W.S.L.S
APPROVED PLANS
PERMIT #: SP-101/20
DATE: 09/29/2021
BY: Katie Esposito
(SEE PERMIT CONDITIONS)

STATE OF DELAWARE
COMPENSATORY MITIGATION PLAN

PORT OF WILMINGTON - EDGEMOOR EXPANSION
EDGEMOOR, NEW CASTLE COUNTY, DELAWARE

September 24, 2021

Prepared for:

Diamond State Port Corporation
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Project No. 11139.LH

Port of Wilmington – Edgemoor Expansion
State of Delaware Compensatory Mitigation Plan

I. SUMMARY OF STATE MITIGATION PLAN

To compensate for impacts to the benthic community and the loss of a public resource as a result of the filling of Subaqueous Lands of the State of Delaware and to better connect the public to these important natural resources via the Fox Point State Park, this mitigation proposal is being offered by the applicant, the Diamond State Port Corporation (DSPC), as a special condition for the issuance of authorizations associated with Hearing Docket No. 2020-P-Multi-0024. The funds are to be utilized in furtherance of the following priority order:

Priority one - Intertidal Wetland Mitigation Project at Fox Point State Park. DSPC will construct approximately 1 acre of intertidal wetland located along the Delaware River at the north end of Fox Point State Park in general accordance with the outline and plans in Section II. DSPC shall be responsible for applying for and obtaining all permits necessary for construction of the wetland. DSPC will also provide ongoing management or reporting that is required resulting from the wetland project until the project is deemed complete.

Priority two – Environmental DNA Monitoring and Research Project. The DSPC will provide funding to establish an Environmental DNA (eDNA) Fisheries Monitoring Program under the operation and management of the Delaware Department of Natural Resources and Environmental Control (DNREC). The program will initially focus on monitoring and research in around the Edgemoor expansion project area. DSPC will fund up to $750,000 for an eDNA Program Development Fund with the funds being used to support monitoring and research activities to help evaluate and understand potential impacts of the proposed project on resident and transient fish species that utilize the Delaware River as more fully described in Section III. By establishing a DNREC program, additional eDNA monitoring in other areas of the state can be accomplished.

Priority three – Increased Public Access at Fox Point State Park to Natural Resources of the Delaware River. The DSPC will consult with DNREC to produce landscape designs for an improved walking trail(s), a viewing/observation platform, vegetation removal to restore the view of the river, lighting enhancements and other amenities to increase public access to the natural resources of the park and the Delaware River as more fully described/depicted in Section IV. Depending upon overall project costs and after the completion of the priority one and priority two elements DNREC may implement/construct these and other enhancements at Fox Point State Park.

DSPC will be obligated to move forward on the above priorities, including acquisition of any permits related thereto, at such a time when federal permits are issued for the Edgemoor expansion project, and the 204(f) application has been authorized.

II. INTERTIDAL WETLAND CONSTRUCTION – FOX POINT STATE PARK

1. Purpose

This document has been prepared to outline the proposed DSPC Intertidal Wetland Mitigation Project at Fox Point State Park (the "Project"). The purpose of this document is to outline the overall conceptual plan for and provide a scope of work of the tasks needed to develop, permit, and implement the Project. The Fox Point State Park is contiguous to the project site, upriver from the project site. The park was created through filling activities performed along the Delaware River shoreline (Integral 2019). Historical aerial photos for the Site dating back to 1954 document the filling activities as well as the condition of the site prior to filling. This generally consisted of aquatic river habitat, and the placed fill material acted in the creation of the upland area that is the park today. The fill reportedly includes a variety of materials, principally dredged material from the Delaware River underlain by steel-making slag, bricks, timber, waste ingots, and ash furnace dust, in addition to miscellaneous trash and debris. Along the upriver end of the park, a low-lying area that is separated from the Delaware River by a constructed revetement has been overgrown with phragmites. The area has been identified as a potential for fill removal to restore the historic use of the site as intertidal land with habitat.

The proposed intertidal wetland creation project has been identified as being environmentally beneficial by replacing/providing habitat to species of interest in the immediate area of the proposed impacts associated with the Port of Wilmington expansion project. The shoreline along Fox Point State Park is substantially similar to the substrate impacted by the project and would provide the opportunity to restore habitat proximate to the project site similar to the Edgemoor project, with the additional benefit of providing wetland plantings to enhance the potential nursery and forage habitat. The design will restore intertidal habitat and include features to provide productive foraging habitat for native fish species as well as habitat +for many other aquatic species.

2. Site Location:

The proposed project is located on the north end of Fox Point State Park along the west bank of the Delaware River. The Site consists of an approximate 1-acre stand of phragmites which is bordered by a rock revetment on the east and north side of the stand. This area is situated at elevations that vary between 6 and 8 feet MLLW (approximately 3 to 5 feet NAVD 88) with most of the site near an elevation of 4 feet NAVD 88. The South side of the site is bordered by an embankment which rises to an approximate elevation of 20 feet, which is comprised of the capped environmentally impacted soil (Black and Veatch, 2009). The West side of the site is bordered by an embankment that rises to an approximate elevation of 10 to 15 feet to the Amtrack railroad right-of-way. North of the Site is a portion of the Delaware River that is described as Fox Point Cove. This area is an open cove area along the Delaware River that is shaped by Fox Point to the South and historic Stoney Point Wharf to the North. The approximated area is indicated in Figure 1.

Fox Point State Park includes approximately 8,400 feet of shoreline within a portion of the Delaware Estuary that is located between estuarine and freshwater portions of the river. According to the Fox Point Phase II, Operating Unit -2 (OU-2), Remedial Investigation Report this area of the river has

Figure 1: Aerial Photograph of Mitigation Area

been identified as oligohaline with 90 percent of salinity observations ranging from 0.5 to 5 parts. Fox Point State Park includes approximately 8,400 feet of shoreline within a portion of the Delaware Estuary that is located between estuarine and freshwater portions of the river. According to the Fox Point Phase II, Operating Unit -2 (OU-2), Remedial Investigation Report this area of the river has been identified as oligohaline with 90 percent of salinity observations ranging from 0.5 to 5 parts per thousand (ppt). In the general area of the site, the shoreline community can be described as tidal low marshes, in particular, Cattail Brackish Tidal Marsh and/or Eastern Reed Marsh predominantly dominated by phragmites (DNREC 2006; Westervelt et al. 2006). These communities regularly occur in oligohaline to mesohaline areas of tidal marshes and occur in the uppermost zone of brackish marshes where there is freshwater influence. The Site itself contains this type of habitat only within the cove at the northern most extent of the Site while the remainder of the OU-2 shoreline is dominated by rock outcrops that do not provide much habitat to ecological receptors (Integral 2019). The site is typical of areas along the river that are monostands of common reed or phragmites, a non-native invasive species that thrives in areas of human disturbance.

3. Preliminary Design:

The preliminary intertidal wetland mitigation plan consists of the removal of fill to restore the area to tidal flow and construct intertidal wetland habitat within the footprint of the existing 1-acre phragmites stand. The invasive phragmites (and any other invasive species) will be removed and treated within the Site, and the 1-acre area will be excavated down to appropriate elevations to provide intertidal interaction and hydrology. High tide water depths are proposed to vary between 2.0 and 3.5 to provide a range of habitat communities going from deep to shallow and emergent intertidal wetlands.

The tidal flow will be provided by excavating through portions of the existing revetment along the northern portion of the park which had been constructed, by others, to contain the fill that is to be removed during the wetland construction. The excavation and grading within the wetland area and revetment removal will restore intertidal flow to the wetland area and provide connection to the river and access to the wetland habitat to the marine species of the river.

Following invasive species removal and associated excavation, the wetland area will be stabilized with coir matting and will be planted with native emergent wetland plants. Plant species and locations will be selected based on anticipated water and tidal depths in the wetland as appropriate, and are anticipated to include:

- Wild Rice (Zizania aquatica)
- Small Saltmarsh Spikerush (Eleocharis parvula)
- Chairmakers Bulrush (Schoenoplectus pungens)
- Pickerelweed (Pontederia cordata)
- Rice Cutgrass (Leersia oryzoides)
- Flatsedge (Cyprerus spp.)
- Switch Grass (Panicum virgatum)
- Sharp-fruited Rush (Juncus acuminatus)
- Rose Mallow (Hibiscus mosheutos)

The preliminary design is provided in the enclosed drawings.

4. Scope of Work

a. Conceptual Design

The preliminary design included will be further developed to incorporate any relevant findings from the existing design investigation and supplemental site studies and feedback from the project stakeholders, primarily DNREC. Additional stakeholders may be identified though the federal compensatory mitigation plan process. The design will restore intertidal wetland habitat and include features to provide productive foraging habitat for native fish species as well as habitat for many other aquatic species which have been impacted by the proposed Edgemoor project.

This design will incorporate our team's knowledge of viable Delaware River shoreline and intertidal marsh wetland management practices, and principles of wetland functional design to create a restored site with diverse habitat and minimal invasive species. This restoration project will be designed to be resilient to fluctuating water levels and storm surge events and will incorporate recommendations and guidance provided by project stakeholders. The restoration plan will feature native plant communities historically present in the area and have an overall landscape aesthetic suitable for this prominent location along the Delaware River.

The intertidal wetland design development addresses the following:

- Potential to improve fish and wildlife habitat,
- Fluctuating water levels associated with the tidal influence on the Delaware River,
- Projected impacts from climate change.

Conceptual Design plans will, at a minimum, include:

- Identification of targeted plant community structures, species compositions, and habitat enhancement features;
- Summary of existing conditions and details of relevant information gathered during the site evaluation activities;
- Site grading and earthwork activities (e.g., site preparation, excavation, grading, etc.);
- Proposed site improvements and final end-use plan depicting contours, dimensions, locations, and materials for each improvement feature;
- General erosion and sediment control plan;
- Revegetation plan and planting schedule;
- Performance Criteria and definition of success measurements;
- Monitoring Criteria and methods;
- O&M Plan;
- Construction specification descriptions; and
- Updated Opinion of Probable Cost for Construction.

The intention of the conceptual design plans and documents is to show a level of detail necessary to enable the issuance of all appropriate authorizations to construct.

To conclude the Conceptual Design stage, DSPC's consultant will provide the design plans incorporating the input from the project stake holders for review and approval by DNREC.

b. Final Design

Based on input received from the federal and state project stakeholders during Preliminary Design Review Meeting, DSPC's consultant will update the design plans and will prepare the Final Design plans to be used to direct construction. During the development of the Final Design plans, DSPC's consultant will prepare plans to support design components that will include:

- All construction documents, plans, notes and specifications required for construction;
- Access agreements and environmental covenants;
- O&M Plan; and
- Monitoring and Performance Criteria Plan.
- Probable Costs

The intention of the Final Design Plans is to be prepared to be used for project implementation and construction by DSPC with oversight by DNREC.

To conclude the Final Design stage, DSPC's consultant will provide the Final Design plans to the project stake holders for review and comment. Following the meeting, DSPC's consultant will incorporate and update the Final Design plans with stakeholder comments and submit the completed Final Design plans to be used for construction. Construction will not commence without the approval of the Final Design plans by DNREC.

5. Construction Sequencing
   a. Mobilization, Utilities, Staging:
      i. A preconstruction meeting will be held prior to mobilization and receipt of all permits and location of onsite utility will be confirmed.
      ii. Contractor will mobilize and install all erosion & sediment controls and stormwater BMPs prior to ground disturbance, followed by establishment of site staging areas.
   b. Invasive Species Removal
      i. Areas of invasive species to be removed under the direction of a wetland scientist/ engineer.
      ii. The contractor shall clear and grub the surficial invasive species and dispose of all plant material in an approved location.
      iii. Following removal of surficial invasive plant material, the top 12 to 24 inches of soil shall be excavated to remove the root systems, tubers, and seed bank. The excavated soil shall be disposed of in an approved location.
   c. Wetland Excavation and Stabilization
      i. Earthwork activities will be performed including mass excavation of the wetland area to achieve proposed wetland elevations. The wetland area will be over excavated to remove unsuitable soil materials. Excavated materials will be disposed of offsite or in an approved disposal area.
      ii. Following wetland excavation, the wetland area will be backfilled with clean, suitable material to achieve final proposed wetland grades.
      iii. Upon achieving final wetland grades, permanent wetland seeding, coir logs, and coir matting will be placed on the wetland surface for stabilization.
   d. Berm and Revetment Modification/Improvement
      i. The berms and revetment on the east and north sides of the wetland area will be modified per the Final Design.
      ii. Following substantial completion of the wetland excavation and stabilization, the wetland will be exposed to tidal flow through removal of a portion of the existing revetement berm.
e. Planting and Final Stabilization
      i. Following substantial completion of the final design, wetland planting shall occur.
      ii. Planting shall be performed during the spring or fall planting seasons unless approved by the engineer.
      iii. Wetland plantings will be primarily comprised of wetland plugs and will be placed appropriately throughout the wetland areas based on anticipated hydrologic conditions and suitable water levels for the selected species.

f. Monitoring, Operations and Maintenance
   i. Monitoring 3 years:
      - The monitoring program will be implemented to verify that sufficient growth and survivability to meet the anticipate survivability rate of 60% of the plants at year 3 (Cole 2002), and direct sufficient supplemental plantings to achieve a stable wetland environment.
      - DSPC will perform visual inspection of wetland area within the first two months of the growing season. Inspection will be conducted for presence and abundance of invasive species, survival of plantings, stability of wetland area and revetment, and tidal interaction.
      - Repeat visual inspection within one month of the end of the growing season.
      - A Monitoring report shall be prepared after visual inspection to note any significant variances from the intended design and/or in plant community and invasive species. Noted issues shall be addressed as part of operation and maintenance.
      - Additional visual inspections should be performed whenever the Delaware River flows reach the 100 years flood flows, or elevation.
   ii. Maintenance:
      - DSPC shall perform annual invasive species treatment and removal for three years as needed to maintain an invasive species abundance of 10% or less.
      - DSPC shall replace dead plants and/or perform supplemental planting as needed to achieve targeted plant densities within the wetland areas.
      - DSPC shall clear debris trapped within or blocking wetland access. Excess accumulation of sediment at the excavated revetment shall be removed if determined to be impeding wetland tidal interaction.

6. Budget for Wetland Creation Project

The preliminary design includes several design elements that will impact the project costs. The existing area of phragmites will be cleared and the existing soil removed and graded down to construct the tidal grades for wetland creation. The wetlands will be constructed with a flow channel to promote access to the species of concern and the channel will be excavated though the existing revetment to provide continuity to the Delaware River. The preliminary estimate of probable costs is summarized:

Scope Item	Budget Estimate
Revetment Removal and Clearing	$88,000
Wetland Grading and Soil Treatments	$234,000
Wetland Establishment	$83,000
Contractor Costs and Contingency	$130,000
Maintenance, Monitoring and Design	$115,000
Budget Estimate	$650,000

This costs estimate will be updated at the conceptual design phase and final design phase prior to commencing construction. The actual cost of the project will be dependent on the final design and contractor bidding.

7. References

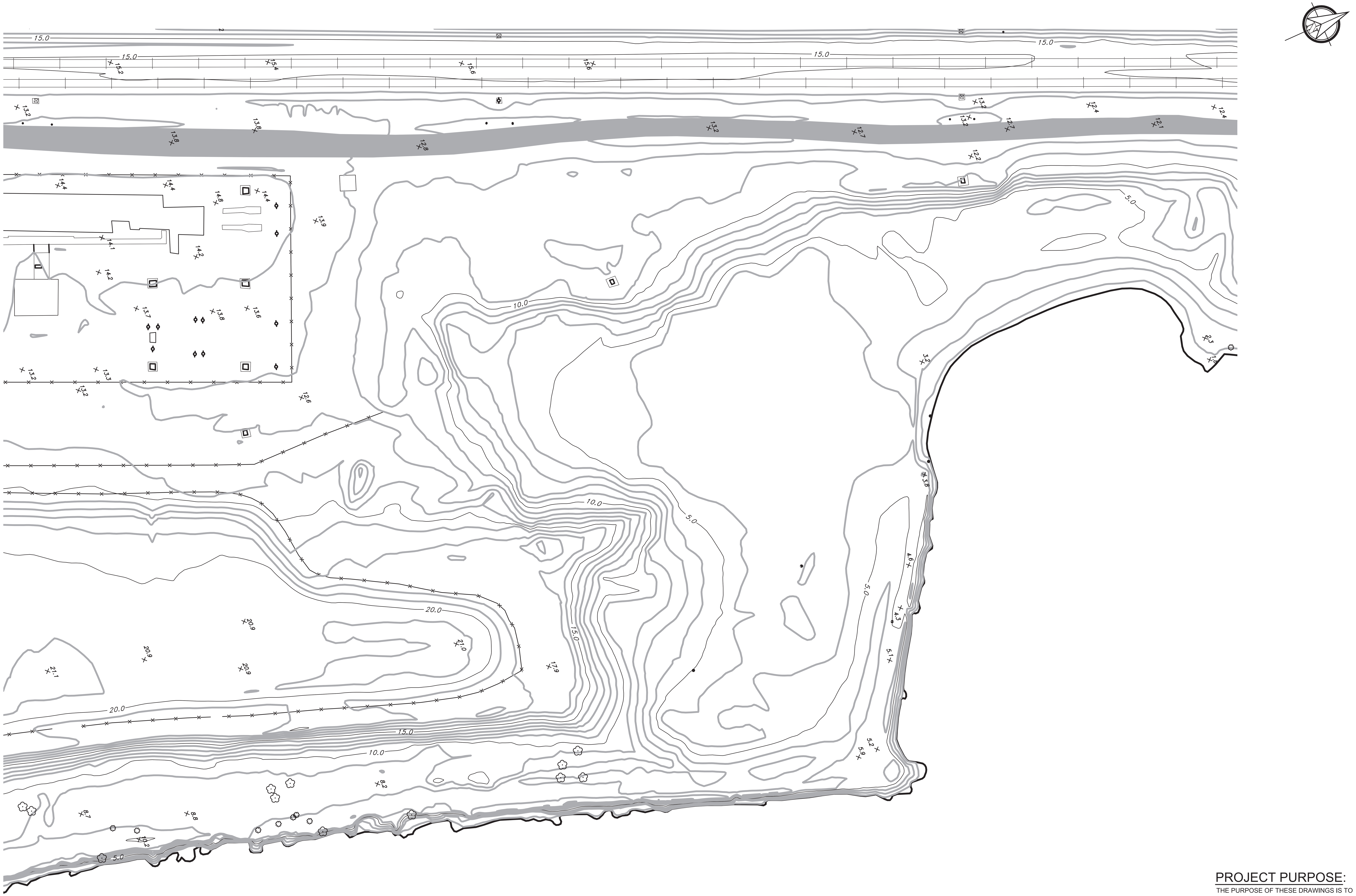
Black and Veatch (2009). "Fox Point State Park Close Out Report, Prepared for State of Delaware Department of Natural Resources and Environmental Control SIRB"

Cole, C. A. and D. Shafer. 2002. Section 404 wetland mitigation and permit success criteria in Pennsylvania, USA, 1986-1999. Environmental Management 30:508-515

DNREC. 2006. Delaware wildlife action plan. Available at: www.dnrec.delaware.gov/fw/dwap/Documents/DE%20Wildlife%20Action%20Plan.pdf

Integral. 2019 Remedial Investigation Report for Fox Point Park Phase II Operable Unit 2 (DE-1011)

Westervelt, K., E. Largay, R. Coxe, W. McAvoy, S. Perles, G. Podniesinski, L. Sneddon, and K. Strakosch Walz. 2006. A guide to the natural communities of the Delaware Estuary: Version 1. NatureServe. Arlington, VA.



PROJECT PURPOSE:

THE PURPOSE OF THESE DRAWINGS IS TO PROVIDE THE CONCEPTUAL PLANS AND DETAILS FOR THE CONSTRUCTION OF A ONE ACRE INTERTIDAL WETLAND AREA AS NOTED IN THE COMPENSATORY MITIGATION PLAN. THIS DESIGN IS CONCEPTUAL AND IS NOT FOR CONSTRUCTION.

30' 0 30' 60'
DRAWING SCALE 1" = 30'

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CHECKED BY: BJD
DRAWN BY: GM
FILE NAME: FPST-CON-WETLAND-11139LH
STATE:
P.E. #

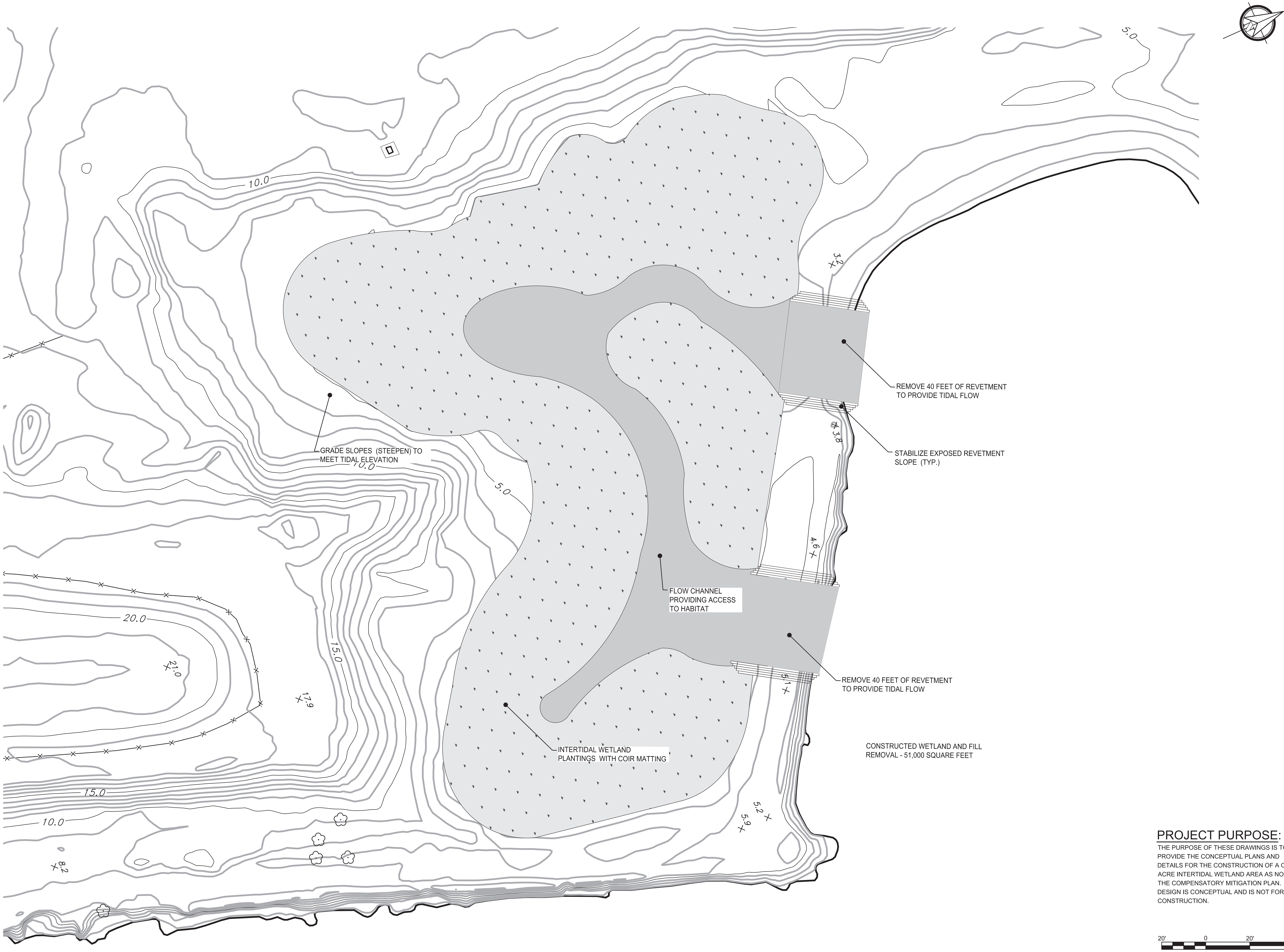
No.	REVISION	CHK'D BY DATE
-		

OWNER:
DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF PARKS AND RECREATION

APPLICANT:
DIAMOND STATE PORT CORPORATION
800 N. FRENCH STREET, 4TH FLOOR
WILMINGTON, DE 19801

FOX POINT STATE PARK CONCEPT PLANS
EXISTING CONDITIONS
PORT OF WILMINGTON
EDGEMOOR EXPANSION
BRANDYWINE HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE

DATE: SEPTEMBER 2021
SCALE: 1" = 30'
PROJECT NO. 11139.LH.08
SHEET: 1 (OF 3)



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FOX POINT STATE PARK CONCEPT PLANS
INTERTIDAL WETLAND PLAN VIEW
PORT OF WILMINGTON
EDGEMOOR EXPANSION

BRANDYWINE HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE

DATE: SEPTEMBER 2021
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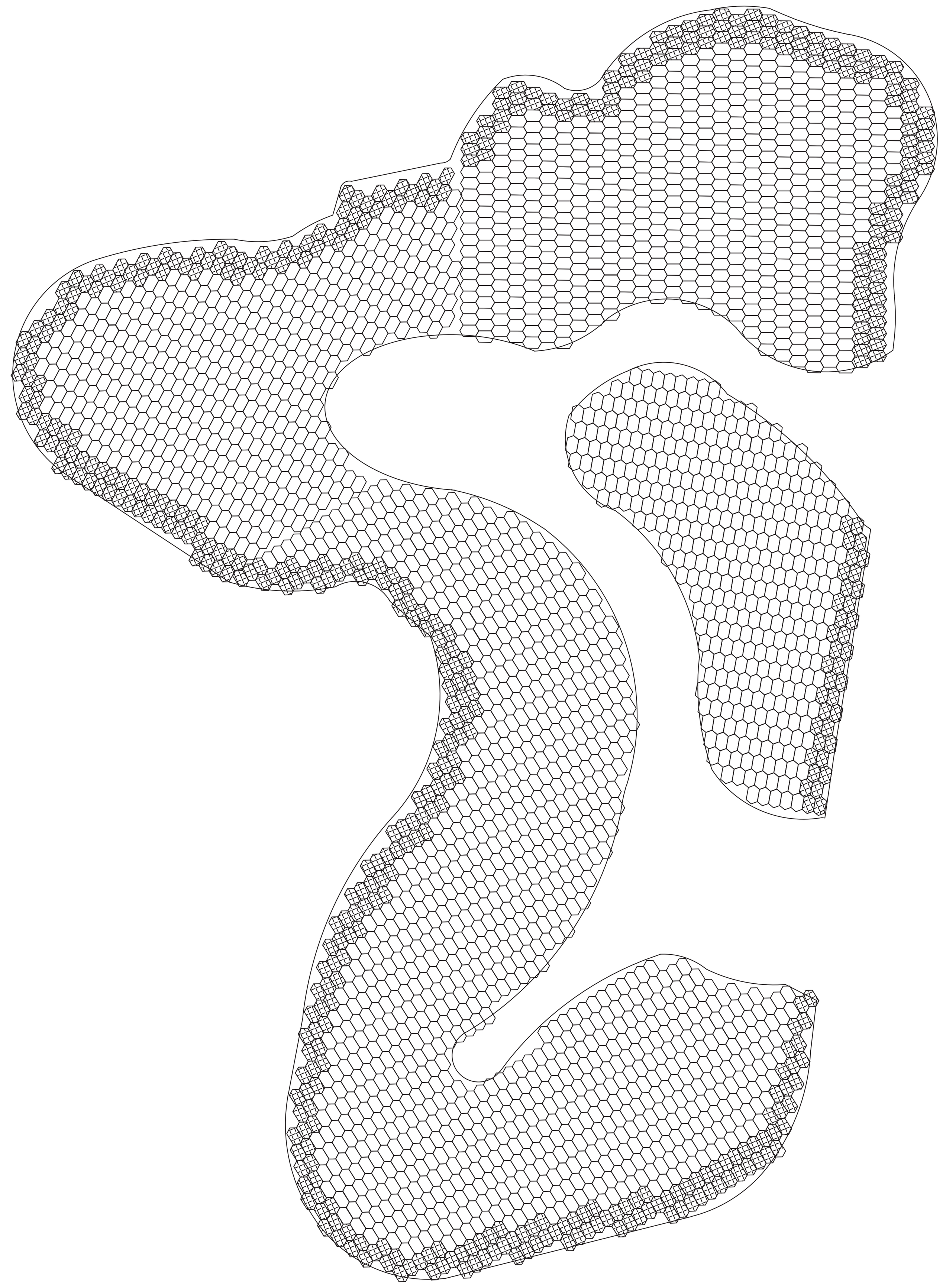


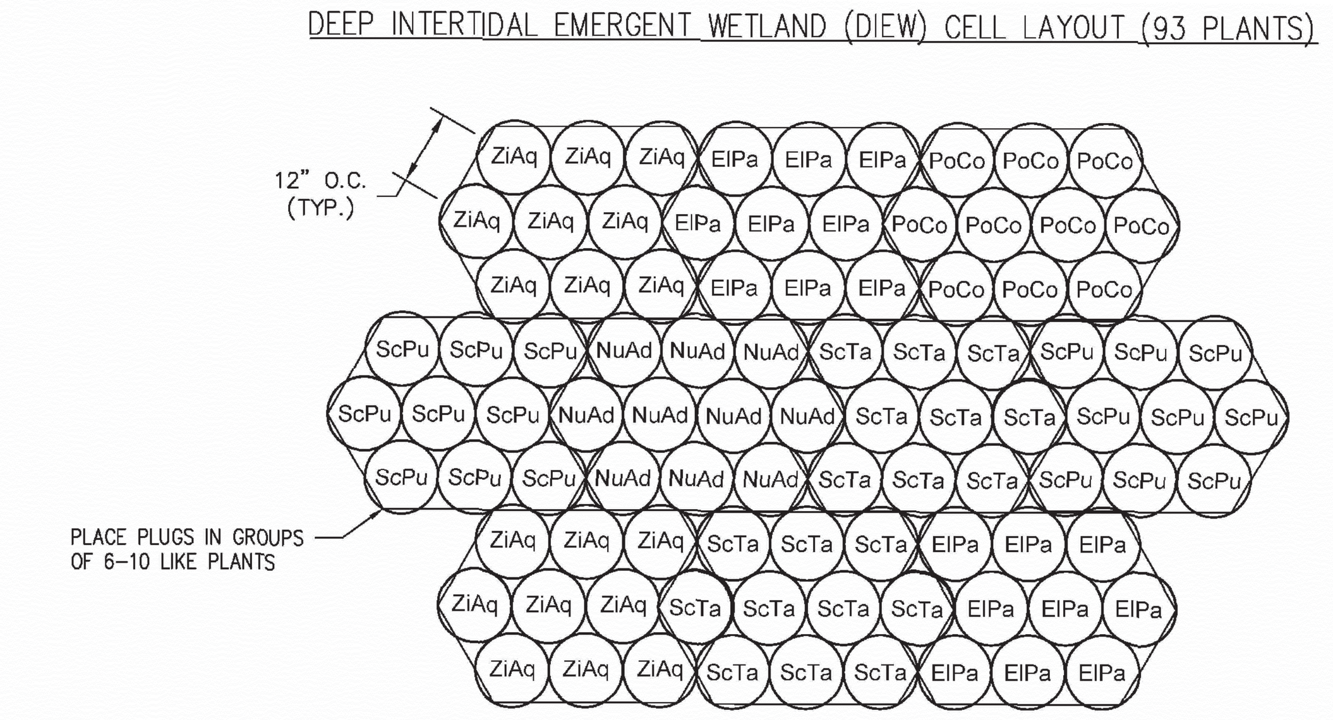
LEGEND:

- SHALLOW INTERTIDAL EMERGENT WETLAND CELL
- DEEP INTERTIDAL EMERGENT WETLAND CELL

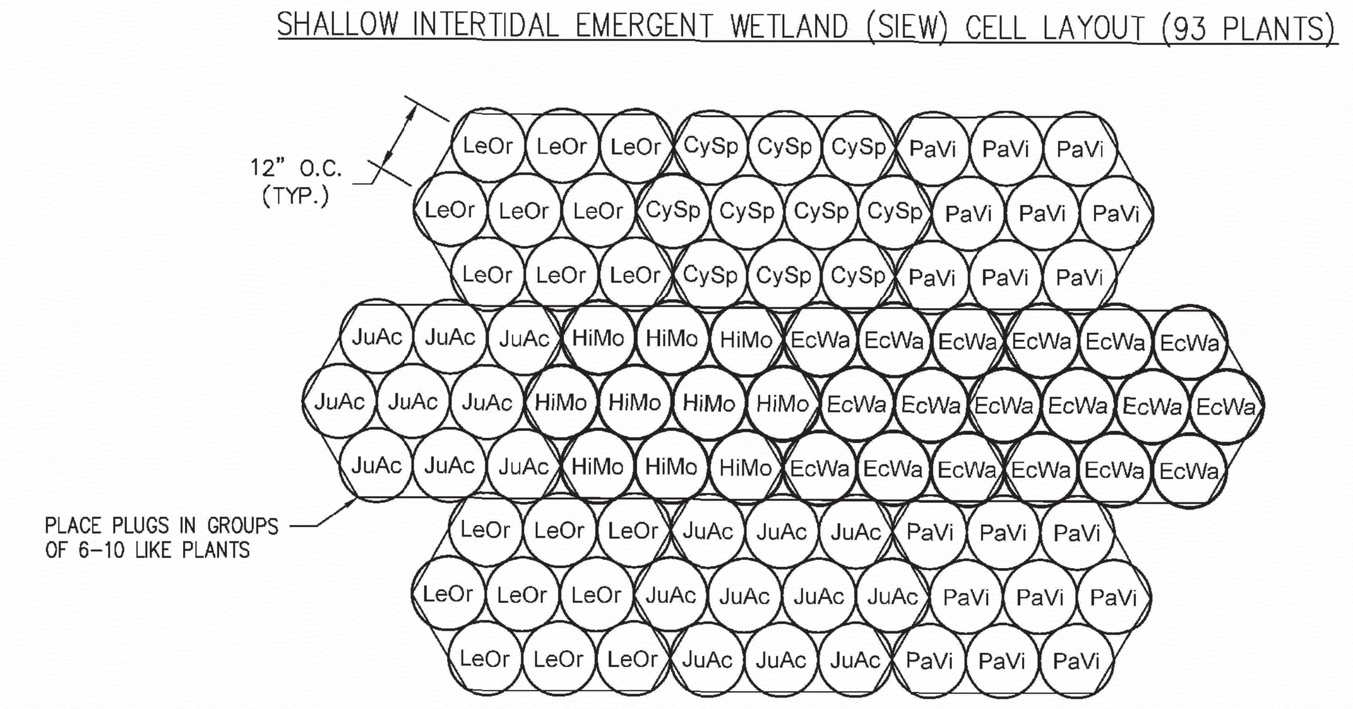
DETAIL: TYPICAL INTERTIDAL WETLAND PLANTING PLAN

SCALE: HORIZ. 1"=20'

DEEP INTERTIDAL EMERGENT WETLAND (DIEW) CELL LAYOUT (93 PLANTS)



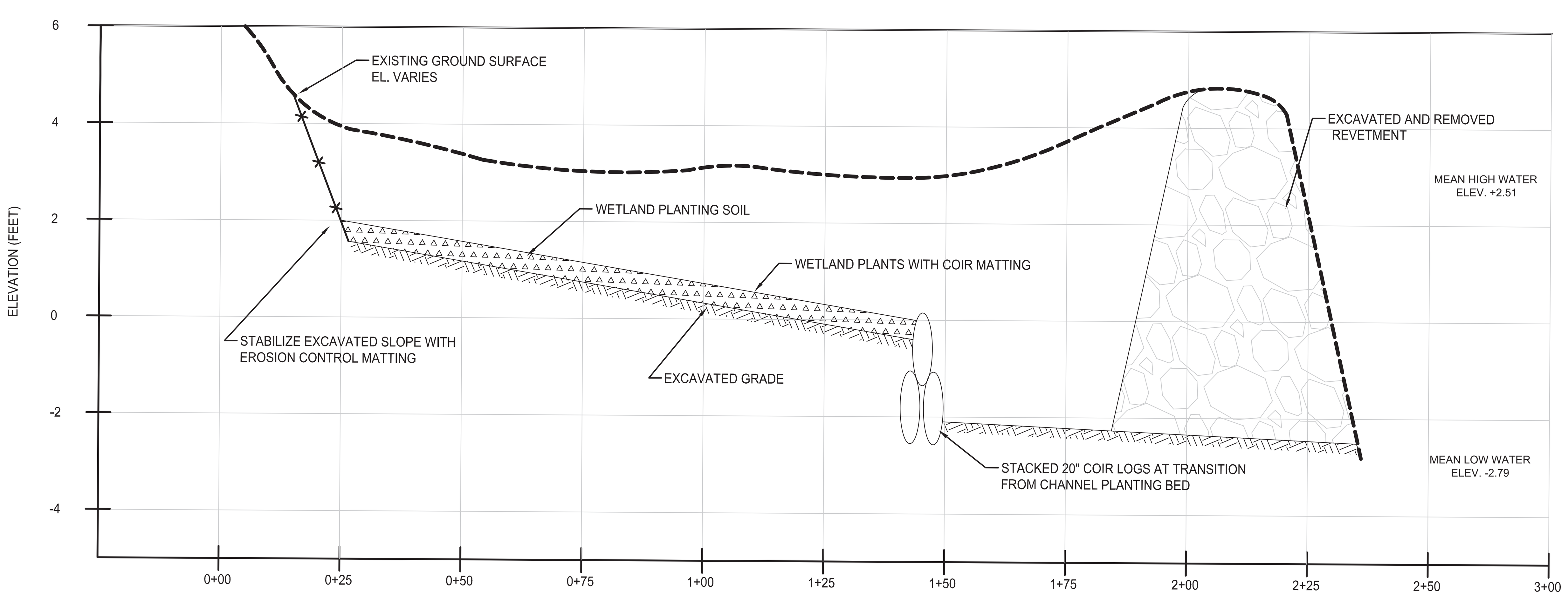
SHALLOW INTERTIDAL EMERGENT WETLAND (SIEW) CELL LAYOUT (93 PLANTS)



NOTES:

1. PLANTS SHALL BE SOURCED FROM A LOCAL REGIONAL VENDOR WHO PROPAGATES ITS OWN PLANTS FROM REGIONALLY–OBTAINED NATIVE STOCK OR SEED, VERIFIED NATIVE SPECIES. ORDERS SHALL BE PREORDERED THE YEAR PRIOR TO PLANTINGS, GROWN SPECIFICALLY FOR THE PROJECT IN APPLICABLE SOILS. PLANTS SHOULD BE PROPERLY ASSESSED PRIOR TO PLANTING.
2. PLANTING SHALL BE PERFORMED PEAK GROWING SEASON, PLANTING IN GROUPS OF 6–10 PER SPECIES. PLANT IN HOLES WITH PROPER DIMENSIONS FOR ROOT STRUCTURE, BACKFILLED AND TAMP SOIL. INDIVIDUAL PLUGS SHOULD BE PLANTED AT 12 INCHES APART ON CENTER.

DETAIL: TYPICAL INTERTIDAL WETLAND PLANTINGS



ELEVATION: TYPICAL WETLAND CROSS SECTION

SCALE: HORIZ. 1"=20'
VERT. 1"=2'

Botanical Name		Common Name	Indicator Status	Size	Spacing	Percent planted	Plants Per Cell*
Deep Intertidal Emergent Wetland Zone (DIEW)							
Zizania aquatica	ZiAq	Wild Rice	OBL	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Eleocharis parvula	ElPa	Small Saltmarsh Spikerush	OBL	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Schoenoplectus pungens	ScPu	Chairmakers Bulrush	OBL	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Pontederia cordata	PoCo	Pickerelweed	OBL	2" pot or tube	Plant 12" to 18" centers	0.1	569
Nuphar advena	NuAd	Spatterdock	OBL	2" pot or tube	Plant 12" to 18" centers	0.1	569
Schoenoplectus tabernaemontani	ScTa	Softstem Bulrush	OBL	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Shallow Intertidal Emergent Wetland Zone (SIEW)							
Leersia oryzoides	LeOr	Rice cutgrass	FACW	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Cyperus spp.	CySp	Flatsedges	FACW	2" pot or tube	Plant 12" to 18" centers	0.1	569
Panicum virgatum	PaVi	Switch grass	FAC	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Juncus acuminatus	JuAc	Sharp-fruited Rush	FACW	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Echinocloa walteri	EcWa	Walter's Barnyard grass	OBL	2" pot or tube	Plant 12" to 18" centers	0.2	1138
Hibiscus moscheutos	HiMo	Rose mallow	OBL	2" pot or tube	Plant 12" to 18" centers	0.1	569

DETAIL: TYPICAL INTERTIDAL WETLAND PLANTING SCHEDULE

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FOX POINT STATE PARK CONCEPT PLANS
INTERTIDAL WETLAND DETAILS AND SECTION
PORT OF WILMINGTON EDGEMOOR EXPANSION

BRANDYWINE HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE

DATE: SEPTEMBER 2021
SCALE: AS SHOWN
PROJECT NO. 11139.LH.08
SHEET: 3 (OF 3)

III. Environmental DNA MONITORING AND RESEARCH PROGRAM

1. Purpose

This document has been prepared to provide a scope-of-work and budget for an Environmental DNA (eDNA) Monitoring and Research Program that will be funded by Diamond State Port Corporation (DSPC) and implemented by the Delaware Department of Natural Resources and Environmental Control (DNREC). The eDNA monitoring project detailed below has been identified as one which will be used, in-part, to satisfy both the State and Federal compensatory mitigation requirements for the Port of Wilmington Expansion Project. Establishment of the program will allow for collection and analysis of routine and meaningful data that will support future resource management decisions.

2. DNREC Environmental DNA Program Establishment and Port Construction Monitoring

In conjunction with the dredging activities proposed to occur in the Delaware River associated with the Port of Wilmington – Edgemoor Expansion Project, the DSPC is proposing to fund monitoring and research activities performed by DNREC in the immediate and adjacent areas through the use of eDNA sampling and analysis. Monitoring activities will help evaluate and understand potential impacts of the dredging project on resident and transient fish species that use this portion of the Delaware River. It is well documented that the region of the Delaware River where the Edgemoor Expansion and the Fox Point State Park mitigation projects include essential habitat for recreationally/commercially valuable species and critical habitat for endangered species (Integral, 2019). As such, DSPC will provide the funding for the purchase of the necessary sampling and analytical equipment to allow for an expansion of the DNREC Environmental Laboratory Section's (ELS) existing eDNA monitoring capabilities. In addition, DSPC proposes to fund expanded eDNA sampling activities in the Delaware River to monitor state and federal public trust species. The sampling activities will be conducted by DNREC's Division of Fish and Wildlife (DFW) Fisheries Section and/or by DNREC's Division of Water (DW) Environmental Laboratory Section (ELS) for the three years (cycles) coinciding to the construction period anticipated for the Port of Wilmington Expansion Project. In addition, sampling activities will be conducted in other areas of the state, not related to Port construction, to assist in ongoing research activities and to assist in the identification of potential future habitat restoration and enhancement projects. DSPC will fund $750,000 towards the activities described above.

a. eDNA Overview

Environmental DNA (eDNA) are intra- and extra-cellular forms of DNA released by organisms into the water, soil, or air, and data is generally used as a supplement to traditional sampling means. The eDNA identified in a sample can be compared to existing databases to determine the presence of specific species. It has proven to be cost-effective, safe, and to perform well in comparing changes in fish communities over time. eDNA sampling has many advantages over traditional sampling of fish communities. First, it is non-invasive; in-water work is minimized as only a simple water sample is needed for detection of species presence/absence. Second, it is time and cost effective; the number of staff needed to conduct sampling is minimized as only

water samples and the associated processing equipment are needed. Samples can be collected temporally to document runs of several anadromous species that are sequential during the spring. Finally, with proper storage, eDNA samples can be retained indefinitely for future analysis to determine additional species' presence without the need to re-collect samples. eDNA methods have proven to consistently detect species absent from traditional sampling such as rare (Jerde et. al. 2011), invasive (Hinlo et. al. 2018), and endangered (Strickland and Roberts 2018) species. eDNA allows for better estimates of biodiversity (Evans et. al. 2016, Bayley and Peterson 2001), a key indicator of overall ecosystem health. As eDNA methods have continued to evolve it has also shown merit for use in estimating species abundance (Lacaoursiere-Roussel, et. al. 2016).

b. DNREC Programmatic Need

According to the DNREC-DFW, numerous immediate needs for eDNA data have recently come to light. For the last 4 years, the Fisheries Section has obtained presence/absence fisheries data at 118 sites throughout the State using traditional sampling techniques and gear. Their traditional data collection efforts were hampered at 30 additional sites, however, due to access issues such as variable water depth, unfavorable bottom type, obstructions (e.g. down trees, steep banks, and uneven ground), and private property limitations. The collection of eDNA from surface water, which doesn't necessarily require a boat and other cumbersome equipment, would allow for the evaluation of species' presence/absence at these critical but challenging sample locations.

DSPC also understands from DNREC-DFW that the monitoring requirements of federally mandated fisheries management plans typically take priority for their staff during the months of March through June. This leaves less time for additional sampling related to other fisheries management priorities using traditional methods. Time efficiency associated with eDNA sampling will potentially allow DNREC to expand its data acquisition efforts on anadromous fish stocks, including the federally endangered Atlantic Sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) and the Shortnose Sturgeon (*Acipenser brevirostrum*).

Just as eDNA data will supplement physical monitoring of the endangered Atlantic Sturgeon and Shortnose Sturgeon in the Delaware River as part of the proposed study, there are apparent and similar data needs in Delaware's tidal Chesapeake Bay watersheds (e.g., Nanticoke River and Broad Creek).

According to DNREC-DFW, invasive species monitoring is yet another ongoing charge that demands time and effort from staff. From Flathead Catfish (*Pylodictis olivaris*) in the C&D Canal to Blue Catfish (*Ictalurus furcatus*) in the Nanticoke River to Northern Snakehead (*Channa argus*) in Delaware's rivers and ponds, data derived from eDNA sampling would provide a more efficient supplemental means of documenting the distribution of these species.

Finally, species specific data derived from eDNA analysis will be used as a barometer of fish species concentration (per unit volume), which can be an indicator of good or poor adult spawning stock abundance during the spring runs. This type of information, if available, would be a major asset to fisheries managers and biologists for population trend analysis.

c. Scope of Work

After consultation with DNREC-DFW, DSPC proposes that eDNA monitoring be conducted regularly in the immediate vicinity of the port expansion project dredging area, and also in areas outside of the immediate dredging area and in adjacent rivers and creeks of the larger Christina River watershed (due to the transient nature of the species of greatest concern). These areas will be evaluated prior to dredging, during dredging, and after dredging (for each dredging cycle), to evaluate what impacts to fish populations are occurring.

Of special interest in the Delaware River are Atlantic Sturgeon and Shortnose Sturgeon. Sturgeon DNA monitoring associated with this Port of Wilmington Expansion Project State Mitigation Plan will address several DNREC management directives and provide much needed information for the conservation and recovery of these species. The data collected during this three-year project will be vital for state and federal fisheries managers to mitigate impacts from dredging, water withdrawals, shoreline stabilization projects, development of breakwater structures and other possible future perturbations within the Delaware River. The results of this study will also be used to guide the DNREC-DFW time-of year restrictions that reduce anthropogenic impacts on sturgeons (and other species). The eDNA monitoring for river-resident juvenile Atlantic Sturgeon and migratory adult Atlantic Sturgeon in the Delaware River will provide a better understanding of habitat use within the Delaware River Estuary and provide guidance for traditional sampling efforts to evaluate changes in the location of nursery habitat.

For the focus area (Delaware River), the DNREC-DFW recommends that sampling occur approximately once per river kilometer, monthly, from Liston Point to the State line (or slightly above). At a distance of approximately 50 kilometers, this would equate to 600 samples annually. As part of this monthly sampling DNREC-DFW will also include targeted sampling on Cherry Island Flats to monitor striped bass populations. The adjacent Christina River watershed includes the main stem of the river, as well as Brandywine Creek, Red Clay Creek, and White Clay Creek. DNREC-DFW staff recommend that sampling occur bi-weekly from March through October for the main stem Christina River at each river kilometer (10 km), for a total of 160 samples annually. Alosine spawning is well documented in the Brandywine Creek and therefore should have an increased sampling frequency. To supplement targeted sampling associated with the Dam #2 fish passage project, DNREC-DFW recommends eDNA sampling at each of the 10 bridges as well as above each of the 10 dams which currently exist on the creek. Sampling should be conducted bi-weekly in March, weekly in April and May (when anadromous species presence is believed to be at its highest), and bi-weekly again in the months of June through October. This increased frequency of sampling equates to approximately 400 samples annually. Finally, sampling in the Red Clay and White Clay creeks should occur at each bridge crossing (12 per creek) bi-weekly for the months of March through October for a combined total of 384 samples annually. This eDNA collection plan equates to 1,544 individual samples per calendar year in the Delaware River and the adjacent Christina River watershed.

All eDNA samples collected during the monitoring period will be collected by DNREC-DFW and/or DNREC-ELS, and all samples will be analyzed by the DNREC-ELS. In addition to Atlantic Sturgeon, species of interest may include, but not be limited to: Shortnose Sturgeon, Striped Bass (*Morone saxatilis*), American Shad (*Alosa pseudoharengus*), Blueback Herring (*Alosa aestivalis*) and Alewife

(*Alosa sapidissima*; collectively, river herring), Hickory Shad (*Alosa mediocris*), and/or American Eel (*Anguilla rostrata*).

In addition to the sampling strategy summarized above for the Delaware River and greater Christina River watershed, it is proposed that DNREC-DFW extend their eDNA monitoring to other rivers, creeks, and ponds in the State over the same three-year period to meet their additional eDNA data needs and to supplement their existing data. Based upon information provided by DNREC-DFW, an additional 570 samples (190 samples annually) could be collected from the Nanticoke River and Broad Creek to evaluate interests related to Atlantic Sturgeon and Shortnose Sturgeon. An additional 2,700 samples (900 samples annually) could be collected from Delaware rivers, creeks and ponds for interests related to invasive species and other species of interest. Last, an additional 1050 samples (350 samples annually) could be collected in waters not already being sampled for other reasons described above.

3. Budget

The DNREC team has indicated that based upon the scope-of-work identified above, capital costs for sampling equipment, analytical instruments, and a sample archive storage freezer capable of holding approximately 70,000 samples is estimated to be $167,000. Additionally, assuming a whole community eDNA analysis conducted as at a cost of $65 per sample, the analytical costs for three years of eDNA monitoring in the Delaware River and Christina River Basin is estimated to be $301,080 ($100,360 annually). Analytical costs for three years of eDNA monitoring in the Nanticoke River and Broad Creek is estimated to be $37,050 ($12,350 annually). Analytical costs for three years of eDNA monitoring for invasive species is estimated to be $175,500 ($58,500 annually). Analytical costs for three years of eDNA monitoring for species of concern in waters not already being sampled for sturgeon or invasive species is estimated to be $68,250 ($22,750 annually). Total cost for the scope-of-work described herein is estimated to be **$748,880**, corresponding to DSPC's commitment noted above. Costs could increase based upon whether individual species of interest are analyzed separately versus the cost for community eDNA analysis, or if capital equipment costs change.

A report summarizing the results of the three-year eDNA monitoring efforts in the State will be prepared by DNREC and will include future eDNA monitoring recommendations/needs.

4. Summary

eDNA data can be used as an indicator of species presence/absence, and potentially species abundance as advances are made in this field. This type of information, in conjunction with traditional fisheries survey methods, can be used by DNREC to direct additional field sampling efforts, for fisheries and watershed management purposes, and to validate past fish collection data. In addition, eDNA data can be utilized to identify future potential mitigation areas in relation to critical habitat and with regard to dam removal/fish passage projects in the State. Finally, eDNA data can be used to identify and track invasive species in the State's water bodies without relying solely upon traditional field collection methods.

If funds remain after completion of the proposed three-year work plan described herein, additional eDNA sampling can be added at the discretion of the DNREC-DFW or can be utilized for additional juvenile sturgeon research in the Delaware River and/or Nanticoke River to meet Atlantic States Marine Fisheries Commission sampling confirmation protocols. In addition, the capital expenditure for analytical equipment will allow DNREC to continue its eDNA monitoring efforts into the future.

5. References

Bayley P.B., Peterson J.T. (2001). "An Approach to Estimate Probability of Presence and Richness of Fish Species." Transactions of the American Fisheries Society, 130, 620–633.

Evans N.T., Olds B.P., Renshaw M.A., Turner C.R., Li Y., Jerde C.L., Mahon A.R., Pfrender M.E., Lamberti G.A., and Lodge D.M. 2016. Quantification of mesocosm fish and amphibian species diversity via environmental DNA metabarcoding. Mol. Ecol. Resour. 16: 29–41.

Hinlo R., Litermans M., Gleeson D., Broadhurst B., Furlan E. 2018 Performance of eDNA assays to detect and qualify an elusive benthic fish in upland Streams. Bio1 Invasion. https://doi.org/10.1007/s10530-018-1760-x.

Jerde, C.L., Mahon, A.R., Chadderton, W.L., Lodge, D.M., 2011. "Sight-unseen" detection of rare aquatic species using environmental DNA: eDNA surveillance of rare aquatic species. Conservation Letters 4, 150–157. http://dx.doi.org/10.1111/j.1755-263X.2010.00158.x.

Lacoursiere-Roussel, A., C ote, G., Leclerc, V., Bernatchez, L. 2016. Quantifying relative fish abundance with eDNA: A promising tool for fisheries management. Journal of Applied Ecology, 53, 1148–1157.

Strickland, G. J., & Roberts, J. H. 2018. Utility of eDNA and occupancy models for monitoring an endangered fish across diverse riverine habitats. Hydrobiologia, 826, 129–144. https://doi.org/10.1007/s10750-018-3723-8

IV. FOX POINT STATE PARK ACCESS AND UPLAND IMPROVEMENTS

1. Purpose

This document has been prepared to provide a conceptual design and scope of work for the proposed DSPC Access and Upland Improvement Project at Fox Point State Park (the "Project"). The purpose of this document is to outline the overall conceptual plan for the upland improvements that are proposed, including a boardwalk path on the north side of the wetland mitigation project that will provide an eventual linkage to a path that is planned to connect to the historic Stoney Point Wharf at the northern end of the park. The upland improvements project proposes to clear the invasive and overgrown vegetation along the existing river side (east) chain link. This will reestablish and enhance the view shed to the river which will reconnect the resource of the river for park users. Additional improvements may include lighting enhancements and other amenities to increase public access to the natural resources of the park and the Delaware River

The Upland Improvement project is a portion of the State of Delaware Mitigation package for the Port of Wilmington Edgemoor Expansion Project (DNREC Hearing Docket #2020-P-MULTI-0024)

2. Site Location:

The Fox Point State Park lands were created through filling activities performed along the Delaware River shoreline (Integral 2019). Historical aerial photos for the Site dating back to 1954 document the filling activities as well as the condition of the site prior to filling. This generally consisted of aquatic river habitat, and the placed fill material acted in the creation of the upland area that is the park today. The fill reportedly includes a variety of materials, principally dredged material from the Delaware River underlain by steel-making slag, bricks, timber, waste ingots, and ash furnace dust, in addition to miscellaneous trash and debris (Integral 2019).

Following several phases of remedial action activities and community input through master planning, the state and the public, the park vision was largely realized by 2009. Today, approximately 55 acres of the uplands portion of the Site has been converted to parkland with public access to walking trails, picnic and play areas, a pavilion, and parking area. The majority of the site is regularly maintained as open fields; however, some areas along the perimeter of the site outside of the fence line delineating the maintained area have experienced overgrowth by invasive shrubs that limit the view of the Delaware River and the habitat areas surrounding the park.

3. Preliminary Designs:

To improve the public use of the park and to enhance and supplement the park amenities, DSPC proposes to design several phases of potential improvements to be constructed with the funds that DSPC commits to the mitigation fund. Each of these projects would provide benefits to the community that utilizes the park, and would be impacted by the Edgemoor Expansion Project, which is located on an adjacent parcel. The removal of woody vegetation along the park's fence line that overlooks the Delaware River will provide visual access to the Delaware River resource which is currently obstructed

from the existing pathways. The addition of a boardwalk along the northern end of the site will provide access and educational opportunities for the community to the intertidal wetlands constructed in the Priority 1 work scope as well as future restoration efforts. Proposed improvements will provide needed maintenance and some new amenities that are intended to enhance the community experience. These projects can be summarized further as follows:

a. Vegetation Control of approximate 2.6 acres

A previous park improvement plan constructed in the 2009-2010 time frame included the placement of a boulder retaining wall upland of the high water line of the Delaware River along the length of the park (to contain clean fill material associated with site remediation) and the construction of a fence line along the pedestrian access ways within the park. Since construction, the space between the fence line and the river has become overgrown with shrubs and trees. In order to improve the public use of the parkway and to increase visible access to the Delaware River, DSPC proposes to design a landscaping project to remove these plants. The project includes:

i. Removal of approximately 2.6 acres of unwanted vegetation and provide erosion control by replanting this area with native grasses as described on sheets 1 & 2 of the attached drawings. The typical overgrowth to be removed are indicated in Figure 1

ii. The replacement plantings and final species selection will be designed and installed per the final design plans, specifications and construction documents as approved by DNREC, which will be prepared as a supplement to the concept plan phase once the project's scope, plan, and budget has been approved.

iii. The replacement plantings will be targeted species to reduce the prevalence of invasive vegetation and will consider the maintenance requirement and access limitations of the area.

iv. Maintenance. During the removal and establishment period, there is an expectation that some additional level of maintenance will be required including:

- DSPC will coordinate with DNREC regarding invasive species treatment and removal for three years as needed to maintain an invasive species abundance of 10% or less.

DSPC will coordinate with DNREC regarding replacement of dead plants and/or supplemental planting as needed to achieve targeted plant densities

Figure 2: Area for Removal of Invasive Vegetation

b. Boardwalk

The proposed boardwalk trail portion of the project is located on the north end of Fox Point State Park along the west bank of the Delaware River. The Site consists of an approximate .50 acre stand of invasive woody plants that include Tree of Heaven, Black Locust, Bradford Pear, Honey Suckle, and Multiflora Rose on the south end of the proposed wetland mitigation site. This area is situated between elevations 18 on the river side of the trail down to approximately elevation 6 at the shoreline along the revetment below the fence.

i. The proposed ADA accessible boardwalk includes two viewing platforms or bump outs and extends from the existing pathway to the northern end of the intertidal wetland as indicated in the sheets 3 & 4 of 4 of the Concept Plans of the upland improvements. The boardwalk and two viewing platforms or bump outs are proposed to be constructed during the first phase of this project.

ii. The boardwalk installation sequence shall be determined by the contractor. Boardwalk installation may occur concurrently with wetland installation if it is determined to not interfere with wetland construction operations.

iii. Generally, following substantial completion of the intertidal wetland area and berm and revetment modification, the proposed boardwalk shall be installed. Installation may start at the upland area of the State Park at the north end of the existing loop trail. See sheets 3 & 4 of 4 of the Concept Plans of the upland improvements dated September 2021.

The boardwalk will be installed per the final design plans and specifications and construction documents which will be prepared as a supplement to the concept plan phase once the project's scope and budget has been approved.

c. Additional upland improvements

Additional improvements to enhance the public experience and usage would likely include projects such as: adding electrical service to the northern parking lot to provide security lighting, extending the service to the boardwalk to provide security lighting along the river, performing pavement patching or overlays along the paved entrance road or providing gravel to resurface the gravel roadways. Designs for these improvements will be prepared to the extent that the funding for the improvements is not fully committed to the priority one and two improvements, or the above projects. Alternatively, these projects may be prioritized by DNREC over the improvements noted above following the implementation of the priority one and two projects. DSPC will work with DNREC to develop designs in line with the priorities of the Department.

4. Budget for Access and Upland Improvement Projects

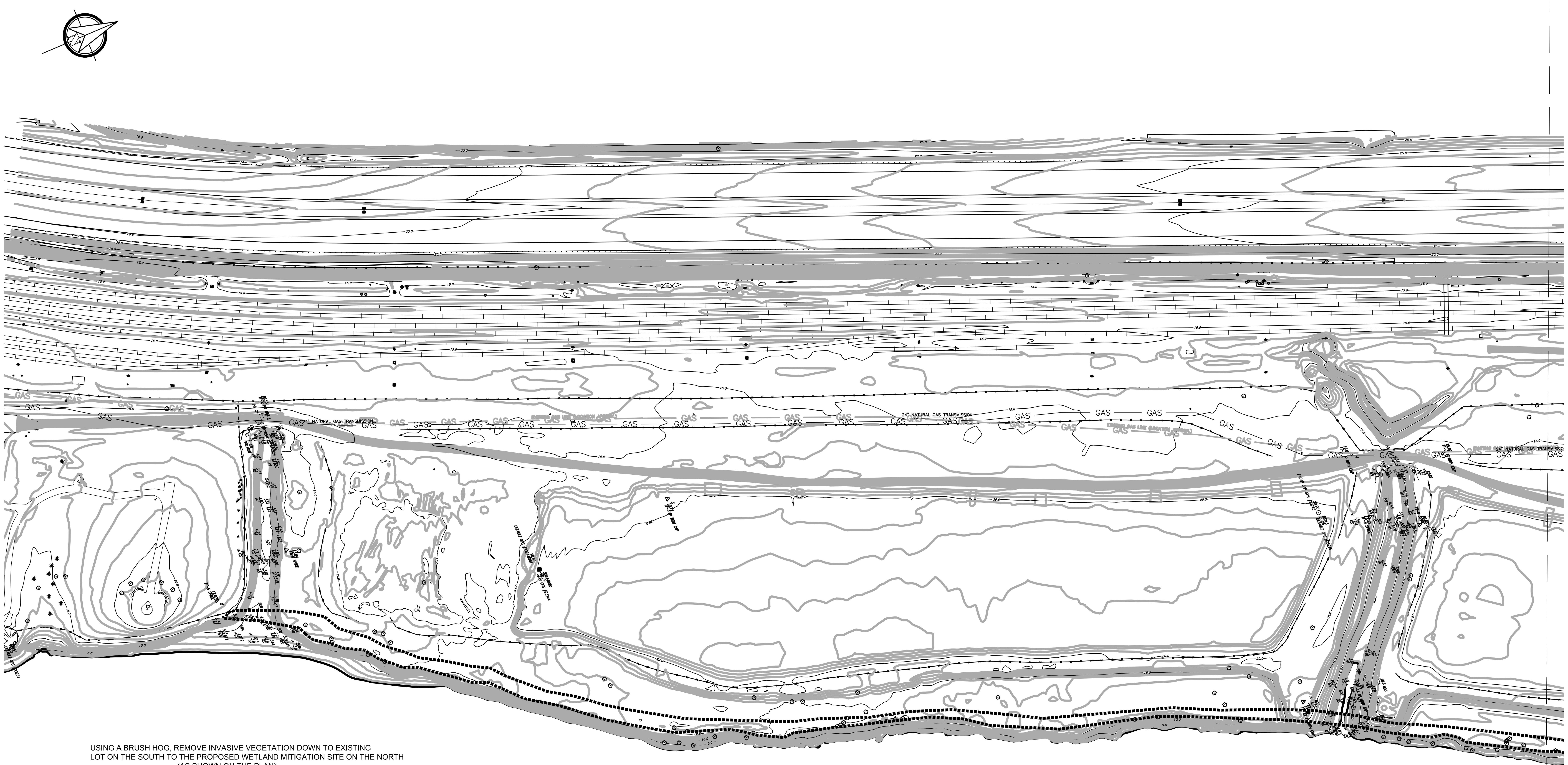
The budget for the site access improvement will be dependent on the implementation costs of priority one and two. The amount of funding remaining has the potential to expand or reduce the conceptual drawing presented in this proposal. The budgets for the enclosed conceptual drawings can be summarized as:

Scope Item	Budget Estimate
Invasive Vegetation Clearing	$330,000
Wetland Boardwalk Improvements	$627,000
Miscellaneous Site Improvements	$400,000 or greater

This costs estimate will be updated at the conceptual design phase and final design prior to commencing construction. The actual cost of the project will be dependent on the final design and the of contractor bidding.

5. References

Integral Consulting, Inc. (2019). "Remedial Investigation Report for Fox Point State Park Phase II Operable Unit (DE-1011)" prepared for American Premier Underwriters.



USING A BRUSH HOG, REMOVE INVASIVE VEGETATION DOWN TO EXISTING
LOT ON THE SOUTH TO THE PROPOSED WETLAND MITIGATION SITE ON THE NORTH (AS SHOWN ON THE PLAN).
INVASIVE VEGETATION SHALL BE REMOVED BETWEEN THE EXISTING CHAIN-LINK FENCE (RUNNING PARALLEL TO THE RIVER) AND THE ROCK REVETMENT: APPROXIMATELY 2.6 ACRES.
ALL DEBRIS SHALL BE COLLECTED AND DISPOSED OFF SITE IN ACCORDANCE WITH STATE AND DNREC REGULATIONS. ONCE VEGETATION IS CUT BACK TO EXISTING GRADE, THE ROOTS AND NEW GROWTH SHALL BE TREATED WITH AN APPROVED SYSTEMIC HERBICIDE EVERY 4 MONTHS DURING THE GROWING SEASON FOR 2 YEARS. ONCE INVASIVE VEGETATION IS CONTROLLED AND ACCEPTED BY DNREC DIVISION OF PARKS, INSTALL BIODEGRADABLE EROSION CONTROL MATTING AND PLANT WITH NATIVES SUCH AS SWITCHGRASS, BROOMSEDGE AND LITTLE BLUESTEM.

REMOVING THE INVASIVE TREES AND SHRUBS ALONG THE EAST EMBANKMENT WILL PROVIDE PARK USERS AN UNOBSTRUCTED VIEW TO THE DELAWARE RIVER. MAINTAINING THIS VIEWSHED ALLOWS PEOPLE TO CONNECT TO THIS VALUABLE RESOURCE.
LEAVING ROOTS AND INSTALLING MATTING WILL STABILIZE THE BANK.
ESTABLISHING NATIVE HERBACEOUS PLANTS WILL ENHANCE THE QUALITY OF THE HABITAT.

AREA OF INVASIVE VEGETATION REMOVAL

BASE PLAN INFORMATION FROM
FOX POINT STATE PARK PHASE 2 Sheets C15, C16 and C17
BY BLACK & VEATCH
PROJECT 041715
DATED 02-04-08
FOX POINT STATE PARK WETLAND FLAG LOCATION
BY TETRA TECH, INC.
PROJECT #R1216-00REN
DATED 5/2/06

PROGRESS DRAWING NOT FOR CONSTRUCTION

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DESIGNED BY: MTS
FILE NAME: FPST-CON-SITE-11139LH
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STATE:
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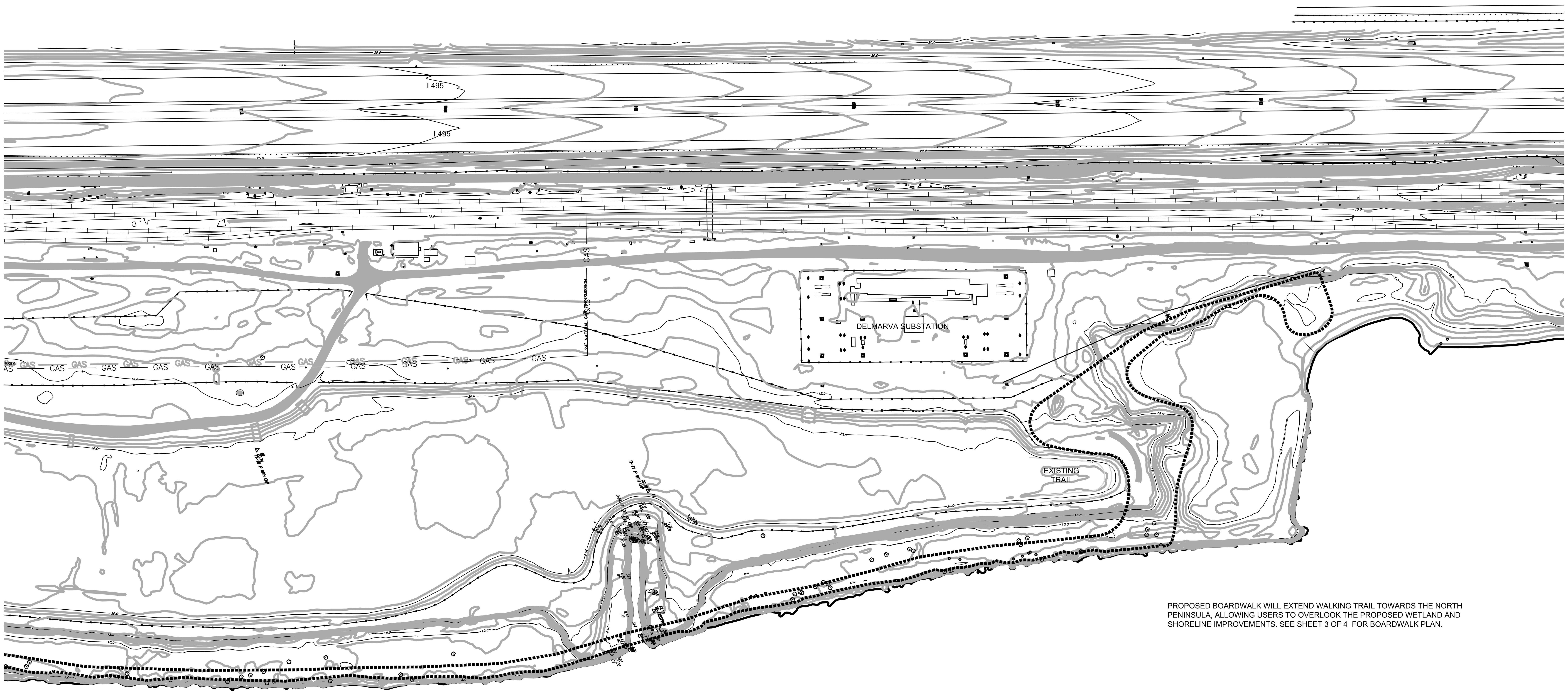
DIVISION OF PARKS AND RECREATION

APPLICANT:
DIAMOND STATE PORT CORPORATION
800 N. FRENCH STREET, 4TH FLOOR
WILMINGTON, DE 19801

FOX POINT STATE PARK CONCEPT PLANS
SITE IMPROVEMENT AND VEGETATION CONTROL
PORT OF WILMINGTON
EDGEMOOR EXPANSION
BRANDYWINE HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE

DATE: SEPTEMBER 2021
SCALE: 1" = 80'
PROJECT NO. 11139.LH.08
SHEET: 1 (OF 4)



PROPOSED BOARDWALK WILL EXTEND WALKING TRAIL TOWARDS THE NORTH PENINSULA, ALLOWING USERS TO OVERLOOK THE PROPOSED WETLAND AND SHORELINE IMPROVEMENTS. SEE SHEET 3 OF 4 FOR BOARDWALK PLAN.

USING A BRUSH HOG, REMOVE INVASIVE VEGETATION DOWN TO EXISTING LOT ON THE SOUTH TO THE PROPOSED WETLAND MITIGATION SITE ON THE NORTH (AS SHOWN ON THE PLAN).
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REMOVING THE INVASIVE TREES AND SHRUBS ALONG THE EAST EMBANKMENT WILL PROVIDE PARK USERS AN UNOBSTRUCTED VIEW TO THE DELAWARE RIVER. MAINTAINING THIS VIEWSHED ALLOWS PEOPLE TO CONNECT TO THIS VALUABLE RESOURCE.
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ESTABLISHING NATIVE HERBACEOUS PLANTS WILL ENHANCE THE QUALITY OF THE HABITAT.

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DATED 02-04-08
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AREA OF INVASIVE VEGETATION REMOVAL

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DATE: SEPTEMBER 2021
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SHEET: 2 (OF 4)

PLAN

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PROJECT #R1216-00REN
DATED 5/2/06

NOTE:
SEE SHEET 2 OF 4
FOR INVASIVE VEGETATION REMOVAL
ALONG RIVER AND AROUND WETLANDS.

40' 0 40' 80'
DRAWING SCALE 1" = 40'

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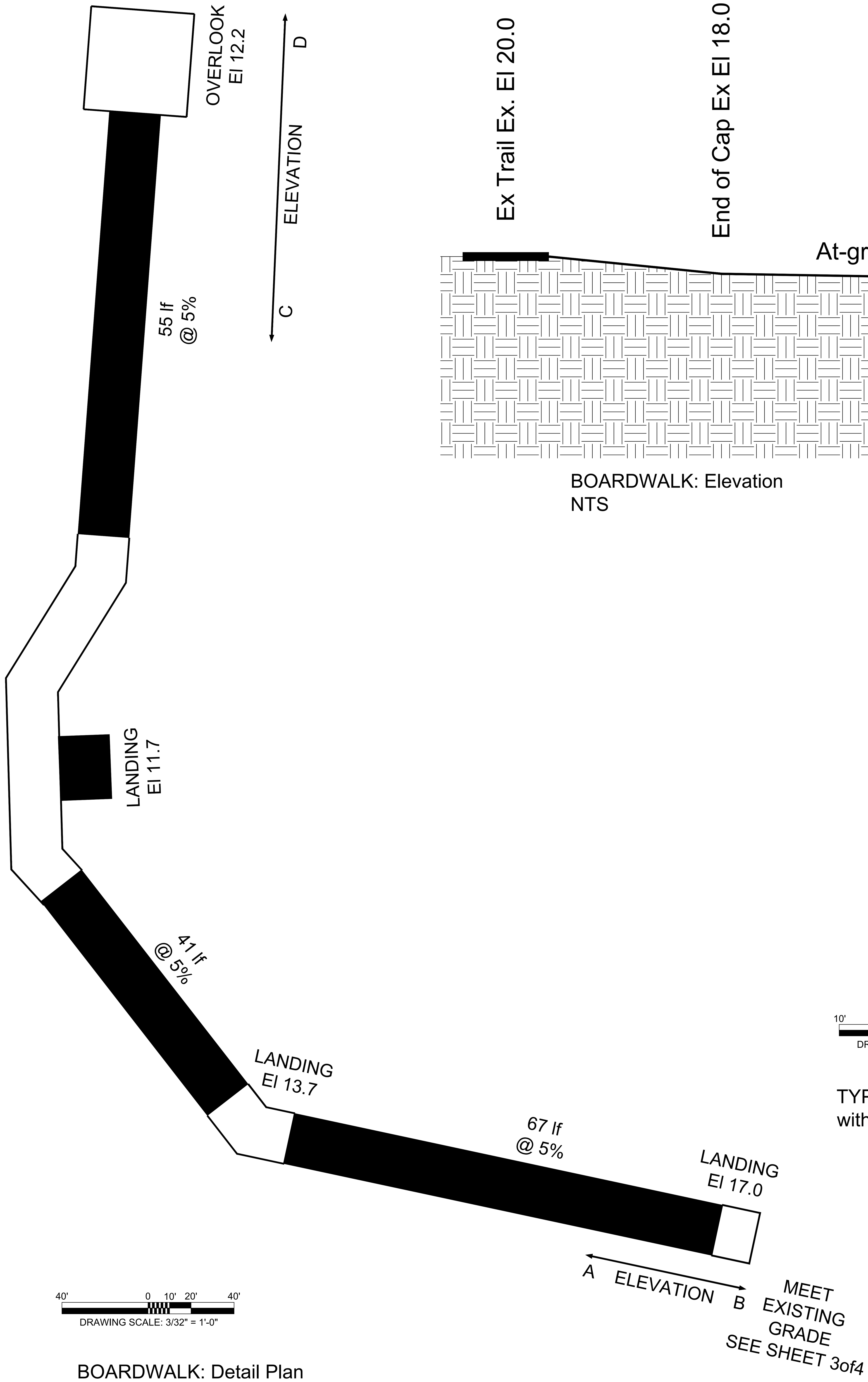
DATE:	SEPTEMBER 2021
SCALE:	1" = 40'
PROJECT NO.	11139.LH.08
SHEET:	3 (OF 4)



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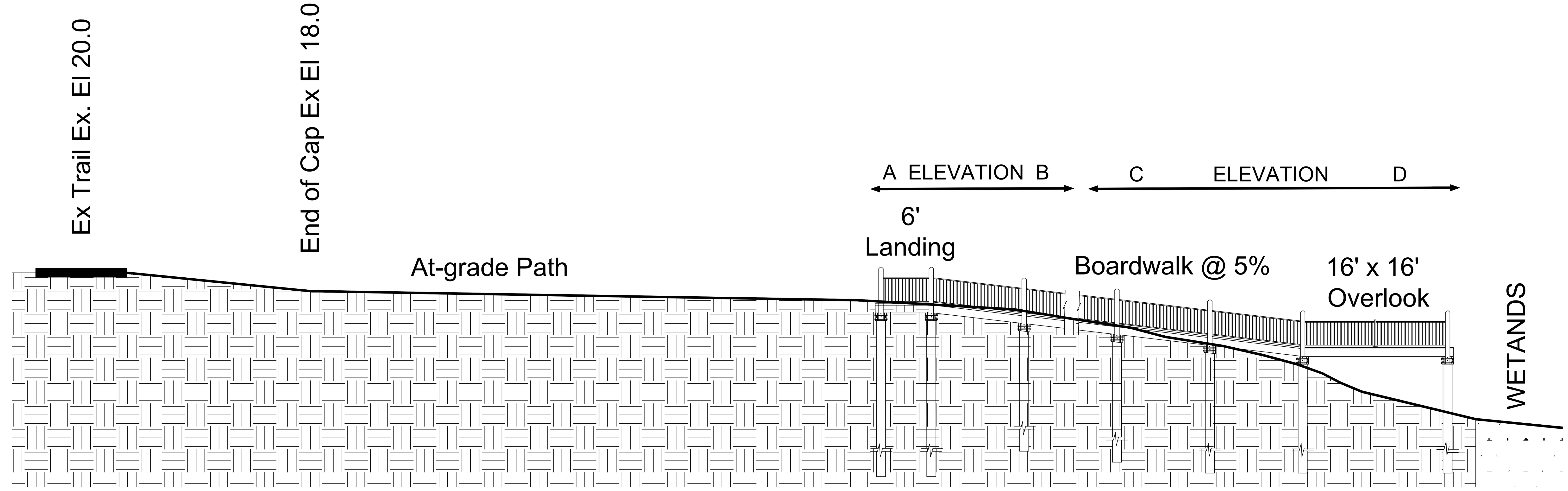
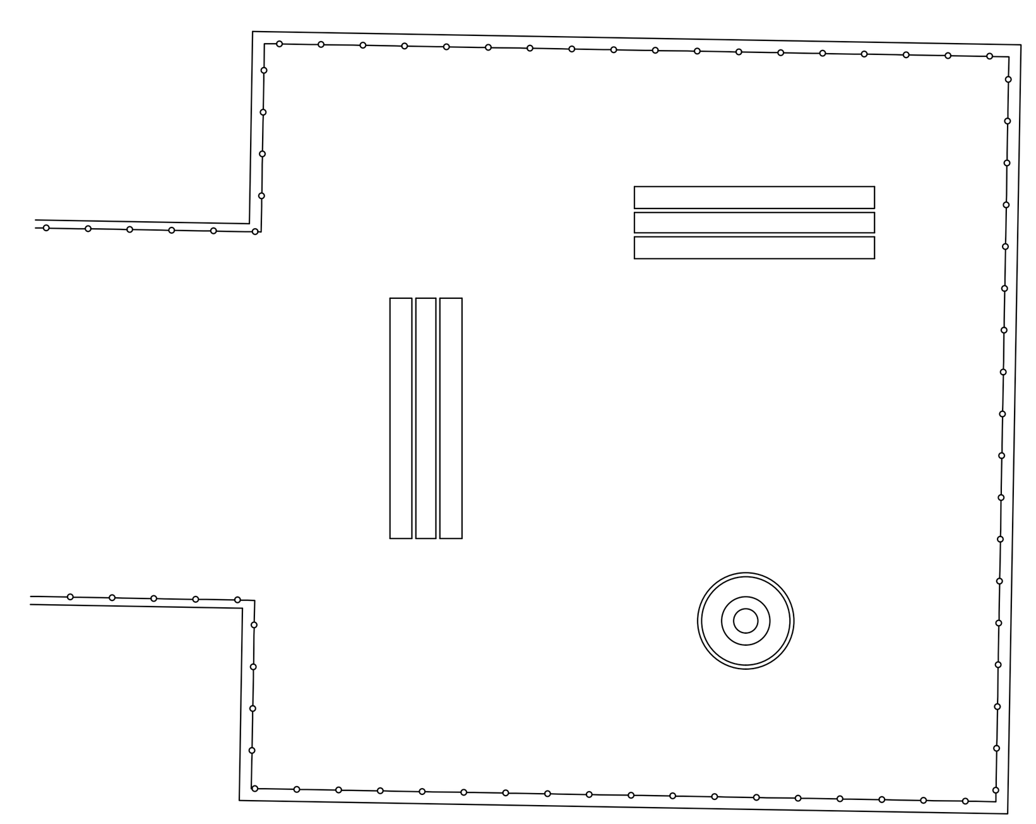
DRAWING SCALE: 3/32" = 1'-0"

BOARDWALK: Detail Plan

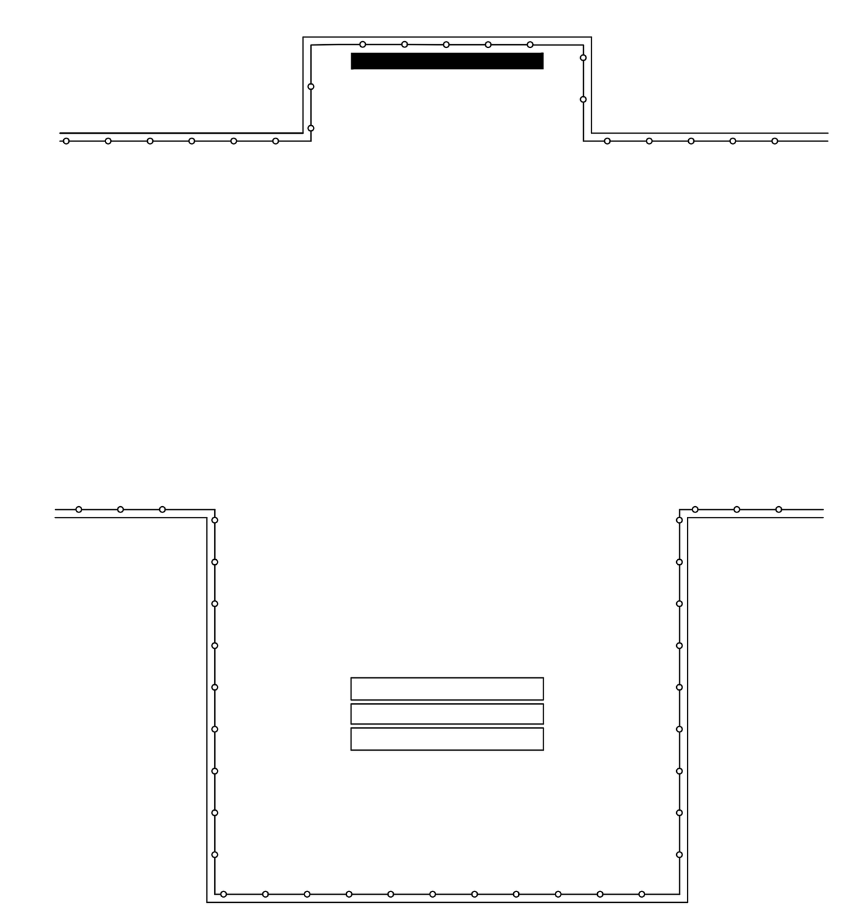


BOARDWALK: Elevation
NTS



10' 0 5' 10'
DRAWING SCALE: 1/8" = 1'-0"

TYPICAL 16' x 16' OVERLOOK
with 6' Benches & Telescope



10' 0 5' 10'
DRAWING SCALE: 1/8" = 1'-0"

TYPICAL 10' x 8' BUMPOUT with 4' Bench
2' X 8' BUMPOUT with Information Panel

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DRAWN BY:	PS

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FOX POINT STATE PARK CONCEPT PLANS
BOARDWALK SECTION AND DETAILS
PORT OF WILMINGTON EDGEMOOR EXPANSION
BRANDYWINE HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE

DATE:	SEPTEMBER 2021
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PROJECT NO.	11139.LH.08
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