WILMINGTON TERMINAL
TURNING BASIN EXPANSION PROJECT
COMPENSATORY WETLAND MITIGATION PLAN

October 26, 2018

Prepared for:
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1.0 INTRODUCTION

Dial Cordy and Associates Inc. (DC&A) was contracted to prepare this mitigation plan for the North Carolina State Ports Authority (NCSPA) as required by the North Carolina Department of Environmental Quality Division of Coastal Management (NCDEQ-DCM) and United States Army Corps of Engineers (USACE) for the subject project. Included within the plan are descriptions of the affected wetlands, results of a functional assessment using North Carolina Wetland Assessment Method (NCWAM), an analysis of mitigation requirements, a review of mitigation options and a conceptual plan for the selected mitigation option**.**

2.0 PROJECT AREA WETLANDS DESCRIPTION

The project area encompasses salt and brackish marshes on the contiguous tidal floodplain of the Cape Fear River (CFR) (Figure 1). The tidal marshes form a continuous fringe along the project area river shoreline that is interrupted only by the mouth of Greenfield Creek. The landward boundary of tidal wetlands within the project area is marked by an existing man-made upland berm that extends continuously along the river shoreline and ties to a tidal gate across the mouth of Greenfield Creek. The berm functions as an artificial shoreline that has effectively reduced the width of the tidally influenced floodplain to approximately 100 feet. The normal high water mark and the Section 404 wetland-upland boundary are both located along the waterward toe of the berm. The tidal floodplain encompasses a mix of relatively natural salt/brackish marshes, disturbed brackish marshes consisting of dense common reed (*Phragmites australis*) stands on shallow fill deposits, and unvegetated tidal mud flats in shallow depressional areas. The entire area waterward of the berm toe, including the common reed stands, is inundated at high tide.

The natural tidal marshes consist predominantly of monospecific stands of smooth cordgrass (*Spartina alterniflora*). The smooth cordgrass marshes occur primarily on the relatively undisturbed lower portion of the tidal floodplain along the river. A few small areas of natural brackish marsh occur along the upper margins of the smooth cordgrass marshes. The brackish marshes are dominated by big cordgrass (*Spartina cynosuroides*) and other brackish species such as narrow-leaved cattail (*Typha angustifolia*), salt marsh aster (*Symphyotrichum tenuifolium*), bull-tongue arrowhead (*Sagittaria lancifolia*), and water primrose (*Ludwigia bonariensis*). Large dense monospecific stands of common reed occur on shallow fill deposits that generally extend waterward onto to the floodplain from the upland berm. The lower extent of the fill deposits and their associated common reed stands marks the boundary between Section 404 and Coastal Area Management Act (CAMA) coastal wetlands. Unvegetated tidal mud flats occur in very shallow linear depressions that appear to be natural features associated with tidal flow. Vegetation of the landward upland berm is a disturbed scrub-shrub assemblage consisting of live oak (*Quercus virginiana*), coastal red cedar (*Juniperus silicicola*), and dense woody vines such as trumpet vine (*Campsis radicans*), catbrier (*Smilax bona-nox*), and poison ivy (*Toxicodendron radicans*).

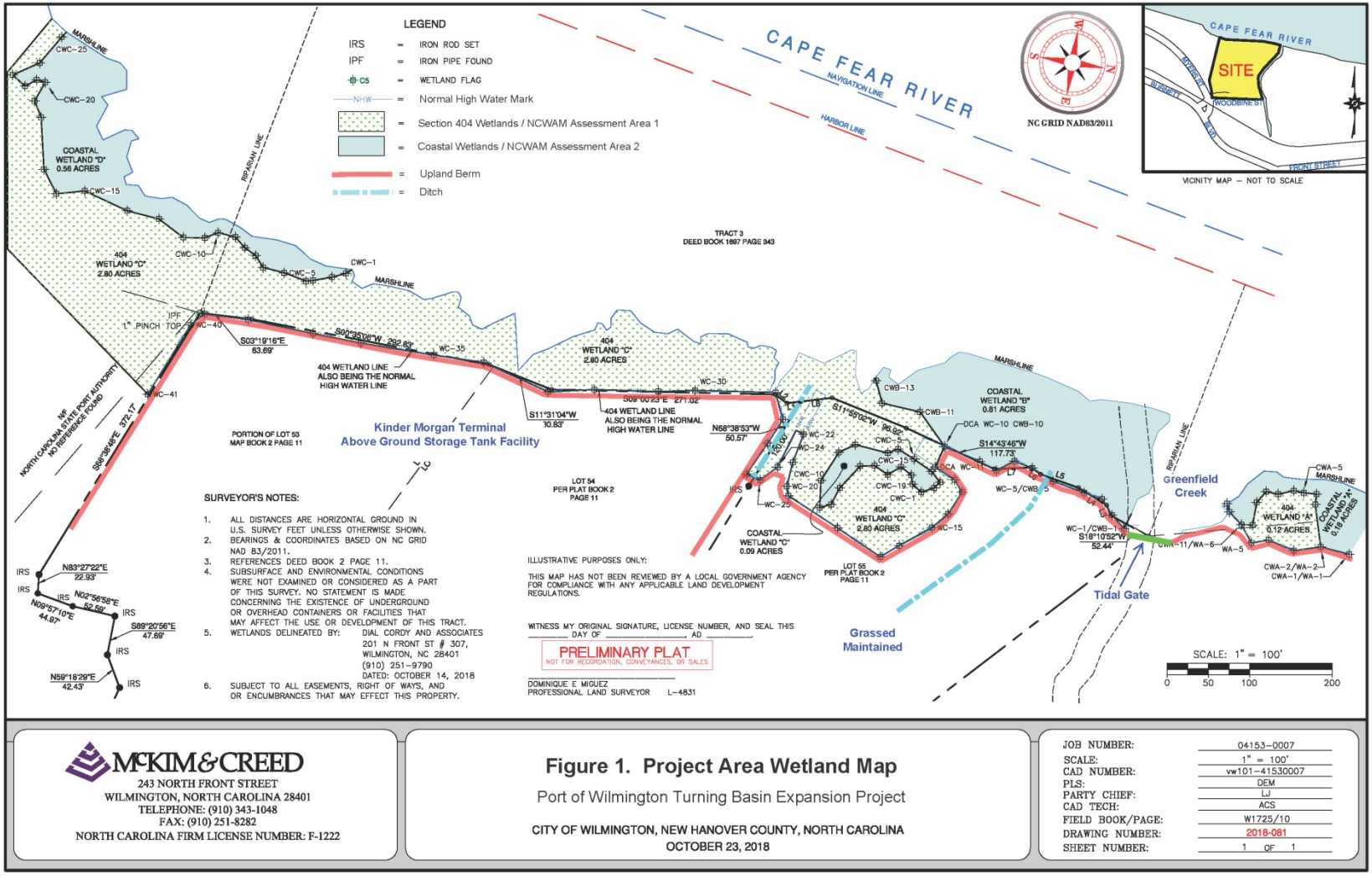


Figure 1. Project Area Wetland Map

3.0 PROPOSED IMPACTS AND WETLAND FUNCTIONAL ASSESSMENT

The proposed expansion of the existing turning basin via dredging would permanently impact a total of 1.4 acres of Section 404 jurisdictional salt/brackish marsh wetlands on the tidal floodplain of the CFR, including 1.01 acres of CAMA coastal wetlands (smooth cordgrass marsh) and 0.39 acre of non-coastal wetlands (common reed marsh) (Figure 2). The 1.4 acres of wetlands would be excavated and permanently converted to subtidal soft bottom. In order to facilitate the determination of compensatory wetland mitigation requirements, a functional assessment of the affected project area wetlands was performed using the NCWAM (NC Functional Assessment Team 2016). The North Carolina Wetland Assessment Method is a rapid assessment method that is based on the evaluation of field indicators of wetland functions. The NCWAM method ultimately generates an overall wetland rating of High, Medium, or Low. Separate NCWAM evaluations were completed for two assessment areas representing the principal wetland communities and conditions within the project area. Assessment Area 1 encompasses the natural smooth cordgrass marshes on the relatively undisturbed portion of the project area floodplain, and Assessment Area 2 encompasses the disturbed common reed marshes that occur on shallow fill deposits (Figure 1). Dial Cordy and Associates Inc. conducted the field assessment on 15 October 2018 in conjunction with the delineation of project area wetlands. The NCWAM Rating Calculator v5.0 (1) was used to complete the field assessment forms and wetland rating sheets (Appendix A). Assessment Area 1 received an overall wetland rating of "High" and Assessment Area 2 received an overall wetland rating of "Low."

Supplemental Field Assessment Information

The overall wetland ratings are based on detailed field observations that are not necessarily captured by the completed NCWAM field assessment forms in Appendix A. The following sections describe additional information from the field assessment that factored heavily in the evaluation of the various field indicator metrics.

Soils, Hydrology, and Vegetation

The floodplain and associated tidal marshes experience unimpeded twice-daily (semidiurnal) tidal flooding directly from the CFR channel. Hydrologic connectivity via overbank/overland tidal flow are not been significantly altered. The entire area waterward of the berm toe was inundated at high tide during the field assessment. Assessment Area 1 is comprised predominantly of natural smooth cordgrass marshes on the relatively undisturbed lower portion of the tidal floodplain along the river. The predominantly dark brown (10 YR 2/1) muck soils of Area 1 appear to be those of the natural floodplain. Thus the ground surface condition, vegetation condition, and surface storage capacity of Assessment Area 1 are considered to be not altered. Assessment Area 2 is positioned on shallow fill deposits that extend waterward from the upland berm onto portions of the tidal floodplain. The fill deposits are presumed to have reduced the depth of tidal inundation and the water storage capacity of the affected floodplain within Area 2. The placement of fill and the associated reduction in the depth of tidal inundation have resulted in the displacement of the natural marsh plant communities by dense

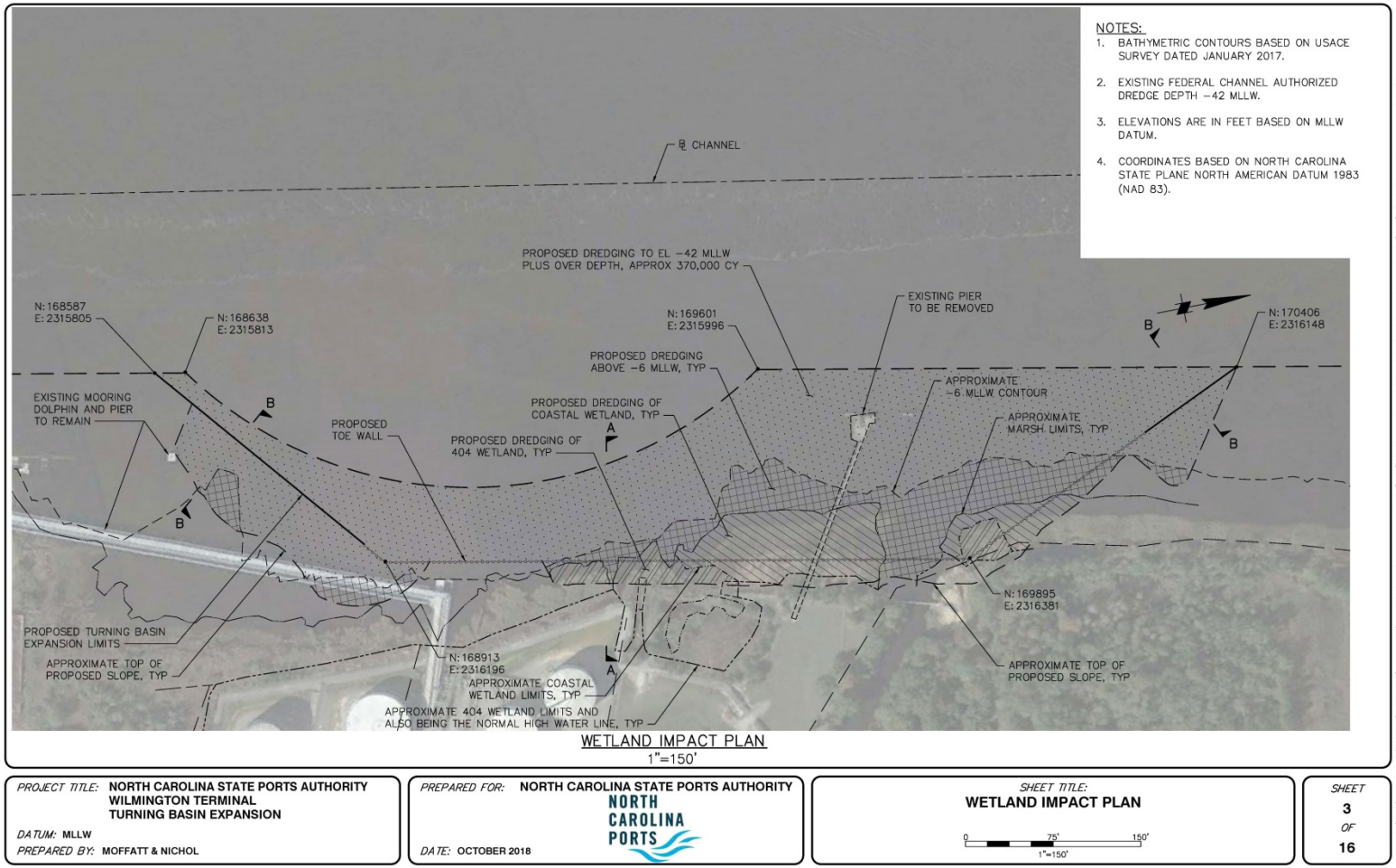


Figure 2. Wetland Impact Plan

monospecific stands of non-native common reed. Thus the ground surface condition, vegetation condition, and surface storage capacity of Assessment Area 2 are considered to be severely altered.

Discharges/Pollutants

The area immediately landward of the upland berm contains an array of approximately 20 aboveground petroleum/chemical storage tanks that are part of the Kinder Morgan Terminal facility. The tanks are completely enclosed by a perimeter containment berm. Stormwater drainage across the surface of the tank area is west towards the river and then north along the landward toe of the berm to the northwest corner of the tank area. Although not visible during the field assessment, there appears to be a culvert or other structure that discharges stormwater through the northwest corner of the containment berm to a tidally influenced ditch that flows directly to the wetland assessment areas. Immediately north of the tank area, there are large maintained (mowed) grassy areas that are drained by a ditch that flows directly to the assessment areas through an open cut in the berm. No obvious discharges of pollutants via the ditches or subsurface flow were observed during the field survey. An oily sheen was observed several inches below ground on the surface of water in an auger hole at a location immediately waterward of the berm. However, no other indicators of surface or subsurface contaminants were observed in either of the assessment areas. No indicators of vegetation stress were observed during the field survey. The cordgrass and common reed marshes were both comprised of dense, tall, vigorous flowering stems. The adjoining CFR reach from Greenfield Creek to Barnards Creek is included on the 2016 Section 303d list of impaired waters based on exceedances of the criteria for copper, dissolved oxygen, and pH. Based on all of these factors, both of the assessment areas are considered to have noticeable evidence of pollutants or discharges that are not overwhelming the treatment capacity of the wetlands.

Riparian Buffer Function and Connectivity to Other Natural Areas

The assessment area tidal marshes provide an effective approximately (~) 100-foot-wide continuous riparian vegetative buffer along the entire project area shoreline. Based on the NCWAM User Manual v5, the evaluation of assessment area connectivity to other natural areas was limited to other natural marsh communities. Connectivity is lacking to the south, as there are no tidal marshes along the east bank of the ~1.3-mile river reach below the project area. To the north, the assessment area marshes are loosely connected to very narrow patches of fringing tidal marsh that occur intermittently along the ~1.0-mile river reach above the project area. Thus the assessment areas are considered to have poor connectivity to other natural areas.

4.0 REQUIRED COMPENSATORY MITIGATION

Based on the NCWAM evaluation, compensatory mitigation would be required to offset impacts to 1.01 acres of smooth cordgrass marsh with a “High” overall functional rating and 0.39 acre of common reed marsh with a “Low” overall functional rating. Although specific compensatory wetland mitigation requirements have yet to be determined through agency coordination, the

Applicant is proposing the creation of 3.0 acres of tidal smooth cordgrass marsh, along the CFR shoreline south of the project area, as the preferred option.

5.0 MITIGATION OPTIONS CONSIDERED

The following mitigation mechanisms were evaluated as potential options to compensate for unavoidable wetland impacts.

5.1 Private Mitigation Banks and NCDCM In-Lieu Fee Mitigation Program

There are currently no private mitigation banks that have available credits in the lower CFR. Furthermore, there are no approved coastal wetland mitigation banks that could potentially provide coastal wetland credits in the near future (NC Mitigation Bank Credit Availability List, Updated 16 Oct 2018). The North Carolina Division of Mitigation Services (NCDMS) In-Lieu Fee (ILF) Mitigation Program currently has no available coastal wetland credits or projects within the lower Cape Fear River; and should any credits become available, the going rate as of 1 July 2017 is $560,000 per acre-credit.

5.2 Permittee Provided Mitigation

5.2.1 Alligator Creek Restoration on Eagle Island

Until recently, a coordinated multi-year effort by federal agencies, State Trustees, and local conservation groups had been underway to restore Alligator Creek and its associated tidal wetlands on Eagle Island. Historical dredged material deposition has essentially filled in the stream channel and altered the hydrology of the floodplain, leading to the displacement of the natural tidal marshes by monospecific common reed stands. The project was the top priority by the National Oceanic and Atmospheric Administration grant and restoration plans were under development, with additional funding and approval from the state pending. As a fully funded project via assistance from the Port of Wilmington, the project could have met the compensatory mitigation requirements for the Turning Basin expansion project. The project would have restored more than 30 acres of tidal marsh and over 0.60 miles of tidal stream channel. However, a mitigation banking group made an offer to purchase the property from the current landowners in 2017, thus eliminating the site as a viable mitigation option for the current project.

5.2.2 Shellbed Island Site 1 Tidal Marsh Creation Site

Dial Cordy and Associates Inc. is currently working with Audubon North Carolina (Audubon) on a lower Cape Fear River oyster restoration project funded through the National Fish and Wildlife Foundation by the North Carolina and Virginia Rivers and Waters Program. Dial Cordy and Associates Inc. has used geographic information system (GIS) based habitat assessment software to identify suitable sites for oyster restoration. The GIS software evaluates

environmental parameters such as elevation, tide and wave energy, and proximity to channels, shorelines, and islands; which are also applicable to the evaluation of potential tidal marsh restoration sites. A number of the identified oyster restoration sites are associated with broad unvegetated tidal flats that are expanding through natural depositional processes, thus providing an opportunity for tidal marsh restoration. Tidal flats along the west side of Shellbed Island encompass an area suitable for suitable for the restoration of ~25 acres of tidal marsh (Figure 2). Audubon will be using ~1.0 acre of the ~25-acre tidal flat area for oyster restoration [see the Audubon web site for additional information (http://nc.audubon.org/news/oyster-reef-project-underway-lower-cape-fear-river)]. Existing salt marshes on the tidal flats have gradually colonized the area over the last 20-30 years, forming circular patches that are similar in shape to oyster reefs that have also naturally recruited to the area (Figure 3). Based on the natural marsh colonization pattern, a conceptual plan for restoring tidal marsh would involve planting small ~0.25-acre areas with 4-inch smooth cordgrass plugs to establish marsh patches similar to those currently present. A total of 12 planted 0.25-acre marsh areas would provide 3.0 acres of salt marsh, thus compensating for the turning basin wetland losses at a ratio exceeding 2:1. While the wetland mitigation project would be performed independently of the Audubon oyster restoration project, marsh construction can be coordinated with the Audubon effort to provide a marsh-oyster reef configuration that would both maximize the ecological functions of the estuarine complex and increase the likelihood of successful salt marsh establishment through tidal and wave energy dispersion.

5.3 Selected Mitigation Option

Based on the above options analysis, the Shellbed Island Site 1 Tidal Marsh Creation Site is the only viable option that can provide the required compensatory mitigation. There are currently no private wetland mitigation banks or NCDMS ILF sites in the CFR basin that could potentially provide compensatory mitigation credits for coastal wetland impacts. A detailed compensatory mitigation plan that incorporates reference wetland metrics, bathymetric survey data, and hydrodynamic analyses would be developed after permit issuance and submitted to regulatory agencies for review and approval within 60 days. The detailed mitigation plan would include success criteria that are based on reference wetland conditions and a monitoring plan that incorporates field sampling of vegetation composition and density/percent cover within both mitigation and reference area marshes. Geographic information system analysis would be used to monitor the overall areal coverage of the established and naturally occurring reference marsh patches. Electronic tide gauges would be installed to continuously monitor tidal fluctuations within the mitigation and reference areas. Tide gauge data would support analyses of any mitigation area composition or density deviations from reference wetland conditions.

6.0 OVERVIEW OF SHELLBED ISLAND AND ONGOING RESTORATION EFFORTS

Overseen by Audubon staff, Shellbed Island is a natural island with a shoreline made up of oyster shell “rakes” and marsh habitat (Figure 3). Also identified as an important bird area, the island has been used as a study site for American oystercatchers where banding, band re-sighting, demographic studies, and censuses of oystercatchers have been conducted. American oystercatchers and laughing gulls nest here, as well as clapper rail. Non-nesting

Figure 3. Proposed Location Map for Shellbed Island Site A

species at the island include saltmarsh and seaside sparrow, northern harrier, Virginia rail, many species of waterfowl, shorebirds and wading birds. Audubon North Carolina works with a number of conservation partners at each sanctuary to protect birds and maintain habitats. At Shellbed Island, partners include the North Carolina Wildlife Resource Commission, North Carolina State University, and North Carolina State Parks.

Audubon North Carolina received a grant from the National Fish and Wildlife Foundation for restoration of oyster habitat in the lower CFR to increase food resources for American oystercatchers that presently roost and nest on a number of islands. As presently planned, restoration of oyster reefs off Shellbed Island includes the construction of patches of oyster reef with a marl base, as presently naturally occurs (Photographs 1 and 2). Oyster reef patches were cited to avoid high energy areas and to maximize the probability of success for recruitment and maturation of the resource. In the lower CFR, American oystercatcher productivity is in decline and a return to a stable and self-sustaining population is needed (Personal communication, Curtis Smalling, Audubon September 2018). Creating oyster reefs near existing American oystercatcher nesting sites would restore foraging grounds and decrease the time American oystercatcher chicks are left unattended. Natural oyster reefs are present in the lower CFR, yet lack of suitable substrate for larval attachment limits their expansion (Alphin et al. 2006), and many reefs near existing American oystercatcher nests are depleted. The purpose of Audubon's proposed restoration is to reestablish oyster habitat adjacent to American oystercatcher nests to improve American oystercatcher productivity while also providing ecosystem services to a myriad of aquatic life.

Shellbed Island's proposed and funded oyster restoration would consist of constructing patch reefs to support an existing natural oyster reef and saltmarsh complex that exists in the western bay of the island (Figures 4 and 5). The reefs would be constructed using organic, industrial-weave burlap bags filled with crushed granite as a base layer and topped with a mixture of limestone marl and clean oyster shell. Reefs would be grouped in triplicate and each reef would be approximately three meters in diameter and 0.6 meters high. This design is intended to mimic the natural reef dimensions found in the area. As proposed, construction may occur in late spring following receipt permit approvals.

Photographs 1 and 2. Naturally occurring oyster reefs and tidal marshes off Shellbed Island.

Figure 4. Aerial Image of Natural Marsh and Oyster Reefs Occurring off Shellbed Island Site A

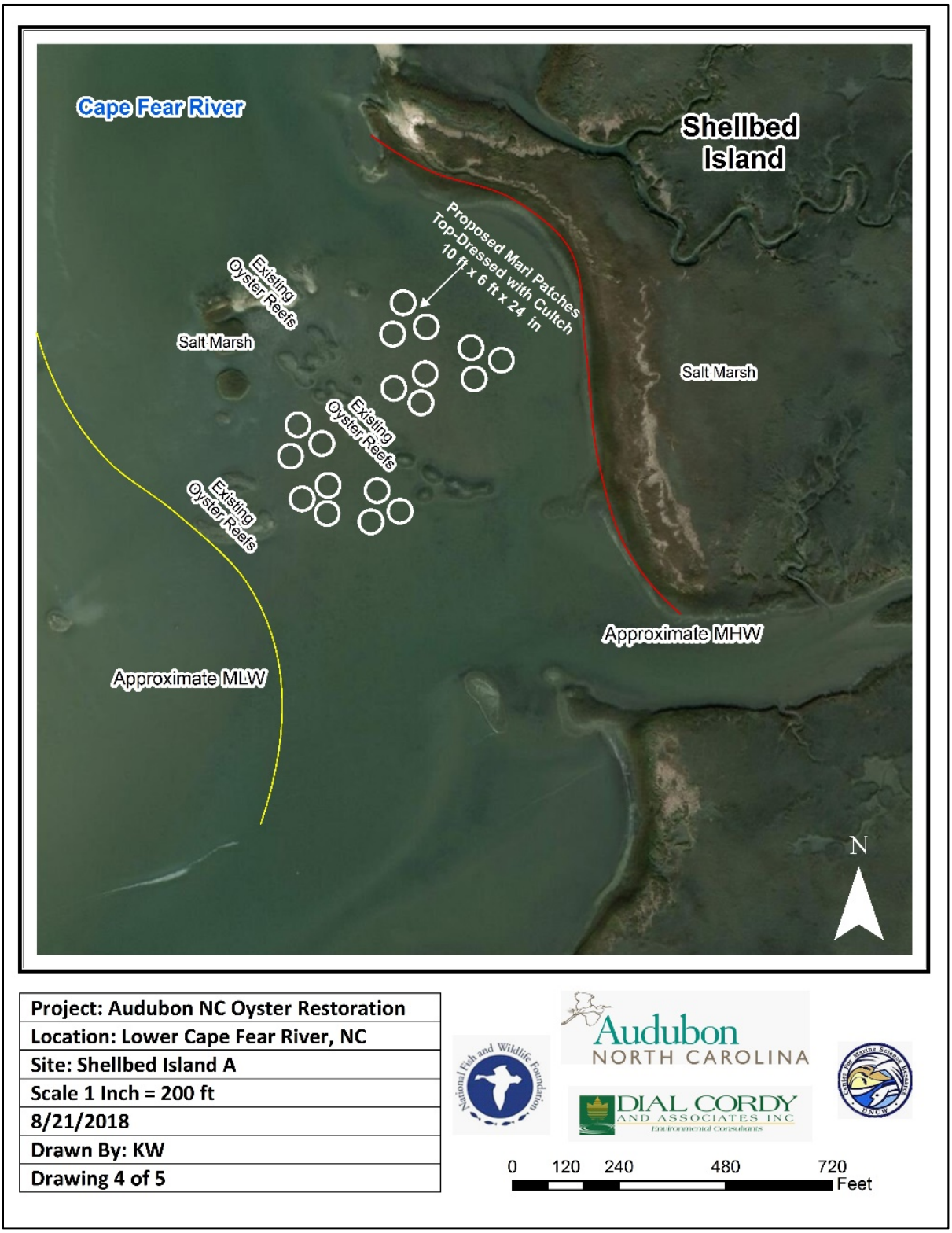


Figure 5. Oyster Conceptual Restoration Design for Shellbed Island Site

6.1 Proposed Tidal Marsh Creation

To compensate for the unavoidable loss of 1.4 acres of tidal wetlands within the project area, the applicant is proposing to create 3.0 acres of smooth cordgrass marsh on Shellbed Island Site A in the lower CFR (Figure 6). This site has been selected due to the high probability of success and as additional augmentation to ongoing oyster restoration in the same location by Audubon. As shown in Figure 6, *Spartina* marsh would be planted in 12- 0.25 acre patches within the shallow intertidal flats adjacent to the island and within the patchwork of proposed new oyster reefs (note graphic is conceptual area). Design would include planting 4-inch plugs of *Spartina alternaflora* two-foot on center within each of the 12 planting sites (Figures 6 and 7). In the event the oyster reef restoration project does not obtain approval by early next summer the wetland sites would be sited landward of the existing oyster reefs, which would serve to dampen any wave activity (Figure 8). *S.alterniflora* planting units would be installed within six months of receipt of required permits for the project. If stabilization is needed, bags of staked oyster shells would be placed along the windward side of the planting areas.

6.2 Success Criteria and Monitoring

The planted sites would be surveyed biannually the first year and annually for four additional years to ensure meeting an 85% success in terms of plant survival and cover. Replanting of any area not achieving success would be done within 30 days of completion of each monitoring event. Monitoring would include random measurement of success using a meter square quadrat over at least 20% of each site. A drone would be used to obtain vertical images of each site and would be used to assess overall site success and percent cover of each site by *S. alternaflora* and other species that have naturally recruited to the site. A list of plant species which have naturally recruited to the sites would also be recorded and accounted for in the quadrat surveys, as percent cover. Photographic documentation of all planted sites would also be completed to visually document that status of each site. Cover and density data would also be collected from a reference wetland located in close proximity to the site, which would be used for comparison to annual conditions at the eight planted sites. Signs of invertebrate, fish and bird utilization would also be recorded. Monitoring reports would be submitted within 30 days of the completion of each monitoring event. The final report after five years would document whether the required success criteria have been met and what adaptive measures have been taken to enhance survival and vegetative success and wildlife utilization. Success would be measured based on achieving 85% plant survival based on quadrat surveys and spatial analysis of cover by vertical images taken by a drone for each event.

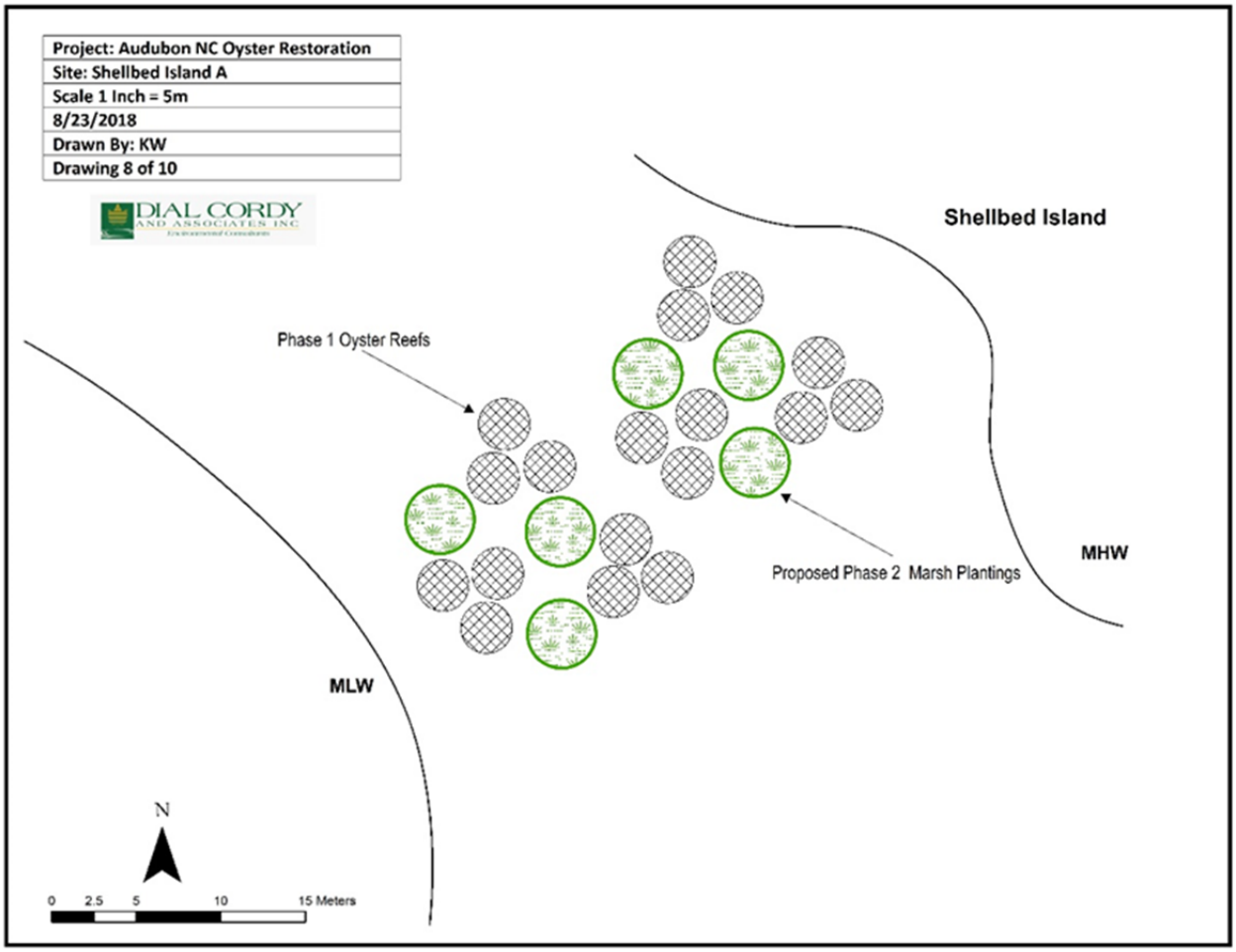


Figure 6. Conceptual Tidal Marsh Wetland Areas Planting Plan

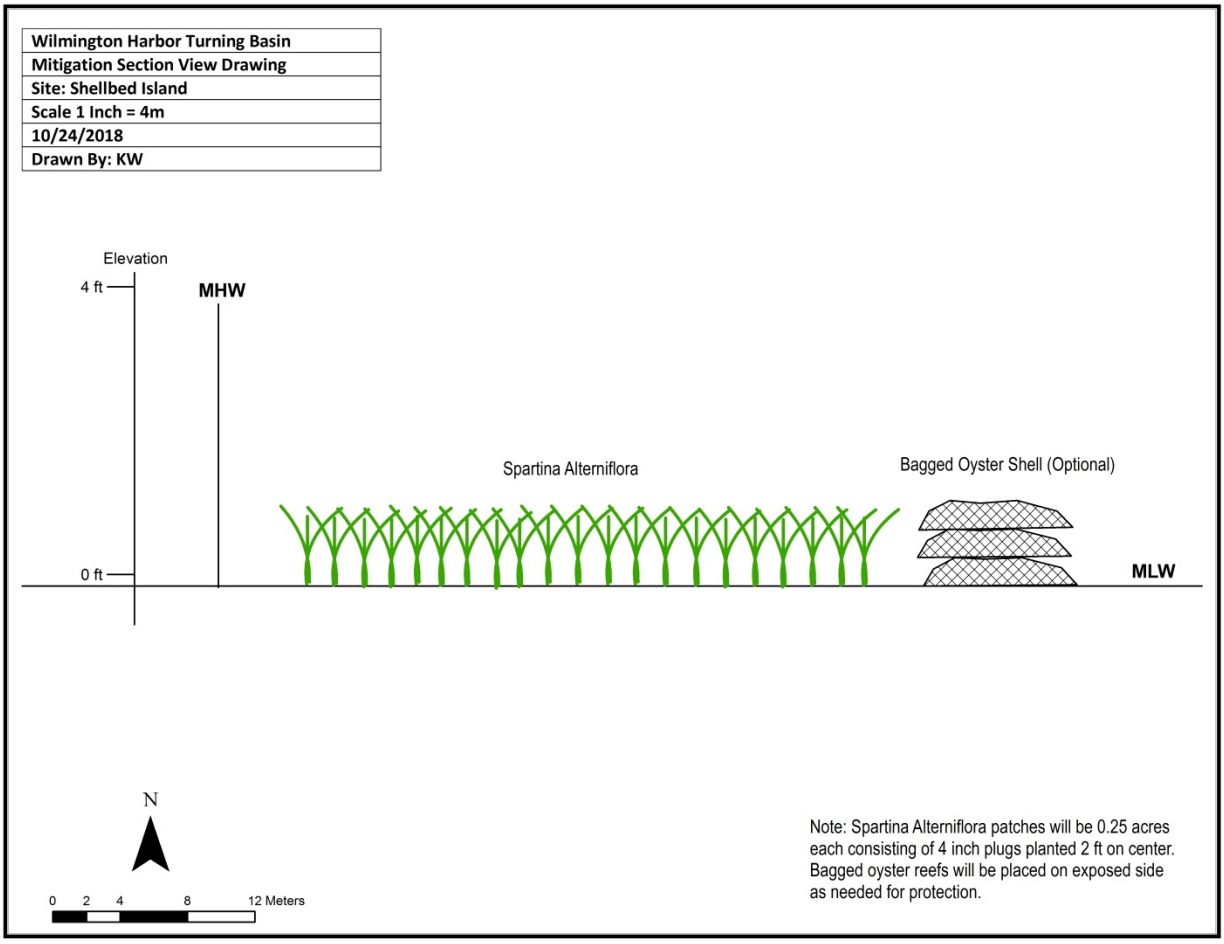


Figure 7. Conceptual Cross-sectional View of Proposed Wetland Planting Site

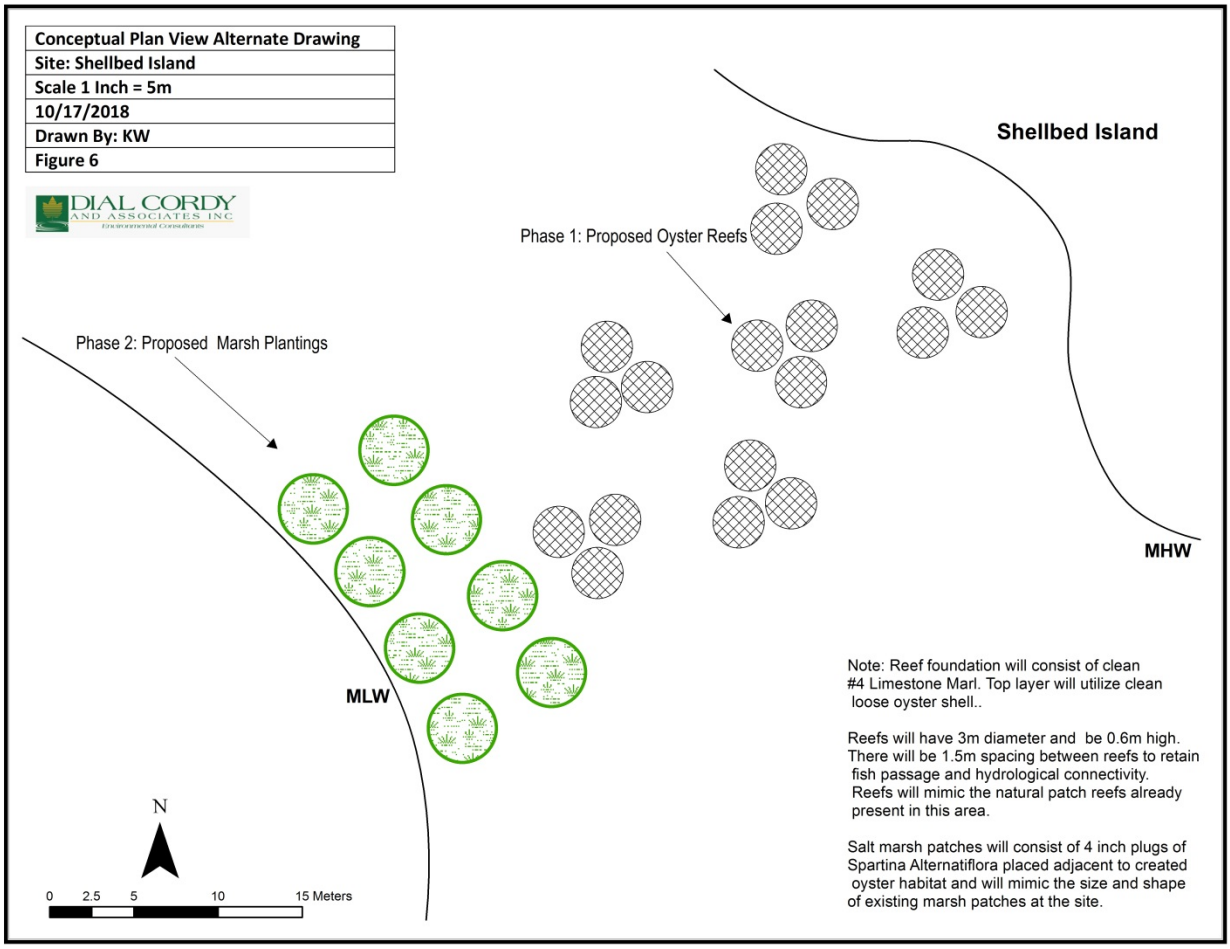


Figure 8. Alternative Siting Plan without Oyster Reef Restoration

APPENDIX A

NCWAM FIELD ASSESSMENT FORMS AND WETLAND RATING SHEETS

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Port of Wilmington Turning Basin Expansion	Date of Evaluation	15 October 2018
Applicant/Owner Name	NC State Ports Authority/Kinder Morgan	Wetland Site Name	Wetland Assessment Area 1
Wetland Type	Brackish/Salt Marsh	Assessor Name/Organization	Rahlff Ingle (DCA)
Level III Ecoregion	Middle Atlantic Coastal Plain	Nearest Named Water Body	Cape Fear River
River Basin	Cape Fear	USGS 8-Digit Catalogue Unit	03030005
County	New Hanover	NCDWR Region	Wilmington
☐ Yes ☉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.210087° -77.953815°

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☉ No

Regulatory Considerations - Were regulatory considerations evaluated? ☉ Yes ☐ No If Yes, check all that apply to the assessment area.

- ☑ Anadromous fish
- ☑ Federally protected species or State endangered or threatened species
- ☐ NCDWR riparian buffer rule in effect
- ☑ Abuts a Primary Nursery Area (PNA)
- ☐ Publicly owned property
- ☑ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- ☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- ☐ Designated NCNHP reference community
- ☑ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

- ☐ Blackwater
- ☐ Brownwater
- ☑ Tidal (if tidal, check one of the following boxes) ☉ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☉ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☉ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☉ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☉ A	☉ A	Not severely altered
☐ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☉ A	☉ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☐ D	Depressions able to pond water < 3 inches deep

3b. ☐ A Evidence that maximum depth of inundation is greater than 2 feet

☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☐ C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☐ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☐ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☐ A No peat or muck presence
- ☐ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☐ A	Little or no evidence of pollutants or discharges entering the assessment area
☉ B	☉ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☐ B	☐ B	☐ B	Confined animal operations (or other local, concentrated source of pollutants)
☐ C	☐ C	☐ C	≥ 20% coverage of pasture
☐ D	☐ D	☐ D	≥ 20% coverage of agricultural land (regularly plowed land)
☐ E	☐ E	☐ E	≥ 20% coverage of maintained grass/herb
☐ F	☐ F	☐ F	≥ 20% coverage of clear-cut land
☐ G	☐ G	☐ G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent dainage and/or overbank flow from affectio the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?

☉ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.

7b. How much of the first 50 feet from the bank is weltand? (Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☉ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☐ ≤ 15-feet wide ☉ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☉ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☐ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☉ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☉ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ◉ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

- ☐ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
◉ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☐ F	◉ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

◉ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directiions? If the assessment area is clear-cut, select option "C."

- ☐ A 0
- ☐ B 1 to 4
- ☐ C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☐ B	Moderate density mid-story/sapling layer
	☐ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☐ B	Moderate density shrub layer
	☐ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☐ B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

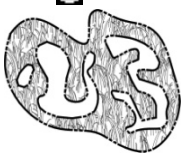
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

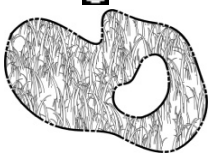
Include both natural debris and man-placed natural debris.

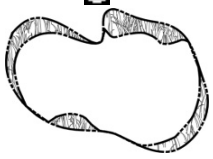
☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐ B Not A

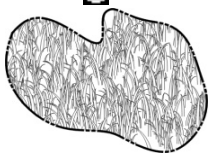
21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A 

☐ B 

☐ C 

☐ D 

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

See wetland mitigation plan

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 5

USACE AID#:		NCDWR #:	
Project Name	Port of Wilmington Turning Basin Expansion	Date of Evaluation	15 October 2018
Applicant/Owner Name	NC State Ports Authority/Kinder Morgan	Wetland Site Name	Wetland Assessment Area 2
Wetland Type	Brackish/Salt Marsh	Assessor Name/Organization	Rahlff Ingle (DCA)
Level III Ecoregion	Middle Atlantic Coastal Plain	Nearest Named Water Body	Cape Fear River
River Basin	Cape Fear	USGS 8-Digit Catalogue Unit	03030005
County	New Hanover	NCDWR Region	Wilmington
☐ Yes ◉ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.210087° -77.953815°

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ◉ No

Regulatory Considerations - Were regulatory considerations evaluated? ◉ Yes ☐ No If Yes, check all that apply to the assessment area.

- ☑ Anadromous fish
- ☑ Federally protected species or State endangered or threatened species
- ☐ NCDWR riparian buffer rule in effect
- ☑ Abuts a Primary Nursery Area (PNA)
- ☐ Publicly owned property
- ☑ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- ☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- ☐ Designated NCNHP reference community
- ☑ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

- ☐ Blackwater
- ☐ Brownwater
- ☑ Tidal (if tidal, check one of the following boxes) ◉ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ◉ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ◉ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ◉ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☐ A	Not severely altered
◉ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐ A	☐ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
◉ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☐ D	Depressions able to pond water < 3 inches deep

3b. ☐ A Evidence that maximum depth of inundation is greater than 2 feet

☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☐ C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☐ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☐ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☐ A No peat or muck presence
- ☐ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☐ A	Little or no evidence of pollutants or discharges entering the assessment area
☉ B	☉ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☐ B	☐ B	☐ B	Confined animal operations (or other local, concentrated source of pollutants)
☐ C	☐ C	☐ C	≥ 20% coverage of pasture
☐ D	☐ D	☐ D	≥ 20% coverage of agricultural land (regularly plowed land)
☐ E	☐ E	☐ E	≥ 20% coverage of maintained grass/herb
☐ F	☐ F	☐ F	≥ 20% coverage of clear-cut land
☐ G	☐ G	☐ G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent dainage and/or overbank flow from affectio the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?

☉ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.

7b. How much of the first 50 feet from the bank is weltand? (Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☉ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☐ ≤ 15-feet wide ☉ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☉ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☐ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☉ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☉ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ◉ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

- ☐ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
◉ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☐ F	◉ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

◉ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directiions? If the assessment area is clear-cut, select option "C."

- ☐ A 0
- ☐ B 1 to 4
- ☐ C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
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- ☐ C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
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17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☐ B	Moderate density mid-story/sapling layer
	☐ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☐ B	Moderate density shrub layer
	☐ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☐ B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

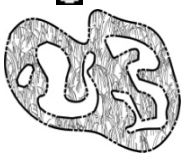
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

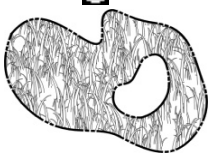
Include both natural debris and man-placed natural debris.

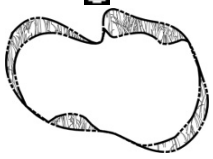
☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐ B Not A

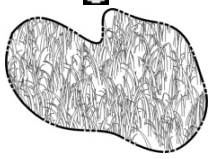
21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A 

☐ B 

☐ C 

☐ D 

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

See wetland mitigation plan