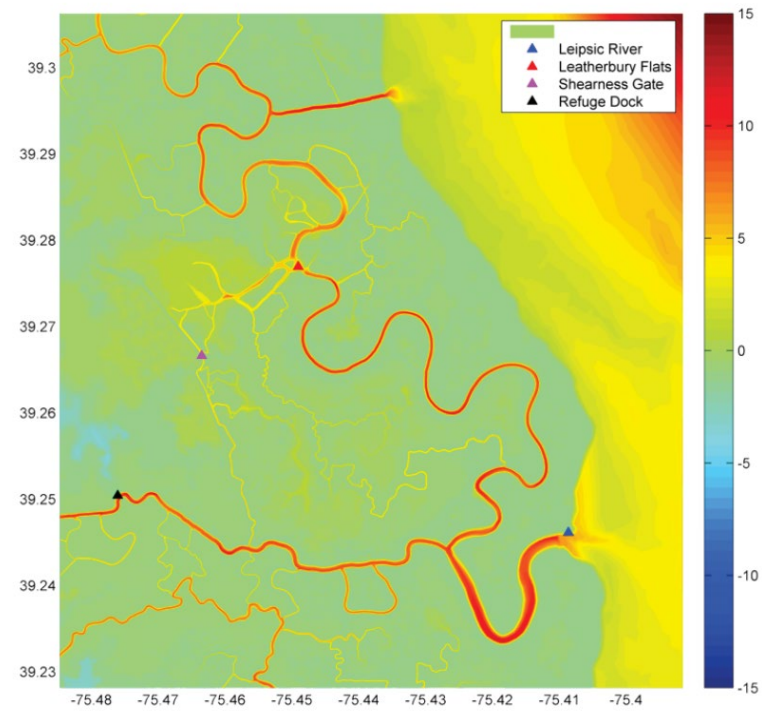
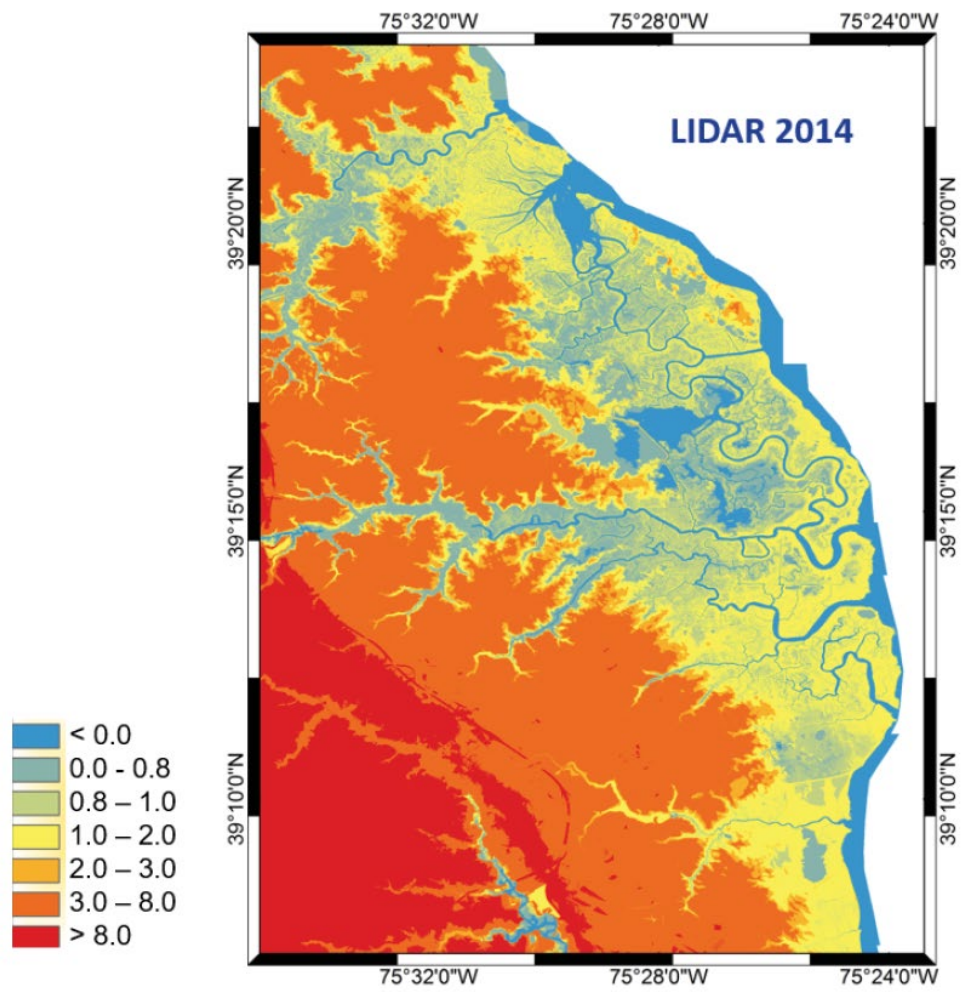


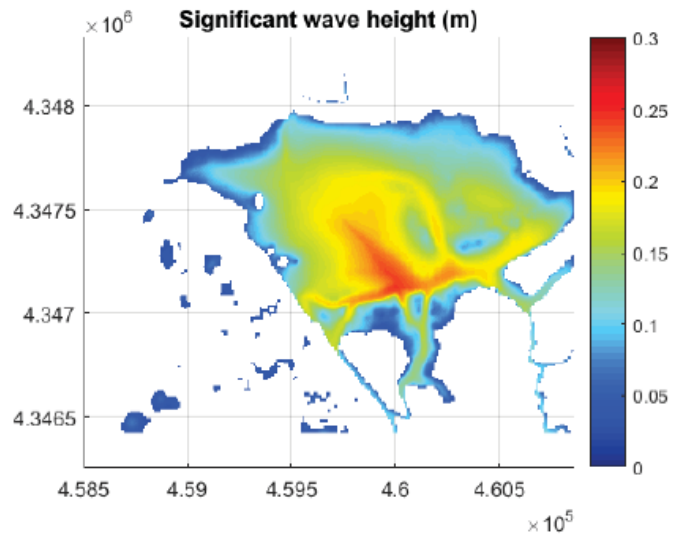
Marsh Elevation Relative to MHW vs Tidal Range



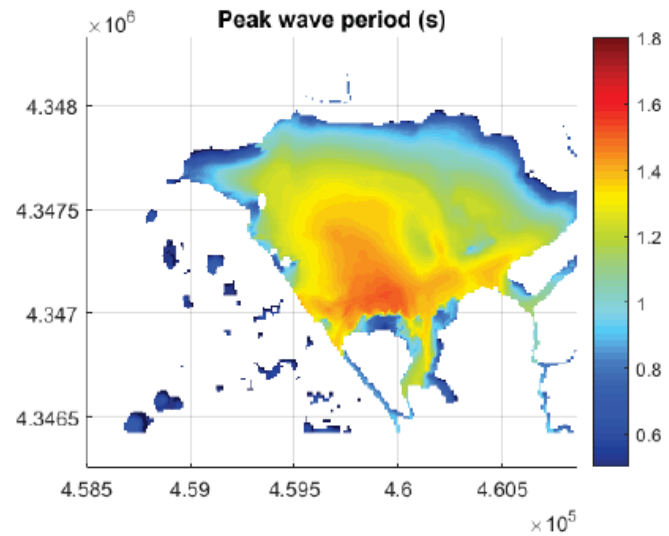
- ◆ Bombay Hook
- Broadkill River
- ▲ St Jones River
- Blackbird Creek
- Primehook Creek
- Murderkil River

	<u>Leipsic River Mouth</u>	<u>USFWS Dock</u>	<u>Shearness Pool</u>	<u>Leatherberry Flats</u>	<u>Sluice Ditch</u>
<u>MHHW</u>	<u>1.02 m</u>	<u>0.88 m</u>	<u>0.96 m</u>	<u>1.35 m</u>	<u>0.92 m</u>
<u>MHW</u>	<u>0.90 m</u>	<u>0.80 m</u>	<u>0.87 m</u>	<u>1.24 m</u>	<u>0.80 m</u>
<u>MTL</u>	<u>0.09 m</u>	<u>0.14 m</u>	<u>-0.01 m</u>	<u>0.34 m</u>	<u>-0.05 m</u>
<u>MLW</u>	<u>-0.77 m</u>	<u>-0.62 m</u>	<u>-0.58 m</u>	<u>-0.63 m</u>	<u>-0.93 m</u>
<u>MLLW</u>	<u>-0.82 m</u>	<u>-0.70 m</u>	<u>-0.62 m</u>	<u>-0.70 m</u>	<u>-0.98 m</u>

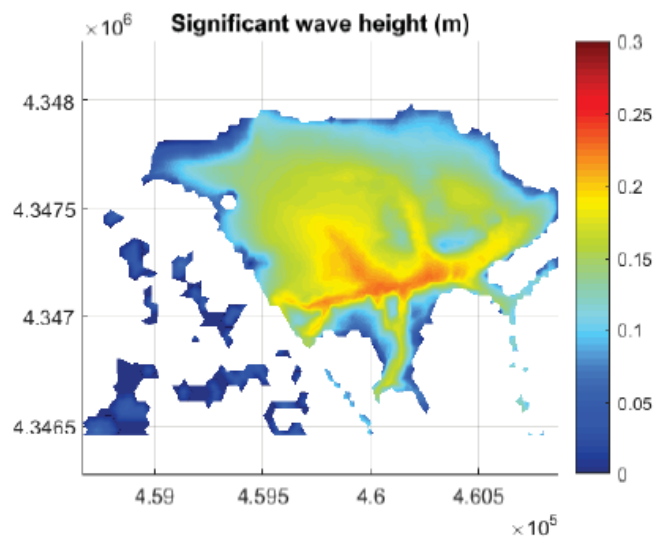




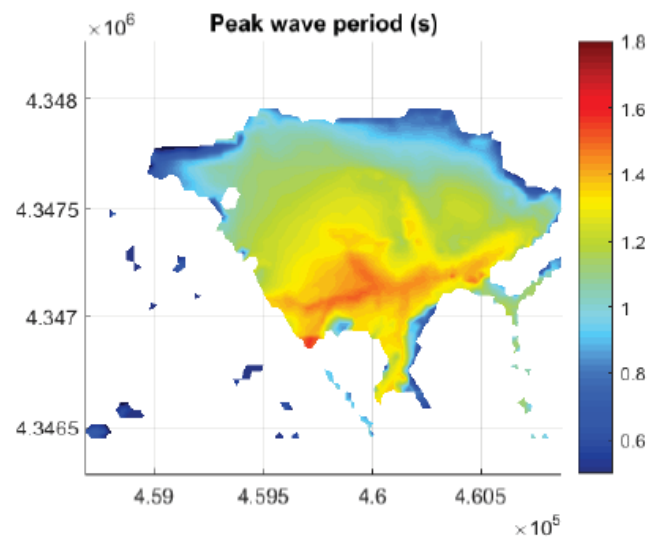
(a)



(b)



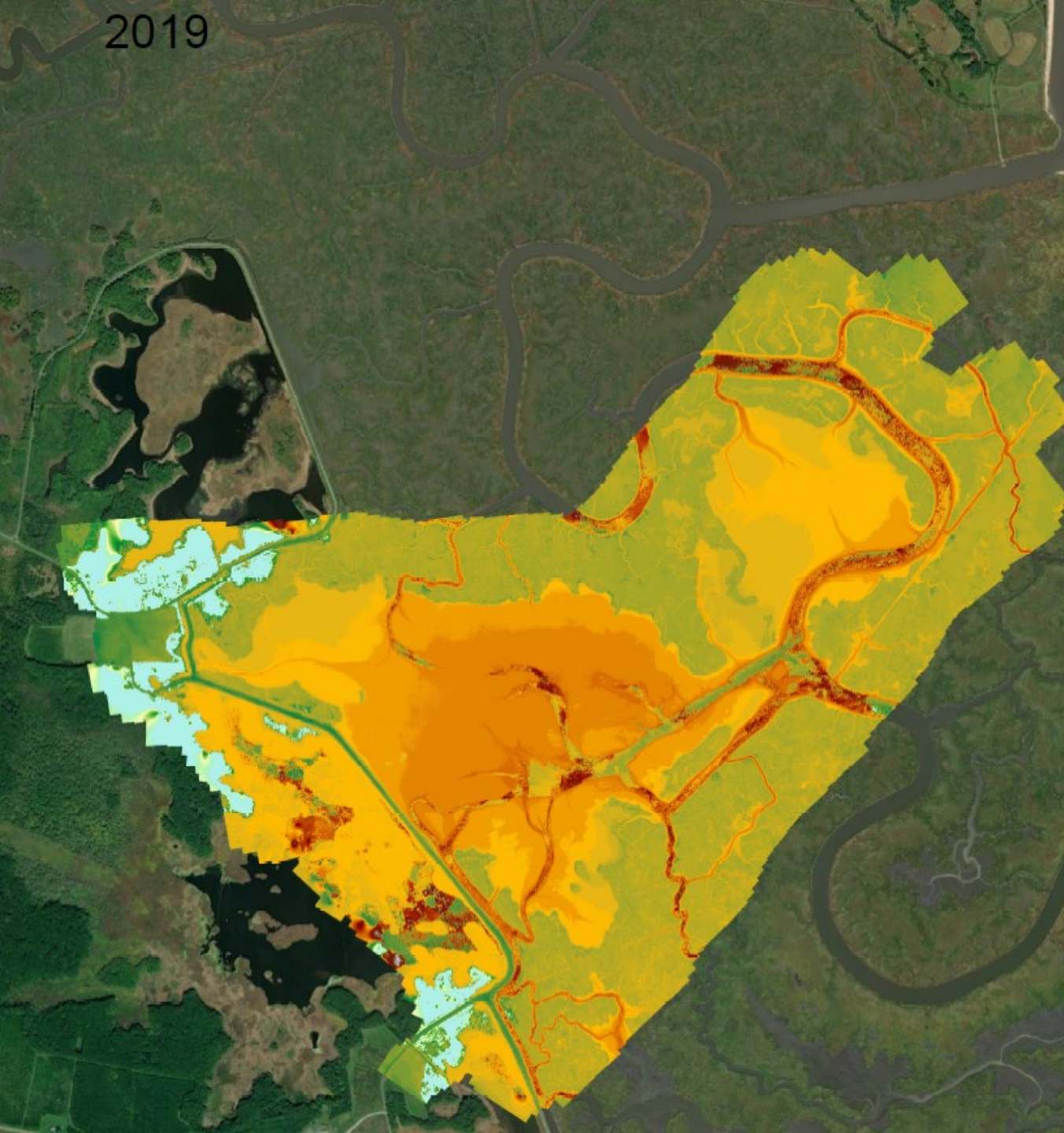
(c)



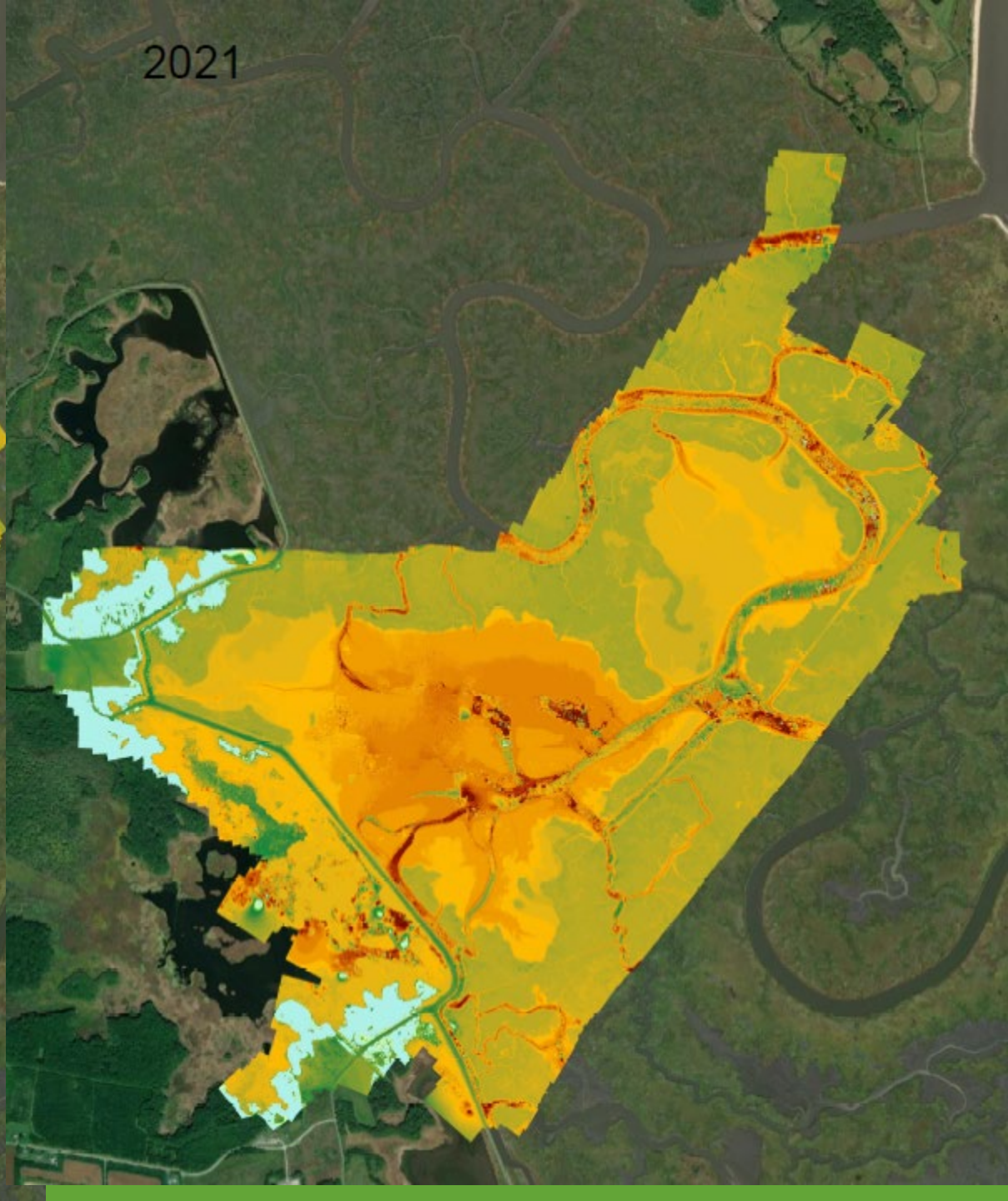
(d)

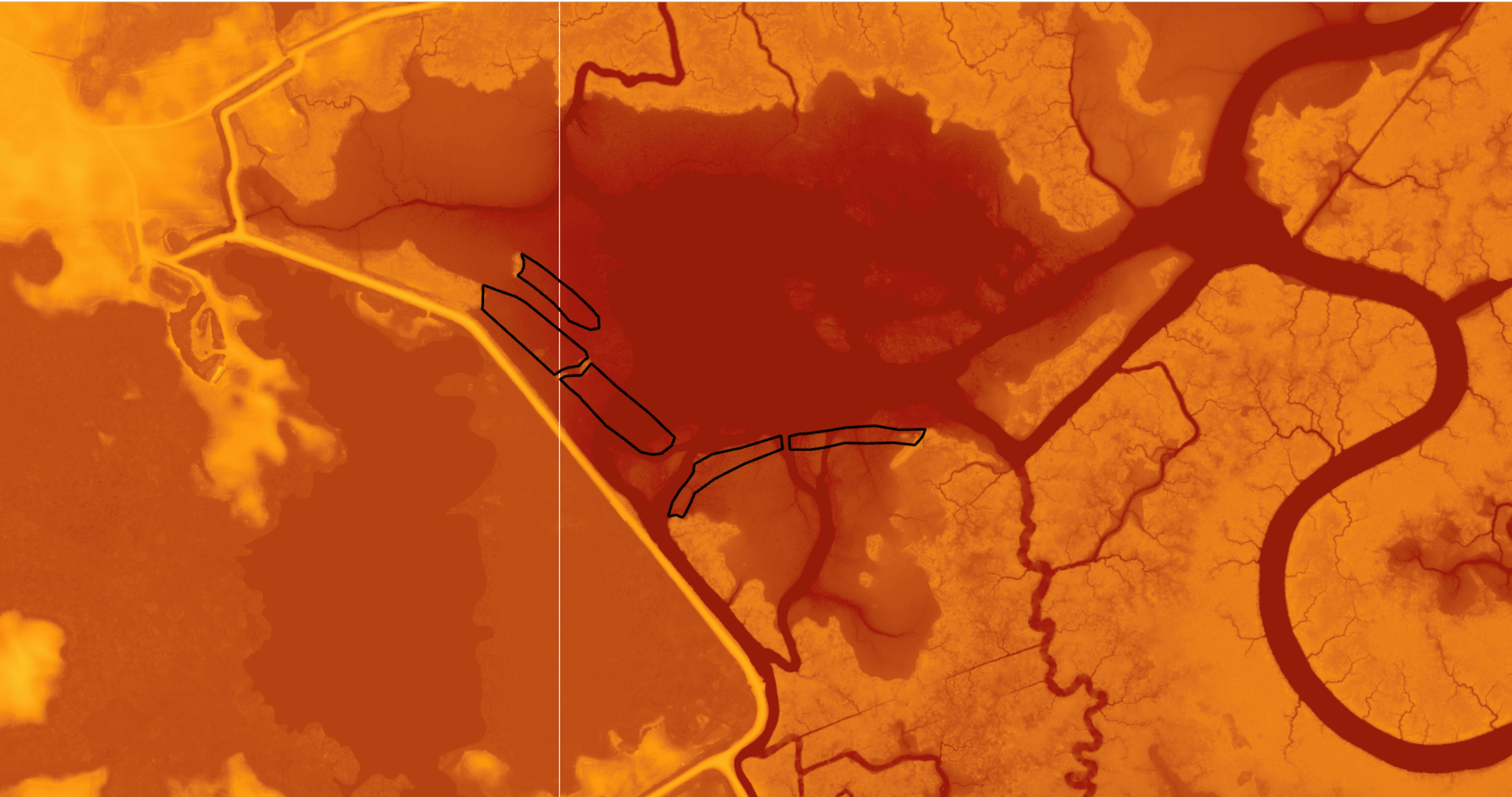


2019



2021







LEGEND

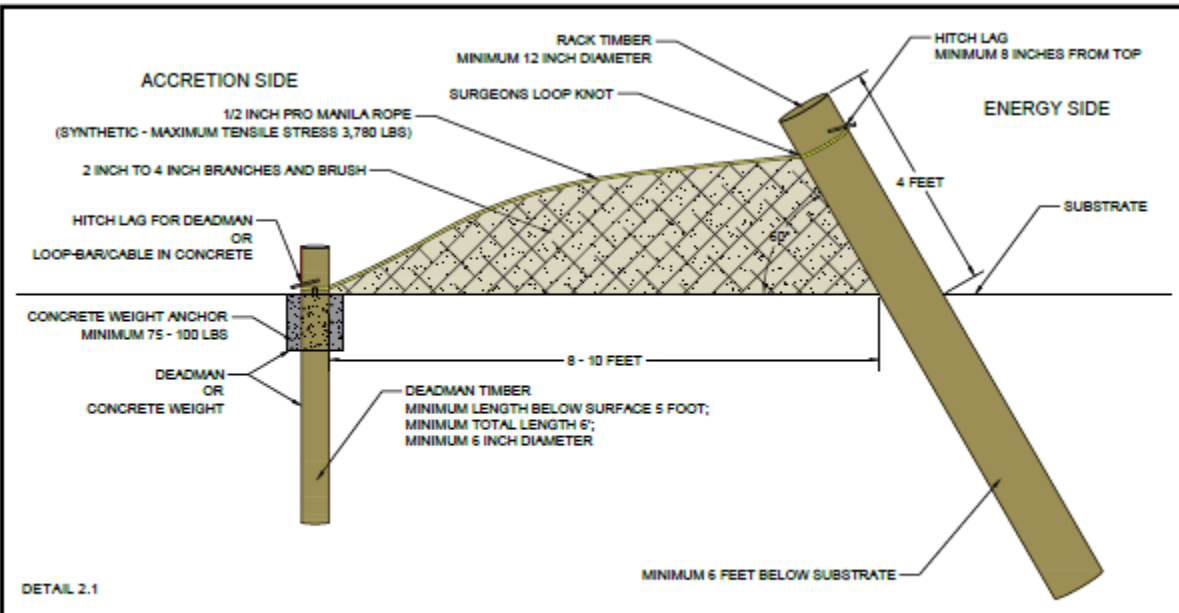
- VERTICAL CONTROL STRUCTURE FOR PARTIAL CHANNEL PLUGS
- NATURAL RACK STRUCTURE



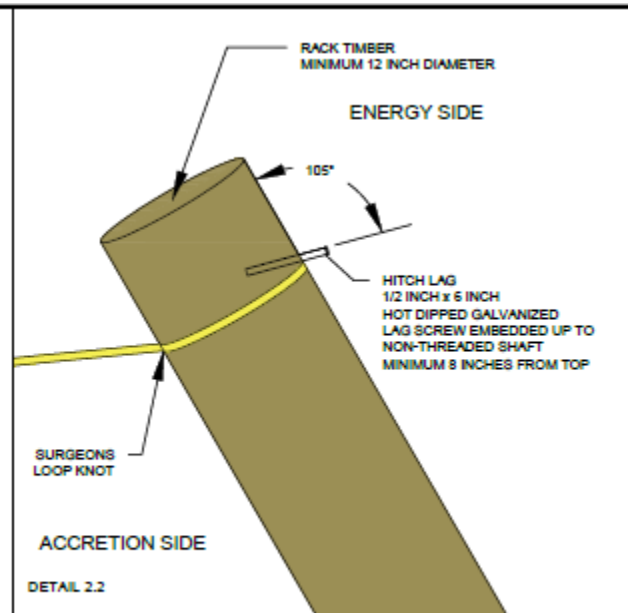
Created By: DJS		Original: 1/4/2023
Revision Date	By	Sheets Affected

PHASE 1 PLAN VIEW WITH PRIORITIES

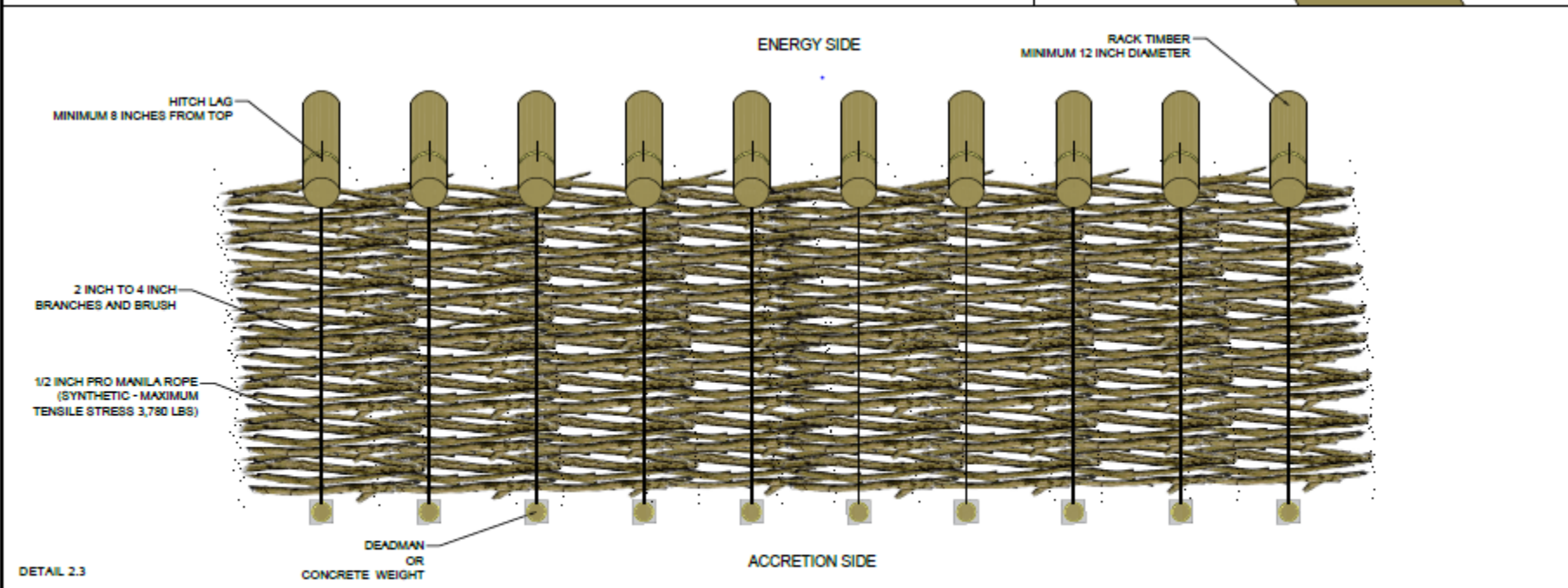
FIGURE:
1.0



DETAIL 2.1



DETAIL 2.2



DETAIL 2.3

Created By: DJS	Original: 1/4/2023
Revision Date	By
	Sheets Affected