Accomack-Northampton Planning District Commission

Application for
FY 27 Virginia Marine Resources Commission
Waterway Maintenance Fund

Table of Contents

Statement of Need and Urgency 4
Background & Previous Efforts 6
Geographic Area & Navigable Waters 7
Waterway Selection Process 8
Economic Justification & Statement of Urgency 9
Project Management & Implementation Strategy 11
Project Timeline 16
Project Costs 19
Current VPA Projects & Projected Funding Needs 21
Project Balances End of CY2025 22
Supporting Documentation 23

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FY27 Folly Creek Funding Request: $2,744,000

Cover Photograph: Accomack County (February 2026)

Statement of Need and Urgency

The Folly Creek Maintenance Dredging Project is a critical investment in maintaining navigability for one of Accomack County's most heavily used rural public boating access corridors while supporting water-dependent livelihoods, safe harbor function, and public safety access on Virginia's Eastern Shore. Condition surveys shown on the permit drawings indicate shoaling along this shallow-draft navigation channel and the need for dredging to restore navigability.

Figure 1. Shoaling within Folly Creek

Folly Creek is a non-federal state waterway that does not benefit from a federally maintained east-west project channel that would provide an alternate route for users attempting to reach Metompkin Inlet and the Atlantic beyond. This is especially significant in a rural coastal setting where access points are limited and the loss of reliable navigation in one channel can have outsized impacts on communities and water-dependent operations.

The project reach proposed in the draft permit package requests dredging of approximately 5,000 linear feet from the Folly Creek boat ramp to the east, restoring a functional navigation template with a 60-foot bottom width, 3:1 side slopes, and a -6 ft MLLW design depth (with allowable overdepths per the plan). Dredging is expected to be completed by mechanical dredging, with barge/scow transport and transfer at the Folly Creek boat ramp location, reflecting the site's physical constraints and rural logistics. The dredged material characterization (predominantly fine-grained clay/sandy clay with high fines content) further underscores the need for careful placement planning and reinforces the project's readiness for disciplined dredged material management. The need is not theoretical—it is documented and experienced daily by local users. The Eastern Shore Regional Dredging Needs Assessment (RDNA) describes Folly Creek as having approximately 1 foot of depth to the landing at its head (three miles above the mouth), and notes that Metompkin Inlet is used by small local fishing and oyster boats but that the entrance channel is changeable and unmarked, requiring local knowledge. This combination—shoaling within the creek and a dynamic inlet system—amplifies navigation risk and emphasizes why maintaining the "main creek" access is essential for safe, predictable movement.

Local stakeholders have underscored both urgency and impact. As Accomack County Public Works Director Stewart Hall stated, "That landing is one of our most used facilities. It is getting exceedingly difficult to get to the north end of Cedar Island or the south end of Metompkin with an outboard… certainly we should try to maintain the main creek." These limitations translate into concrete public costs: reduced access windows at low tide, increased risk of groundings, longer travel routes, and reduced reliability for reaching sheltered waters—especially during deteriorating weather conditions when safe harbor access becomes most critical.

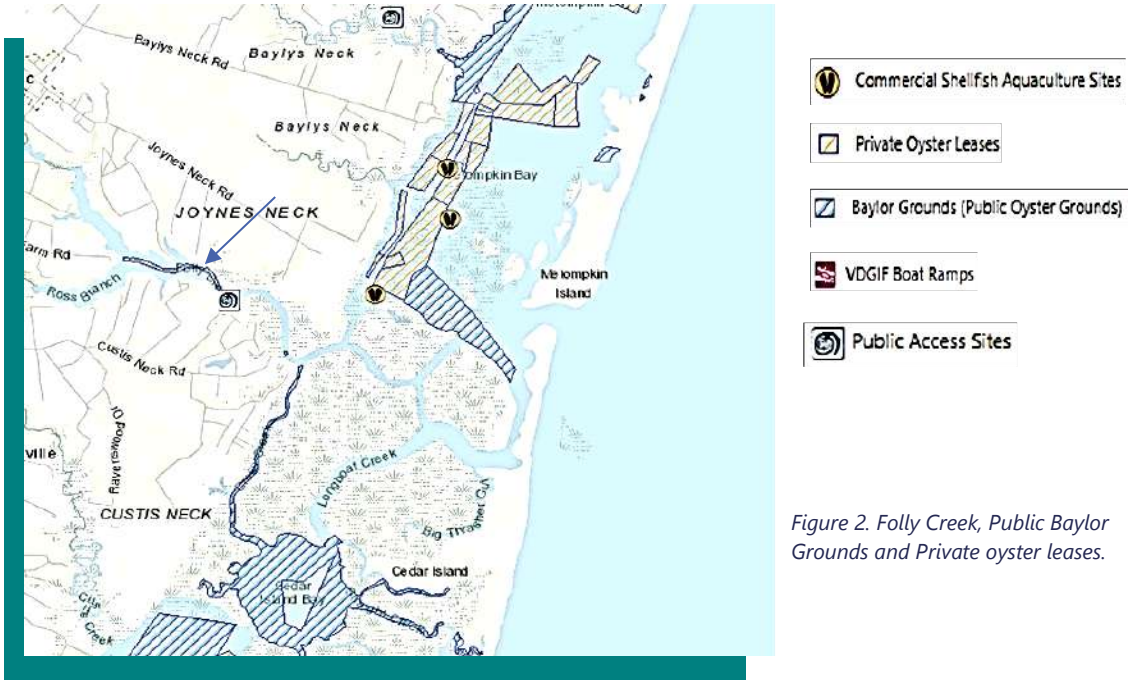

Figure 2. Folly Creek, Public Baylor Grounds and Private oyster leases.

The waterway's significance also reflects its role in supporting water-dependent commercial activity. Prior A-NPDC WMF materials document that local watermen consistently utilize Folly Creek to access public Baylor grounds and private oyster leases in nearby waters (Metompkin Bay north of the ramp and Cedar Island Bay south of the ramp). Maintaining navigability therefore supports not only recreation but also the continuity of fisheries and aquaculture access that rural communities depend upon.

Accomack County has made substantial recent capital investments in Folly Creek Landing, underscoring both the facility's importance and the urgency of maintaining navigable access to protect that public investment. In 2020 Folly Creek Landing boat ramp was completely renovated, including two new ramps, new bulkheads, and a gangway connection between a new wooden dock and a floating dock. With more than $482,000 in County investment, Folly Creek Landing is a major public asset and warrants dependable water access maintained through routine dredging. Given the County's investment, maintaining navigable access through dredging is essential to protect and realize the public benefit of that infrastructure.

Finally, Folly Creek has advanced through a deliberate, phased planning pathway designed by A-NPDC and the Eastern Shore Regional Navigable Waterways Committee, moving from identification and prioritization in regional planning to the development of permit-ready implementation materials. The draft permit package now includes a Folly Creek-specific Dredged Material Management Plan detailing project reach, channel template, dredging method, transfer logistics, and estimated dredge quantities (9,100 CY within the paid template; up to 17,200 CY at maximum allowable template). This is a shovel-ready posture: the need is documented, the community reliance is established, and the implementation approach is defined.

Background & Previous Efforts

The Eastern Shore has long relied on navigable creeks and inlets for working waterfront activity, recreation, and safe harbor access. Recognizing the need for coordinated management, Accomack and Northampton Counties established the Eastern Shore Regional Navigable Waterways Committee (ESRNWC) through joint action, and A-NPDC has staffed and supported that work for years through regional planning and project development. Recognizing the need to maintain navigable waterways, Accomack and Northampton Counties formalized the Eastern Shore Regional Navigable Waterways Committee (ESRNWC) through a Joint Resolution. This committee has since served as a central voice for regional waterway management, working closely with the U.S. Army Corps of Engineers Norfolk District, state and federal agencies, and key stakeholders, including commercial watermen and aquaculture operators.

In 2016, the ESRNWC and A-NPDC staff developed the Regional Dredging Needs Assessment, providing a strategic framework for prioritizing and managing dredging projects across the Eastern Shore. At the same time, A-NPDC was actively engaged in the development of the Virginia Working Waterfront Master Plan in collaboration with the Northern Neck PDC, Middle Peninsula PDC, and Hampton Roads PDC. This initiative, funded by the Virginia Coastal Zone Management Program (CZM) through Grant #NA15NOS4190164, helped outline a comprehensive approach to sustaining waterfront-dependent industries and addressing the long-term viability of navigable waterways. By 2018, when the Virginia General Assembly established the Virginia Waterway Maintenance Fund (WMF), the ESRNWC and A-NPDC were well-positioned to secure funding for preliminary engineering services to support shallow-draft maintenance dredging. With the full backing of Accomack and Northampton Counties, the ESRNWC was able to launch several critical dredging initiatives, including Nassawadox Creek, Kings Creek, Folly Creek, and Red Bank Creek, ensuring these waterways remained accessible for maritime commerce, recreation, and emergency response.

The completion of the Kings Creek Phase 2 Dredging and Beneficial Use Project in November 2023 marked a significant milestone in regional dredging efforts. A total of 22,888 cubic yards of material was removed and utilized for beach restoration in Cape Charles. The project, executed by Michel's Construction, Inc. and Waterway Surveys & Engineering, Ltd., successfully addressed both navigational needs and shoreline stabilization. The $1.38 million project stands as a model for beneficial use dredging, demonstrating how dredged material can be repurposed to enhance coastal resilience while maintaining navigability.

At the same time, the region has taken proactive steps toward long-term dredged material management through the Middle Peninsula & Eastern Shore Dredge Material Management Initiative. This initiative, funded through a $3.04 million VPA Waterway Maintenance Grant (FY25), aims to create dedicated master plans for dredge material placement in both the Middle Peninsula and the Eastern Shore. By identifying and leasing strategic placement sites, the initiative will provide sustainable solutions for managing dredged material, expanding beneficial use opportunities such as habitat restoration and coastal resilience projects, and addressing regulatory challenges that often hinder dredging efforts.

The Eastern Shore continues to lead the way in sustainable waterway management, thanks to a strong foundation of regional collaboration, strategic planning, and proactive project implementation. The successful completion of the Kings Creek Dredging and Beneficial Use Project, the advancement of the Folly Creek dredging effort, and the launch of the Middle Peninsula & Eastern Shore Dredge Material Management Initiative underscore the region's commitment to maintaining navigable waterways, supporting local economies, and enhancing coastal resilience. With continued support from state, federal, and local partners, these efforts will help safeguard the Eastern Shore's maritime infrastructure and environmental sustainability for years to come.

Geographic Area & Navigable Waters

The Eastern Shore of Virginia (ESVA) is a unique and environmentally rich coastal peninsula, stretching approximately 70 miles between the Chesapeake Bay and the Atlantic Ocean. This region is composed of two counties—Accomack and Northampton—along with nineteen incorporated towns, each with deep historical ties to the water. The peninsula is shielded from direct Atlantic exposure by an extensive barrier island system and expansive tidal marshes, which play a vital role in buffering against coastal storms and providing critical habitat for fisheries and wildlife. However, these natural features also contribute to sediment transport and deposition, exacerbating shoaling and navigational challenges in the region's waterways.

Figure 3. ESVA State and Federal Managed Waterways

Historically, both natural processes and human activities have influenced sedimentation patterns in the Eastern Shore's creeks, many of which have experienced progressive infill due to changes in storm intensity, frequency, and sea-level rise. These shifts in coastal dynamics have made navigation increasingly difficult, impacting both commercial and recreational waterway users. Addressing these challenges through maintenance dredging is essential not only for restoring access to vital waterways but also for leveraging the beneficial use of dredged materials to combat coastal erosion, mitigate flooding, and enhance habitat resilience.

Navigable waters, as defined by U.S. 33 CFR §329.4 (2023), include "those waters that are subject to the ebb and flow of the tide and/or are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce." These waterways serve as the backbone of the Eastern Shore's maritime economy, supporting a diverse range of industries and activities. The region has long relied on its navigable creeks, bays, and inlets to sustain commercial fishing, aquaculture, tourism, and transportation. From historic oystering fleets to modern ecotourism ventures, the Eastern Shore's economy is deeply intertwined with the accessibility and functionality of its waterways.

The importance of navigability extends beyond economic considerations; it is a matter of public safety and infrastructure resilience. Shoaling in critical waterways not only disrupts commercial activities but also impedes emergency response efforts, particularly in remote island and coastal reliant communities such as Chincoteague Island, Onancock, Willis Wharf, Tangier Island, and Cape Charles where waterways serve as vital economic and primary transportation routes. Ensuring reliable navigation supports local economies, sustains cultural heritage, and enhances coastal resilience in the face of climate-driven changes.

The Eastern Shore is home to the largest concentration of working waterfronts in Virginia, with over 200 sites identified in the Virginia Working Waterfront Master Plan. These working waterfronts are defined as properties that provide direct access to coastal waters and support commercial and recreational marine activities. Industries dependent on these waterfronts include commercial and recreational fishing, aquaculture, ecotourism, boat building, marine research, offshore energy support, and national defense. Many of these industries, particularly aquaculture and commercial fishing, rely on year-round access to navigable waters to harvest shellfish, transport

goods, and sustain local employment.

Public boat ramps, which are essential to both recreational and commercial users, further underscore the need for dredged waterway maintenance. These ramps facilitate access for commercial watermen harvesting clams, oysters, crabs, and fish, as well as for ecotour guide operators, charter fishing businesses, and recreational boaters. With tourism generating nearly $250 million annually for the Eastern Shore economy and commercial seafood landings exceeding $49 million, ensuring the long-term viability of navigable waterways is not just a local concern—it is a statewide economic imperative.

As the Eastern Shore continues to face the realities of rising sea levels and increasing coastal erosion, a proactive approach to dredging and waterway maintenance will be crucial. By integrating beneficial use strategies—such as placing dredged materials in ways that reinforce eroding shorelines or restore marsh habitats—regional projects can serve dual purposes: maintaining economic access while enhancing environmental resilience. These efforts will not only protect the livelihoods of those who depend on the water but also ensure that the Eastern Shore remains a thriving maritime hub for future generations.

Waterway Selection Process

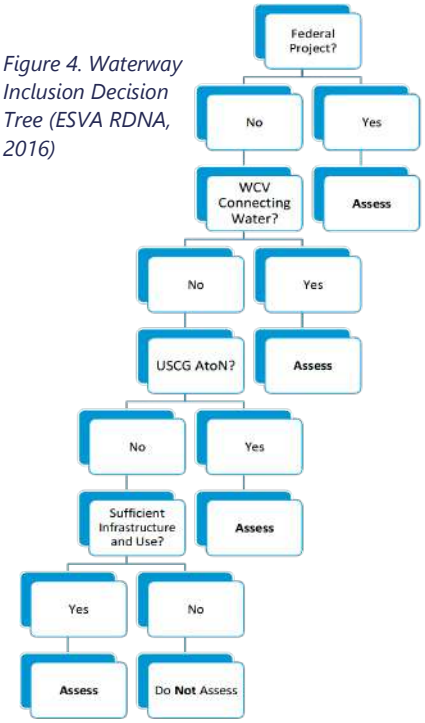

Figure 4. Waterway Inclusion Decision Tree (ESVA RDNA, 2016)

The Eastern Shore of Virginia (ESVA) relies on its network of navigable waterways to support commercial fishing, aquaculture, ecotourism, recreational boating, and waterfront access for coastal communities. As these waterways continue to experience natural sedimentation, shoaling, and restricted access, a strategic and data-driven approach is required to prioritize dredging efforts. The Regional Dredging Needs Assessment (RDNA) was developed to provide a comprehensive evaluation of the Eastern Shore's waterways, identifying critical areas where navigation has become restricted to the point that dredging is necessary for continued use.

The RDNA inventories and evaluates waterways based on a set of objective criteria established by the Accomack-Northampton Planning District Commission (A-NPDC) in collaboration with the Eastern Shore Regional Navigable Waterways Committee (ESRNWC). This assessment ensures that dredging projects are pursued based on actual need, environmental feasibility, and economic benefit. The Waterway Inclusion Decision Tree (Figure 4) was developed as part of this process to systematically determine whether a waterway should be included in regional dredging plans. The criteria consider multiple factors, including:

- **Current Navigability:** Water depth at mean low water (MLW) and the presence of significant shoaling.
- **Usage & Economic Impact:** The level of commercial and recreational activity dependent on the waterway.
- **Public Access & Infrastructure:** Proximity to boat ramps, working waterfronts, and community access points.
- **Environmental Considerations:** Potential impacts on submerged aquatic vegetation (SAV) and habitat restoration opportunities.

Folly Creek illustrates the type of documented, on-the-water constraint the RDNA was designed to capture and

prioritize. RDNA describes Folly Creek as a seaside creek leading from the south end of Metompkin Bay and reports extremely limited depths—approximately 1 foot to the landing at its head (with the RDNA's non-federal channel summary table listing ~1.2 feet at MLW). RDNA also notes the presence of a County launching ramp and pier along Folly Creek (about one mile west of Light 87), confirming that navigation constraints affect a public access corridor, not simply an undeveloped shoreline. In addition, RDNA's table identifies Folly Creek (SW04) as "Never" dredged, underscoring the chronic nature of the constraint and the importance of establishing a sustainable maintenance pathway for this non-federal rural waterway.

The RDNA further reinforces that dredging need on the seaside is closely tied to safe and reliable access to ocean inlets and adjacent working waters. In the Folly Creek/Metompkin system, RDNA notes that Metompkin Inlet is used by small local fishing and oyster boats, but the entrance channel is changeable and unmarked and should not be entered without local knowledge. This context underscores why maintaining reliable access through primary creek corridors is essential for safe operations and predictable passage for rural users.

The results of the RDNA reaffirmed the critical role that dredged waterways play in sustaining the Eastern Shore's coastal economy and cultural heritage. Water-dependent industries such as aquaculture, commercial fishing, and charter tourism generate millions in economic activity each year, supporting thousands of jobs across the region. The loss of navigability in key waterways jeopardizes these industries, making routine dredging and channel maintenance essential.

In addition to direct economic benefits, dredging also ensures the safety and accessibility of local waterways. Many Eastern Shore communities—particularly those located on barrier islands and remote coastal areas—depend on navigable channels for transportation, emergency response, and public safety. Ensuring that waterways remain open and well-maintained provides a lifeline for these communities, safeguarding their connectivity to mainland resources and services.

By utilizing a structured, data-driven approach to waterway selection, the A-NPDC and ESRNWC continue to advance a region-wide strategy for sustainable dredging. This process not only prioritizes projects that yield the greatest economic and environmental benefits but also ensures that limited state funding is directed to the areas of highest need. Moving forward, the integration of beneficial use strategies—such as placing dredged material to restore shorelines and marsh habitats—will enhance both the long-term sustainability of these projects and the resilience of the Eastern Shore's coastal environment.

Economic Justification & Statement of Urgency

The Eastern Shore of Virginia (ESVA) depends on its waterways for economic stability, public safety, and long-term resilience. Yet ongoing sedimentation and rapid shoaling in shallow-draft channels—including Folly Creek—continue to restrict access for commercial watermen, aquaculture operators, recreational boaters, and emergency responders. The Folly Creek Maintenance Dredging Project is essential to restore reliable navigation at a heavily used public access point and to sustain access to working waters connected to Metompkin Bay/Inlet and the Atlantic beyond. RDNA documents Folly Creek's constrained conditions, including ~1 foot depth to the landing at its head (with the non-federal summary table listing ~1.2 ft at MLW) and notes the presence of a County launching ramp and pier in the Folly Creek corridor.

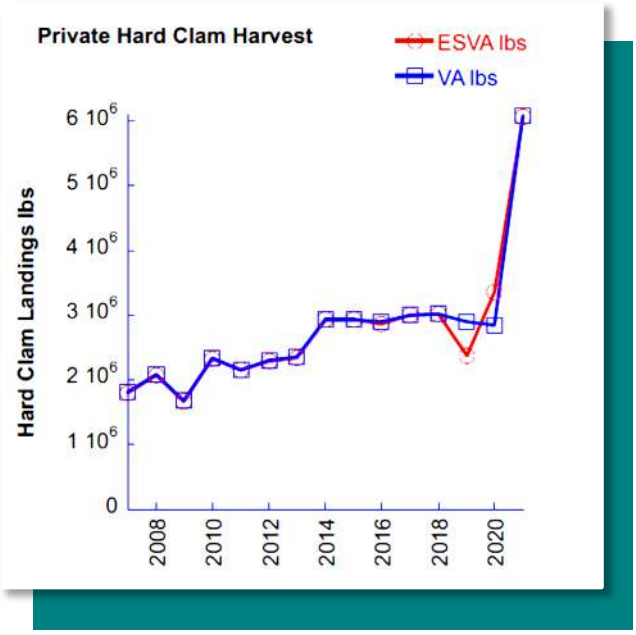

Figure 5. VA and ESVA Hard Clam Landings 2008-2020

The economic value supported by navigable waterways on ESVA is substantial, and Folly Creek is directly tied to that water-dependent economy. In 2021, commercial seafood landings generated $79.04 million for the region, including a dominant share of Virginia's clam production (the FY26 WMF attachments cite ESVA producing 99.9% of Virginia's total clam harvest, valued at $57.68 million) and significant landings of blue crabs (6.57 million pounds valued at $11.69 million). Access constraints at Folly Creek matter because local watermen and aquaculture operators use this waterway to reach public Baylor grounds and private oyster leases in adjacent waters—specifically Metompkin Bay north of the ramp and Cedar Island Bay south of the ramp—meaning reduced navigability directly threatens the reliability and safety of getting to and from working grounds.

Beyond fisheries and aquaculture, ESVA's visitor economy is strongly tied to waterfront access and coastal recreation. Tourism impact reporting shows direct visitor spending on the Eastern Shore reached $247.9 million in 2023, and more recent reporting indicates spending increased to $261.6 million in 2024, supporting 1,869 tourism jobs and generating $14 million in local tourism-related taxes. These benefits depend on safe, functional access at public landings. Folly Creek Landing is not a minor facility: Accomack County has recently invested in the site by fully renovating the landing, adding two new boat ramps, new bulkheads, and a dock/gangway system connecting to a floating dock—improvements the County highlighted as benefiting both watermen and recreational users. (Additionally, public reporting during construction described the ramp/dock replacement as roughly a $482,000 project, reinforcing that this is a significant public asset that requires dependable water access to deliver its full public return.).

ESVA counties total landings value and weight.	SUM VALUE	SUM POUNDS
Accomack	$21,288,907	6,885,210
Northampton	$57,753,347	9,115,504
	$79,042,254	**16,000,714**

ESVA Direct Visitor Spending 2019-2023 (in millions)						
	2019	**2020**	**2021**	**2022**	**2023**	**Percent Change (2023/2019)**
ACCOMACK	$134.7	$118.2	$168.5	$166.4	$179.6	33.3%
NORTHAMPTON	$48.5	$41.2	$68.3	$66.0	$68.3	40.9%
ESVA **Regional Total**	**$183.2**	**$159.4**	**$236.8**	**$232.4**	**$247.9**	**35.3%**

Public safety is an equally compelling driver. RDNA notes that Metompkin Inlet is dynamic and that its entrance channel is changeable and unmarked and should not be entered without local knowledge—making reliable access through primary creek corridors especially important for safe operations in rural seaside waters. Local leadership has underscored the real-time impacts of shoaling at Folly Creek: Accomack County Public Works Director Stewart Hall described the landing as one of the County's most used facilities and stated it is becoming 'exceedingly difficult' for shallow-draft vessels to reach the north end of Cedar Island or the south end of Metompkin; he added that even if the inlet is too dynamic to maintain, 'certainly we should try to maintain the main creek'. When shoaling constrains a primary access corridor, the result is not only economic disruption but also elevated risk—groundings, tide-limited access windows, and reduced reliability for safe-harbor use and response operations in rapidly changing conditions. The urgency of the Folly Creek project is heightened by its documented navigation constraints and clear readiness for implementation, enabling timely procurement and construction within the WMF funding cycle. RDNA identifies Folly Creek as never dredged, underscoring the chronic nature of the restriction. Meanwhile, the current permit/DMMP framework for Folly Creek defines a practical maintenance template (e.g., a 60-foot bottom width, 3:1 side slopes, and a -6 ft MLLW design depth with allowable overdepths) and anticipates mechanical dredging consistent with rural logistics. The project also presents a forward-looking opportunity to pursue beneficial use as an add alternate—thin-layer placement and/or marsh enhancement—if feasible sites clear screening and permitting, without compromising the base goal of restored navigation.

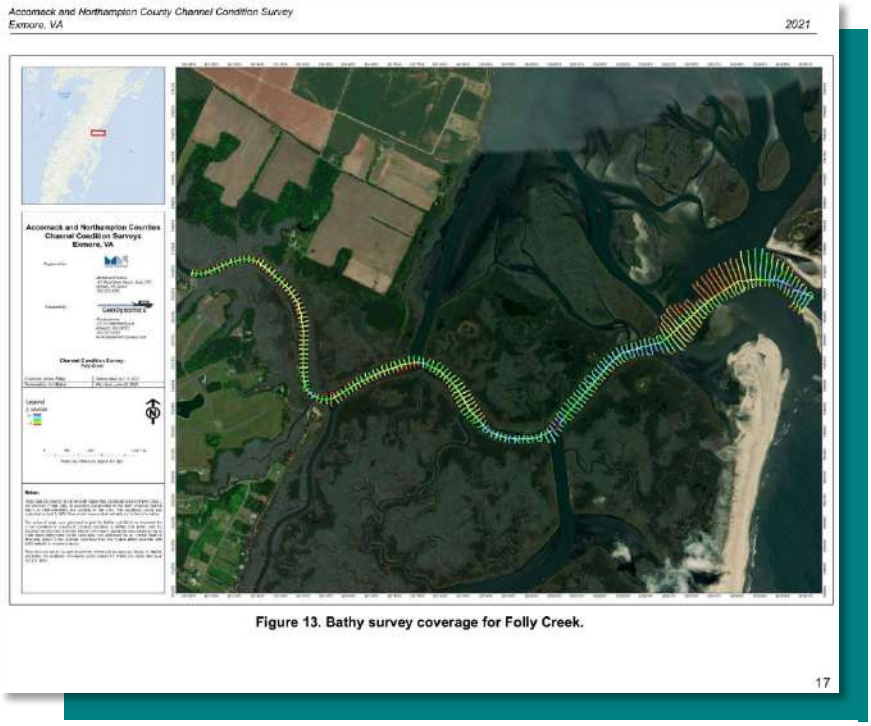

Figure 6. 2021 Folly Creek Channel Condition Survey

In short, the Folly Creek Maintenance action: it is more than an investment in ESVA's working waterfront economy, public access infrastructure, tourism and recreation benefits, and rural maritime safety. By securing WMF support, Accomack County and A-NPDC can restore a critical shallow-draft corridor, protect the value of recent public facility investments at Folly Creek Landing, and sustain the connectivity that Eastern Shore communities and industries depend on.

Project Management & Implementation Strategy

The Folly Creek Maintenance Dredging Project will be led by Accomack County, with project oversight, grant administration, and coordination managed by the Accomack-Northampton Planning District Commission (A-NPDC). A-NPDC has extensive experience administering complex federal and state grants and has supported multiple Eastern Shore dredging projects from planning and permitting through procurement, construction coordination, reporting, and closeout.

Project Oversight & Contractor Selection

This project is structured to protect a high-value public access asset—Folly Creek Landing—which Accomack County has recently renovated with two new ramps, new bulkheads, and a dock/gangway system that connects to a floating dock, explicitly intended to serve watermen and recreational users. Because Folly Creek is a non-federal rural shallow-draft waterway and RDNA documents extremely shallow conditions (approximately 1 foot to the landing at the head; ~1.2 feet at MLW in the RDNA table), maintaining reliable navigation access is essential to keep this public facility functional and safe for the users it was upgraded to serve.

Funding & Reimbursement Process

Accomack County will serve as the WMF reimbursement recipient, with reimbursements disbursed based on eligible, documented project expenditures and performance. A-NPDC will manage project tracking, reimbursement documentation, and required reporting to ensure transparency, fiscal accountability, and compliance with WMF requirements.

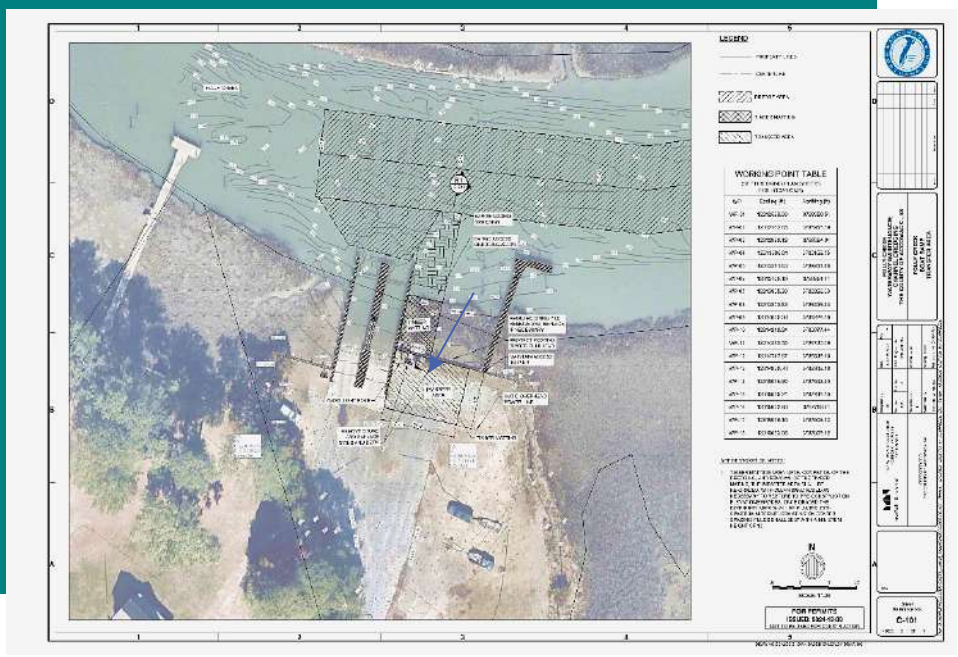

Figure 7. Proposed Transfer/Offload Site

For FY26 and beyond, administration of the Waterway Maintenance Fund has transitioned to the Virginia Marine Resources Commission (VMRC), which serves as the responsible agency for administering the Virginia Waterway Maintenance Grant Fund. A-NPDC will coordinate closely with VMRC on reporting format, invoice support, and closeout documentation to ensure timely reimbursement and full compliance with program requirements.

Dredging & Material Transport Operations

The current permitted framework anticipates dredged material placement uplands at a suitable area to be determined by the contractor, with transport logistics that may include barge/scow movement to the transfer/offload location and trucking to the contractor-selected placement site.

Key Operational Considerations:

- Transfer/Offload Logistics at Folly Creek Landing: The DMMP anticipates the Folly Creek boat ramp as the transfer/offload site; contractor work plans will incorporate ramp protection measures (e.g., mats as needed), traffic control, and restoration of temporarily disturbed areas following completion.
- Tidal/Weather-Driven Scheduling: Dredging and transport activities will be planned around tidal cycles and weather windows to maintain safe operations and minimize disruption to public access.
- Disposal Planning and Compliance: Contractor-sourced upland placement requires careful planning for haul routes, staging, dewatering/handling where applicable, and compliance with all permit conditions.

Parallel Beneficial Use (BU) Add Alternate (if feasible and permitted):

In addition to the base-bid, contractor-sourced upland placement approach, Accomack County and A-NPDC will advance a parallel Beneficial Use (BU) concept that may be incorporated as an add alternate if one or more sites clear feasibility screening, site-control requirements, and permitting within the project schedule. This structure is intentionally designed to preserve the project's core deliverable—restored navigability—while enabling the Commonwealth to capture marsh-resilience co-benefits when a ready, feasible BU site is available. If BU approvals are not secured in time, dredging and placement will proceed under the base bid without delay.

BU Objective and Rationale

The BU add alternate focuses on thin-layer placement and/or marsh enhancement to improve marsh platform elevation, reduce vulnerability to sea level rise and erosion, and strengthen habitat and coastal protection functions. This concept aligns with the region's growing emphasis on pairing navigation maintenance with restoration opportunities when feasible and permitted.

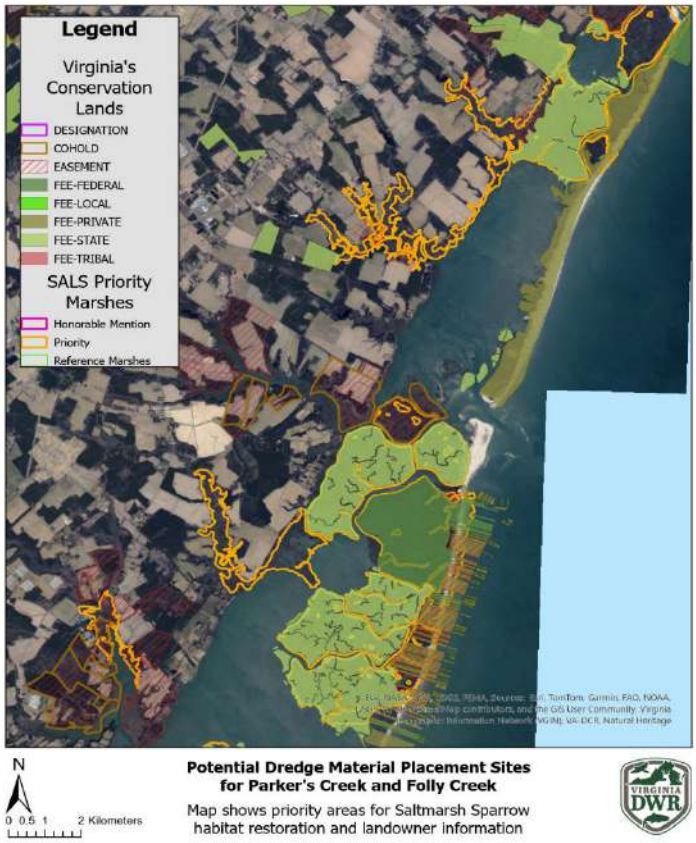

Figure 8. BU SALS Landowner Map

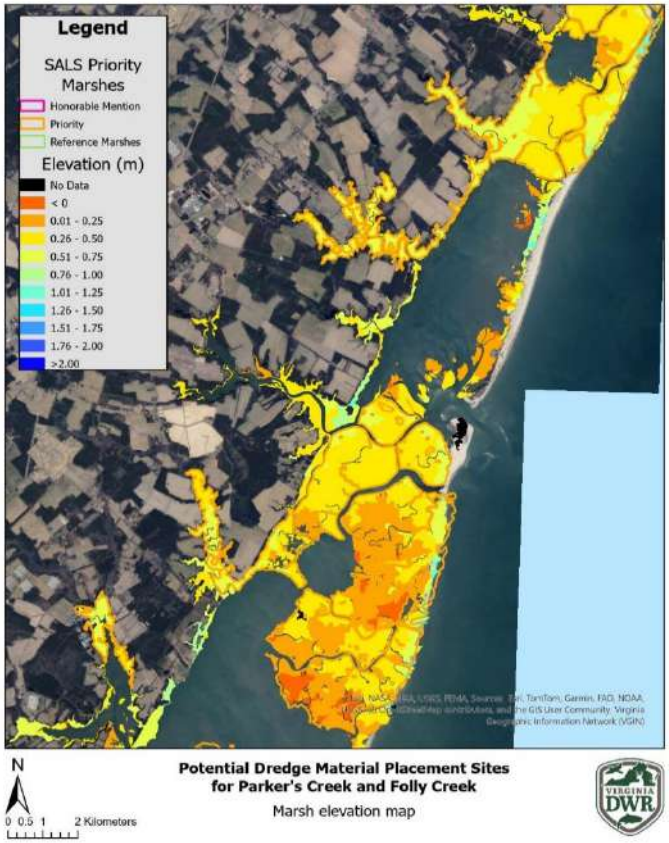

Figure 9. Marsh Elevation Map

Saltmarsh Sparrow Relevance and Conservation Value

Marsh restoration in Accomack County carries added conservation value because Virginia's seaside marshes are identified as the southern extent of the Saltmarsh Sparrow breeding range, and the species is recognized as a Species of Greatest Conservation Need in Virginia. The Atlantic Coast Joint Venture Virginia guidance is explicitly designed to support restoration, enhancement, and conservation actions that maintain persistent, high-quality nesting habitat over the next 10 years while improving long-term salt marsh resilience—goals directly aligned with thin-layer placement and marsh enhancement when site conditions support those measures.

Through coordination with the Virginia Department of Wildlife Resources (DWR), A-NPDC has incorporated third-party conservation planning priorities into early BU screening. DWR has noted that marshes in Accomack have been prioritized for restoration by the Atlantic Coast Joint Venture to benefit high-marsh species such as the Saltmarsh Sparrow, and that beneficial use of dredged material and thin-layer placement are identified tools to restore high marsh habitat for Saltmarsh Sparrows and other marsh-dependent wildlife.

Agency Coordination and Data-Driven Site Screening (DWR)

A-NPDC has initiated coordination with the Virginia Department of Wildlife Resources (DWR) to support identification and screening of candidate marsh sites where sediment placement may deliver durable public benefits. Through this coordination, A-NPDC has obtained GIS layers and screening products that inform feasibility, ownership pathways, and marsh condition—allowing BU opportunities to be evaluated using objective indicators rather than anecdote or convenience siting.

Screening products include:

- **State Marshlands Ownership Context:** Supports early identification of candidate areas on publicly managed marshlands and clarifies that approvals would be required for any state-owned marshland placements.
- **BU + SALS Priority + Landowner Screening Map:** Identifies candidate placement areas in relation to priority marsh designations and landowner/management feasibility categories, supporting early evaluation of site-control practicality and partnership pathways.
- **UVVR (Unvegetated–Vegetated Marsh Ratio) Screening:** Highlights marsh condition and relative instability, supporting prioritization of marshes where sediment enhancement may be most beneficial.
- **Marsh Elevation Screening:** Identifies lower-elevation marshes that may be more susceptible to inundation/subsidence and therefore stronger candidates for thin-layer placement intended to improve marsh persistence.

Together, these products allow the project team to prioritize sites that (1) demonstrate vulnerability indicators consistent with thin-layer placement or marsh enhancement, and (2) have a feasible pathway for permissions, monitoring, and stewardship.

Protection of Existing High-Quality Habitat and Work-Window Considerations

Because the BU add alternate may be implemented in or near habitat used by Saltmarsh Sparrows, the project will follow best-practice precautions in the ACJV guidance to avoid unintended impacts to existing suitable habitat. This includes engaging landowners/land managers and restoration experts early; phasing work when approaches are not widely implemented in similar ecological settings; and avoiding intensive marsh modification during the active Saltmarsh Sparrow breeding season (April–August) and other critical seasonal windows.

Site Control and Approvals Pathway

BU implementation would require site-specific coordination and approvals based on ownership and management. The project's screening approach explicitly accounts for public ownership/management feasibility and the requirements associated with state marshlands and other conservation lands. Final BU site selection will only proceed where site control and permissions are achievable and where placement can be implemented in compliance with applicable permits and environmental requirements.

Add Alternate Structure and Implementation

To maintain schedule certainty and protect the WMF-funded navigation outcome, BU will be structured as an add alternate (or optional bid item) within the procurement package. The add alternate would be activated only if, prior to award or during final pre-construction coordination:

1. A BU site (or sites) is confirmed feasible based on access/logistics and sediment compatibility;
2. required permissions/site control are secured; and
3. the permitting pathway is confirmed for implementation within the project period of performance.

If activated, the BU add alternate would include site-specific design parameters (e.g., target placement thickness ranges, methods to avoid unintended impacts, and documentation/monitoring requirements) consistent with the mapped screening indicators and final permit conditions.

Benefit to the Commonwealth

This approach ensures WMF funds achieve the primary intended purpose—restoring and maintaining navigability in a rural shallow-draft channel—while creating a practical mechanism to realize additional public value through marsh resilience improvements where feasible. By pairing a deliverable base bid with a DWR-informed, data-driven BU add alternate, the project can maximize return on investment without introducing avoidable schedule or implementation risk.

Navigational Aids & PATON Maintenance

Unlike some channels where existing Private Aids to Navigation (PATONs) are a defined project obligation, Folly Creek's navigation marking needs will be addressed based on final permit conditions and post-dredge operating requirements. If private aids (temporary or permanent) are required to enhance mariner safety or mark the maintained channel, Accomack County will coordinate with the U.S. Coast Guard PATON program and comply with applicable federal requirements for establishing and maintaining private aids (including CG-2554 application procedures and 33 CFR Part 66 requirements).

Key Considerations:

- PATON Approval & Compliance: Any PATONs installed will be reviewed/authorized through the appropriate Coast Guard process and maintained per permit requirements.
- Routine Inspection & Maintenance: If PATONs are required, Accomack County will establish an inspection/maintenance schedule to keep aids functional and ensure continued safe navigation following dredging.
- Cost Management: Where marking is necessary, buoy-based aids can be used strategically to improve visibility while limiting long-term maintenance liabilities.

Project Timeline

Folly Creek Channel Dredging – Accomack County

Approximate Project Timeline (Base Bid + BU Add Alternate): To be finalized during negotiations with Contractor

Phase 0 — Pre-Award Readiness and Coordination (Base + BU)

Dredging Activity	Approximate Project Timeframe
Finalize project scope/limits for bid package	**Feb–Mar 2026**
Agency coordination check-in (VMRC/DEQ/USACE as applicable) to confirm permit status, work windows, and any special conditions affecting dredging/placement	**Feb–Apr 2026**
Finalize procurement strategy (IFB vs RFP; base bid + alternates; unit-price vs lump-sum; survey requirements; insurance/bonding)	**Mar–Apr 2026**
BU Track begins (parallel): Coordinate with DWR/partners and refine BU candidate list using your map screening (UVVR, elevation, SALS/landowner layers)	**Mar–May 2026**
BU feasibility Gate #1: Shortlist 1–3 BU candidate marsh sites (or confirm "screening only" if not ready)	**By May 2026**

Phase 1 — Permitting/Authorization Finalization (Base + BU)

Dredging Activity	Approximate Project Timeframe
Confirm JPA/permit package is final (or identify needed amendment, if dredge quantity/template/placement approach changes materially)	**Apr–Jun 2026**
If needed: JPA amendment submission (only if disposal approach changes in a way that must be reflected in permits)	**May–Jun 2026**
Confirm baseline disposal pathway is permitted/allowable (contractor-sourced upland site to be selected, with required approvals)	**May–Jun 2026**

Phase 1 — Permitting/Authorization Finalization (Base + BU)

Dredging Activity	Approximate Project Timeframe
BU Track: Begin BU site permission conversations (VMRC state marshlands / other landowners; partner MOUs if needed)	**May–Jul 2026**
BU feasibility Gate #2: Decide whether BU is realistic this cycle (Yes = keep as add alternate; No = keep as future option)	**By mid-Jul 2026**

Phase 2 — Procurement and Award (Base + BU Add Alternate)

Dredging Activity	Approximate Project Timeframe
Construction services solicitation development (plans/specs, bid schedule, alternates, survey deliverables, disposal requirements, ramp protection/traffic control)	**Apr–Jun 2026**
Solicitation posting period (questions, addenda, site visit)	**Jun–Jul 2026**
Bid opening / evaluation	**Late Jul 2026**
Award negotiations & execution (including confirming disposal plan, staging, and schedule)	**Late Jul–Aug 2026**
BU Track: If feasible, finalize add alternate scope language (site(s), target thickness ranges, access constraints, monitoring expectations)	**Jul–Aug 2026**
BU feasibility Gate #3 ("Go/No-Go for this contract"): Include BU add alternate in executed contract only if site control and permitting pathway are credible	**By contract execution (Aug 2026)**

Phase 3 — Mobilization and Construction (Base Bid)

Dredging Activity	Approximate Project Timeframe
Contractor mobilization to Folly Creek; establish staging/transfer area at Folly Creek Landing; implement ramp protection/traffic control plan	**Sep 1–15, 2026**
Pre-dredge condition documentation: photos + baseline soundings at key points	**Early Sep 2026**
Commence mechanical dredging and transport operations (barge/scow to ramp transfer; trucking to disposal)	**Mid-Sep 2026**
Complete dredging + disposal operations (duration depends on production rate, weather, access limits, and haul distance)	**4–6 weeks typical → Late Sep–Late Oct 2026**
Weather/equipment contingency window	**+2–4 weeks → Through Nov 2026 (if needed)**
Contractor demobilization and site restoration	**Late Oct–Nov 2026**

Phase 4 — Post-Dredge Survey, Documentation, Closeout (Base + BU)

Dredging Activity	Approximate Project Timeframe
Post-dredge hydrographic survey (third party preferred) + as-built surfaces	**Oct–Nov 2026** (or immediately upon completion)
Engineer/PM review of survey vs template; punch list if needed	**Nov–Dec 2026**
WMF closeout documentation: pay estimates, invoices, disposal documentation, photos, survey deliverables	**Dec 2026–Jan 2027**
Final reimbursement package submission	**Jan–Feb 2027**

BU Add Alternate Timeline (Only If "Go" at Gate #3)

BU Implementation (parallel to or immediately after dredging)

Dredging Activity	Approximate Project Timeframe
Finalize BU site access plan, placement method, and monitoring/photo points	**Aug–Sep 2026**
Mobilize BU placement equipment (if different from base bid disposal logistics)	**Sep–Oct 2026**
BU placement (thin-layer and/or marsh enhancement)	**Oct–Nov 2026** *(preferred outside peak nesting windows where feasible)*
BU post-placement documentation (photos, elevation checks if included)	**Nov–Dec 2026**
BU monitoring (light-touch, grant-appropriate)	**Spring 2027 and/or Fall 2027** *(depending on partner capacity and requirements)*

Project Costs

The total estimated cost for the Folly Creek Mechanical Dredging Project (Accomack County) is approximately $2.744 million, accounting for all necessary construction activities, contingencies, and administrative requirements. Because final pricing and scheduling will be determined through procurement and contract negotiations with the prime contractor, the budget is presented as a planning-level estimate based on current unit pricing and anticipated logistics.

The project begins with mobilization and demobilization, estimated at $679,199, to deploy and remove specialized dredging equipment and support resources required for rural shallow-draft operations. The dredging effort itself is based on removing approximately 17,150 cubic yards (CY) to achieve the target template of 6′ MLW with a 1-foot allowable overdepth, at an estimated unit cost of $59 per CY, totaling $1,011,850. Because upland placement requires coordinated trucking logistics, the estimate also includes truck mobilization of $30,180 and truck hauling costs of $266,887, reflecting the equipment, labor, and transport needed to move dredged material from the transfer/offload area to the contractor-selected upland placement site.

Together, these direct dredging and transport components produce a subtotal of $1,988,116. Given the inherent uncertainties associated with shallow-draft dredging—particularly weather and tidal scheduling, production variability, and disposal site logistics—a 20% contingency is included, totaling $397,623, to manage unforeseen conditions and maintain flexibility during implementation. In addition to construction, Permitting, Engineering, and Design are budgeted at $190,859 (8%), supporting regulatory compliance, technical documentation, and final design refinements as needed. Project Planning & Administration are budgeted at $167,002 (7%) to cover procurement support, project oversight, coordination among Accomack County, A-NPDC, contractors, and regulators,

reimbursement documentation, and required reporting through closeout.

Folly Creek Mechanical Dredging– Accomack Approximate Project Costs: To be determined by contract negotiations with the Prime Contractor				
Dredging Activity	**Unit Price**	**Unit**	**Quantity**	**Cost Estimate**
Mobilization/Demobilization	$679,199	EA	1	$679,199
Unit Cost • **6′ MLW + 1-foot allowable over depth (17,150 CY)**	$59	CY	17,150	$1,011,850
Truck Mobilization	$30,180	EA	1	$30,180
Truck Haul	$266,887	EA	1	$266,887
Subtotal				$1,988,116
Contingency (20%)				$397,623
Permitting, Engineering, and Design (8%)				$190,859
Project Planning & Administration (7%)				$167,002
TOTAL				**$2.744M**

Altogether, these components bring the projected total to approximately $2.744 million, representing a comprehensive and strategic investment in restoring navigability in Folly Creek while ensuring fiscally responsible implementation and full documentation for WMF reimbursement and long-term channel management.

Accordingly, A-NPDC requests $2.744 million in WMF support to implement the Folly Creek Mechanical Dredging Project and restore reliable navigability for recreational users, water-dependent commercial activity, and public safety access on Virginia's Eastern Shore.

Current VPA Projects & Projected Funding Needs

Project	Current Status	Estimated Need
Red Bank Creek	• Phase 1B remains active; however, the committee's most recent condition review indicates reduced/deficient dredging need at this time. • ESRNWC has directed staff to pursue administrative reallocation/transfer of remaining Red Bank Phase 1B WMF balance to address higher-priority needs (Nassawadox Phase 1B), subject to WMF/VMRC processing requirements.	**> $4.25M for Phase 2 (planning-level estimate; Phase 2 pursued if future conditions warrant)**
Folly Creek	• Phase 1B is in progress and positioned for implementation transition. Staff and project engineers have determined to advance a mechanical dredging permit pathway with contractor-supplied upland placement as the baseline approach. • A draft JPA package has been completed, including: JPA form; Folly Creek-specific DMMP; gradation/sediment data from vibracore sampling; and permit figures. • Near-term readiness items include finalizing the Adjacent Property Owner (APO) table and preparing the FY27 WMF implementation request.	**~ $2.744M for Phase 2 (current planning estimate; subject to procurement and prime contractor negotiations)**
Nassawadox Creek	• Phase 1B is active and focused on refining the dredged material management pathway following VMRC's denial of the nearshore berm concept; the current strategy is an upland placement alternative (Tangier Island) with associated permit revisions. • Staff and consultants have advanced pre-application coordination and identification/screening of candidate upland areas to support a revised alternatives analysis and resubmittal pathway. • Next steps include completing Phase 1B and initiating Phase 2 scope and procurement development.	**$4.19M for Phase 2 (implementation estimate)**
Dredge Material Management Initiative (DMMI) - ESVA (MPPDC/A-	• The ESVA DMMI is under active implementation with a Project Management Team (PMT) meeting monthly to manage scope, schedule, budget, and coordination across partner agencies. • Current work elements include reimbursement/payment flow; channel prioritization and digital channel delineations; procurement sequencing for technical support scopes; CARP-DMMI integration; and	**FY25 DMMI award: $1,518,600 (project budget; balance tracked through PMT invoicing/expenditure**

NPDC)	data/standards needs (including USACE-standard methods where applicable).	**reporting)**

Project Balances End of CY2025

Balances as of December 31, 2025			
	Revenues	Expenditures	Balance
Kings Creek – Ending Balance	$ 993,144.77		
		$ -	$ 993,144.77
Nassawadox - Northampton	$ 2,362,000.00		
		$ (209,877.58)	$ 2,152,122.42
Nassawadox – ANPDC	$ 1,100,000.00		
		$ (980.00)	$ 1,099,020.00
Nassawadox – Est. Total	$ 4,455,144.77		
		$ (210,857.58)	$ 4,244,287.19
Red Bank	$ 222,060.00		
		$ (134,992.83)	$ 87,067.17
Folly Creek	$ 203,500.00		
		$ (139,333.69)	$ 64,166.31
Dredge Material Management Initiative	$1,518,600.00		
		$ (30,511.35)	$ 1,488,088.65

Supporting Documentation

The below listed supporting documentation is attached to this application.

1. Eastern Shore of Virginia Regional Dredging Needs Assessment. Accomack-Northampton Planning District Commission (A-NPDC) 2016
2. Fisheries Landings for the Eastern Shore of Virginia. Virginia Institute of Marine Science, William and Mary 2021
3. Accomack and Northampton County Channel Condition Surveys. Geodynamics 2021
4. Saltmarsh Restoration Priorities for the Saltmarsh Sparrow: Virginia - Version 2.0. Atlantic Coast
5. Joint Venture 2023
6. Economic Impact of Tourism on Virginia Localities, 2016-2023 Direct Visitor Spending. Tourism Economics 2023
7. Direct Economic Impact and Spending Shares by Industries. Tourism Economics 2024
8. Folly Creek Dredging Joint Permit Application Draft. Moffat and Nichol, 2025
9. Potential Dredge Material Placement Sites for Parker's Creek and Folly Creek – SALS Priority Marshes. Virginia Department of Wildlife Resources 2026

Eastern Shore of Virginia Regional Dredging Needs Assessment

Prepared for: Virginia Coastal Zone Management Program
Prepared by: Accomack-Northampton Planning District Commission

This project was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA15NOS4190164 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended.

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TABLE OF CONTENTS

Preface i
Acknowledgements i
Executive Summary ii

I. INTRODUCTION 1

Geographical and Jurisdictional Setting 1
Mainland Peninsula 1
Islands and Tidal Marshes 2
Eastern Shore Waterways 2

Ecomomic Justification for Need 2

Funding and Maintenance 3
USCG Aids to Navigation 4
Local Commitment to Maintenance 4

II. METHODOLOGY 5

III. RESULTS 9

Federal Waterways 9
CAPE CHARLES CITY HARBOR 17
CHESCONESSEX CREEK 18
CHINCOTEAGUE BAY GREENBACKVILLE 18
CHINCOTEAGUE HARBOR OF REFUGE 19
CHINCOTEAGUE INLET 19
DEEP CREEK (ACCOMACK CO.) 21
GUILFORD CREEK 21
LITTLE MACHIPONGO RIVER 22
NANDUA CREEK 23
OCCOHANNOCK CREEK 23
ONANCOCK RIVER 24
OYSTER CHANNEL 25
PARKER CREEK 25
QUINBY CREEK 26
STARLING CREEK 27
TANGIER CHANNELS 27
WISHART POINT CHANNEL 29
WATERWAY ON THE COAST OF VIRGINIA (WCV) 29

Non-Federal Channels, Creeks, and Waterways of Concern 37
CHINCOTEAGUE UNITED STATES COAST GUARD BASE 41
FOLLY CREEK TO METOMPKIN INLET 41
KINGS CREEK 41
METOMPKIN INLET 41

GARGATHY CREEK 42
GREAT MACHIPONGO INLET AND CHANNEL 42
HUNGARS CREEK 42
HUNTING CREEK 43
NASSAWADOX CREEK (and Church and Warehouse Creeks) 43
PUNGOTEAGUE CREEK 45
RED BANK CREEK 45
QUINBY – EASTERN END OF FEDERAL CHANNEL TO QUINBY INLET 45
WACHAPREAGUE CHANNEL AND DAY MARKER 122 TO WACHAPREAGUE INLET 46

IV. SUMMARY AND CONCLUSIONS 46

Discussion 47

Conclusions 48

V. RECOMMENDATIONS 49

Shallow Draft Navigation and Sediment Management Plan 49

Figures

Figure 1: Waterway Assessment Inclusion Tree 6

Figure 2: Federal Channel Project Area Map 7

Figure 3: USCG AtoN Removal Plans Mapped 8

Figure 4: 2016 Aerial Image of the Mouth of Nassawadox Creek. Photo coutesy of Friends of Nassawadox Creek 44

Figure 5: Waterway Condition Summary 47

Tables

Table 1: Federal Channel Summary Table (17 listed north to south, first seaside then bayside; 32 total, 15 WCV in the next section) 10

Table 2: WCV Summary Table (15 total WCV projects, alphabetically ordered) 31

Table 3: WCV Comprehensive Dredging List 34

Table 4: Non-Federal Channel Summary Table (27, alphabetically ordered) 37

Table 5 : USACE Hurricane Sandy funded Eastern Shore mitigation projects 50

Appendices

APPENDIX A. - INVENTORY OF EASTERN SHORE WATERWAYS **53**

APPENDIX B. - NON-FEDERAL WATERWAYS ASSESSMENT JUSTIFICATION DATA **56**

APPENDIX C. - GLOSSARY **59**

APPENDIX D. - VALUE TO THE NATION **63**

APPENDIX E. - USERS GUIDE TO DREDGING ON THE EASTERN SHORE OF VIRGINIA **65**

APPENDIX F – NOTES AND ADDITIONAL RESOURCES **74**

PREFACE

The purpose of this study was to assess the navigability of the Eastern Shore of Virginia's waterways. The study was conducted for both short-term and long-range planning purposes and was made possible through a grant from the Virginia Coastal Zone Management Program (VCZMP) through the National Ocean and Atmospheric Administration (NOAA). It is expected that additional work will be needed to develop a strategic, comprehensive plan to address dredging needs in the region.

ACKNOWLEDGEMENTS

This project would not have been possible without the work, advice, and guidance provided by the members of the Eastern Shore of Virginia Regional Navigable Waterways Committee, especially the Chairman, Mr. John Joeckel. Neither would this research project have been possible without the assistance of the United States Army Corps of Engineers staff in the Norfolk District office. In addition, previous works by the Middle Peninsula Planning District Commission and the Virginia Institute of Marine Science were valuable resources. It is important to note that any errors or omissions in this report are the responsibility of Accomack-Northampton Planning District Commission staff and not those whom provided assistance along the way.

EXECUTIVE SUMMARY

Safely navigable waterways, dredged to an adequate depth for their varied uses are vital to the economy, culture, and quality of life for residents of and visitors to the Eastern Shore of Virginia. There has been a decline in federal funding for maintenance of federal channels and an absence of state and local funding for non-federally designated waterways. With well over 100 uniquely identified waterways, each with varying degrees of shoaling, a comprehensive evaluation of current conditions was needed.

To begin to accomplish this objective, the Accomack-Northampton Planning District Commission (A-NPDC) partnered with the Eastern Shore of Virginia Regional Navigable Waterways Committee (ESRNWC) and local stakeholders to develop this *Regional Dredging Needs Assessment*. This document provides a comprehensive evaluation of existing conditions in navigable channels and identifies where navigation has become restricted to the point where dredging is needed and is intended to serve as a supplemental resource and first step towards a prioritized regional dredging strategic plan.

Waterways of the Eastern Shore were first inventoried and evaluated using criteria established by the ESRNWC. A total of 59 waterways, including the 32 federal project areas and 27 non-federal waterways, were assessed. In total, about 37% (22) channels were determined to have sections of the waterway with no more than three feet of water depth at mean low water. Of the federal waterways, about 69% do not currently meet their respective authorized depths and about 31% (10), most of which are part of the Waterway on the Coast of Virginia, have sections with less than two feet of water at mean low water. A third of non-federal waterways which are not WCV connecting waters have sections with no more than three feet of water depth at mean low water and almot half (5/12) of the non-federal WCV connecting waters are in this condition. In addition, 81% of all assessed waterways are in need of permits prior to maintenance.

There are additional hindrances to completing dredging projects, including, but not limited to, expired permits and challenges with securing new permits, limited records of historic dredging (especially for the Waterway on the Coast of Virginia), and increased difficulty in securing appropriate dredge spoil locations. However, there are also new discoveries and technologies associated with the beneficial use of dredge spoil, and there are success stories from communities who have ongoing maintenance of their waterways without the use of federal funds.

With continued guidance and data from the United States Army Corps of Engineers, new tools and potential resources such as Section 22 and a regional sediment management plan, and dedicated local stakeholders, this report can be used towards the creation and implementation of a comprehensive strategic regional dredging plan that will ensure the continued safe use and enjoyment of our Eastern Shore waterways.

I. Introduction

This Regional Dredging Needs Assessment provides a comprehensive evaluation of existing conditions in navigable channels and identifies where navigation has become restricted to the point where dredging is needed.

In order to complete this assessment, the Accomack-Northampton Planning District Commission (A-NPDC) worked closely with the Eastern Shore Regional Navigable Waterways Committee (ESRNWC), the United States Army Corps of Engineers (USACE), and the Accomack County Public Works Department. Previous Virginia Coastal Zone Management Program (VCZMP)/National Oceanic and Atmospheric Administration (NOAA)-funded dredging planning projects were considered during the assessment criteria development process. Once criteria were finalized, the A-NPDC compiled information from existing bathymetric surveys and solicited local information from members of the ESRNWC and stakeholders with whom they engaged for up-to-date accounts of existing conditions for channels not previously surveyed and channels not surveyed within recent timeframes.

In an effort to recognize the needs of shallow draft navigation users, the following report has been developed to assist public policy decision makers by defining the existing conditions of local waterways and describing the problems, needs, and opportunities associated with their use and maintenance.

Geographical and Jurisdictional Setting

The Eastern Shore of Virginia is a narrow, approximately 70-mile peninsula separating the Chesapeake Bay from the Atlantic Ocean with two Counties and 19 incoporated Towns. The peninsula is buffered from coastal impacts along its Atlantic coast by a barrier island chain and vast tidal marshes and along some areas of its Chesapeake Bay coast by various islands and tidal marshes. The creeks that shape the Chesapeake Bay coast are in general much larger than those on the ocean or Seaside of the peninsula. Historic land-use activities and changes to the dynamic coastal environments have contributed to the sedimentation of many creeks of the Eastern Shore. Furthermore, the region faces unique challenges with regards to coastal flooding, coastal erosion, and inundation from sea-level rise, in that potential changes in storm intensities and frequency and changes in relative sea-level, will impact sedimentation patterns that affect the shoaling and navigability of coastal waterways.

Mainland Peninsula

The peninsula was both deposited by and shaped by fluctuations in sea level during the past 200,000 years.[1] [2] The highest land elevations vary from approximately 25-50 feet along a “spine” trending

[1] Colman, et al., 1988. The record of major Quaternary sea-level changes in a large Coastal Plain estuary, Chesapeake Bay, eastern United States: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 68, no. 2-4, p. 99–116.
[2] Colman, et al., 1990. Ancient channels of the Susquehanna River beneath Chesapeake Bay and the Delmarva Peninsula: Geological Society of America Bulletin, v. 102, no. 9, p. 1,268–1,279.

northeast-southwest along the center of the peninsula with greater elevations occurring in Accomack County to the north.

Islands and Tidal Marshes

The Eastern Shore of Virginia is buffered from coastal impacts along its Atlantic Coast due largely to the presence of a discontinuous barrier island chain, of which the majority has not been developed as result of conservation efforts. These islands are likely no older than 10,000 years, as their formation had to have followed the end of the last ice age, about 18,000 years ago when sea levels were about 300 feet lower than today.[3]

Eastern Shore Waterways

Many of the navigation channels identified for this report are designated as Federal Navigation Channels, as defined by the USACE. “Navigable Waters” are administratively defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce up to the head of navigation. Shallow draft navigation channels and turning basins are specified as those with a depth of less than 15 feet when measured at mean low water (MLW).[4] According to the Commonwealth of Virginia, "State Waters" means all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands.[5]

Economic Justification for Need

Figures from the Virginia Marine Resources Commission (VMRC) from 2014 indicate that almost $1.5 million of commercial fisheries goods landed on the seaside of the Eastern Shore alone. The USACE determined that the annual value of water-based recreation on the seaside alone is $1,920,741.00 (USACE, 2011.a). This figure is perceived by local members of the ESRNWC as a significant underestimate of the value of recreation on the seaside and thus a misrepresentation of the impact of declining maintenance of the regional waterways (ESRNWC Chairman, personal communication, August 15, 2016). The total value of commercial landings for both Accomack and Northampton Counties from both the seaside and the bayside for 2014 was about $38 million (VMRC, 2016). This value does not include the value associated with recreational boating, support industries, e.g., tackle shops, marinas and boat repair and maintenance services, lodging, restaurants, ecotourism, and other tourism related activities that bring visitors to the Eastern Shore waterways. Data has indicated that the sale value indicated by VMRC is much lower than the actual economic value. For example, in 2013 Northampton County landed about $20 million in clams and oysters, but shellfish farms sold over $36.7 million (Murray, 2014).

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[3] Hein, C.J., Fitzsimons, G.G., FitzGerald, D.M., *Fallon, A.R., 2016, Records of migration and ebb-delta breaching at historic and ancient tidal inlets along a river-fed paraglacial barrier island, Journal of Coastal Research, SI 75, p. 228-232.
[4] USACE. March 1999. Coastal Engineering Technical Note I-63.
[5] Code of Virginia § 62.1-44.3 http://law.lis.virginia.gov/vacode/title62.1/chapter3.1/section62.1-44.3/.

In 2015, the farm gate value for Virginia shellfish aquaculture was $48.3 million (Virginia Shellfish Aquaculture Situation and Outlook Report, April 2016, VIMS), $32.3 million in hard clams and $16.0 million in oysters. The farm gate value of a cultivated product is the net value of the product when it leaves the farm, after marketing costs have been subtracted, and is lower than retail price, as it does not include costs for shipping, handling, storage, marketing, etc.

On the Eastern Shore in 2014, private sector quahog (clam) landings total value for both counties was over $25 million (about 4/5 of that originating in Northampton County). For quahogs, the public sector landing value is almost negligible, but not so for the public sector oyster landings in Accomack County, which were about half of the private landing value. The total public and private sector landing value for oysters was about $7.5 million for both counties Just as the region's aquaculture industry is booming, access to these water-access-only sites are becoming more challenging and dangerous.

Tourism has a significant impact on the Eastern Shore of Virginia economy. Visitors come to the Eastern Shore to fish, crab, boat our waterways and take advantage of the growing eco-tourism opportunities. While here, visitors require the services provided by our lodging, restaurant, marina, and tackle shop businesses, all generating revenues, taxes and employment to the Eastern Shore economy. The number of residents with tourism related jobs increased from 2,597 in 2011 to 2,910 in 2015, and revenues from tourism during that time increased by $37 million to over $261 million.

Funding and Maintenance

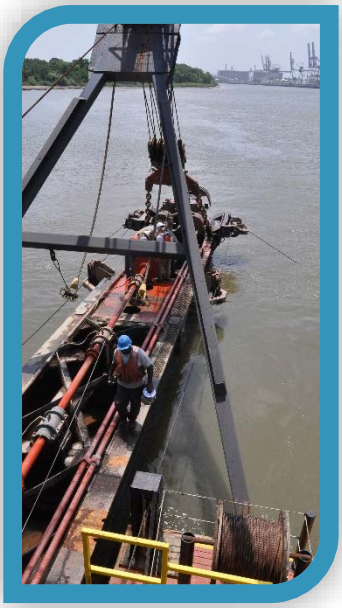
As a coastal peninsula, navigable waterways are vital to the economic viability of the Eastern Shore of Virginia. Thus, navigability has historically been an issue of concern. Residents and tourists are only able to explore and utilize the coastal resources and wildlife of the Atlantic and Bay ecosystems with adequate access to these waters. Natural processes commonly cause impacts to the coastal waters and the Eastern Shore. Of particular importance are the waters and water depths within and approaching facilities and infrastructure.

Public marinas, such as Wachapreague Town Marina, Willis Wharf County Marina, etc., have access to state funding with the Virginia Port Authorities (VPA) Aid to Local Ports Fund. Typically, these projects cost less than $100,000 and can often be accommodated by the VPA funding. Larger channel projects, however, often exceed $1 million in cost and thus, could not be funded by the VPA.

Federal funding for USACE shallow draft, low-use navigation projects has been in decline for decades, and has been more drastically reduced in the last ten years. Current budget metrics are not providing sufficient funding at levels to sustain maintenance dredging of the 32 Federal navigation dredging projects located on the Eastern Shore. More recently, Federal funding for the maintenance of federal harbors has changed to be prioritized based on the national economic benefits of the harbor related to commercial navigation (see **Appendix D**). Harbors that lack significant commercial navigation are not currently a high funding priority. Consequently, maintenance of recreational harbors and harbors with limited commercial traffic has been deferred indefinitely. In addition, there are many bayside and seaside channels with economic significance that are not designated as

federal channels, and thus alternate sources of funding for maintenance are required. An evaluation of current Commonwealth navigable waterway and ecosystem project funding mechanisms is necessary to determine the ability of the Commonwealth to implement needed non-federal waterway projects.

Within the Water Resources Development Act of 1974, Section 22, the USACE were granted general authority to cooperate with states to provide several services, on a cost-shared basis, including technical assistance to support preparation of comprehensive water resource plans.



USCG Aids to Navigation

Since 2013 the USACE and the United States Coast Guard (USCG) have been working together to determine the best way to make the Waterway on the Coast of Virginia (WCV)/Virginia Inside Passage (VIP) safer. Due to natural shoaling and shifting of aquatic sediment, some of the Aids to Navigation (AtoN) are no longer accurately marking safely navigable waterways. Due to the limitations of funding available for the maintenance of these channels, the USACE and USCG have determined that many of the AtoN will be systematically removed by 2019. Some of the permanent AtoN will also be replaced with buoys, so that they may be more easily moved to accurately mark the channel as it naturally shifts. **Figure 3** reveals which of the AtoNs will be kept (green), removed (red), and reevaluated in the future (orange).

Eleven of the fifteen federal WCV projects and seven of the twenty-seven non-federal waterway project areas are scheduled to have the AtoNs removed by the end of 2019.

Local Commitment to Maintenance

The ESRNWC was formed based upon previous years' efforts of the Eastern Shore Navigation Partnership, with the hope of developing a more comprehensive strategic plan for dredging. The goal is to have a waterway dredging project schedule for the next 5 to 10 years, rather than suggesting dredging projects on an annual, last-minute basis. With the development of a comprehensive strategic plan for waterway projects, funding needs can be forecasted and long-term planning accomplished for obtaining the necessary permits and development of plans to use the sediment obtained by the waterway dredging in a beneficial manner. The ultimate objective is to develop a multi-year, multi-project Eastern Shore Shallow Draft Navigation and Regional Sediment Management Plan.

II. Methodology

The purpose of this section is to explain the methodology utilized to determine which creeks were to be assessed as to their dredging needs and how that need was determined.

This report considers the condition of federal projects and state waterways, however, locally-owned marinas and dock areas are not included. Private marinas are responsible for funding their own maintenance.

Of the 87 creeks and waterways inventoried, see **Appendix A** for this list, a total of 59 project areas were identified for assessment. This includes all 32 of the federal projects, all 12 of the non-federal connecting waters for the WCV, and 15 non-federal waterways. The non-federal waterways were included based on their existing infrastructure, safety concerns (i.e., USCG access), and economic value. The WCV connecting waters were included as they have recent USACE surveys, their importance in accessing the federal projects on the seaside, and their necessity in the continuity of the WCV, also known as the Virginia Inside Passage (VIP). The next criteria for inclusion was the presence of USCG AtoN; however, several waterways with no AtoNs were included based on the presence of essential infrastructure and the value provided to commercial and recreational fishing and boating. **Appendix A** and **Appendix B** record these criteria for 43 of the inventoried non-federal waterways, exclusive of the 12 WCV connecting waters.

Figure 1, on the following page, supplies a visual representation of this decision making process. The last qualifying question asked for a waterway was if there was "sufficient infrastructure and use." This question was addressed using data from VMRC, the Virginia Department of Game and Inland Fisheries (VDGIF), the *2013 Eastern Shore of Virginia Transient and Working Waterfronts Inventory Needs Assessment*, and input from the ESRNWC members and additional stakeholders.

Tables 1, 2, and **4** are comprehensive in nature and supply the majority of data necessary for planning. **Table 1** provides information for the federally-designated channels, **Table 2** for the WCV (also federally-designated), and **Table 4** for non-federally designated channels (including WCV connecting waters). They are designed to be comparable and to serve as the core reference points for this assessment report.

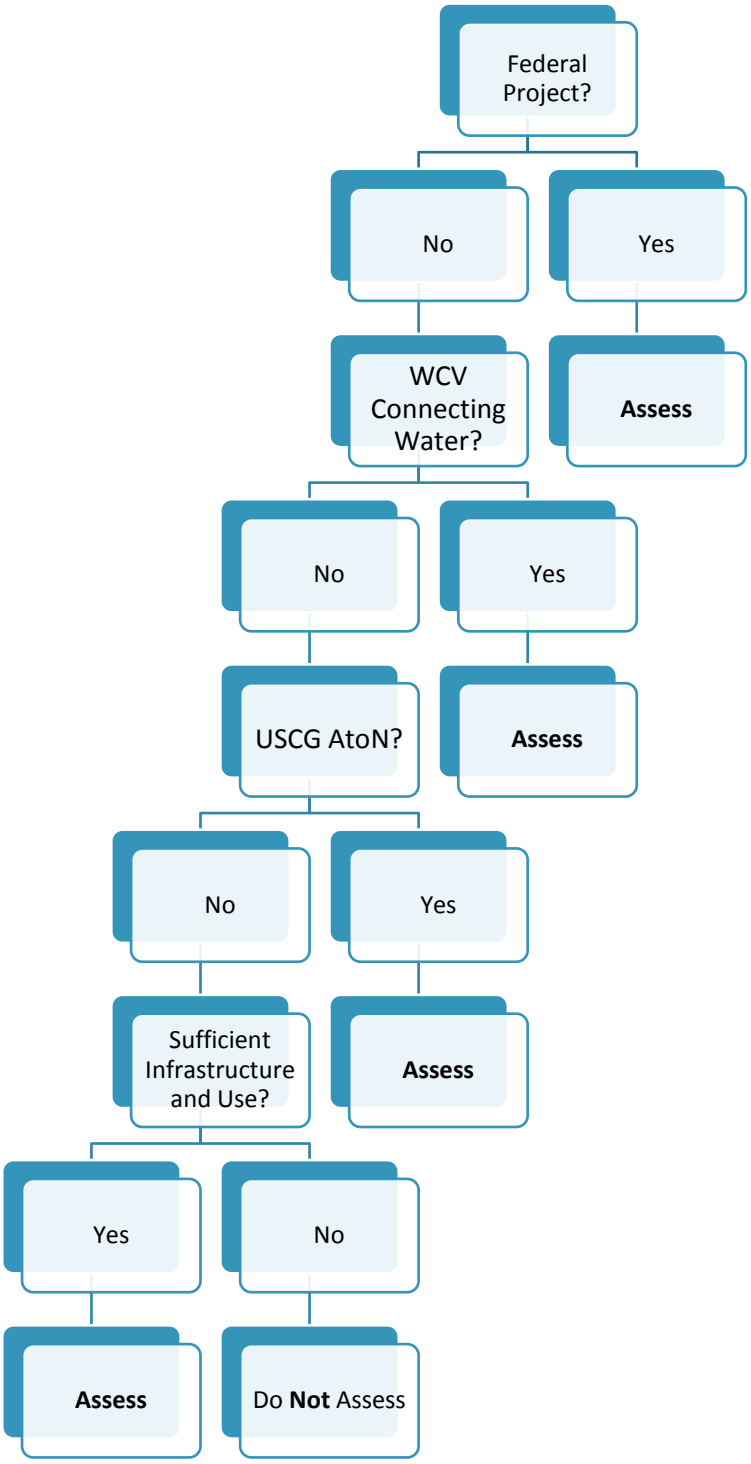


Figure 1: Waterway Assessment Inclusion Tree

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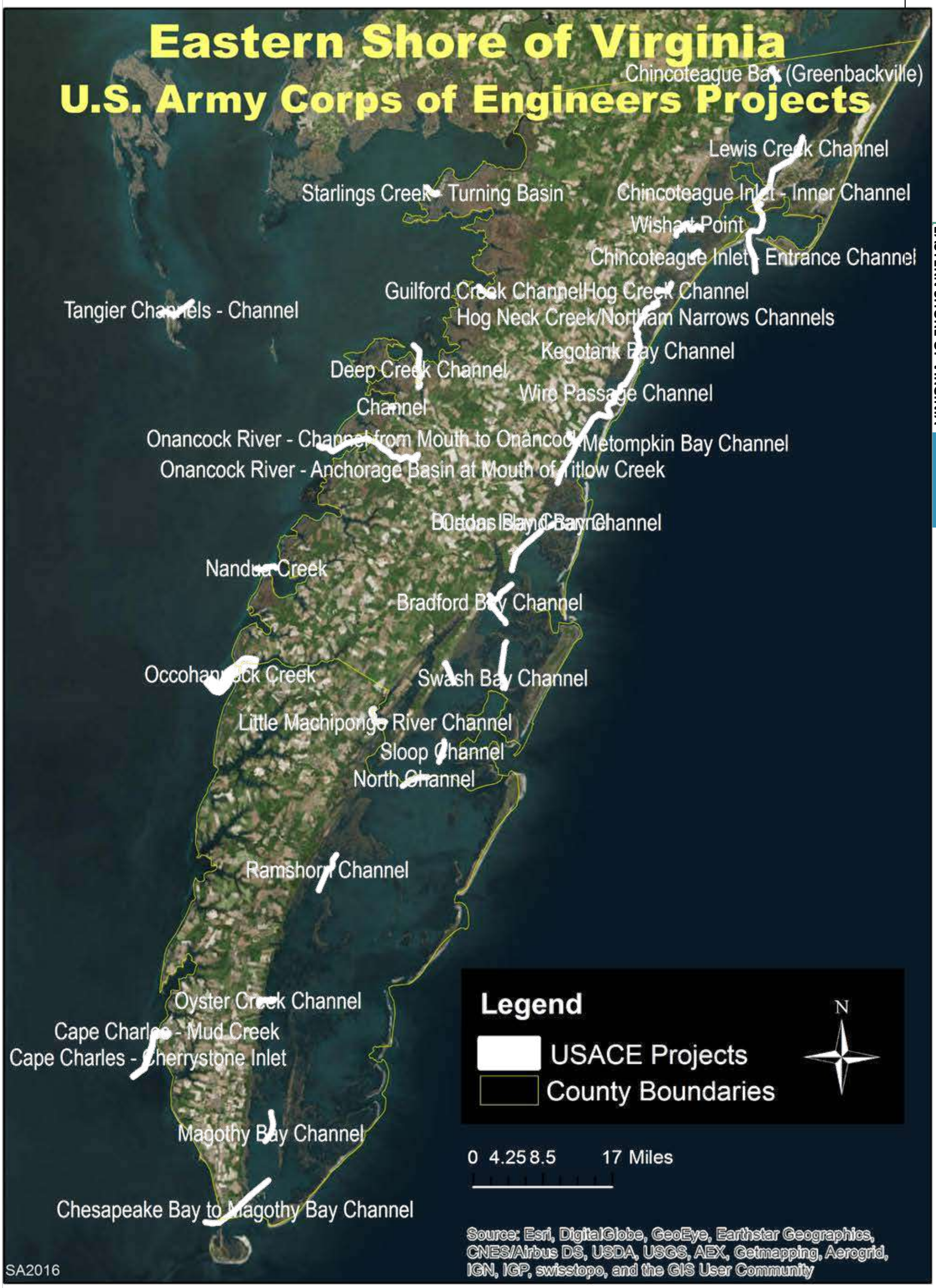

Figure 2: Federal Channel Project Area Map

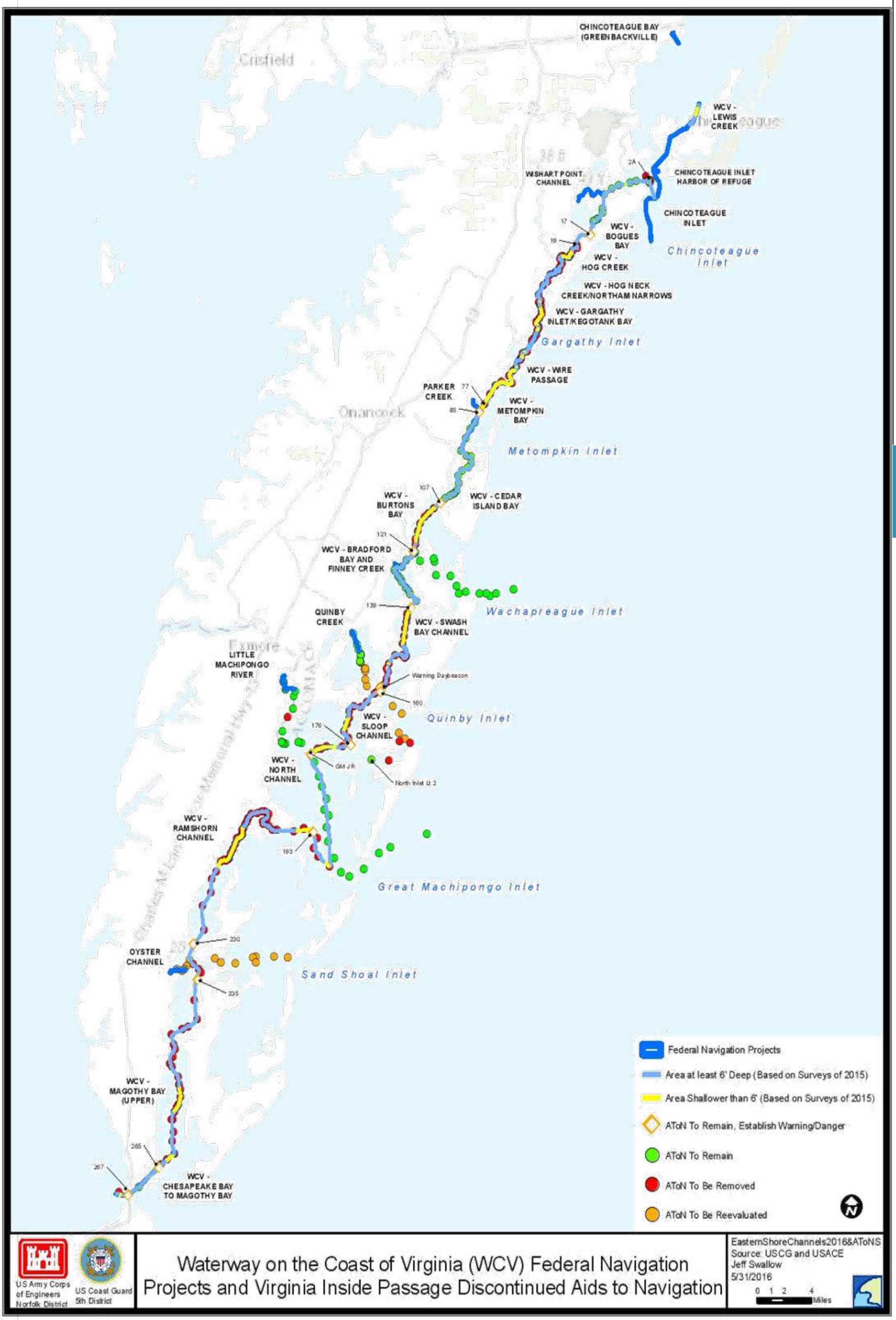

Figure 3: USCG AtoN Removal Plans Mapped

III. Results

The following sections summarize the findings of the Regional Dredging Needs Assessment and are organized by waterway maintenance responsibility:

- Federal Waterways
- Federal WCV
- Non-Federal Waterways

Federal Waterways

The summary table that follows (**Table 1**) contains data important to assessing the condition of the waterway and will be useful for supporting a dredging prioritization process. The last two columns provide the status of the project permits. These permits are required before any funded project can be serviced; however, they are not sought after until funding is confirmed. Therefore, the process of obtaining the relevant permits can often slow down progress towards project completion significantly. Historically, dredging projects were required to have active VMRC and Virginia Water Protection (VWP) (also known as DEQ-401) permits, with some also requiring Local Wetlands Board (LWB) permits, all of which can be applied through a Standard Joint Permit Application. Only two of the federal projects, Guilford Creek and Bogues Bay, require LWB Permits, which expired in 2000 and 2006 respectively. As of October 2015, the Virginia Department of Environmental Quality (VDEQ) does not require the USACE to obtain VWP permits to meet the section 401 water quality certification requirement for dredging projects. If a project's VDEQ permit is active, the project will continue to operate under the permit until its expiration. If a project's VDEQ permit is expired, the section 401 water quality requirement is to be met through the coordination of the Coastal Zone Management Act's (CZMA) Federal Consistency Determination (FCD).

Two-thirds of all federal channels have one or more of their required permits set to expire in the next year (by November of 2017). Projects for which the USACE has no permit data availablewere assumed to have no active permits. Of the 17 federal, non-WVC waterways, 12 are currently in need of permit work. Of the 15 federal WCV waterways, 9 are currently in need of permit work. None of the non-federal waterways had active permits at the time of the assessment.

The following descriptions include the USACE project name, authorization, project code, and status. The USACE project code was included, so that users of this report can easily find and request data concerning the federally designated waterways, but this code is primarily for access to data on the Electronic Survey Distribution System (ESDS) at http://gis.nao.usace.army.mil/ESDS, and often does not directly correlate to the project permits or other USACE project data. The first paragraphs consist of the USACE provided description and direct information from the United States Coast Pilot. The following paragraphs and tables provide historic dredging and economic value, primarily sourced from the *Eastern Shore of Virginia Seaside Commercial Use Assessment Report* of May, 2015 and from VMRC data. Projects are in alphabetical order within the section and all of the WCV are together in the unique section that follows.

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Table 1: Federal Channel Summary Table (17 listed north to south, first seaside then bayside; 32 total, 15 WCV in the next section)

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	USACE Authorized Length (miles)	USACE Authorized Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Chincoteague Bay (Greenbackville)	CB_01_CBC	2013	6	60	0.8	5	Most < 6 ft, entrance < 5 ft [10/27/2014]	N	NR	May '17/ -
Chincoteague Inlet Harbor of Refuge	CH_01_CHR	2013	7	60	0.05	8	[4/8/2016] < 5 ft in places; < 3 ft near some slips FY16&17 funded	NA	NR	June '19/ -
Chincoteague Inlet - Outer Channel	CH_01_CHI	2009***	1	200	1.2	12	No part of channel < 9 ft [6/10/2015] FY16&17 funded	N	Feb '20	Jan '19/ -
Chincoteague Inner Channel	CH_01_CHI	2009***	1	100	6.4	9	No part of channel < 9 ft [6/10/2015]	N	Apr '17	June '19/ May '97
Wishart Point Channel	H-51-11-066	1971*** *	Unknow n	60	2.0	6	No Survey	NA	-	-

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Parker Creek	H_51_27_038	1998***	10	40	1.5	5	Many shoaled locations < 1 ft [11/2012]	NA	Dec '06	Dec '05/ -
Quinby Creek	QB_01_QBY	2016	3				All < 2 ft, much < 1 ft [8/6/2014] Dredging to be done in October, 2016	N	June '19	June '18/ -
Entrance Channel				80	1	8	-			
Creek Channel				60	0.1	8	-			
Turning Basin				200	0.1	8	-			
Little Machipongo River	LM_01_LMR	1988***	NA	80	1.5	8	All portions > 10ft [10/22/2014]	N	NR	Mar '95/ -
Oyster Channel	OY_01_OYS	2008***	4-6	80	0.8	6	Much of channel < 3 ft; center of harbor ≈ 5 ft [7/21/2016] {Much of channel < 4 ft; center of harbor < 6 ft [5/5/2015]}	M	NR	June '07/ Mar '79

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Starling Creek (Saxis)	SC_01_STC	2015	5				After dredge, all > 7 ft [8/18/2015]	N	Oct '19	NR/ Dec '87
Channel to Harbor of Refuge				60	0.5	7	-			
Entrance Channel				60	0.4	7	-			
Tangier Channels	TN_01_TNC	2014, 2018**	3-6				[5/21/2014] FY17 funded	N	Apr '17	Sept '22/ Aug '11
Channel to Sound				60	0.9	8	6 ft to 9 ft			
Entrance Channel				100	0.3	8	Narrow from Mailboat Harbor to Fishermen's Corner			
To Chesapeake Bay				60	0.7	7	Channel shifted, places down to ~ 6 ft			
Guilford Creek	GF_01_GFD	1997*** *	Increase				About half < 5 ft; all < 4 ft [4/11/2015]	N	Sept '99	Mar '05/ Dec '98

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Deep Creek	DC_01_DCA	1957****	Increase				[10/28/14]	N	-	-
Channel				75	2.5	7	Most of channel between 4 & 5 ft			
Turning Basin				200	0.1	7	Entire turning basin < 2 ft			
Chesconessex Creek	Inactive	1967****	Un-known				6ft in channel, 2ft near public launch (Navionics®; no USACE survey data)	N	-	-
Onancock Creek	ON_01_ONC	2010 & 2014	Un-known				Most > 12 ft [9/17/2014]	N	Nov '19	Jan '20/ Oct '09
Anchorage Basin at Mouth of Titlow Creek				4 acres	0	6	-			
Basin in North Branch				100-180	0	12	All > 8 ft			
Channel from Mouth to Onancock				100-200	5.9	12	-			

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Channel in Joynes Branch				100	0.1	6	Most about 5.5 ft			
Channel in North Branch				100	0.2	12	Some between 9 & 10 ft			
Turning Basin at Onancock				0.7 acres	0	12	-			
Nandua Creek	ND_01_NDC	2002	See Section	60	1.3	6	Most between 7 & 12 ft, few places about 6.5 ft [10/28/14]	N	Nov '07	June '08/ Jan '98
Occohannock Creek	Unknown	Un-known	Un-known	100	1.0	9	Majority of channel ≥5 ft, areas up to 26 ft (Navionics®); Although authorized to 9 ft deep and 100 ft wide, the original project was only dredged to 6 ft deep and 60 ft wide.	N	-	-

Project Name	Project Code	Last Year Dredged	Avg. Req. Dredging Cycle (years) *****	USACE Authorized Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to MLW) [Survey Date]	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Cape Charles City Harbor	CC_01_CCH	1987; 2015					After dredge, most > 18 ft [10/28/2015]	N	Oct '17	Jan '30/ Sep '14
Cherrystone Bar				500	2.8	18	This area about 11 ft			
City Harbor				400-1000	0.6	18	-			
Entrance to Harbor of Refuge				60	0.1	7	-			
Harbor of Refuge				200-250	0.1	7	-			
Mud Creek				100-180	0.1	10	-			

* NA means that there are currently no AtoNs.

** NR means not required. Wetlands Permits are only required for Guilford Creek and Bogues Bay. As of Oct. 2015, once the VDEQ-401 expires, it will not be required and the project will operate under the CZMA Federal Consistency Determination (FCD).

*** Data uncertainty.

**** Only recorded maintenance.

***** The average required dredging cycle is an observation from analyzing dredging data. The actual dredging requirements can vary depending upon weather events, construction and land use in adjacent areas, new infrastructure such as jetties, etc.

CAPE CHARLES CITY HARBOR

Deep > 14' CC_01_CCH ACTIVE

The Cherrystone Bar, Inlet Channel-and Harbor, and the Mud Creek Channel and Basin were authorized by the river and Harbor Act of September 19, 1890 and modified by the River and Harbor Acts of 1938, 1945 and the Water Resources Development Act (WRDA) of 1986. The harbor of refuge was approved by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of July 14, 1960.

The USACE provided the following description. A channel 18 feet deep and 500 feet wide from the 18-foot contour in Chesapeake Bay, through Cherrystone Bar and Inlet, to the harbor entrance; basin in the harbor 18 feet deep, 1,000 feet to 400 feet wide and 3,000 feet long; a channel 10 feet deep and flaring from 100 feet to 180 feet wide and 260 feet long, to a basin 10 feet deep, 180 feet wide and 420 feet long at the head of Mud Creek; a harbor of refuge on the north side of Mud Creek 7 feet deep, 200 to 250 feet wide, and 375 feet long, connected to Mud Creek by an entrance channel 7 feet deep and 60 feet wide. All depths refer to mean low water.

In early 2015, the inner and outer harbor were dredged and the sand portion of the spoil was used to nourish the Town beach. The federal channel was dredged Labor Day weekend of 2016 and the sand portion of the spoil used to nourish the Town's public beach. The long-term intention is to add dunes on the northern end of the beach and perhaps be built higher from the sand fences (Cape Charles Code Official, personal communication, June 8, 2016).

Fiscal Year (Federal)	Cubic Yards Removed	Cost
Channel & Harbor		
1945	Unknown	Unknown
1966	62,463	Unknown
1967	336,95	Unknown
1987	479,608	Unknown
2016	596,589	Unknown
2017	Scheduled	Unknown
Mud Creek Basin		
1959	13,672	Unknown
1961	985	Unknown
1963	1,660*	Unknown
1964	1,830*	Unknown
1965	1,150*	Unknown
1967	3,553	Unknown
1987	9,540	Unknown
2015/16	Unknown	Unknown

Harbor of Refuge		
1967 (new work)	96,725	Unknown

*Pre-dredging quantity, after dredging estimate not completed.

CHESCONESSEX CREEK

Shallow ≤ 14' No Survey Data INACTIVE

The project was approved by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of 14 July 1960. A channel 6 feet deep and 60 feet wide from the mouth of the creek 3.2 miles into Chesconessex Creek; an access channel 50 feet wide and 6 feet deep from that depth in Chesconessex Creek to a turning basin of the same depth, 50 feet wide and 150 feet long, opposite the public landing on the north shore of the creek; an access channel 50 feet wide and 6 feet deep from that depth in Chesconessex Creek to a turning basin of the same depth, 100 feet wide and 250 feet long opposite the public landing on the south shore.

There is no survey data for this project, as it is inactive.

There are two County-maintained public facilities on the creek including a boat ramp with parking at the end of Southside Rd. (Rt. 649) on the south side of the Creek and a truckable timber pier and crab shacks on the northern side of the Creek at the end of Rt. 656 that are active and provide commercial and recreational access to the Creek and the Chesapeake Bay. There are also VMRC leased oyster grounds near the public boat ramp and the mouth of the Creek.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1967 (new work)	31,075	Unknown

CHINCOTEAGUE BAY GREENBACKVILLE

Shallow ≤ 14' CB_01_CBC ACTIVE

The project was authorized by the River and Harbor Act of 26 August 1937. An approach channel 5 feet deep and 60 feet wide from that depth in Chincoteague Bay to an L-shaped harbor of the same depth, 60 feet wide and 1500 feet long at Greenbackville, Va. The total length is approximately 4200 feet. All depths refer to mean low water.

Historically, this area is dredged about every 6 years. In the past couple of decades, this area is dredged at the same time as the Chincoteague Harbor of Refuge, which is an efficient use of the dredge and fuel. The ESRNWC is actively seeking FY2017 or FY2018 funding to have the USACE dredge this project in the near future, hopefully prior to the May 2017 expiration of the DEQ-401-Permit, as there has not been an FCD completed for this waterway.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1961	31,730	Unknown
1967	22,722	Unknown
1973	42,230	Unknown
1983	23,076	$129,427.96
1991	8,000	$8,300.00
1997	Unknown	Unknown
2002	Unknown	Unknown
2006	11,422	$126,832.00
2009	Unknown	Unknown
2013	13,353	$234,864.51

CHINCOTEAGUE HARBOR OF REFUGE

Shallow ≤ 14' CH_01_CHR ACTIVE

The project was approved by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of 1960. A channel 8 feet deep and 60 feet wide from "The Canal" to and including a basin of the same depth, 235 feet wide and 650 feet long. All depths refer to mean low water.

On average, this harbor has been dredged about every 6 years. As the cost of dredging is much lower with higher frequency, as this is the only harbor of refuge on the seaside of the Eastern Shore of Virginia, and as it is in such close proximity to several other recreationally, commercially, and economically-important dredge project areas, this area should be maintained at least every 6 years as it has been for the last two decades.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1962 (new work)	109,260	Unknown
1973	Unknown	Unknown
1985	27,505	$94,087.00
1991	10,700	$77,200.00
1997	Unknown	Unknown
2003	11,900	Unknown
2007	1,885	$58,770.00
2009	Unknown	Unknown
2013	5,558	$48,196.70

CHINCOTEAGUE INLET

Shallow ≤ 14' CH_01_CHI ACTIVE

The project was approved by the Chief of Engineers during 1972 under authority of Section 107 of the River and Harbor Act of 1960. A channel 12 feet deep and 150 feet wide across the Ocean Bar in the Atlantic Ocean to the mouth of the Inlet; thence, a channel 9 feet deep and 100 feet wide from the Inlet through the "Canal" and thence along Chincoteague Channel to a point approximately 2000 feet north of the State Highway bridge to Chincoteague; a distance of approximately 6.9 miles. All depths refer to mean low water.

Historically, this channel has been dredged annually since the original dredging in 1971. However, when the scheduled FY2016 work begins there will not have been a full dredge event since 2009. Although the USACE Dredge Currituck has dredged portions of the project to take down certain shoals over the last seven years (J. Swallow, USACE, personal communication, July 7, 2016), the upcoming maintenance is anticipated to remove more cubic yards than previous years and come at a higher cost.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1971 (new work)	40,500	Unknown
1973-1974	127,295	Unknown
1974	48,500	Unknown
1974	78,795	Unknown
1975	86,290	Unknown
1976	86,290	Unknown
1978	45,783	Unknown
1978	65,808	Unknown
1979-1980	111,393	Unknown
1980 (August)	54,855	Unknown
1980 (February)	93,880	Unknown
1981	111,758	Unknown
1982	118,450	$534,500.00
1983	100,390	$638,544.00
1984	186,084	$1,094,028.19
1985	182,216	$839,116.58
1987	266,957	Unknown
1988	121,184	$580,457.76
1990	123,037	Unknown
1991	99,000	$467,800.00
1992	80,000	$665,000.00
1992 (Inner)	45,000	$280,000.00
1993	148,000	$945,000.00
1994	123,300	$673,000.00
1995	120,800	$958,200.00
1996	Unknown	Unknown

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1997	Unknown	Unknown
1998	73,000	$860,400.00
2002	72,592	$348,64.80
2003-2004	Unknown	592,500.00
2005	12,500	Unknown
2006	70,000	Unknown
2007	Unknown	Unknown
2008	63,800	Unknown
2009	Unknown	Unknown
2016	Scheduled	TBD

DEEP CREEK (ACCOMACK CO.)

Shallow ≤ 14' DC_01_DCA ACTIVE

The project was authorized by the River and Harbor Act of 3 September 1954. A channel 7 feet deep and 75 feet wide from that depth in Pocomoke Sound to and including a turning basin of the same depth, 200 feet wide and 300 feet long opposite the terminal facilities at the town of Deep Creek, a distance of approximately 2.4 miles. All depths refer to mean low water.

The survey results from the *2013 Transient and Working Waterfront Inventory Needs Assessment* (TWWINA) indicated that water depth at both the access channel and in the marina and boatyard slips is less than one foot at mean low water. According to the October 2015 USACE survey map, the northern part of the creek channel is sufficiently deep, but as one approaches the turning basin, the depth decreases, and at the basin is often below 2 feet at mean low water. This is a critical location on the bayside for fishing net repair (2013 TWWINA). USACE records indicate that since the original work almost 60 years ago, Deep Creek has not had any dredging maintenance. Due to the worsening conditions here, dredging should be considered in the near future.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1957 (new work)	138,207	Unknown

GUILFORD CREEK

Shallow ≤ 14' GF_01_GFD ACTIVE

The project was approved during 1997 by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of 1960, as amended. A channel 6 feet deep and 60 feet wide over a length of about 1 mile, from Beasley Bay into Guilford Creek, including a turning basin 6 feet deep and 100 feet

square; a rock groin approximately 140 feet in length at the dredged material placement site at Guard Shore. All depths referred to mean low water.

The March 2016 USACE Survey map shows significant areas on the north side of the Guilford Creek channel, on both the north and south of the turning basin, and directly adjacent to the New Rd. docks, all with depths of less than 3 feet at mean low water.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1997	Unreported	Unknown

LITTLE MACHIPONGO RIVER

Shallow ≤ 14' LM_01_LMR ACTIVE

The project was authorized by the River and Harbor Act of 3 July 1930 and modified in 1989 under Section 107 of the River and Harbor Act of 1960. A channel 8 feet deep at mean low water and 80 feet wide from the town of Willis Wharf to deep water in the river below and a turning basin adjacent to the channel.

Willis Wharf, on the west bank of Parting Creek 1 mile above the junction with Machipongo River, is a hub for the shellfish and fishing industries. Willis Wharf is the location of both Cherrystone Aqua-Farms and H.M. Terry Company, which provide significant employment and are economically-important aquaculture companies. A County-owned boat ramp, kayak launch, and a marine railway capable of handling craft up to 60 feet are available. Additionally, the County owns a boat harbor on the west side of Parting Creek. The harbor offers about 41 slips for commercial fishing boats, about 30 of which are available for rent seasonally. The harbor has electricity, water and a launching ramp. This location is the only location on the seaside that has facilities that offer net repair. (2013 TWWINA, 2015 SCUAR)

According to USACE records, this area has not been maintained since 1988. In 2013, the TWWINA surveys indicated that at mean low water there was only a 3 foot water depth for portions of the access channel. The 2014 USACE survey maps reveal the area just south east of the public ramp and harbor has shoaled depths that restrict the safe passage of vessels through much of the tidal cycle. Due to the economic value of this area, it is important to make sure that safe and efficient access to the harbor and commercial working waterfront is maintained.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1948	16,108	Unknown
1972	20,728	Unknown
1987	38,087	$246,297.00
1988 (new work, basin)	36,650	$182,579.60

NANDUA CREEK

Shallow ≤ 14' ND_01_NDC ACTIVE

The project was authorized by the River and Harbor Act of 3 June 1896 and modified by the River and Harbor Act of 3 July 1930. A channel 100 feet wide and 9 feet deep at mean low water across the bar at the mouth of Nandua Creek. A traffic survey revealed that the maintenance of a 100-foot wide, 9-foot deep channel is not justified at this time. A 60-foot wide, 6-foot deep channel will be maintained until traffic indicates the need for a change.

The 1931 dredging was not necessary due to natural scour. Although the inlet to Nandua Creek hasn't been dredged since 2002, the channel maintains a depth of 7 feet or greater at mean low water according to the October 2014 USACE survey maps. There is one area on the northwest portion of the channel, west of Milbys Point and east of red marker number 6, where there is some shoaling beginning to move into the channel. It is possible that this could cause an issue, but the majority of the channel provided ample depth for small vessel navigation as of 2014.

There are commercial operations located on the creek and significant recreational use that are dependent on navigable access.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1998	21,000	$139,100.00
2002	21,281	$110,181.00

OCCOHANNOCK CREEK

Shallow ≤ 14' Not on ESDS ACTIVE

The project was authorized by the River and Harbor Act of 3 July 1930, and modified by the River and Harbor Act of 2 March 1945. A channel 9 feet deep and 100 feet wide from that depth in Chesapeake Bay upstream 1.0 mile. A traffic survey revealed that the maintenance of a 100-foot wide, 9-foot deep channel is not justified at this time. A 60-foot wide, 6-foot deep channel will be maintained until traffic indicates the need for a change. The USACE has no data available for this waterway.

Occohannock Creek flows into the Chesapeake Bay and is located 18 miles northward of Cape Charles Harbor. A fixed bridge 5.4 miles above the entrance is the head of navigation. The channel over the bar to the entrance of the creek has a Federal project depth of 9 feet and a width of 100 ft. Inside the creek, depths of about 5 feet can be carried to Morley Wharf on the south side 4 miles above the entrance, with lesser depths to the fixed bridge. The channel over the bar of Occohannock Creek is marked by lights and daybeacons, but it is narrow and tortuous, and difficult to navigate without local knowledge. The channel within the creek also is narrow, but the ends of the shoals are marked by daybeacons all the way to Morley Wharf. A public pier and boat ramp are at Morley Wharf. Gasoline, hull and engine

repairs, a 25-ton travel lift, and limited marine suppled are available at Davis Wharf, on the north side of the creek. (NOAA, BookletChart 12226)

There are many active VMRC oyster ground leases and a large public Baylor grounds area within the creek.

The 2013 TWWINA survey respondents indicated that there was at least 5 feet of water depth at mean low water both in the slips of Davis Wharf and in the access channel, indicating that shoaling is probably not an issue in Occohannock Creek. In 2013 there was a comment on the survey for the TWWINA pointing out that red Marker #3 needed to be moved since it was no longer at the channel, but this is outside of the creek.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1932	Unknown	Unknown
1942	Unknown	Unknown

ONANCOCK RIVER

Shallow ≤ 14' ON_01_ONC ACTIVE

The project was authorized by the River and Harbor Act of 3 March 1925 and modified by the River and Harbor Acts of 26 August 1937 and 2 March 1945. A channel 200 feet wide and 12 feet deep across Onancock Bar, thence a minimum width of 100 feet to a point roughly 1,200 feet above the mouth of the North Branch, widened at the upper end to form a turning basin 200 feet square. A turning basin of about 2.3 acres and 12 feet deep at Onancock. A channel 6 feet deep and 100 feet wide in the lower 500 feet of Joynes Branch and an anchor-age basin 6 feet deep and 3.9 acres in area at the mouth of Titlow Creek. All depths refer to mean low water.

Although the Onancock River, or Creek, has not had a full channel dredge completed by the USACE since 1963. The USACE Currituck dredged from July 23 to August 2010. After hurricane Sandy, the Dredge Murden returned for work on the Creek from April 25 to May 8, 2014. The depth in the channel is 12 feet or greater at mean low water according to the September 2014 USACE survey maps.

The waterway receives relatively heavy recreational and commercial use and also serves as a critical industrial access point for the transportation of gravel to the region.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1963	195,824	Unknown
2010	9,634 from channel, 15,738 total	Approx. $158,000
2014	Unknown	Unknown

OYSTER CHANNEL

Shallow ≤ 14' OY_01_OYS ACTIVE

The project was authorized by the River and Harbor Act of 2 March 1945 and modified by the River and Harbor Act of 3 September 1954. A channel 1.0 mile long, 6 feet deep at mean low water and 80 feet wide from deep water in Liscombes Channel to and including a turning basin of the same depth, 1,100 feet long and approximately 8 acres in area at Oyster, Virginia.

The USACE July 2016 Survey map shows that at mean low tide, there is about a 5-foot water depth in the harbor, and less than 3 feet of water depth in the access channel, which leads to Liscombes Channel. This is almost a foot less water depth in just over a year, as the May 2015 Survey map showed that at mean low tide, there was about a 6-foot water depth in the harbor, and at least 3 feet of water depth in the access channel. Although the Oyster Public Harbor doesn't offer transient boating facilities, it is one of only a few facilities available on the southern portion of the Shore, and 100 percent of the seasonal slips are occupied by commercial users to supply the various seafood processors in Oyster.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1948	Unknown	Unknown
1956	46,280	Unknown
1957	129,390	Unknown
1961	81,460	Unknown
1968	11,389	Unknown
1971	48,174	Unknown
1984	57,447	$264,042.00
1991	46,100	$341,800.00
1998	26,000	$120,700.00
2002	26,127	$93,127.00
2008	30,440	$168,382.80

PARKER CREEK

Shallow ≤ 14' H_51_27_038 ACTIVE

The project was approved by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of 1960. A channel 5 feet deep and 40 feet wide from that depth in Metompkin Bay into Parker Creek, a distance of approximately one half mile. All depths refer to mean low water.

Prior to 1993, this creek was dredged with regularity, however, it has not been dredged since that time. According to the 2012 survey there are many spots with less than 3 feet of water at mean low water. Some places appear to have no water at mean low water. Parkers Creek Landing, a public concrete boat ramp with parking, is located at the end of Fox Grove Road (Rt. 666).

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1964	45,125	Unknown
1974	52,602	Unknown
1986	50,805	Unknown
1991	29,000	$271,600.00
1993	31,000	$353,000.00
1998	Unknown	Unknown (Cottrell Contracting Corp.)
2005	Surveyed	Unknown
2012	Surveyed	Unknown

QUINBY CREEK

Shallow ≤ 14' QB_01_QBY ACTIVE

The project was authorized by the River and Harbor Act of 17 May 1950. A channel 8 feet deep and 80 feet wide from that depth in Upshur Bay to within approximately 600 feet of Quinby Landing, thence 60 feet wide to Quinby Landing, a total of 6,900 feet; and a mooring and turning basin at the head of the 60-foot channel and opposite the terminal landing, 8 feet deep, 200 feet wide and 400 feet long. All depths refer to mean low water.

The frequency with which this channel is being dredged has declined over the last 3 decades, unless there is some missing USACE data. Regular dredging is required to ensure safe entry to the harbor, which can accommodate 80 vessels, 60% of which are estimated to be commercial vessels (2013 TWWINA). The TWWINA surveys indicated that at mean low water there was only 3 feet water depth for portions of both the slips and the access channel. More recent discussions with users indicated that there was less than 1-foot water depth in portions of the access channel at low tide. The federal channel is scheduled for dredging in October of 2016.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1982	95,034	$191,367.00
1986	84,302	$253,532.50
1991	73,900	$311,600.00
1995	43,300	$268,500.00
2004	65,200	Unknown
2007	65,194	$236,631.56
2016	Scheduled	

STARLING CREEK

Shallow ≤ 14' SC_01_STC ACTIVE

The entrance channel and turning basin were authorized by the River and Harbor Act of 30 August 1935. The harbor of refuge was approved by the Chief of Engineers under authority of Section 107 of the River and Harbor Act of 14 July 1960. A channel 7 feet deep and 60 feet wide from that depth in Pocomoke Sound to the mouth of Starlings Creek; a turning basin of the same depth, 100 feet wide and approximately 1,100 feet long inside the entrance; and a channel 60 feet wide connecting the turning basin with a harbor of refuge, 7 feet deep, 200 feet wide, and 500 feet long. All depths referred to mean low water.

Since the Harbor of Refuge was dredged in 1965, Starling Creek has been maintained about every 5 years. There is a USACE data gap from 1979 to 1991, but based on the amount of spoil removed, it is thought that there was unrecorded dredging during this time.

The significant increase in the costs associated with dredging is easily recognized in the table below. In 1991 almost the same amount of spoil was removed, but the associated cost almost doubled.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1961	49,300	Unknown
1965 (new work, Harbor of Refuge)	93,432	Unknown
1966	57,584	Unknown
1970	72,288	Unknown
1974	73,894	Unknown
1979	74,520	Unknown
?	Unknown	Unknown
1991	78,300	$340,200.00
1996	Unknown	Unknown
2001	Unknown	Unknown
2005	-	-
2015 (Sandy)	82,500	$689,484.40

TANGIER CHANNELS

Shallow ≤ 14' TN_01_TNC ACTIVE

The channel was authorized by the River and Harbor Act of 2 March 1919 and modified by the P.W.A. Acts of 3 January 1934 and 30 August 1935 and River and Harbor Act of 2 March 1945. In 1964, under Section 107 of the River and Harbor Act of 14 July 1960, the project was modified to provide a channel from the basin through Tangier Creek westward to the Chesapeake Bay. A channel 8 feet deep, 100 feet

wide, and 1,300 feet long in Tangier Sound; thence 8 feet deep, 60 feet wide, and 4,800 feet long to an anchorage basin 400 feet square and 7 feet deep adjacent to the town of Tangier, Virginia. All depths referred to mean low water.

Historically the channels have been dredged every 2 to 3 years, however, the frequency has been declining. As the major means of transportation for goods, services, and residents is via water, it is imperative that the channels be dredged with sufficient frequency to provide safe and effective transportation regardless of the tide. According to the May 2014 USACE Survey maps, the majority of the channel system has a water depth of over 8 feet at mean low water.

The channels create an estimated $140,000 in benefits each year. Since construction in 1967, it has provided over $3 million in transportation savings, increased crab production, and provided access to a harbor of refuge. In addition, Tangier is a unique and historic geography, which was named to the Virginia Register of Historic Places in 2015 (USACE, http://www.nao.usace.army.mil/About/Projects/TangierNav/). Tangier was also one of only 4 locations surveyed in the region where facilities that provide hull and motor repairs exist (2013 TWWINA).

Fiscal Year (Federal)	Cubic Yards Removed	Cost
Channel to Tangier Sound		
1957	51,508	Unknown
1959	49,000	Unknown
1963	77,222	Unknown
1965-1966	99,920	Unknown
1969	91,920	Unknown
1972	92,170	Unknown
1974	122,789	Unknown
1977	117,146	Unknown
1980	71,898	$209,032.12
1982	79,041	$316,680.95 TOTAL
1985	Portion of 108,041	$469,099.82 TOTAL
1988	81,040 9,346 of this was Wachapreague Channel	$337,249.90 TOTAL $23,688.00 of this was Wachapreague Channel
1991	69,479	$394,000.00 TOTAL
2000	Unknown	Unknown
2005	49,800	Unknown
2018 (Sandy)	est. 55,000	est. $991,500.00 TOTAL

Channel to Chesapeake Bay		
1966 (new work)	99,920	Unknown
1969	12,235	Unknown
1977	31,491	Unknown
1982	19,000	$316,680.95 TOTAL
1985	Portion of 108,041	$469,099.82 TOTAL
1988	10,803	$337,249.90 TOTAL
1991	10,325	$394,000.00 TOTAL
2000	Unknown	Unknown
2006	24,900	Unknown
2009	49,768	$487,018.44
2010	24,904	$357,187.55
2015	56,353	$0.00 bid: $1,063,528.06
2018 (Sandy)	Scheduled est. 55,000	est. $991,500.00 TOTAL

WISHART POINT CHANNEL

Shallow ≤ 14' H-51-11-066 ACTIVE

The channel was authorized under Section 107 of the River and Harbor Act of 14 July 1960. The channel runs from the WCV at the Four Mouths through Ballast Narrows and across Powell's Bay to Wishart Point, approximately 2.0 miles in length.

This project area is not surveyed frequently. USACE Electronic Survey Distribution System (ESDS) data from 2006 is most current, but is inaccessible on the ESDS. Efforts to have the channel dredged from about 1995 to 2010 were unsuccessful. According to Navionics, there is a depth of 5 feet above MLW at and in the channel approaching Wishart Point. The ramp at Wisharts Point is not in a usable condition and the ownership of the property is in an indeterminate state. Funds to complete facility repairs were never granted from VMRC's Saltwater Recreational Fishing Development Fund, as the channel was never dredged to make the project viable.

Fiscal Year (Federal)	Cubic Yards Removed	Cost
1971 (new work)	13,101	Unknown

WATERWAY ON THE COAST OF VIRGINIA (WCV)

Shallow ≤ 14' All Shoals listed Below ACTIVE

The project was authorized during 1970 under Section 201 of the Flood Control Act of 1965. That portion of the project located within Virginia is a modification of a previous project designated: Waterway on the Coast of Virginia. The Waterway on the Coast of Virginia project was authorized by the River and Harbor Act of 25 June 1910 and modified by the River and Harbor Act of 2 March 1945.

DELAWARE BAY - CHESAPEAKE BAY WATERWAY, DE, MD, VA (VA PORTION) - A channel in Virginia 6 feet deep and 100 feet wide from the Maryland-Virginia line in Chincoteague Bay to Chesapeake Bay, being a portion of the 145 mile channel from Delaware Bay at Roosevelt Inlet, Delaware, to Chesapeake Bay, Virginia. All depths referred to mean low water. Construction of the previous project was completed in 1959 and provides a channel 6 feet deep and 60 feet wide from Chincoteague Bay to Chesapeake Bay, a distance of 87 miles.

Before 2000, the USACE did not maintain comprehensive records of which sections of the WCV were dredged, but rather that dredging for some portion of the WCV was funded. The data in **Table 2** therefore, may be incomplete or even inaccurate. The "Last Year Dredged" provided in **Table 2** was based on the information in **Table 3** and the frequency of dredging prior to 1994 from the 1994 VIMS Report. All information provided for dredging which occurred prior to 1978 are based on card catalog references from USACE Surveys that stated "After Dredging" in the description, and not actual dredging data. These card catalog references could be follow-up surveys to assess the continued success of the dredging project, rather than new dredging work, and so their accuracy is not confirmed. Almost all WCV project areas were surveyed in 2015 by USACE using Hurricane Sandy Disaster Funds. The data from the survey maps was used to provide the assessment for the WVC waterways as presented in the seventh column in **Table 2**.

With complete records indicating when these waterways were dredged, it is impossible to suggest a frequency with which maintenance should be completed.

Table 2: WCV Summary Table (15 total WCV projects, alphabetically-ordered)

Project Name	Project Code	Pre-1994 approximate dredging frequency *****	Last Year Dredged* ***	Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to mean low water) [Survey Date]***	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
				USACE Authorized						
Bogues Bay	WC_10_BOG		2008?	60	0.5	6	Okay, ≤ 4 ft at the entrance to Cat Creek [6/10/2014]	N	NR	Jan '14/ Aug '03
Bradford Bay (BB) and Wachapreague Channel (WC)	WC_50_BFC	7 years	2013 WC & 2014 BB	60	5.5	6	Okay, no portion < 6 ft [5/15/2016]	N	Nov - 17	Jan '28/ -
Cedar Island Bay (northeast of Teagles Ditch)	WC_40_CIB			60	0.2	6	Channel has rounded and shifted south/southeast [5/22/2015] (Might be included in the Burtons Bay Permit.)	N	- no info	- no info
Chesapeake Bay to Magothy Bay (see also Holly Bluff Island permit #87-1656 exp. '90/'97)	WC_80_CBM	5 years		60-100	4.3	6	Multiple shoals: west side (≈ 3.5 ft), just east of NWR ramp (≈ 4 ft), most of Magothy Bay section (≈ 4 ft) [Jan/Feb 2015]	N	May '12	Oct '12 -
Gargathy Inlet	WC_25_GIK			60	1.5	6	**Poor**, channel shifted east at Gargathy Beach (≈ 2 ft), shoaled at north end of inlet to ≤ 0.5 ft [6/7/2015]	Y	Jan '09	Feb '14/ -

Project Name	Project Code	Pre-1994 approximate dredging frequency *****	Last Year Dredged* ***	Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to mean low water) [Survey Date]***	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
Wire Passage (seems to be under Gargathy permits, more research by USACE needed)	WC_30_WIR			60	2.8	6	**Poor**, much of channel ≤ 3 ft, some exposed mud flats, closed completed at Metompkin Island [5/30/2014]	Y		
Kegotank Bay	WC_25_GIK	6 years		60	1.3	6	**Poor**, channel shifted east at Gargathy Beach (≈ 2 ft), shoaled at north end of inlet to ≤ 0.5 ft [6/7/2015]	Y	Mar 88	Mar '93/ -
Hog Creek	WC_15_HOG	8 years		60	1	6	**Poor**, almost entire channel ≤ 4 ft, some areas ≤ 2 ft [6/10/2014]	Y	Apr '02	Dec '09/ -
Northam Narrows (Hog Neck Creek)	WC_20_HNC	6 years				6	Okay, the channel has shifted in several spots in the northern half [6/9/2014]	Y	NR	Mar '93/ -
Lewis Creek	WC_05_LEW			60	1.3	6	Okay, but northern section often ≤ 6 ft [4/1/2015]	N	Oct '02	Aug '07/ -
Magothy Bay (Upper)	WC_75_MAG	4 years		60	1.7	6	**Poor**, much shoaled ≤ 4 ft, some ≤ 2.5 ft [6/29/2015]	Y	'12	Exp.
Metompkin Bay	WC_35_MET	6 years		60	5	6	**Poor**, entire channel north of Battle Point is ≤ 2 ft, in some places exposed mud flats, closed	Y	Apr '19	Aug '19/ May '85

Project Name	Project Code	Pre-1994 approximate dredging frequency *****	Last Year Dredged* ***	Width (ft)	Length (miles)	Depth (ft)	USACE Survey Results (all depths in reference to mean low water) [Survey Date]***	Removal of USCG AtoN? Y/N/M/NA*	VMRC Permit Exp. Date**	VDEQ-401 VWP Permit Exp. Date/FCD **
							completed at Metompkin Island [5/30/2014]			
North Channel	WC_65_NCH	4 years		60	1.5	6	**Poor**, entire channel ≤ 2 ft [3/25/2015]	Y	June '19	May '18/ -
Ramshorn Channel	WC_70_RHC			60	2.3	6	**Poor**, almost entirely ≤ 2 ft [2/11/2015]	Y	June '19	Sept '19/ Sept '96
Sloop Channel	WC_60_SLP	4 years		60	1.2	6	**Poor**, almost entirely ≤ 2 ft [5/13/2015]	Y	June '19	May '18/ -
Swash Bay Channel	WC_55_SWH	5 years	1997?	60	2.7	6	**Poor**, almost entirely ≤ 2 ft [4/23/2015]	Y	Aug '02	Sept '02/ -

* NA means that there are currently no AtoNs.

** NR means not required. Wetlands Permits are not required for any of the WCV projects. As of Oct. 2015, once the VDEQ-401 expires, it will not be required and the project will operate under the CZMA Federal Consistency Determination (FCD).

*** Based on the 2014-2015 USACE Survey Maps.

**** Data is incomplete from USACE, see WCV section for explanation.

***** Data from Table 1. In the 1996 VIMS WCV Report.[6]

[6] Priest, Walter I., et al., 1996. Beneficial Uses of Dredged Material from the Waterway on the Coast of Virginia. Special Report No. 330 in Applied Marine Science and Ocean Engineering VIMS.

Table 3: WCV Comprehensive Dredging List

Year	WCV Section (if reported)	Cubic Yards Removed	Cost USD
1900	Oyster Channel	After Dredging	Survey*
1932	Occohannock Creek	After Dredging	Survey*
1937	Starlings Creek	After Dredging	Survey*
1942	Occohannock Creek	After Dredging	Survey*
1943	Starlings Creek	After Dredging	Survey*
1948	Starlings Creek	After Dredging	Survey*
1954	Quinby Creek	After Dredging	Survey*
1955	Starlings Creek	After Dredging	Survey*
1956	Oyster Creek	After Dredging	Survey*
1956	Quinby Creek	After Dredging	Survey*
1957	Burtons Bay (North and South)	After Dredging	Survey*
1957	Metompkin Bay (South)	After Dredging	Survey*
1957	Bradford Bay	After Dredging	Survey*
1957	Sloop Channel	After Dredging	Survey*
1957	Oyster Channel	After Dredging	Survey*
1957	Metompkin Channel	After Dredging	Survey*
1957	North Channel	After Dredging	Survey*
1958	Chesapeake to Magothy	After Dredging	Survey*
1958	Bogues Bay (Hog Creek)	After Dredging	Survey*
1959	Bogues Bay (Hog Creek)	After Dredging	Survey*
1960	Quinby Creek	After Dredging	Survey*
1960	Chesapeake Bay to Magothy Bay	After Dredging	Survey*
1961	Starlings Creek	After Dredging	Survey*
1961	Oyster Channel	After Dredging	Survey*
1962	Chesapeake to Magothy Bay	After Dredging	Survey*
1962	Bradford Bay	After Dredging	Survey*
1962	Sloop Channel	After Dredging	Survey*
1962	Burtons Bay	After Dredging	Survey*
1962	Metompkin Channel	After Dredging	Survey*
1963	North Channel	After Dredging	Survey*
1963	Onancock River	After Dredging	Survey*
1963	Quinby Creek	After Dredging	Survey*
1964	Chesapeake to Magothy Bay	After Dredging	Survey*
1965	Starlings Creek	After Dredging	Survey*
1966	Starlings Creek	After Dredging	Survey*
1966	Chesapeake to Magothy Bay	After Dredging	Survey*
1966	Bradford Bay	After Dredging	Survey*
1966	Metompkin Bay	After Dredging	Survey*

Year	WCV Section (if reported)	Cubic Yards Removed	Cost USD
1967	North Channel	After Dredging	Survey*
1967	Sloop Channel	After Dredging	Survey*
1967	Burtons Bay	After Dredging	Survey*
1967	Chesapeake to Magothy Bay	After Dredging	Survey*
1968	Quinby Creek	After Dredging	Survey*
1969	Chesapeake to Magothy Bay	After Dredging	Survey*
1969	Burtons Bay (South)	After Dredging	Survey*
1970	Starlings Creek	After Dredging	Survey*
1970	Chesapeake to Magothy Bay	After Dredging	Survey*
1971	Oyster Channel	After Dredging	Survey*
1972	North Channel	After Dredging	Survey*
1972	Chesapeake to Magothy Bay	After Dredging	Survey*
1973	Metompkin Bay	After Dredging	Survey*
1973	Quinby Creek	After Dredging	Survey*
1973	Burtons Bay (North and South)	After Dredging	Survey*
1974	Sloop Channel	After Dredging	Survey*
1974	Starlings Creek	After Dredging	Survey*
1975	North Channel	After Dredging	Survey*
1976	Chesapeake to Magothy Bay	After Dredging	Survey*
1977	Quinby Creek	After Dredging	Survey*
1977	Bradford Bay	After Dredging	Survey*
1977	Chesapeake to Magothy Bay	After Dredging	Survey*
1977	Burtons Bay	After Dredging	Survey*
1978	Bogues Bay WC_10_BOG	20,189	Unknown
1982	Unspecified	709,303	1,137,563.41
1983	Unspecified	639,968	90,922.65
1986	Metompkin Bay/Parker Creek	476,172	$605,56.06
1986	Unspecified	391,791	593,708.00
1987	Unspecified	197,818	337,409.61
1988	Bradford Bay & Finney Creek WC_50_BFC	8,555	Unknown
1988	Unspecified	98,860	345,579.22
1989	Unspecified	391,369	727,364.44
1990	Unspecified	160,300	527,122.60
1991	Unspecified	190,900	1,113,500.00
1991	Unspecified	40,000	2,300.00
1992	Lewis Creek	35,000	605,000.00
1992	TOTAL?	175,000	979,000.00
1993	Unspecified	220,000	1,341,000.00
1994	Unspecified	115,900	1,231,600.00

Year	WCV Section (if reported)	Cubic Yards Removed	Cost USD
1995	Unspecified	145,600	955,900.00
1996	Gargathy	Unknown	Unknown
1997	Swash Bay & *unknown*	Unknown	Unknown
1998	Chincoteague & *unknown*	156,000	$995,000.00
2000	Unspecified	Unknown	Unknown
2001	Unspecified	Unknown	Unknown
2002	North, Sloop & Burton Bay	216,870	$537,903.50
2003	WCV-IDIQ, Start in FY 2004	111,400	Unknown
2004	Bogues Bay	4,000	Unknown
2007	Unspecified	175,002	792,789.07
2008	Bogues Bay	1,500	190,982.50
2009	Magothy	Unknown	Unknown
2009	WW on the Coast of VA IDIQ	81,033	$331,048.21
2013	Wachapreague Channel	29,107	773,765.41
2014	Bradford Bay	est. 82,000	est. $1,122,500.00

*USACE records are incomplete, this is when 'after dredging' surveys were completed, which may indicate that dredging was done just prior to this date.

Non-Federal Channels, Creeks, and Waterways of Concern

The following descriptions include those waterways which were not designated as federal projects and thus must be funded using state, local, or alternative funding for completion. **Appendix B** supplies a list of all 41 non-federal channels, excluding the 12 WCV connecting waterways, considered using the decision-making process identified in **Figure 1**.

The Chincoteague USCG Base and Kings Creek have previously been dredged by the USACE and were done as "work for others". There are additional projects that the USACE may have been contracted to complete; however, records are lacking. The following paragraphs and tables provide historic dredging and economic value, primarily sourced from the *Eastern Shore of Virginia Seaside Commercial Use Assessment Report*, personal communications, and from VMRC data, but due to gaps in historic data, some may be inaccurate or incomplete.

All of the descriptions for the state waters following **Table 5** have information from the United States Coast Pilot online resource hosted by NOAA, some have additional information supplied by members of the ESRNWC and local residents and stakeholders.

Because the non-federal channels are not eligible for federal funding, they are not required to have a FCD. However, they are required to have the VMRC permit with an approved dredge spoil placement site.

Table 4: Non-Federal Channel Summary Table (27, alphabetically ordered)

State Waterway Project Key	Name	Last Year Dredged	Water Depth (ft) (at MLW) *		Total Length (Approx. in miles)	Local Assessment / USACE Survey Results (for WCV projects)	Removal of USCG AtoN? Y/N/M/NA
			Min	Max			
SW01	Chincoteague USCG Station	2011		5.5		Needs dredging	NA
SW02	Eastern End of Federal Channel to Quinby Inlet	Never	6	49	4.8	Deep water	M
SW03	End of Oyster Channel to Sand Shoal Inlet	Never	12	64	7.5	Deep water	M

State Waterway Project Key	Name	Last Year Dredged	Water Depth (ft) (at MLW) *		Total Length (Approx. in miles)	Local Assessment / USACE Survey Results (for WCV projects)	Removal of USCG AtoN? Y/N/M/NA
SW04	Folly Creek-WCV project area (SW23)	Never			1.2	Deep water	NA
SW05	Gargathy Creek	Never			3.0	Deep water at least from Gargatha Landing to Inlet	NA
SW06	Great Machipongo Inlet & Channel	Never	15	66	12.7	Deep water, some shoaling near the ocean Inlet	N
SW07	Hungars Creek	Never	4	8	3.0	Good water in channel, shoals past Masden Gut	N
SW08	Hunting Creek	Never	1	9	1.3	Entering the Creek from Bagwell, the water shallows quickly to ≤ 4 ft	N
SW09	Kings Creek	2004	3	7	0.7	Narrow entrance channel,	N
SW10	Metompkin Inlet & Metompkin Inlet to WCV project area (SW23)	Never			1.3	Deep water	NA
SW11	Nassawadox Creek (& Church & Warehouse Creek)	2008 (300,000y^3)	1	2	0.1	Entrance to channel from Bay unmarked and in need of removal of hazards to navigation.	NA (removed previously)
SW12	Pungoteague Creek	Never	7	15	2.2	Good water in channel, shoals in the Bay near entrance to Creek	N
SW13	Red Bank Creek to Hog Island Bay	Never	1	6	2.3	Shallow, but nice ramp facility	Y
SW14	Wachapreague Channel (Finney Creek, in front of the Town & working waterfront)		7	11	2.0	Majority of channel deep water	NA

State Waterway Project Key	Name	Last Year Dredged	Water Depth (ft) (at MLW) *		Total Length (Approx. in miles)	Local Assessment / USACE Survey Results (for WCV projects)	Removal of USCG AtoN? Y/N/M/NA
SW15	Wachapreague Inlet to Day Marker 122	Never	15	40	4.0	Majority of channel deep water, but many areas of shoaling	N
SW16 (WC_12_B2H)	WCV - Bogues Bay To Hog Creek Connecting Waters	Never	6	15	2.3	Deep water, but 2 short areas ≤ 7 ft in southern section [7/1/2014]	Y
SW17 (WC_52_B2S)	WCV - Bradford Bay Channel To Swash Bay Channel Connecting Waters	Never	4	10	1.4	Shoals out as enters Swash Bay to ≤ 4 ft [5/15/2015]	N
SW18 (WC_48_B2B)	WCV - Burtons Bay Channel To Bradford Bay Channel Connecting Waters	Never	2	10	0.8	Narrow, shoaled out as enters Burtons Bay (≤ 3 ft) [5/51/2015]	Y
SW19 (WC_42_C2B)	WCV - Cedar Island Bay Channel To Burtons Bay Channel Connecting Waters (Teagles Ditch)	Never	6	10	0.5	Good (≥ 7 ft, most at ≤ 10 ft) [5/22/2015]	N
SW20 (WC_77_C2M)	WCV - Chesapeake Bay/Magothy Bay To Upper Magothy Bay Connecting Waters	Never	1	10	2.3	Majority of eastern side of channel shoaled to less than 2 ft, but channel could have shifted and there still be ample depth [3/7/2015]	Y
SW21 (WC_07_C2B)	WCV - Chincoteague Inlet To Bogues Bay Connecting Waters	Never	4	10	5.0	Okay, some shoaling east of Walker Point (≈ 3 ft) and east of Hammock Point (≈ 4 ft) [6/7/2015]	N
SW22 (WC_17_H2H)	WCV - Hog Neck Creek To Hog Creek Connecting Waters	Never	4	15	0.7	Most ≥ 6 ft, except small section at south end (approaching Northam	Y

State Waterway Project Key	Name	Last Year Dredged	Water Depth (ft) (at MLW) *		Total Length (Approx. in miles)	Local Assessment / USACE Survey Results (for WCV projects)	Removal of USCG AtoN? Y/N/M/NA
						Narrows), but very narrow [6/9/2014]	
SW23 (WC_38_M2C)	WCV - Metompkin Bay Channel To Cedar Island Bay Channel Connecting Waters	Never	4	10	3.0	Okay [6/1/2015]	N
SW24 (WC_68_R2N)	WCV - North Channel To Ramshorn Channel Connecting Waters	Never	2	11	12.75	Northern section in Hog Bay okay, but shoaled to ≤ 3 ft in Outlet Bay leading to Point Creek in 'The Ramshorn', which is also silted in to depths of ≤ 4 ft [3/19/2015]	Y-Hog Bay N-E to W to Ramshorn
SW25 (WC_62_S2N)	WCV - Sloop Channel To North Channel Connecting Waters	Never	2	11	1.8	Okay, but shoals out as enters Hog Island Bay [5/4/2015]	Y
SW26 (WC_58_S2S)	WCV - Swash Bay Channel To Sloop Channel Connecting Waters	Never	0	10	5.5	**Poor**, almost entirely ≤ 3 ft [5/5/2015]	Y
SW27 (WC_72_M2R)	WCV - Upper Magothy Bay To Ramshorn Connecting Waters (≈ 13 miles)	Never	0.5	12	15	Almost 15 mile stretch, all suitable depth, except the northern portion (≈ 4 miles) in Ramshorn Bay. [3/8/2015]	Y

*Min/Max depth for non-WCV waterways was derived from Navionics maps. If this data is not provided, then the Navionics maps were deemed unreliable and no local knowledge was obtained.

CHINCOTEAGUE UNITED STATES COAST GUARD BASE

In 2007, this was a USACE "work for others" project and 10,500 cubic yards were removed.

Just over 10,000 cubic yards were removed at a cost of $317,006.00 in 2011.

Fiscal Year (Federal)	Cubic Yards Remove	Cost
2007 "work for others"	10,500	Unknown
2011 "work for others"	10,347	$317,006.00

FOLLY CREEK TO METOMPKIN INLET

On the seaside, this creek leads westward from the south end of Metompkin Bay and has a depth of 1 foot to the landing at its head, 3 miles above the mouth. A County launching ramp and a pier are on the south side of Folly Creek about 1 mile west of Light 87. Metompkin Inlet, the ocean entrance between Metompkin and Cedar Islands, is used by some small local fishing and oyster boats. The changeable entrance channel is unmarked and should not be entered without local knowledge (Coast Pilot).

This project area coincides with another state waterway project area, WCV - Metompkin Bay Channel to Cedar Island Bay Channel Connecting Waters. There are only AtoNs on the small segment that is part of this project area. Therefore, the Folly Creek to Metompkin Inlet project area includes the 1.3 miles from the Folly Creek Road County boat ramp facility to the junction with the WCV, and picks up an additional 1.2 miles from where the WCV turns south, northeast to Metompkin Inlet.

KINGS CREEK

About 1 mile northward of Cape Charles Harbor and eastward of Sandy Island, this Northampton County bayside creek has depths of 3.5 feet for 1 mile upstream. The shoal that extends out from the north side of the entrance bares at low water; a light marks the entrance. The creek is used extensively by fishermen and pleasure craft. Gasoline, diesel fuel, berths, and marine supplies are available at a marina just inside the entrance.

Sandy Island, former site of a factory, and which has now almost completely eroded away, is potentially a good spoil site (N 37º 17' 01" ; W76º 01' 29") (Granville Hogg, ESRNWC Member, personal communications, September 3, 2016).

Private funds enabled this waterway to be dredged in 2004, as did a permit from VMRC.

METOMPKIN INLET

On the seaside, this inlet is the ocean entrance between Metompkin Island and Cedar Island. The inlet is used by some small local fishing and oyster boats. The changeable entrance channel is unmarked and should not be entered without local knowledge.

GARGATHY CREEK

From Kegotank Landing (County, public) on the northern bank at the end of Kegotank Road (Rt. 681 near Modest Town), to Gargatha Landing (County, public) on the southern bank, the creek depth is unknown, but smaller recreational boats use the waterway regularly. From Gargathy Landing, there is deep water to Gargatha Inlet. The Inlet itself, was one navigated as part of the WCV, however, the constantly changing and shifting shoals of the inlet and the increasing breadth of the inlet, make it challenging to navigate safely to the Atlantic, but is used to navigate to Kegotank Bay to the north. Gargathy Creek provides access to the aquaculture beds in Gargathy Bay, fishing opportunities in the guts and bays, as well as access to Wire Passage which once connected to Metompkin Bay, but has now closed in due to the western migration of the island sands.

GREAT MACHIPONGO INLET AND CHANNEL

Great Machipongo Inlet leads between Hog Island and Cobb Island to Great Machipongo Channel. Shoals on either side of the entrance are marked by breakers at all times; the bar breaks only in heavy weather. The inlet is marked by buoys that are shifted in position with changing channel conditions (Coast Pilot).

Great Machipongo Channel extends northwestward through Hog Island Bay from the inlet to the mainland where it continues as Machipongo River. Willis Wharf on the west bank of Parting Creek 1 mile above the junction with Machipongo River, is a base for shellfish and fishing boats. A public launching ramp is available and a marine railway can handle craft up to 60 feet (Coast Pilot).

A County-owned boat harbor is just below Willis Wharf on the west side of Parting Creek. An area with about 41 slips available for commercial fishing boats. The harbor has electricity, water and a launching ramp (Coast Pilot).

USCG AtoNs mark this entire length and beyond into the Atlantic. These are not scheduled for removal.

HUNGARS CREEK

Hungars Creek and Mattawoman Creek have a common outlet to the Bay 8 miles northward of Cape Charles Harbor. Hungars Creek is marked by lights, daybeacons, and bush stakes, and Mattawoman Creek by bush stakes. Both creeks are difficult to follow without local knowledge (Coast Pilot).

Hungars Creek extends about 4 miles in a northeasterly direction to Bridgetown**.** Depths of 3 feet are available in the narrow entrance channel, marked by lights, thence decreasing to 1 foot to Bridgetown (Coast Pilot).

Mattawoman Creek extends about 2 miles in a southeasterly direction and has several branches at its head. The best approach is to follow the lights at the entrance of Hungars Creek to the light off Wilsonia Neck**,** then follow the bush stakes southeastward and southward along the shore. The controlling depth is about a foot to the head of navigation (Coast Pilot).

Although there are no public access facilities on Hungars Creek, the access channel is important to access the extensive aquaculture ground leases in the creek. According to the ESRNWC Chairman, this creek is one of the top three creeks in importance to aquaculture.

HUNTING CREEK

Another tributary channel, 3.5 miles northeastward of Pocomoke Sound Light 6, leads to Hunting Creek along the south side of Guilford Flats and southward through The Thorofare to the wharf at Hopkins on the east side of Hunting Creek. The marked channel has depths of 7 feet or more to within 0.7 mile of Hopkins, thence 2.5 feet to the wharf and Hunting Creek Pier (Coast Pilot). This data may be a bit dated, as satellite imagery and Navionics reveal shallow waters no deeper than four feet from day marker "9" up the creek. The Hunting Creek Pier is 440 feet in length. Hunting Creek also has a County pier for crabbing and fishing and a concrete boat ramp at Johnson Landing.

NASSAWADOX CREEK (and Church and Warehouse Creeks)

Past the mouth of the creek, the channel to Bayford typically has greater than 3 feet of water at low tide. Primary attention to maintenance needs to be at the mouth of the creek, thus the short length of maintenance, 0.1 miles, or approximately 500 feet. Additional spot dredging in the channel may be necessary when operations commence to complete maintenance.

The condition of the creek as entered from the Bay, as of 2016, is considered hazardous. The AtoNs have been removed and replaced with danger signs. Two steel pilings have rusted and fallen over, creating a hazard submerged just below the water line at low tide. The northern channel section entering the Bay has about a 100 feet section of 3.5 feet depth at low tide (as of August 28, 2016). Inside the 100- feet length of 3.5 feet depth, there is between 5 and 10 feet channel depth to Warehouse Creek. There is also a southern channel which is partially marked by PVC pipes along shellfish lease areas and has a minimum depth of 4 to 6 feet. Aerial photographs of the Bay entrances at low tide, as pictured in **Figure 4**, are available from Friends of Nassawadox Creek several times a year.

A *Dredge Project Plan* by USACE was active from 2003 to 2007 at a cost of $500,000 and included the completion of a survey. The projected costs associated with the dredging escalated when USACE engineers increased the project scope from the locally requested 500 feet to approximately 9,000 feet length. The plan included sourcing funding from waterfront residents, who protested when USACE made it clear that their project was to support commercial activities and was not designed for recreational boating support. The project ultimately folded.

Figure 4: 2016 Aerial Image of the Mouth of Nassawadox Creek. Photo coutesy of Friends of Nassawadox Creek

Smaller-scale dredging was accomplished in 2008 with a permit from VMRC (#2005-4-92) for the organization, Friends of Nassawadox Creek. About a dozen volunteer Nassawadox Creek recreational boaters removed approximately 300 cubic yards at a total cost of $13,500. The funding was donated by community residents and included a Piranha P-135E dredge system (20-30 cubic yards per hour) and a J1450 Carolina Skiff platform. That equipment is still operational and could be used if necessary and volunteers could be organized and a new permit acquired.

FY	Cubic Yards Removed	Cost
2004 privately funded and implemented	300	$13,500

As of 2016, VMRC has granted many shellfish ground leases that include several of the main boating channels on all three creeks including the eight-foot-deep channel about 900 feet upstream of Bayford. There is a publically available tool from VMRC, the Chesapeake Bay Online Map, accessible online. Church Creek has shellfish leases from shore to shore in places without regard for the boating channel; however, the plat plan can and usually does take these issues into account. Warehouse Creek follows the same pattern from the beginning of the shellfish condemnation line. Warehouse Creek is the outflow from the Riverside Memorial Hospital Waste Water Treatment Plant. Shellfish from this area must be transported (currently to Occohannock Creek) to a different water body for cleansing to allow commercial sale.

The only commercial support facility on Nassawadox Creek is located at Bayford and offers a dock, fuel, concrete ramp (in need of maintenance), and a sandy launch. In addition, there is a shed that has sorting tables and is used during soft shell crab harvest by two operators. On all three creeks, there are a total of six crabbing personnel including helpers. Shellfish leases now cover large areas, and there are about 25-30 personnel that are actively engaged in commercial harvesting in this area.

PUNGOTEAGUE CREEK

Three miles northeastward of Nandua Creek, this bayside creek has depths of 8 feet to the pier at Harborton, 2 miles above the mouth, and thence 4 feet to the ruins of Boggs Wharf, 3 miles above the mouth. Above this point the creek shoals rapidly. The entrance and inside channel are marked as far as Harborton. For years, barges loaded pulpwood at Harborton for delivery to West Point on the York River, but this hasn't been occurring for almost two decades. Barges carrying trash from Tangier Island still operate at the facility. The County facilities at Harborton include both a drive on and launch facilities and offers ample parking, restrooms and trash cans.

This waterway offers a lot of oyster aquaculture, and is highly used by both commercial watermen and recreational boaters. In addition to the public and private facilities at Harborton, the Eastern Shore Yacht and Country Club is located on the Creek as is the Sandpiper Marine and Campground.

RED BANK CREEK

The VDGIF dual boat ramp provides access to extensive public Baylor grounds and oyster ground leases in both Hog Island and Outlet Bays and beyond to USCG AtoN marked channel to the Great Machipongo Channel to the Atlantic Ocean. This is the only public boat ramp on the seaside for about 20 miles between Willis Wharf and Oyster Harbor.

There is shoaling as the creek enters Hog Island Bay and the guts that lead through Fowling Point and Castle Ridge to Ramshorn Bay are extremely narrow and do not provide adequate water depth for many vessels.

QUINBY – EASTERN END OF FEDERAL CHANNEL TO QUINBY INLET

A channel to the seaside village, marked by lights, follows Sandy Island Channel to Upshur Bay, thence through a slough in the mudflats to a dredged channel leading to a basin that has a public County landing and harbor with a pump-out station available with a wide concrete boat ramp with rental slips and parking. A no-wake speed limit is enforced. Quinby Inlet, the ocean entrance between Parramore/Revell Islands and Hog Island, has a fan of breakers across the bar at the entrance. The buoys marking the inlet are frequently shifted and not charted. The inlet should not be used without local knowledge (Coast Pilot).

The USCG AtoNs in the federally-designated Quinby project areas are not scheduled to be removed, however, those marking this state waterway are scheduled to be reevaluated at a later date, after the 2016 federal channel dredging, to determine if they should remain or be removed.

WACHAPREAGUE CHANNEL AND DAY MARKER 122 TO WACHAPREAGUE INLET

”The Little City by the Sea” is on the mainland about 4 miles west-northwest of Wachapreague Inlet. It serves as an important oystering and fishing center and is a base for recreational, commercial and charter fishing boats. Gasoline, diesel fuel, berths, and some marine supplies can be obtained. Hull and engine repairs can be made; largest marine railway, 50 feet. Although the channel between the WCV and along the Town’s working waterfront is considered a state waterway, it rarely needs maintenance, as it has historically and is currently a naturally deep channel.

A depth of about 4 feet can be carried from Wachapreague Inlet through Hummock Channel and Wachapreague Channel, marked by lights, to the wharves and marinas at the town. Wachapreague Inlet, between Cedar Island and Parramore Island, is 20 miles south-southwestward of Chincoteague Inlet. The entrance is marked by a lighted bell buoy and unlighted buoys that are shifted in position with changing channel conditions. The controlling depth is about 5 feet through the inlet, which is used by many fishing boats and by some boats seeking shelter, but should be entered only with local knowledge. There are many areas of shoaling between Day Marker 122 and Wachapreague Inlet. This waterway is used extensively by recreational and commercial vessels as well as housing the USCG Station Wachapreague.

Wachapreague Inlet has undergone drastic changes as result of dynamic coastal process and storms. The inlet is currently several times wider than it once was due to the coastal erosion of Cedar Island and shoals have been significantly relocated in parts of the inlet channel. Navigation around certain areas is particularly dangerous where shoaling, pilings, ships, and other objects once located on the southern end of Cedar Island are now in or just beneath the water.

IV. Summary and Conclusions

The Eastern Shore of Virginia’s history, culture, and economies are closely connected to the region’s proximity to, and safe navigation of, the surrounding tidal waters. Current predictions indicate that federal funding for dredging shallow draft navigation projects will continue to decline, thus the need for prioritization and alternative planning has arisen. This analysis has also revealed the substantial dependence that the Eastern Shore has on waterways of the Commonwealth where funding for maintenance of these non-federal waterways has been almost non-existent. The threat of a reduction in safely-navigable waterways, both federal and state, particularly as the tourism and aquaculture industries are growing, is a concern for communities and economies in the region.

To address these concerns, A-NPDC completed an assessment of local waterways, both federally and non-federally designated, on the seaside and bayside of the Eastern Shore of Virginia. This assessment was based primarily on USACE data and survey maps, previous reports and resources, personal communication with the ESRNWC and users of our waterways, and aid to navigation charts. The results of these assessments indicate that 22, or 37%, of the 59 assessed waterways of the Eastern Shore of

Virginia are in immediate need of maintenance attention and 56, or 81%, of these will require permit work in order to make progress towards accomplishing dredging.

Discussion

About 37% of the waterways assessed have at least some portion of the waterway with three feet or less water depth at mean low water. Of the 32 federal channels, 69% (22) of them do not meet their respective authorized depths, and 37% (12) of them have at least some portion of the channel with three feet or less water depth. These calculations are based on the assumption that those waterways which are scheduled for USACE maintenance in the next year are already dredged to depth, so it is expected that an even greater percentage of waterways have portions with three feet or less water at the time of this assessment. Almost half of the non-federal, WCV connecting waters have sections with three feet or less water and 37% (10) of the total 27 non-federal assessed waterways have areas of three feet or less water at mean low water.

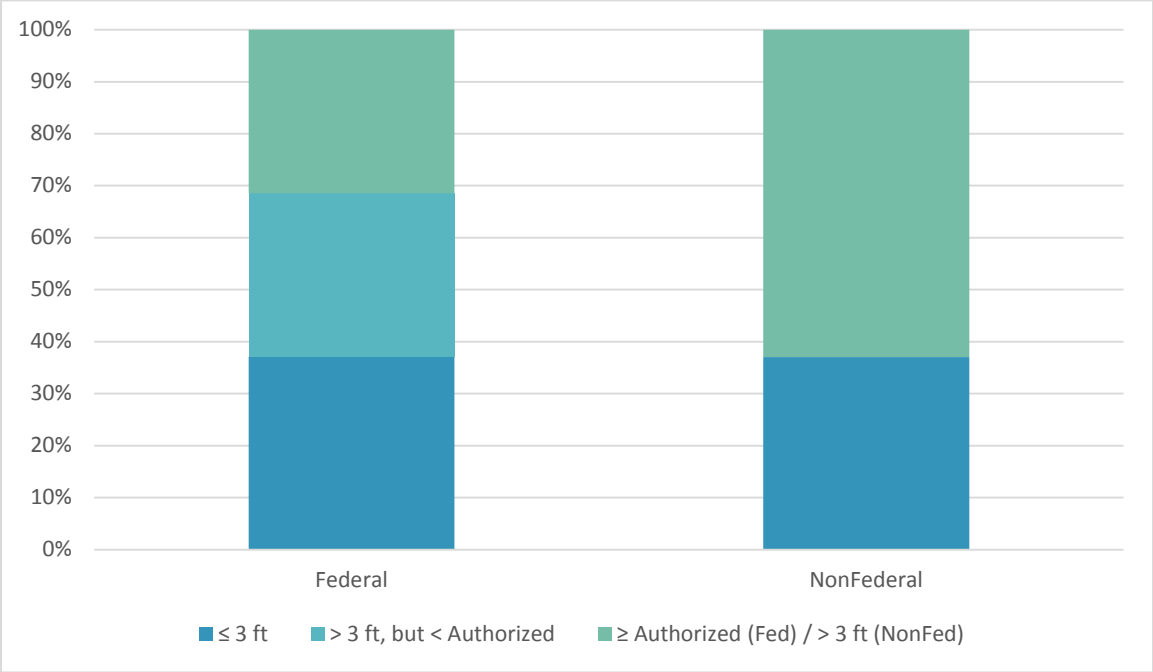

Figure 5: Waterway Condition Summary

About 21 of the 59 total assessed waterways are in need of immediate maintenance attention to ensure the continued safe navigation of the waterways. Fortunately, many of the local recreational boaters and even commercial watermen operate skiffs and other shallow-draft vessels. Many of these power boats draft less than one foot. For example, a 23-foot Ultra Carolina Skiff drafts only about 7 inches, but requires additional depth for safe operation of the outboard motors. However, vessels that are designed for off-shore boating, typically require deeper, wider channels for safe navigation. In addition, 21 of the 32 federal project areas and all of the non-federal project areas are in need of permit work, which slows the process in reaching completion for a dredging project.

Conclusions:

- Safely navigable waterways are vital to the social and economic wellbeing of residents and visitors of the Eastern Shore of Virginia,
- Federal budget constraints are likely to continue into the future. Not only are the USACE projects scrutinized by their 'Value to the Nation', explained in **Appendix D**, but also their direct commercial economic value. Some of the language used in **Appendix D** may require referring to the glossary in **Appendix C**,
- The Commonwealth of Virginia offers insufficient funding ($1 million annually statewide) for the projects that 3,315 miles (NOAA) of coastline and 3,165 square miles of water require.
- Almost half of our assessed waterways are not federally-designated, and as such can never receive federal funding for project dredging,
- 69% of federal channels do not currently meet their respective authorized depths
- 37% (23 of 62) of all assessed waterways are in immediate need of maintenance, with at least some of the waterway having depths of only 3 feet or less at mean low tide,
    - 37% (12 of 32) of federally-designated waterways are in this condition,
        - The majority of these are WCV
    - 37% (10 of 27) of non-federal waterways are in this condition,
        - A third of non-federal waterways which are not WCV connecting waters are in this condition,
        - Almost half (5/12) of the non-federal, WCV connecting waters are in this condition, and
- 81% of all assessed waterways are in need of permits prior to maintenance.

V. Recommendations

The following recommendations are based on the assessments and findings presented in this report:

- It is recommended that the Eastern Shore Regional Navigable Waterways Committee (ESRNWC) consider this report when selecting and prioritizing future dredging projects. The works cited in this report and additional resources are listed in **Appendix F**.
- A database with the waterways included in this assessment should be created and continuously updated as new information about the condition of waterways be available.
    - Updates should be ongoing, but a complete update accomplished annually, with special attention following large storm events.
- A comprehensive strategic plan for dredging of the Eastern Shore of Virginia waterways should be pursued.
    - Accomplishing this with the USACE Planning Assistance to States (Section 22) would be ideal. The result of which would be a *Shallow Draft Navigation and Sediment Management Plan* (more details below).
    - This plan should include consideration of alternative funding options.
    - This plan should consider changing the potential scope of work, on a project by project basis, from the federal project dimensions to smaller scale maintenance projects that still meet the navigations needs of that particular waterway, but that are affordable and can be implemented locally.
        - To that end, **Appendix E** provides a guide for working towards the dredging of a waterway. Some of the language used in **Appendix E** may require referring to the glossary in **Appendix C**.
- A regional *Shallow Draft Navigation and Sediment Management Plan* (discussed in further detail below) would provide vital insight into completing projects in a holistic way that can increases our coastal resilience and decreases the frequency with which our waterways require maintenance dredging.
- Steps should be taken to increase state funding of waterway maintenance projects.
- It is recommended that the Eastern Shore attempt to synthesize our regional priorities with other Virginia regions, in particular the Middle Peninsula, to maximize the USACE dredging schedules. This would allow for efficient use of the dredge once it enters the Chesapeake Bay.

Shallow Draft Navigation and Sediment Management Plan

Regional sediment management (RSM) is an approach that is intended to manage sediment using natural processes and treat sediment as a resource in a system context. Potentially this can save money; improve the environment; help address problems with erosion, wetland loss and habitat loss; increase our coastal resilience; and decrease the frequency with which our waterways require dredge maintenance.

Broadly speaking, RSM refers to the optimum utilization of various sediment resources (littoral, estuarine, and riverine) in an environmentally-effective and economically-feasible manner. RSM changes

the complexion of engineering activities within the systems from the local or project-specific scale to a broader regional scale which is defined by the natural sediment processes. By managing the sediment on regional scale, RSM aids in making the best local project decisions within the context of a regional plan that maximizes overall benefits and/or reduces total cost. Matching a dredged material disposal need with a beneficial use solution is likely to be more practical, cost-effective, and environmentally advantageous when made as part of a broad, watershed-level planning effort. This approach requires innovative collaboration at the local level to achieve implementable solutions.

Hurricane Sandy funds have made it possible to implement a few mitigation projects on the Eastern Shore to be carried out by USACE, listed in **Table 5**. In order to be most efficient with dredge materials, they must be thought of as a resource for similar mitigation projects region-wide. Knowing which projects, dredging and mitigation, are compatible, and a plan in place to effectively complete these collaborative projects is imperative to effective management of our coastal resources, particularly with limited funding.

Table 5 : USACE Hurricane Sandy funded Eastern Shore mitigation projects

Year	Section	Cubic Yards Removed	Cost USD
2016	Wallops Island Beach Nourishment	3,214,732	$35,911,947.50
2017	Tangier Jetty – authorization: Water Resources Development Act of 1996	NA	$642,000.00 ($100,000 federally funded, 50/50 state/federal cost share on remainder)
2018	Wallops Island Restoration	est. 850,000	est. $13,742,500.00

Because over wash may be one of the major causes of sediment loss from the littoral zone along much of this coastal Virginia, certain local communities on the seaside have expressed interest in pursuing mitigation projects to restore barrier islands on the seaside of the Eastern Shore and are interested in incorporating such projects into future regional planning efforts. The primary objective of these mitigation activities would be to attempt to stabilize landward retreat and the disintegration of the barrier islands by adding sediment to the system and translating the barriers into various types of modified morpho-sedimentary environments, which would also aid in preventing sedimentation of adjacent seaside waterways. These restoration efforts would primarily depend on the emplacement of suitable sediments to build up barrier systems. These localities suggest that the success of coastal erosion mitigation and restoration efforts depends on locating sufficient volumes of sand and mixed sediments (sand plus silt plus clay) that are suitable for placement on beaches, for building dunes, and for creating marshes.

Development of dynamic RSM plans would be needed for future planning, construction, and monitoring of wetland and barrier island restoration. Such a process should help enrich the range of beneficial use alternatives considered, improve compatibility with watershed-wide planning goals, and enhance stakeholder acceptance of the results.

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Appendices

Appendix A. - Inventory of Eastern Shore Waterways

The following table provides a full inventory of major creeks of the Eastern Shore. They are separated by seaside and bayside and then ordered north to south. There are a total of 87 identified, 32 federally-designated projects (Wire Passage is considered under the Gargathy Inlet project) and 55 local waters. The 'Assessed?' columns identifies if the waterway was included in this *Regional Dredging Needs Assessment*.

Name	County	Peninsula Side	Federally Designated?	Assessed?
Chincoteague Bay (Greenbackville)	Accomack	Seaside	Yes	Yes
Swans Gut Creek (Captain's Cove/Horntown area)	Accomack	Seaside	No	No
Lewis Creek (WCV)	Accomack	Seaside	Yes	Yes
Little Mosquito Creek	Accomack	Seaside	No	No
Chincoteague USCG Station	Accomack	Seaside	No	Yes
Chincoteague Inlet Harbor of Refuge	Accomack	Seaside	Yes	Yes
Chincoteague Inlet	Accomack	Seaside	Yes	Yes
Chincoteague Inlet to Bogues Bay Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Wishart Point Channel (Atlantic)	Accomack	Seaside	Yes	Yes
Bogues Bay (WCV)	Accomack	Seaside	Yes	Yes
Bogues Bay to Hog Creek Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Assawoman Creek	Accomack	Seaside	No	No
Hog Creek (WCV)	Accomack	Seaside	Yes	Yes
Hog Neck Creek to Hog Creek Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Northam Narrows (Hog Neck Creek) (WCV)	Accomack	Seaside	Yes	Yes
Kegotank Bay (WCV)	Accomack	Seaside	Yes	Yes
Gargathy Inlet (WCV) (seems to include Wire Passage)	Accomack	Seaside	Yes	Yes
Gargathy Creek	Accomack	Seaside	No	Yes
Wire Passage (WCV) (seems to be included in Gargathy Inlet permit)	Accomack	Seaside	Yes	Yes
Metompkin Bay (WCV)	Accomack	Seaside	Yes	Yes
Parker Creek	Accomack	Seaside	Yes	Yes
Metompkin Inlet	Accomack	Seaside	No	Yes
Metompkin Bay Channel to Cedar Island Bay Channel (WCV)	Accomack	Seaside	No	Yes
Folly Creek-Metompkin Inlet	Accomack	Seaside	No	Yes

Name	County	Peninsula Side	Federally Designated?	Assessed?
Cedar Island Bay (WCV)	Accomack	Seaside	Yes	Yes
Cedar Island Bay Channel to Burtons Bay Channel Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Burtons Bay Channel to Bradford Bay Channel Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Wachapreague Channel	Accomack	Seaside	No	Yes
Day Marker 122 to Wachapreague Inlet	Accomack	Seaside	No	Yes
Bradford Bay and Finney Creek (WCV)	Accomack	Seaside	Yes	Yes
Bradford Bay Channel to Swash Bay Channel Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Swash Bay Channel (WCV)	Accomack	Seaside	Yes	Yes
Swash Bay Channel to Sloop Channel Connecting Waters (WCV)	Accomack	Seaside	No	Yes
Quinby Creek	Accomack	Seaside	Yes	Yes
Eastern End of Federal Channel to Quinby Inlet	Northampton	Seaside	No	Yes
Sloop Channel (WCV)	Northampton	Seaside	Yes	Yes
North Channel (WCV)	Northampton	Seaside	Yes	Yes
Great Machipongo Inlet & Channel	Northampton	Seaside	No	Yes
North Channel to Ramshorn Channel Connecting Waters (WCV)	Northampton	Seaside	No	Yes
Ramshorn Channel (WCV)	Northampton	Seaside	Yes	Yes
Little Machipongo River	Northampton	Seaside	Yes	Yes
Sloop Channel to Ramshorn Channel Connecting Waters (WCV)	Northampton	Seaside	No	Yes
Upshur Creek	Northampton	Seaside	No	No
Red Bank Creek	Northampton	Seaside	No	Yes
Mill Creek	Northampton	Seaside	No	No
Indiantown Creek	Northampton	Seaside	No	No
Taylor Creek	Northampton	Seaside	No	No
Oyster Channel	Northampton	Seaside	Yes	Yes
End of Oyster Channel to Sand Shoal Inlet	Northampton	Seaside	No	Yes
Upper Magothy Bay to Ramshorn Connecting Waters (WCV)	Northampton	Seaside	No	Yes
Magothy Bay (Upper) (WCV)	Northampton	Seaside	Yes	Yes
Chesapeake Bay to Magothy Bay (WCV)	Northampton	NA	Yes	Yes

Name	County	Peninsula Side	Federally Designated?	Assessed?
Chesapeake Bay /Magothy Bay to Upper Magothy Bay Connecting Waters (WCV)	Northampton	Seaside	No	Yes
Pitts Creek	Accomack	Bayside	No	No
Bullbeggar Creek	Accomack	Bayside	No	No
Holdens Creek	Accomack	Bayside	No	No
Starling Creek (Saxis)	Accomack	Bayside	Yes	Yes
Messongo Creek	Accomack	Bayside	No	No
Cattail Creek	Accomack	Bayside	No	No
Muddy Creek	Accomack	Bayside	No	No
Tangier Channels	Accomack	Bayside	Yes	Yes
Guilford Creek	Accomack	Bayside	Yes	Yes
Youngs Creek	Accomack	Bayside	No	No
France Creek	Accomack	Bayside	No	No
Little Back Creek	Accomack	Bayside	No	No
Bagwell Creek (Parkers Landing Rd)	Accomack	Bayside	No	Yes
Hunting Creek (Hopkins unincorp.)	Accomack	Bayside	No	Yes
Doe Creek	Accomack	Bayside	No	No
Deep Creek	Accomack	Bayside	Yes	Yes
Chesconessex Creek	Accomack	Bayside	Yes	Yes
Onancock Creek	Accomack	Bayside	Yes	Yes
Parkers Creek	Accomack	Bayside	No	Yes
Matchotank Creek	Accomack	Bayside	No	No
Pungoteague Creek	Accomack	Bayside	No	No
Butcher Creek	Accomack	Bayside	No	No
Nandua Creek	Accomack	Bayside	Yes	Yes
Craddock Creek	Accomack	Bayside	No	No
Occohannock Creek	Northampton	Bayside	Yes	Yes
Nassawadox Creek (& Church & Warehouse Creek)	Northampton	Bayside	No	Yes
Westerhouse Creek	Northampton	Bayside	No	No
Hungars Creek	Northampton	Bayside	No	Yes
Mattawoman Creek	Northampton	Bayside	No	No
Barlow Creek	Northampton	Bayside	No	No
the Gulf (Smith Beach)	Northampton	Bayside	No	No
Cherrystone Inlet	Northampton	Bayside	No	No
Kings Creek	Northampton	Bayside	No	Yes
Cape Charles City Harbor	Northampton	Bayside	Yes	Yes
Longs Pond	Northampton	Bayside	No	No

Appendix B. - Non-Federal Waterways Assessment Justification Data

The table below provides the data used to determine if a non-federal waterway were to be included in the dredging needs assessment and correlates to further explanation in the methods section. The twelve WCV connecting waters were not included here, as their inclusion was not dependent upon the presence of facilities.

Waterway Name	USCG AtoN? Y/N*	Facilities	Use	Assess?
Hunting Creek (Hopkins unincorp.)	Y	Landing (2)	Com & Rec Fishing & Boating, Aquaculture	Yes
Pungoteague Creek	Y	Landing, Country Club, Campground, Aquaculture, Seafood Co.	Com & Rec Fishing & Boating, Aquaculture	Yes
Hungars Creek	Y		Com & Rec Fishing & Boating, Aquaculture	Yes
Kings Creek	Y	Marina, Restaurant, Campground, Seafood Co.	Com & Rec Fishing & Boating, Aquaculture	Yes
Nassawadox Creek (& Church & Warehouse Creek)	N	Landing	Com & Rec Fishing & Boating, Aquaculture	Yes
Chincoteague USCG Station	NA	USGS Station	USGS Station	Yes
Day Marker 122 to Wachapreague Inlet	Y	**USGS Station**, Marina (3), Ramp, Fuel, Lodge, Campground, VIMS Lab, Seafood Co.	**USGS Station**, Com & Rec Fishing & Boating, Aquaculture, Research/Education	Yes
Folly Creek-Metompkin Inlet	N, but leads into VIP with AtoNs	Landing,	Com & Rec Fishing & Boating, Aquaculture	Yes
Gargathy Creek	N	2 Landings	Com & Rec Fishing & Boating, Aquaculture	Yes
Wachapreague Channel	N	**USGS Station**, Marina (3), Ramp, Fuel, Lodge, Campground,	Com & Rec Fishing & Boating, Aquaculture, Research/Education	Yes

		VIMS Lab, Seafood Co.		
Eastern End of Federal Channel to Quinby Inlet	Y	Landing, Campground, Seafood Co.	Com & Rec Fishing & Boating, Aquaculture	Yes
Great Machipongo Inlet & Channel	Y	Landing, Restaurant, Aquaculture, Seafood Co., & Crab Shanties	Com & Rec Fishing & Boating, Aquaculture, Research	Yes
Red Bank Creek	N	Landing	Com & Rec Fishing & Boating, Aquaculture	Yes
Metompkin Inlet	N		Com & Rec Fishing, USCG Atlantic access	Yes
Bagwell Creek (Parkers Landing Rd)	N	Parkers Landing Rd, no ramp	Rec Fishing & Boating	No
End of Oyster Channel to Sand Shoal Inlet	Y	Public harbor, landing, UVA Center, Seafood Co.	Com & Rec Fishing & Boating, Aquaculture, Research/Education	Yes
Bullbeggar Creek	N			No
Butcher Creek	N		Rec Fishing & Boating	No
Cattail Creek	N	Landing	Com & Rec Fishing & Boating, Aquaculture	No
Craddock Creek	N		Com & Rec Fishing & Boating	No
Doe Creek	N		Rec Fishing & Boating	No
France Creek	N		Rec Fishing & Boating	No
Holdens Creek	N			No
Little Back Creek	N		Rec Fishing & Boating	No
Matchotank Creek	N		Rec Fishing & Boating	No
Messongo Creek	N	Landing (2), Seafood Co.	Com & Rec Fishing & Boating, Aquaculture	No
Muddy Creek	N	Landing, Pier, Beach	Com & Rec Fishing & Boating, Aquaculture	No
Pitts Creek	N	Landing (actually on Pocomoke River)	Com & Rec Fishing & Boating	No
Youngs Creek	N		Rec Fishing & Boating	No
Barlow Creek	N		Com & Rec Fishing & Boating, Aquaculture	No
Cherrystone Inlet	N	Private companies docks, etc.	Com & Rec Fishing & Boating, **Aquaculture**	No

Longs Pond/ Old Plantation Creek/ Arlington Creek	N	Tomb of Custis	Com & Rec Fishing & Boating, **Aquaculture**	No
Mattawoman Creek	N		Com & Rec Fishing & Boating, Aquaculture	No
Parkers Creek	?	Landing	Com & Rec Fishing & Boating	Yes
the Gulf (Smith Beach)	N	Seafood Co.	Com & Rec Fishing & Boating, **Aquaculture**	No
Westerhouse Creek	N		Rec Fishing & Boating, **Aquaculture**	No
Assawoman Creek & Inlet	N	Old NASA ferry dock	Com & Rec Fishing & Boating	No
Little Mosquito Creek	N	Ramp, Slips, Trails End Resort	Rec Fishing & Boating	No
Swans Gut Creek (Captain's Cove/Horntown area)	N			No
Indiantown Creek	N	Indiantown Rec Park (no water access)		No
Taylor Creek	N		Rec Fishing & Boating	No
Upshur Creek	N	TNC dock	Rec Fishing & Boating, Research/Education	No

Appendix C. - Glossary

Aids to Navigation: Buoys, beacons, fog signals, lights, radio beacons, range markers, and generally any charted or published information serving the interest of safe navigation.

Appropriation: Congressional funding for the construction and maintenance of navigation channels and turning basins.

Authorization: Congressional approval for the construction and maintenance of navigation channels and turning basins.

Authorized Dimensions: Length, width, and depth dimensions of a navigation project as specified in the authorizing document.

Beach: The shoreline zone comprised of unconsolidated sandy material upon which there is mutual interaction of the forces of erosion, sediment transport and deposition extending from the mean low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff, or marsh, or where no such change can be identified, to the line of woody vegetation (usually the effective limit of storm waves), or the nearest impermeable manmade structure, such as a bulkhead, revetment, or paved road (§28.2-1400 of the Code of Virginia).

Beach nourishment: Placement of good quality sand along a beach shoreline to raise the elevation of the nearshore area. (VIMS, 2006)

Beach of the Commonwealth: Public beach.

Channel: Part of body of water deep enough to be used for navigation. Channels can be either natural or artificial waterways.

Constructed Dimensions: Channel dimensions which have been provided by initial or new work dredging.

Continuing Authorities Program (Navigation): Congressionally directed authority provided to the Chief of Engineers on an on-going basis for small navigation projects as defined by Section 107 of the River and Harbor Act of 1960, as amended.

Deauthorized Navigation Channel or Turning Basin: Navigation channels and turning basins (or portions thereof) which were never constructed and subsequently were removed from any further consideration as a result of a formal deauthorization process.

Draft: The depth of water displaced by a vessel.

Dredging: The practice of excavating and removing material from underwater locations, either by mechanical or hydraulic means.

Dredging Cycle: The period of time (years) between dredging events. Also referred to as dredging frequency.

Dredging Process: Removal (usually from underwater), transportation, and placement of material, for the purpose of constructing new waterways, maintaining existing waterway dimensions, obtaining fill for land reclamation, beach nourishment, dike and levee construction, creating wetlands and marshes, obtaining materials from borrow areas or other beneficial uses.

Fuel Taxed Inland Waterways System: 27 waterways of the United States' interior, along the Atlantic and Gulf Coasts, and in the Pacific Northwest where fuel consumed by vessels transporting cargo is subject to a Federal tax (currently 20 cents per gallon). The fuel taxed waterways comprise near 11,000 miles of waterways at least 9 feet deep and includes 186 lock sites. These waterways move over 600 million tons and would cost over 125 billion dollars to replace. (REF: INLAND WATERWAYS USERS BOARD 23rd ANNUAL REPORT TO THE SECRE TARY OF T HE ARMY AND UNITED STATES CONGRES S, AUGUST 2009)

General Navigation Feature: Refers to any navigation channel, turning basin, anchorage, and dredged material placement area which is cost shared between the Federal government and the local sponsor of a Federally authorized project. It excludes Aids to Navigation which are paid fully by the Coast Guard as well as lands, easements, rights-of-way, relocations (LERRS) which are the responsibility of the local sponsor.

Hydraulic Dredging: Dredging performed by a hydraulic dredge, which generally moves bottom material via a centrifugal pump and pipeline or hopper directly toward a dredged material placement area.

Inactive Navigation Channel or Turning Basin: Navigation channels and turning basins which are no longer actively used for either commercial or recreation pursuits. In some cases, inactive projects might become eligible for deauthorization.

Joint Permit Application or JPA: The standard Joint Permit Application for shoreline stabilization structures and other activities conducted in wetlands and the marine environment. The applicant completes one form and submits to either local agency or VMRC, which is responsible for distributing to local, state and federal permitting and advisory agencies (e.g. Virginia Institute of Marine Science, Department of Game and Inland Fisheries, Department of Conservation and Recreation, Department of Environmental Quality, U.S. Army Corps of Engineers). (VIMS, 2006)

Maintained Dimensions: Navigation channel dimensions (length, width, and depth) that are determined by using traffic, or other restrictions, which are less than or equal to authorized dimensions, or the constructed dimensions if less than the authorized dimensions.

Maintenance Dredging: The removal of shoal material from a constructed project. (USACE) Dredging activities for navigation purposes that have been previously authorized by the Commission, to the depth previously authorized by the Commission, and where a royalty has been previously paid to

the Commission for the initial removal State-owned submerged lands (Constitution of Virginia Article XI Section II) (VMRC).

Mean Lower Low Water (MLLW): A tidal datum established by the National Ocean Service. The average height of all lower low waters recorded over a specific 19-year period called the National Tidal Datum Epoch. It is the reference datum used for Federal navigation projects.

Mean low water (MLW): The average height of low waters over a nineteen year period. Virginia is a low water state, meaning private property extends to the mean low water line.

Mechanical Dredging: Dredging performed with a mechanical dredge which normally lift the dredged material above the waterline by means of buckets or scoops of various designs and deposit it in a barge or similar conveyance for transport and placement.

Navigation Channel: A project feature with authorized project limits/dimensions, which is designed, constructed and maintained for use by commercial and/or recreational navigation traffic. This definition includes appropriate harbors, canals, turning basins, anchorage/mooring areas and/or waterways.

Overdepth Dredging: Any dredging below the authorized depth (or constructed depth if less than the authorized depth) to include required, allowable and non-pay dredging overdepth.

Private Beach: a beach, as defined by §28.2-1400 of the Code of Virginia, whose underlying fee (ownership) is held privately and not by a local, state or federal governmental entity and whose public use is restricted or controlled by the property owner.

Project Dimensions: (see Authorized Dimensions).

Public beach: A sandy beach located on a tidal shoreline suitable for bathing in a county, city or town and open to indefinite public use (Code of Virginia §10.1-705)

Recreational Craft: Non-commercial vessels used for recreational activity.

Resource Protection Area (RPA): The component of the Chesapeake Bay Preservation Area comprised of lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters (9VAC10-20-40).

River and Harbor Act: Congressional Authorization for construction of Federal navigation channels and turning basins.

Royalties: Fees paid to the Commonwealth for certain uses of submerged public lands. They are assessed in addition to permit fees. All royalties are subject to change in accordance with the Commission's public participation procedures and regulatory adoption process. Contact the Virginia Marine Resources Commission Habitat Management Division for a current royalties schedule (VMRC Subaqueous Guidelines Section I).

Shallow Draft Navigation System: Those navigation channels and turning basins with a depth of less than 15 feet when measured at MLW (REF: Coastal Engineering Technical Note I-63, March 1999).

Shoaling Rate: This is the rate at which sediment fills a navigation channel or feature, usually measured in terms of cubic yards per year.

Turning Basin: General navigation features which allow ships to make a U-turn and leave a channel the way they entered. They eliminate the need for long backing-out movements.

Vessels: Towboats, barges, and other waterborne craft.

Water Resources Development Act of 1986 -- Title I, Section 101 (Public Law 99-662): The non-Federal share of the cost of general navigation features is 1 0 percent for that portion of the project which has a depth not in excess of 20 feet.

Water Resources Development Act of 1996 -- Title II, Section 201 (Public Law 104-303): Designates that land based and aquatic dredged material disposal areas built for construction and operation and maintenance shall be considered a General Navigation Feature and cost shared in accordance with Title I of the Water Resources Development Act of 1986 (Public Law 99-662).

Water Resources Development Act of 2007 – Sections 2005, 2029 and 2037 (Public Law 110-114): To provide for the conservation and development of water and related resources, to authorize the Secretary of the Army to construct various projects for improvements to rivers and harbors of the United States, and for other purposes.

Waterborne Commerce: Commodities moved or transported by way of navigation channels.

Waterway: Any body of water wide enough and deep enough to accommodate the passage of water craft.

Appendix D. - Value to the Nation

The following is a guide sheet for local sponsors and stakeholders to provide input to the USACE for project budget justifications.

Although USACE is committed to finding balance among economic, recreation, and the environment with their projects, their Civil Works program focuses on coastal protection, disaster preparedness and response, environmental protection and restoration, flood risk management, recreational opportunities, and others. This could be an important focus in requesting a project be completed.

General:

- Whenever possible, cite the source of the factual information provided.
- If possible, information should be specific to the project.
- In addition to specific factual information, the sponsor or stakeholder may provide a narrative describing the importance of the project from their perspective.
- Not all factors apply to each project. Use the best information you can obtain in the categories that follow. Sooner is better. Provide what you can in the short term, and follow up with information that takes longer to obtain.

Commerce (commodities, tonnages, cargo value, transportation savings):

- Estimated annual tonnages by commodity moving on the project (sand/gravel, aggregates, petroleum, grain, fish, shellfish, etc.)
- Whenever possible, list by name the various businesses that use the project.
- For fish/shellfish, if available provide estimated cargo value relating to the tonnage.
- Estimated number, size, draft and type of commercial vessels using the project.
- Estimated annual trips for commercial vessels (count both inbound and outbound.)
- Estimated transportation savings vs. other mode or other harbor.
- If project were not dredged, estimate the additional costs for light loading, waiting for tide, using truck or rail, or going to another harbor.
- Are you already being forced to light load or wait for tide? Estimate savings to you if channel or harbor is dredged.
- List and describe other commercial uses with supporting information.
    - Seafood buyers and processors located on or adjacent to the project.
    - Charter boats, head boats – size, number of boats, estimated annual trips.
    - Ferries, tour boats, eco-tours, scientific and educational tours. Cite estimated annual vessel trips and estimated passengers carried on the project.
    - Boat repair yards, commercial marinas, etc.

Safety and Public Health:

- Does the project serve as a harbor of refuge? If so, estimate the typical number of vessels that use the harbor in a storm, and identify the next closest available harbor.

- US Coast Guard – use of the project as a base for Search & Rescue activities, ice- breaking, aids to navigation maintenance, etc.
- Life threatening situations caused by shoaling – cite sources if available.
- Groundings on shoals, accidents, injuries and fatalities at the project.

National, State and Local Security:

- Cite any military use such as Navy or Marines.
- Coast Guard use for Homeland Security activities.
- Shipment of any commodities or equipment used by the military.
- Use by local or state law enforcement activities.

Recreation:

- Estimated number of recreation boats using the project and vessel trips.
- Number of boat ramps and marinas on the project.

Environmental Factors:

- Does the project factor into a local, state or federal environmental initiative?
- What environmental benefits are to be gained from the project?
- Is the work required to support agreements with other agencies?
- Be sure to explain why such factors should influence priority.

Consequences:

- What happens if the project is not dredged?
- Jobs lost and businesses affected.
- Lost tax revenues.
- Describe extent and value of local investments that would go unrealized.
    - Local investments in dredging, dredged material placement sites and other real estate, bulkheads, piers, public landings, boat ramps, etc.
    - Private investments in businesses.

Other Remarks:

- Unique features available only at that project.
- Cultural or historic values.
- Why is the project important to you?

Appendix E. - Users Guide to Dredging on the Eastern Shore of Virginia

The intention of this appendix is to provide guidance through a dredging project – from the identification of a dredging need, to identification of sediment disposal site, to applying for a dredging permit, to the dredging of a channel. Much thanks to the Middle Peninsula Planning District Commission for sharing their 2011 publication: *Users Guide to Dredging in Tidewater Virginia*, which provided a template and much information for this asset to this Report.

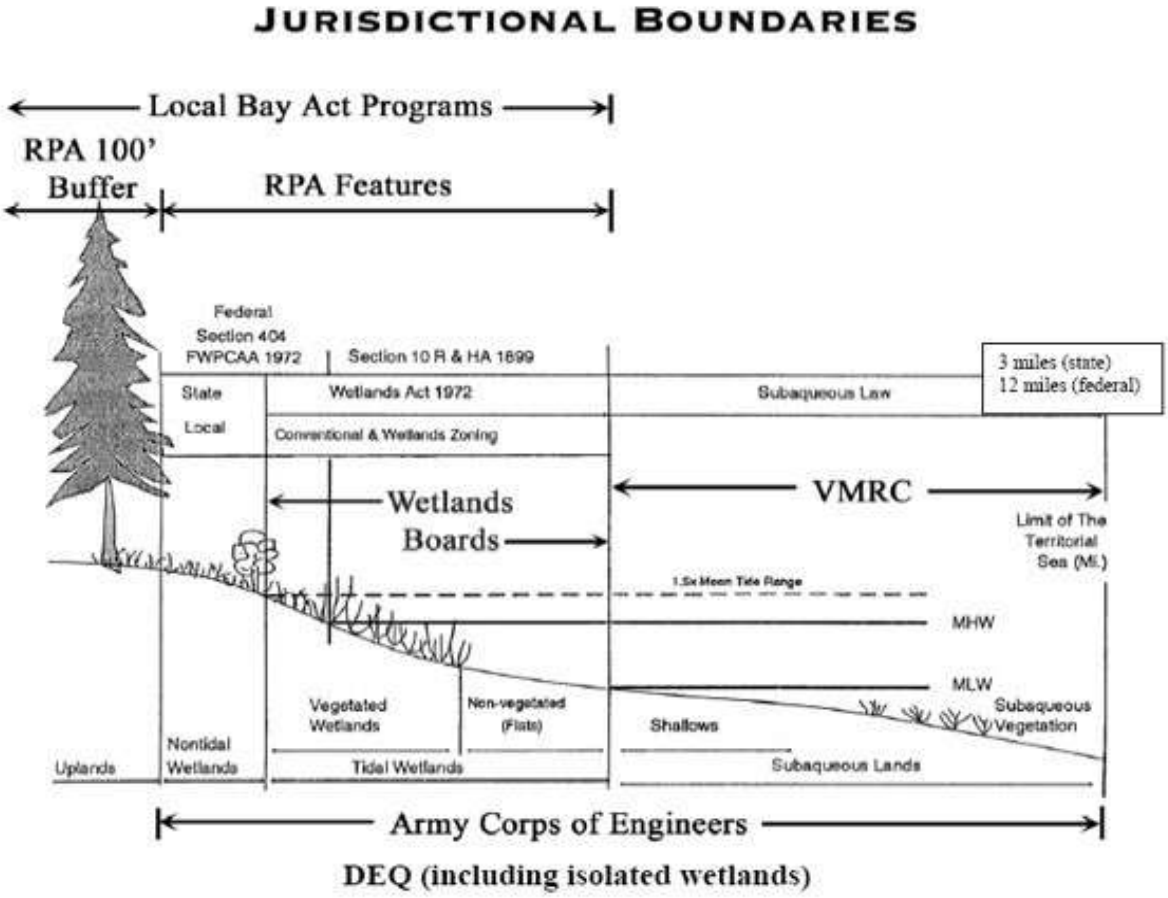
STEPS: The Execution of a Dredging Project

1. Identify Channel with Dredging Need:

To begin the dredging process, a navigable channel must be identified as having a need for dredging, which is evident when navigation becomes obstructed and/or limited, particularly due to shoaling. The need may be identified by a private or public entity, but may also be identified by the USACE if a problem is noticed during a routine survey of a channel. Following the identification of a channel in need of dredging, the party interested in having the channel dredged may choose to meet with the regulatory agencies responsible for the review and permitting of the proposed dredging. These agencies typically include the USACE, Virginia Department of Environmental Quality (DEQ), Virginia Marine Resources Commission (VMRC) and local wetlands board. Locally, we have the Eastern Shore Navigable Waterways Committee which will often will facilitate and assist with this process. The agencies will review the channel in question and the associated project need. Preliminary comments will be offered relative to the information necessary to complete the JPA and the agencies will recommend design considerations necessary to avoid or minimize adverse environmental impacts. Also there will be consideration and discussing regarding the suitability of the proposed disposal site as well as the associated permit fees, royalties and/or mitigation costs.

The Role of Jurisdictional Boundaries

The jurisdictional boundaries of the Virginia Commonwealth in conjunction with the specifics of the individual dredging project will ultimately determine the permits necessary to complete a dredging project. As shown in the figure below, the jurisdictional boundaries of federal, state and local jurisdictions have the tendency to overlap, which makes the permitting process project specific and at times complicated.



With a specific channel identified, it is important to note whether the channel has been previously dredged or not. This will likely influence the amount of permit fees and royalties required by the permitting agencies. According to VMRC's Subaqueous Guidelines Section II, K, II maintenance dredging is defined by VMRC as dredging activities for navigation purposes that have been previously authorized by the Commission, to the depth previously authorized by the Commission, and where a royalty, if applicable, has been previously paid to the Commission for the initial removal of State-owned submerged lands. (Please note that public entities, including towns, cities and counties are exempt from dredging royalties). As a maintenance dredging project, the applicant is required to pay VMRC's permit fee, but shall be exempt from all other fees and royalties. Typically, maintenance dredging requires no additional permit fees from the USACE or DEQ, however, mitigation costs may or may not be applicable. If a project is within the jurisdiction of the local

wetlands board, permit fees and/or mitigation costs may be required. This will vary between counties.

2. Pre-Dredge Bathymetric Survey:

For the identified channel, a pre-dredge bathymetric survey is needed to determine the water depths relative to mean low water (MLW). The pre-dredge survey may be performed by anyone (i.e. certified engineer, licensed land surveyor or firm, private entity, etc.), but should include sufficient transects and be referenced to MLW. The survey evaluates current depth conditions and ultimately guides the amount of dredging that will occur at the site. For private channels, maximum project depths typically are governed by the draft of the vessels utilizing the area. For channels designated as federally maintained, maximum project depths are previously established by the District Engineer (USACE) or by Congress.

3. Identify and Select a Disposal Site:

Once a channel is identified as having a dredging need, a disposal site location should be determined and prepared to receive and permanently contain the dredged material. Since overboard disposal of dredged material into tidal waters is generally not permitted (VMRC Subaqueous Guidelines Section III, E), applicants will need to consider disposal areas that are acceptable to the various permitting agencies. Factors to consider for a disposal site, include, but are not limited to the following (VMRC Subaqueous Guidelines Section III, C):

1. Encroachment into natural drainage ways;
2. Chemical nature of the dredged material and its potential for polluting adjacent or nearly underground water supplies;
3. Encroachment over the underground utilities, i.e. water lines and sewer facilities;
4. Value of the site to the natural environment;
5. Proximity to populated areas; and
6. Anticipated use of the material or disposal site after dredging material is placed and consolidated.

According to§10.1-704 of the Code of Virginia, the beaches of the Commonwealth (i.e. beaches classified as public) shall be given priority consideration as sites for the disposal of dredged material determined to be suitable for beach nourishment for public benefit. The Secretary of Natural Resources shall have the responsibility of determining if the dredged material is suitable for beach nourishment; however, if a public beach placement site is not suitable or available, dredged material may be placed on private beach, or in a private or public upland containment site. In general, the regulatory and advisory agencies reach a decision on the suitability of an area for beach nourishment.

Depending on the sediment disposal site, VMRC has associated royalties. Such royalties may be important in determining the most feasible disposal site for the dredge project:

a. Public Beach

If a public beach is chosen as the disposal site, fee simple and adjacent property owners may benefit from the additional protection offered by the larger beach. VMRC requires a permit and charges an encroachment royalty of $0.05 per square foot for placement of sandy dredge material over the adjacent State-owned subaqueous lands (i.e. area channelward of MLW). The placement of sandy dredge material on public or

b. Private Beach or Shoreline

Applicants may have to work with fee simple and adjacent property owners to obtain an easement if the proposed disposal site is a private beach or shoreline. If the private property owner is unwilling to relinquish property rights to the applicant, then they will need to apply for permits to allow for the placement of the dredge material on their property. Ideally the applicant and property owner will be co-applicants on the VMRC JPA (see Section 3 for more information). VMRC has no jurisdiction landward of MLW; therefore, there will never be a placement royalty assessed by VMRC for the disposal of dredge material above MLW. The placement of sandy dredge material on public or private beaches, landward of MLW, is exempt from local wetlands boards. Permits may, however, be required from the DEQ and the USACE. The placement of dredge material on intertidal shorelines which do not meet the definition of a beach will require permits from the local wetland board, DEQ and the USACE.

c. Private Upland Containment Site

A containment site owned privately may be used for disposal of dredged material, particularly if the dredge material is unsuitable for beach nourishment. The upland containment site acts as a permanent reserve for dredged sediment and in some case acts as a holding location for dredged material to dry. Also in ideal situations the upland containment site is not located within the Resource Protection Area (RPA).

d. Public Upland containment site

A containment site owned by a public entity may be used for disposal of dredged material, if it is unsuitable for beach nourishment. The upland containment site acts as a permanent reserve for dredged sediment and in some case acts as a holding location for dredged material to dry. Also in ideal situations the upland containment site is not located within the RPA.

Additionally, as county wetland boards regulate the use and development of wetlands, the placement of dredged material on public and private beach, and/or upland private or public containment site may fall in the jurisdiction of the local Wetlands Board. Wetlands Boards within the Eastern Shore have very similar wetland permit application fees and those fees are the same for both residential and commercial projects. Wetland Boards will receive the JPA application for review and within 45 days the Wetland Board will notify the applicant if a wetland permit is required or not. The table below reviews the fee schedule for wetland permits for each county within the Eastern Shore of Virginia.

County	**Wetland Permit Fee**	**Contact for more information**
Accomack	Non-commercial/residential or Commercial Project: $297.00 (+ $160.00 advertisement costs for public notice)	(757) 787-5721
Northampton	Non-commercial/residential or Commercial Projects: $300 application (+ advertisement costs for public notice)	(757) 678-0443 ext. 544

4. Submission of the Joint Permit Application:

One of three parties, including a public entity (i.e. political subdivision), private entity (i.e. home owner, home owner association), or a public private partnership, ma y request a dredging project. This request is made upon the completion and submission of a Local/State/Federal Standard Joint Permit Application (JPA) to VMRC. Commission serves as the clearinghouse agency for the distribution of the JPA to the advisory and regulatory agencies routinely involved in the review and permitting of dredge projects. This application must be submitted for any and all projects which propose to impact to tidal and non-tidal shorelines and submerged lands. This includes dredging projects, erosion control project, private or commercial piers, utility and road crossings, etc. Upon receipt of a given application by all of these regulatory agencies, the JPA is concurrently reviewed by the wetlands board, VMRC, USACE, and DEQ. Most dredge projects additionally are received by the National Marine Fisheries Service (NMFS), the Environmental Protection Agency (EPA), the Virginia Institute of Marine Science and possibly other State advisory agencies.

In accordance with the Code of Virginia, VMRC assesses a permit fee of $25 for projects costing $10,000 or less, and $100 for projects costing more than $10,000. Copies of the JPA may be obtained from the local wetlands boards, VMRC, DEQ, USACE, or can be downloaded from the Norfolk District Corps of Engineers web site at http://www.nao.usace.army.mil/Missions/Regulatory/JPA.aspx.

Agencies will review the JPA application and contact the applicant individually about additional permit requirements for the project. As mentioned earlier each project is unique which requires unique consideration as well as associated permits.

As the USACE has regulatory authority over Section 404 of the Clean Water Act (33 U.S.C. §1344), Section 10 of the Rivers Harbors Act of 1899 (33 U.S. C. §403), and Section 103 of the Marine Protection Research and Sanctuaries Act (33 U.S.C. §1413), shallow water dredging projects may qualify for additional national and regional permits. The USACE will notify the prospective permittee within 45 days of receiving the JPA application whether the project may proceed under the nationwide permit or whether an individual permit is required. If, after reviewing the notification, the District Engineer determines that the proposed activity would have more than a minimal individual or cumulative adverse impact on the aquatic environment or otherwise may be contrary to the public interest, the engineer will either condition the nationwide permit authorization or reduce or eliminate the adverse impacts, or notify the prospective permittee the at the activity is not authorized by the nationwide permit and provide the permittee with instruction on how to seek

authorization under an individual permit. The specifics of the projects will determine the type of permits required for the project, but below is sample of permits that dredging project may require:

- Nationwide Permit 3 Maintenance2: authorizes the removal of accumulated sediments and debris in the vicinity of and within an existing structure and the placement of new or additional riprap to the structure. The removal of sediment is limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure(s) was built but cannot extend further than 200 feet in any direction from the structure.
- Nationwide Permit 19 Minor Dredging3: authorizes dredging of no more than 25 cubic yards below the plane of the ordinary high watermark or the mean high water mark from navigable waters of the United States.
- LOP-2 (Letter of Permission)4: authorizes dredging (channels and basins) for certain navigationally-related recreational and commercial dredging projects, by either mechanical or hydraulic method, in waters of the United States, within the geographical limits of the Commonwealth of Virginia under the regulatory jurisdiction of the Norfolk District Corps, subject to the terms and conditions further set out herein.

To have questions answered about particular projects within the region please call the Norfolk District Public Affairs Office at 757-201-7500 or cenao-pa@usace.army.mil.

As the Virginia Department of Environmental Quality administers the Virginia Water Protection (VWP) Permit Program (§§ 62.1-44.15 and 62.1-44.15:20 of the Code of Virginia) for the Commonwealth, impacts to surface waters such as land clearing, dredging, filling, excavation, draining or ditching in open water, streams and wetlands require such a permit. For maintenance dredging previously authorized, a regional permit 19 (RP-19) may be required which does not does include a fee. However, if it is determined that a permit from DEQ is required, then the fee structure is based on the size of the area to be dredged, the amount of material to be removed, the habitat of the area, and if the area is tidal or non-tidal. Since each project is case specific and such things as avoidance and minimization of wetland impacts, and project purpose and need are all taken into consideration it is best to call the DEQ Tidewater Regional Office for more details at (757) 518-2158.

Once the application has been approved by all of the regulatory agencies exerting jurisdiction, the permittee is responsible for the project's permit fees, associated dredging and placement royalties and/or mitigation costs. With respect to VMRC, according to VA Code §28.2-1206 Section E, "All counties, cities and towns of the Commonwealth shall pay the required permit fee but shall be exempt from all other fees;" such fees include dredging and placement fees. For private applicants, dredging fees will apply while VMRC will consider the dredging fees for private public partnerships on a case by case basis. The approved permit shall specify a royalty which may not be less than $0.20 per cubic yard and no more than $0.60 per cubic yard. In establishing the royalty, VMRC takes the following factors into consideration:

1. The primary and secondary purpose for removing the bottom material;

2. Whether the material has any commercial value and whether it will be used for any commercial purpose;
3. The use to be made of the removed material and public benefit or adverse effect upon the public that will result from the removal or disposal of the material;
4. The physical characteristics of the material to be removed; and
5. The expense of removing and disposing of the material.

In most cases the applicant is charged $0.45 per cubic yard for dredged material, proposed to be removed from State-owned bottom. If the dredged material is high quality and has the potential for commercial use, then the applicant may be charged $0.60 per cubic yard.

As stated earlier, another factor contributing to the projects associated dredging royalty is whether the project is considered a maintenance dredge project or not. A maintenance dredge, as defined by VMRC, is a dredging activity for navigation purposes that have been previously authorized by the Commission, to the depth previously authorized by the Commission, and where a royalty, if applicable, has been previously paid to the Commission for the initial removal State-owned submerged lands (Constitution VMRC Subaqueous Guidelines Section II). Therefore, if one's project meets this definition the permittee is exempt from dredging royalties. If the project is not considered maintenance, then the permittee will be charged $0.20-$0.60 per cubic yard.

A permittee is also responsible for placement royalties. If the dredged sediment is placed below mean low tide then the associated royalty is $0.05 per square foot. However, to place dredged material above the mean low water mark on private property, the private property owner may have to obtain a wetlands or coastal primary sands dunes and beaches permit.

Ultimately the permittee is liable for the proper completion of the project, in particular closely adhering to all of the permit conditions issued by the regulatory agencies. These include strict adherence to the maximum permissible project depths, vegetated wetlands buffers, allowable dredge footprints and proper erosion and sediment control at the dredge cut, pipeline or transfer route and dredge disposal site. The permittee is also required to adhere to any regulations or laws that protect threatened and endangered species and other sensitive habitats such as submerged aquatic vegetation or oyster reefs.

For a comprehensive overview of permit fees, dredging fees, and encroachment/placement fees associated with dredging projects, please refer to the Dredging Project Table on the following page.

5. Selection of a contractor:

With the parameters for a dredged project approved by the appropriate regulatory agencies, the permittee seeks bids from marine contractors and subcontractors capable of meeting the permits parameters.

6. Pre-dredging conference:

Often, as permit condition, a pre-dredging conference is held at the site prior to the commencement of dredging. The permittee, the dredging contractor, and a member of the VMRC staff must attend the meeting. Other agencies may choose to participate. Held seven days prior to the commencement of dredging, the conference includes an inspection of the dredge material containment area, an inspection of the previously staked dredge area, and a discussion of the terms and conditions of the permit.

7. Dredging

Initiation of the dredge project commences only after all parties acknowledge that they understand the terms and conditions of the permits issued.

8. Post-Dredge Bathymetric Survey:

The permittee will often be required to provide a post-dredging bathymetric survey of the dredged area within 30 days following dredging of the channel. The survey must be signed and dated as being accurate and true. The survey must be referenced to mean low water and include a transect at the channelward end of the dredge cut and at specified intervals along the dredged channel to the landward terminus of the dredged area. Accurate bathymetric data from each transect shall be used to establish the top width of the dredge cut (± 1') and must include a depth measurement exterior to both sides of the dredge cut. If applicable, the survey must also indicate the horizontal distance between the top of the dredge cut and the vegetated wetlands depicted on the project drawings.

9. VMRC Final Review:

VMRC is responsible for regulating activities on State-owned submerged land, tidal wetlands and dunes/beaches pursuant to Chapters 12, 13, and 14, Subtitle III, of Title 28.2 of the Code of Virginia. Hence, following dredging activities and receipt of the required post-dredge bathymetric survey, VMRC staff will review the dredged activity to verify that it was completed in accordance with the terms and conditions of their permit. The remaining permitting authorities will also review the project to insure project compliance with their laws and regulations.

Table 3: This matrix identifies sediment disposal options as well as the associated costs (ie. permit fees, dredging fees and royalties and encroachment fees) for entities interested in pursuing a maintenance or new dredging project.

Dredging Project Applicant	Type of Dredging		Sediment Disposal Site Options					Associated Costs		
	Maintenance	New	Public Beach	Private Beach		Public Upland Containment Site	Private Upland Containment Site	Permit Fees	Dredging fees and royalties	Encroachment/Placement royalties
				Easement	No easement					
Public Entity	✱		✓	✓		✓	✓	VMRC: Dredging Permit is $25, but if the cost of the project is to exceed $10,000 the permit fee of $100 shall be paid DEQ: will vary based on permit requires (ie. Virginia Water Protection Permit) USACE: individual permits may require a fee up to $100 (case sensitive); additional permits related to a nationwide permit there are no additional permit fees **Local Wetland Board:** Wetland Permit fees vary (Refer to Table 2)	Counties, Cities and Towns are exempt from all other dredging royalties	Counties, Cities, and Towns are exempt from all other dredging royalties
Public Entity		✱	✓	✓		✓	✓			
Public Entity	✱		✓		✓	✓	✓			Counties, Cities, and Towns are exempt from all other dredging royalties
Public Entity		✱	✓		✓	✓	✓			
Private Entity	✱		✓	✓		✓	✓	VMRC: Dredging Permit is $25, but if the cost of the project is to exceed $10,000 the permit fee of $100 shall be paid DEQ: will vary based on permit requires (ie. Virginia Water Protection Permit) USACE: individual permits may require a fee up to $100 (case sensitive); additional permits related to mulit-user permits there are no additional permit fees **Local Wetland Board:** Wetland Permit fees vary (Refer to Table 2)	Exempt from all other fees and royalties due to being a maintenance dredging activity	$0.05 / ft^2 below MLW and the applicant may have to pay legal fees to obtain an easement for placement on private property
Private Entity		✱	✓	✓		✓	✓		$0.20 - $0.60, per cubic yard ; in the majority of cases the fee is $0.45	
Private Entity	✱		✓	✓	✓	✓	✓		Exempt from all other fees and royalties due to being a maintenance dredging activity	$0.05 / ft^2 below MLW and private land owners may need to obtain a permit for beach nourishment along and adjacent to private property
Private Entity		✱	✓	✓	✓	✓	✓		$0.20 - $0.60, per cubic yard ; in the majority of cases the fee is $0.45	
Public Private Partnership	✱		✓	✓		✓	✓	VMRC: Dredging Permit is $25, but if the cost of the project is to exceed $10,000 the permit fee of $100 shall be paid DEQ: will vary based on permit requires (ie. Virginia Water Protection Permit) USACE: individual permits may require a fee up to $100 (case sensitive); additional permits related to mulit-user permits there are no additional permit fees **Local Wetland Board:** Wetland Permit fees vary (Refer to Table 2)	Exempt from all other fees and royalties due to being a maintenance dredging activity	$0.05 / ft^2 below MLW and the applicant may have to pay legal fees to obtain an easement for placement on private property
Public Private Partnership		✱	✓	✓		✓	✓		$0.20 - $0.60, per cubic yard ; in the majority of cases the fee is $0.45	
Public Private Partnership	✱		✓		✓	✓	✓		Exempt from all other fees and royalties due to being a maintenance dredging activity	$0.05 / ft^2 below MLW and private land owners may need to obtain a permit for beach nourishment along and adjacent to private property
Public Private Partnership		✱	✓		✓	✓	✓		$0.20 - $0.60, per cubic yard ; in the majority of cases the fee is $0.45	

Appendix F – Notes and Additional Resources

Notes

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Navionics. Information comes from multiple public and private sources, including government and Hydrographic Office charts, their own survey data, as well as Community sonar logs. Navionics provides acknowledgement of third party notices and copyright licenses at http://www.navionics.com/acknowledgements.

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Fisheries Landings for the Eastern Shore of Virginia (ESVA) 2021

Richard A. Snyder
Virginia Institute of Marine Science

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isheries Landings for the Eastern Shore of Virginia (ESVA) 2021.

VIMS ESL Technical Report #10.

Richard A. Snyder
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http://www.vims.edu/esl/

6 April 2021

Virginia (VA) landings data were requested from VMRC (Table 1) and analyzed by Richard Snyder at VIMS ESL. Landings data reflect where seafood entered market systems, and so may have different origins that will blur categorizing economic activity ascribed to the act of harvest and the act of processing for market. For example, almost all menhaden are landed in Deltaville, VA, some of the conch/welks and dogfish recorded for Accomack may have originated elsewhere to be processed in Wachapreague, and visiting Maryland crabbers early in the season contribute to blue crab landings. Shellfish data (oysters and clams) are separated as "public" and "private" to indicate the origin of the shellfish on public grounds or on private lease grounds. Aquacultured oysters and clams are embedded in the "private" designation, which includes harvest of wild shellfish on private leases, hatchery-based extensive culture (spat on shell), and intensive aquaculture (containerized).

Table 1. Fisheries data request criteria supplied by VMRC data management staff.

Date; 3/21/22
Dept: Plans and Statistics - JD
Database: FSMRPT (Trip level and Historical database)
Criteria:
Year(s): 1929-2021
Species: All Species
County: 1 (Accomack), 45 (Northampton)
Systems: 1-9 All Virginia Waters
*2020 & 2021 Offshore landings not available

Trends in oyster and clam landings over time are shown in Figure 1 and Figure 2. After a period of low harvests 1990 to 2005, both public and private oyster landings have increased, with landings from private lease holdings exceeding the public grounds harvest. Some of this is undoubtedly due to the emergence of intensive aquaculture. The clam landings almost entirely represent aquaculture production, with a spike seen in 2021 doubling the previous year's landings. For 2021, ESVA oyster landings were 23.1% of the total VA public and 16.5% of the total VA private landings. The clam landings for ESVA are 99.9% of the total for Virginia (Tables 2, 3, & 4), with 16.6% coming into Accomack County and 83.4% coming into Northampton County (Tables 3 & 4) . The divergence in the 2019 and 2020 clam data are likely misallocations of data by year that would offset each other. Clam data does not include "Ocean" or "Public" harvest which is a small fraction of the total.

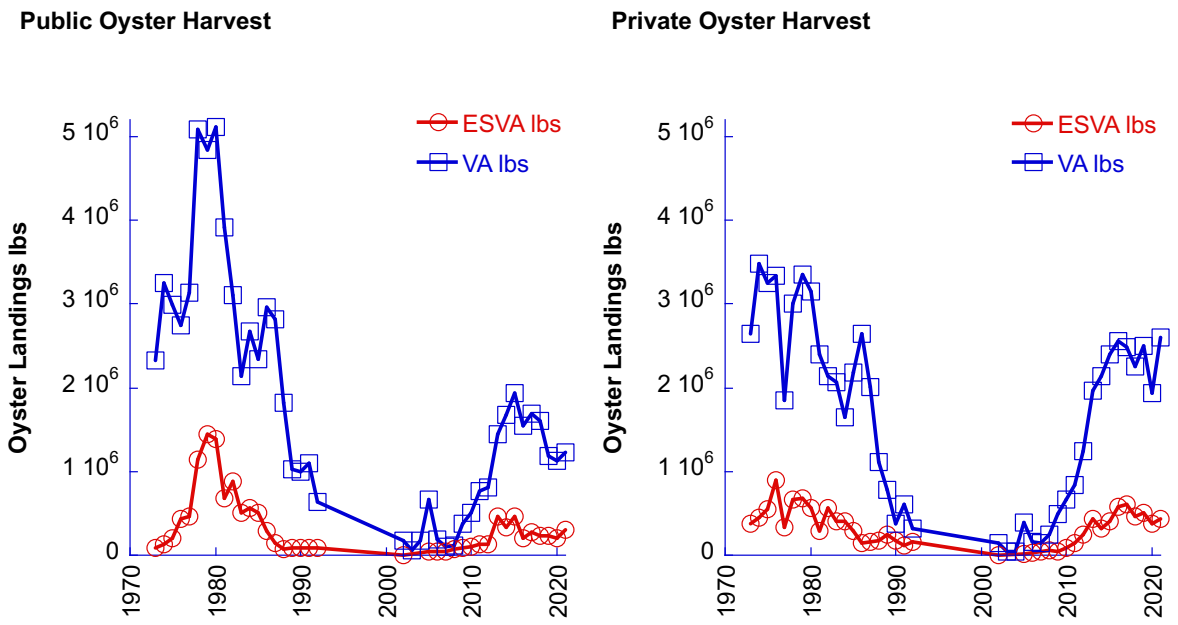

Figure 1. Oyster landings for Virginia from public grounds and private leases.

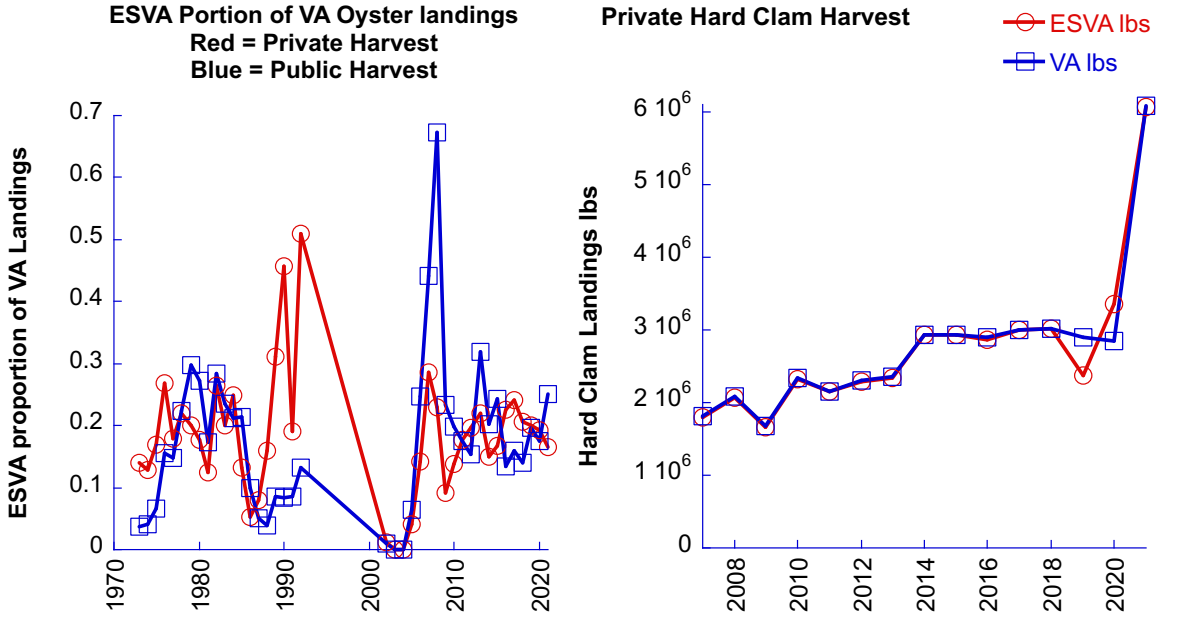

Figure 2. ESVA (Accomack and Northampton Counties) portion of Virginia total oyster landings from public and private grounds (left) and private grounds clam landings for ESVA and all of Virginia (right).

Table 2. Landings of all species for 2021 in all Virginia waters sorted by value ($; left) and by total weight (lbs; right)

2021 All VA by $	$	Lbs	2021 All VA by lbs	$	Lbs
QUAHOG, PRIVATE	$57,759,879	6,078,173	CRAB, BLUE	$31,908,190	16,920,630
CRAB, BLUE	$31,908,190	169,20,630	QUAHOG, PRIVATE	$57,759,879	6,078,173
OYSTERS, PRIVATE	$21,647,262	2,594,187	MENHADEN	$713,465	5,321,554
OYSTERS, PUBLIC	$8,371,194	1,224,481	OYSTERS, PRIVATE	$21,647,262	2,594,187
SPOT	$3,467,514	1,156,127	CATFISH, BLUE	$1,331,697	2,563,897
BASS, STRIPED	$2,806,056	836,158	DOGFISH, SPINY	$407,014	2,414,282
CATFISH, BLUE	$1,331,697	2,563,897	OYSTERS, PUBLIC	$8,371,194	1,224,481
CONCHS	$1,248,373	438,600	SPOT	$3,467,514	1,156,127
MENHADEN	$713,465	5,321,554	BASS, STRIPED	$2,806,056	836,158
SHRIMP (PENAEID)	$599,917	239,967	CONCHS	$1,248,373	438,600
CROAKER, ATLANTIC	$509,920	272,932	CRAB, HORSESHOE	$422,128	347,386
CRAB, HORSESHOE	$422,128	347,386	CROAKER, ATLANTIC	$509,920	272,932
DOGFISH, SPINY	$407,014	2,414,282	SHAD, GIZZARD	$42,830	270,253
BASS, BLACK SEA	$333,828	129,019	SHRIMP (PENAEID)	$599,917	239,967
MACKEREL, SPANISH	$288,346	143,318	MACKEREL, SPANISH	$288,346	143,318
QUAHOG, PUBLIC	$132,164	20,753	FISH, BAIT	$104,647	143,016
BUTTERFISH	$126,191	22,374	BASS, BLACK SEA	$333,828	129,019
SEATROUT, SPOTTED	$120,599	51,594	CATFISH, NK	$60,961	115,916
COBIA	$110,888	29,425	BLUEFISH	$74,386	75,555
FISH, BAIT	$104,647	143,016	DRUM, BLACK	$31,670	63,340
WHITING, KING	$82,537	36,343	SEATROUT, SPOTTED	$120,599	51,594
BLUEFISH	$74,386	75,555	CARP	$6,738	50,509
CATFISH, NK	$60,961	115,916	EEL, AMERICAN	$60,432	40,288
EEL, AMERICAN	$60,432	40,288	ALEWIFE	$4,456	39,555
FLOUNDER, SUMMER	$52,336	32,315	RIBBONFISH	$36,433	36,894
DRUM, RED	$50,364	17,788	WHITING, KING	$82,537	36,343
SEATROUT, GREY	$49,810	27,884	MINNOW	$36,463	34,053
SHAD, GIZZARD	$42,830	270,253	FLOUNDER, SUMMER	$52,336	32,315
MINNOW	$36,463	34,053	COBIA	$110,888	29,425
RIBBONFISH	$36,433	36,894	SEATROUT, GREY	$49,810	27,884
DRUM, BLACK	$31,670	63,340	DOGFISH, SMOOTH	$9,630	25,416
MULLET	$20,543	14,642	BUTTERFISH	$126,191	22,374
PUFFER, NORTHERN	$15,875	5,951	QUAHOG, PUBLIC	$132,164	20,753

SPADEFISH	$10,898	9,926
PERCH, WHITE	$10,366	15,942
DOGFISH, SMOOTH	$9,630	25,416
HARVESTFISH	$8,211	3,227
CARP	$6,738	50,509
TAUTOG	$6,255	2,145
TRIGGERFISHES	$4,820	2,124
SHARK, BLACKTIP	$4,792	6,389
ALEWIFE	$4,456	39555
TOADFISH, OYSTER	$4,029	1,791
POMPANO, COMMON	$3,449	832
MACKEREL, KING	$3,200	1,421
WHELK, KNOBBED	$2,291	1,909
WHITING, KING	$1,624	706
PERCH, YELLOW	$1,051	876
SHEEPSHEAD	$943	472
SHAD, HICKORY	$750	1,955
REDFISH	$731	1,475
CREVALLE	$711	711
SHAD, AMERICAN	$668	2,184
SHAD, AMERICAN	$497	1,158
MACKEREL, ATLANTIC	$442	1,000
PIGFISH	$245	817
CREVALLE	$181	181
AMBERJACK	$150	120
GARFISH	$30	203

DRUM, RED	$50,364	17,788
PERCH, WHITE	$10,366	15,942
MULLET	$20,543	14,642
SPADEFISH	$10,898	9,926
SHARK, BLACKTIP	$4,792	6,389
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PIGFISH	$245	817
CREVALLE	$711	711
WHITING, KING	$1,624	706
SHEEPSHEAD	$943	472
GARFISH	$30	203
CREVALLE	$181	181
AMBERJACK	$150	120

Total 2021 VA: $133,111,071 and 41,892,137 lbs

Table 3. Landings data form Accomack and Northampton Counties, 2021, sorted by value ($).

Accomack 2021 by value ($)

SPECIES NAME	SUM VALUE	SUM POUNDS
QUAHOG, PRIVATE	$8,177,127	1,124,802
CRAB, BLUE	$6,176,515	3,075,611
OYSTERS, PUBLIC	$2,152,765	301,541
OYSTERS, PRIVATE	$2,043,169	222,959
SPOT	$998,725	332,909
BASS, STRIPED	$639,582	188,016
CRAB, HORSESHOE	$375,029	303,363
CONCHS	$197,328	70,474
DOGFISH, SPINY	$156,439	819,709
CROAKER, ATLANTIC	$141,749	68,432
MINNOW	$33,275	31,456
BLUEFISH	$26,679	17,090
QUAHOG, PUBLIC	$25,278	3,995
MENHADEN	$23,940	206,048
MACKEREL, SPANISH	$22,469	10,162
FISH, BAIT	$19,842	26,302
DRUM, BLACK	$17,724	35,449
FLOUNDER, SUMMER	$13,341	7,129
WHITING, KING	$11,845	5,180
DOGFISH, SMOOTH	$8,837	23,433
DRUM, RED	$7,691	2,030
PUFFER, NORTHERN	$7,053	2,015
SEATROUT, GREY	$5,899	3,159
MACKEREL, KING	$3,180	1,413
BUTTERFISH	$1,858	1,268
SEATROUT, SPOTTED	$647	232
SHARK, BLACKTIP	$322	429
MULLET	$280	278
SHEEPSHEAD	$182	91
RIBBONFISHES	$61	61
PERCH, WHITE	$44	106
MACKEREL, ATLANTIC	$36	67

Northampton 2021 by value ($)

SPECIES NAME	SUM VALUE	SUM POUNDS
QUAHOG, PRIVATE	$49,503,027	4,945,649
CRAB, BLUE	$5,514,163	3,494,388
OYSTERS, PRIVATE	$1,839,749	207,604
CONCHS	$403,219	131,244
BASS, STRIPED	$157,401	44,580
CROAKER, ATLANTIC	$62,788	35,952
CRAB, HORSESHOE	$47,100	44,022
SPOT	$44,895	14,965
OYSTERS, PUBLIC	$39,900	5,588
FISH, BAIT	$25,564	17,443
RIBBONFISHES	$24,418	24,460
DRUM, BLACK	$13,767	27,534
MENHADEN	$11,538	90,477
SPADEFISH	$9,805	8,938
BLUEFISH	$8,058	4,112
COBIA	$7,873	2,080
QUAHOG, PUBLIC	$6,462	2,439
SEATROUT, SPOTTED	$6,004	2,492
BUTTERFISH	$5,768	824
SEATROUT, GREY	$4,994	2,863
FLOUNDER, SUMMER	$4,446	1,972
WHITING, KING	$3,133	1,368
DRUM, RED	$2,732	1,187
MACKEREL, SPANISH	$2,609	1,267
WHELK, KNOBBED	$1,550	1,292
POMPANO, COMMON	$1,470	323
TAUTOG	$513	179
SHEEPSHEAD	$242	121
MULLET	$161	142

Table 4. Landings data form Accomack and Northampton Counties, 2021, sorted by weight (lbs).

Accomack 2021 by weight (lbs)

SPECIES NAME	SUM VALUE	SUM POUNDS
CRAB, BLUE	$6,176,515	3,075,611
QUAHOG, PRIVATE	$8,177,127	1,124,802
DOGFISH, SPINY	$156,439	819,709
SPOT	$998,725	332,909
CRAB, HORSESHOE	$375,029	303,363
OYSTERS, PUBLIC	$2,152,765	301,541
OYSTERS, PRIVATE	$2,043,169	222,959
MENHADEN	$23,940	206,,048
BASS, STRIPED	$639,582	188016
CONCHS	$197,328	70,474
CROAKER, ATLANTIC	$141,749	68,432
DRUM, BLACK	$17,724	35,449
MINNOW	$33,275	31,456
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SEATROUT, GREY	$5,899	3,159
DRUM, RED	$7,691	2,030
PUFFER, NORTHERN	$7,053	2,015
MACKEREL, KING	$3,180	1,413
BUTTERFISH	$1,858	1,268
SHARK, BLACKTIP	$322	429
MULLET	$280	278
SEATROUT, SPOTTED	$647	232
PERCH, WHITE	$44	106
SHEEPSHEAD	$182	91
MACKEREL, ATLANTIC	$36	67
RIBBONFISHES	$61	61

Northampton 2021 by weight (lbs)

SPECIES NAME	SUM VALUE	SUM POUNDS
QUAHOG, PRIVATE	$49,503,027	4,945,649
CRAB, BLUE	$5,514,163	3,494,388
OYSTERS, PRIVATE	$1,839,749	207,604
CONCHS	$403,219	131,244
MENHADEN	$11,538	90,477
BASS, STRIPED	$157,401	44,580
CRAB, HORSESHOE	$47,100	44,022
CROAKER, ATLANTIC	$62,788	35,952
DRUM, BLACK	$13,767	27,534
RIBBONFISHES	$24,418	24,460
FISH, BAIT	$25,564	17,443
SPOT	$44,895	14,965
SPADEFISH	$9,805	8,938
OYSTERS, PUBLIC	$39,900	5,588
BLUEFISH	$8,058	4,112
SEATROUT, GREY	$4,994	2,863
SEATROUT, SPOTTED	$6,004	2,492
QUAHOG, PUBLIC	$6,462	2,439
COBIA	$7,873	2,080
FLOUNDER, SUMMER	$4,446	1,972
WHITING, KING	$3,133	1,368
WHELK, KNOBBED	$1,550	1,292
MACKEREL, SPANISH	$2,609	1,267
DRUM, RED	$2,732	1,187
BUTTERFISH	$5,768	824
POMPANO, COMMON	$1,470	323
TAUTOG	$513	179
MULLET	$161	142
SHEEPSHEAD	$242	121

Table 5. ESVA counties total landings value and weight.

Accomack	SUM VALUE	SUM POUNDS	Northampton	SUM VALUE	SUM POUNDS
	$21,288,907	6,885,210		$57,753,347	9,115,504

Table 6. ESVA (Accomack + Northampton Counties) 2021 landings totals sorted by value (left) and weight (right)

SPECIES NAME	SUM VALUE	SUM POUNDS	SPECIES NAME	SUM VALUE	SUM POUNDS
QUAHOG, PRIVATE	$57,680,154	6,070,450	CRAB, BLUE	$11,690,677	6,569,999
CRAB, BLUE	$11,690,677	6,569,999	QUAHOG, PRIVATE	$57,680,154	6,070,450
OYSTERS, PRIVATE	$3,882,918	430,563	DOGFISH, SPINY	$156,439	819,709
OYSTERS, PUBLIC	$2,192,665	307,129	OYSTERS, PRIVATE	$3,882,918	430,563
SPOT	$1,043,620	347,874	SPOT	$1,043,620	347,874
BASS, STRIPED	$796,983	232,596	CRAB, HORSESHOE	$422,128	347,386
CONCHS	$600,547	201,719	OYSTERS, PUBLIC	$2,192,665	307,129
CRAB, HORSESHOE	$422,128	347,386	MENHADEN	$35,478	296,525
CROAKER, ATLANTIC	$204,537	104,384	BASS, STRIPED	$796,983	232,596
DOGFISH, SPINY	$156,439	819,709	CONCHS	$600,547	201,719
FISH, BAIT	$45,406	43,745	CROAKER, ATLANTIC	$204,537	104,384
MENHADEN	$35,478	296,525	DRUM, BLACK	$31,492	62,983
BLUEFISH	$34,737	21,202	FISH, BAIT	$45,406	43,745
MINNOW	$33,275	31,456	MINNOW	$33,275	31,456
QUAHOG, PUBLIC	$31,740	6,434	RIBBONFISHES	$24,479	24,521
DRUM, BLACK	$31,492	62,983	DOGFISH, SMOOTH	$8,837	23,433
MACKEREL, SPANISH	$25,078	11,429	BLUEFISH	$34,737	21,202
RIBBONFISHES	$24,479	24,521	MACKEREL, SPANISH	$25,078	11,429
FLOUNDER, SUMMER	$17,787	9,101	FLOUNDER, SUMMER	$17,787	9,101
WHITING, KING	$14,978	6,548	SPADEFISH	$9,805	8,938
SEATROUT, GREY	$10,893	6,022	WHITING, KING	$14,978	6,548
DRUM, RED	$10,422	3,217	QUAHOG, PUBLIC	$31,740	6,434
SPADEFISH	$9,805	8,938	SEATROUT, GREY	$10,893	6,022
DOGFISH, SMOOTH	$8,837	23,433	DRUM, RED	$10,422	3,217
COBIA	$7,873	2,080	SEATROUT, SPOTTED	$6,651	2,724
BUTTERFISH	$7,626	2,092	BUTTERFISH	$7,626	2,092
PUFFER, NORTHERN	$7,053	2,015	COBIA	$7,873	2,080
SEATROUT, SPOTTED	$6,651	2,724	PUFFER, NORTHERN	$7,053	2,015
MACKEREL, KING	$3,180	1,413	MACKEREL, KING	$3,180	1,413
WHELK, KNOBBED	$1,550	1,292	WHELK, KNOBBED	$1,550	1,292
POMPANO, COMMON	$1,470	323	SHARK, BLACKTIP	$322	429
TAUTOG	$513	179	MULLET	$441	420
MULLET	$441	420	POMPANO, COMMON	$1,470	323
SHEEPSHEAD	$424	212	SHEEPSHEAD	$424	212
SHARK, BLACKTIP	$322	429	TAUTOG	$513	179
PERCH, WHITE	$44	106	PERCH, WHITE	$44	106
MACKEREL, ATLANTIC	$36	67	MACKEREL, ATLANTIC	$36	67
Totals	**$79,042,254**	**16,000,714**			

Accomack and Northampton County Channel Condition Surveys

Spring 2021

DESCRIPTIVE REPORT

Submitted by:

GeoDynamics

Complex Coastal Change Made Clear

Submitted to:

moffatt & nichol

Table of Contents

1.0 Introduction 1

1.1 BACKGROUND 1
1.2 SURVEY AREA 1
1.3 SURVEY OBJECTIVES 4
1.4 REPORT PURPOSE 4
1.5 SURVEY LOGISTICS 5
1.6 SURVEY CONDITIONS 5
1.7 SURVEY PERSONNEL 7
1.8 NAVIGATION AND POSITIONING 7

2.0 Singlebeam Sonar Bathymetric Survey Methodology 8

2.1 EQUIPMENT AND CONTROL 8
2.1.1 Vessels 8
2.1.1.1 R/V Echo 8
2.1.1.2 R/V War Eagle 9
2.1.1.3 Software Systems Inventory 10
2.1.1.4 Hardware Systems Inventory 11
2.1.1.5 Sonar Equipment 11
2.1.2 Vertical Control 12
2.1.3 Horizontal Control 12
2.2 SINGLEBEAM DATA ACQUISITION 12
2.2.1 Data Acquisition Software 12
2.3 SINGLEBEAM DATA PROCESSING 13
2.3.1 Processing Workflow 13
2.4 CORRECTIONS TO ECHO SOUNDINGS 13
2.4.1.1 POS MV SM Correctors 13
2.4.1.2 Dynamic Draft Correctors 14
2.4.1.3 Sound Speed Correctors 14
2.4.1.4 Water Level Correctors 15
2.5 QUALITY CONTROL 15
2.5.1 Singlebeam Data Acquisition and Monitoring 15
2.5.2 Singlebeam Calibration Checks 15

3.0 Bathymetric Survey Results 16

3.1 SOUNDING DATA 16

4.0 Quality Assurance and Control Methodology 21

4.1 CROSSING DATA REVIEW 21

A. CONCLUDING REMARKS 24

APPENDIX A: SURVEY ACTIVITY LOGS 25

APPENDIX B: HYDROGRAPHIC SURVEY CONRTOL 33

APPENDIX C: SINGLEBEAM VESSEL CALIBRATION REPORT 36

APPENDIX D: SOUND VELOCITY SENSOR CALIBRATION REPORT 39

APPENDIX E: VERTICAL DATUM CONVERSION 40

APPENDIX F: SCOPE OF WORK 49

List of Figures

Figure 1. Planning map overview of the Folly Creek Survey Area. 2
Figure 2. Planning map overview of the Red Bank Creek Survey Area. 2
Figure 3. Planning map overview of the Nassawadox Creek Survey Area. 3
Figure 4. Planning map overview of the Hungars Creek Survey Area. 3
Figure 5. Atmospheric and tidal records for survey days. 6
Figure 6. Photos showing sources of survey control used throughout survey operations. 7
Figure 7. R/V Echo. 8
Figure 8. R/V War Eagle. 9
Figure 9. Odom CV100 digital echosounder mounted on the R/V Echo and R/V War Eagle. 12
Figure 10. HYPACK singlebeam data processing workflow. 13
Figure 11. SonTek CastAway-CTD sound speed profiler. 14
Figure 12. Image illustrating the mechanical bar check of sonar index. 15
Figure 13. Bathy survey coverage for Folly Creek. 17
Figure 14. Bathy survey coverage for Red Bank Creek. 18
Figure 15. Bathy survey coverage for Nassawadox Creek. 19
Figure 16. Topo-bathy survey coverage of Hungars Creek. 20
Figure 17. Image illustrating crossing data statistics from Red Bank Creek. 21
Figure 18. Image illustrating crossing data statistics from Folly Creek. 22
Figure 19. Image illustrating crossing data statistics from Nassawadox Creek. 22
Figure 20. Image illustrating crossing data statistics from Hungars Creek. 23

List of Tables

Table 1. Summary of Survey Activities **5**
Table 2. List of Survey Personnel and Responsibilities **7**
Table 3. RTK-VRS GNSS base station coordinates. **7**
Table 4. R/V Echo Vessel Specifications **9**
Table 5. R/V War Eagle Vessel Specifications **10**
Table 6. Singlebeam Software Systems Inventory **10**
Table 7. Singlebeam Hardware Systems Inventory **11**
Table 8. CV100 specification **11**

1.0 Introduction

1.1 Background

Geodynamics was contracted by Moffatt & Nichol to perform bathymetric channel surveys of four waterways throughout Accomack and Northampton Counties. The work includes elevation and position data collected along specified azimuths at specified intervals relative to designated channels, and at the surveyor's discretion in morphologically complex locations. This work utilized hydrographic surveying techniques that meet or exceed the criteria outlined in the U.S. Army Corps of Engineers Hydrographic Surveying Manual, EM 1110-2-1003.

1.2 Survey Area

The survey covers four creeks on the Eastern Shore of Virginia (Figure 1 - Figure 4). Data were collected in four waterways including Folly Creek and Red Bank Creek on the Atlantic Ocean side of the Delmarva Peninsula, and Nassawadox Creek and Hungars Creek on the Chesapeake Bay side of the peninsula. For each channel, data were acquired along centerlines and 100' spaced channel crosslines.

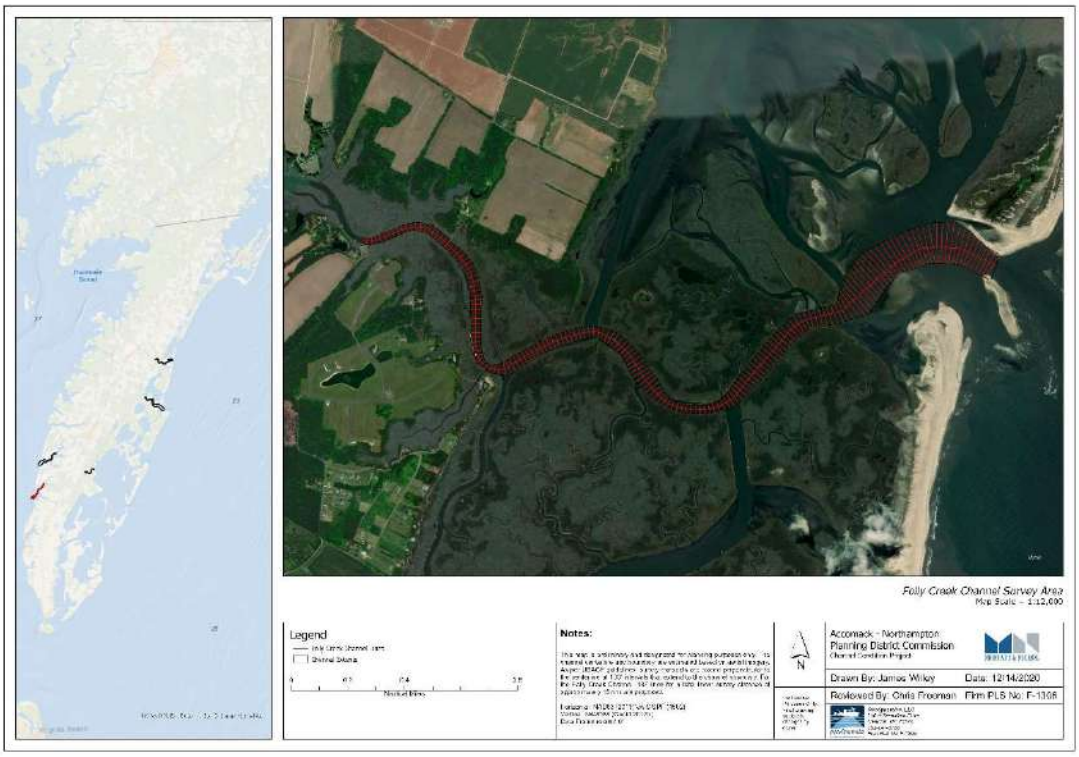


Figure 1. Planning map overview of the Folly Creek Survey Area.

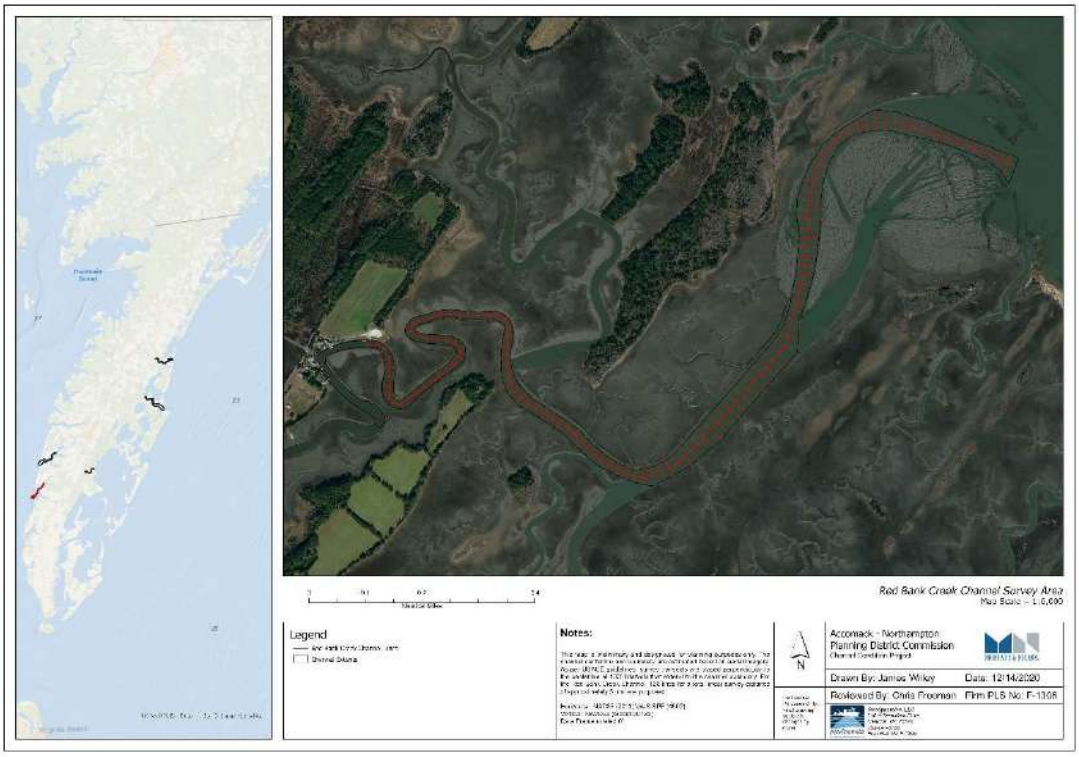


Figure 2. Planning map overview of the Red Bank Creek Survey Area.

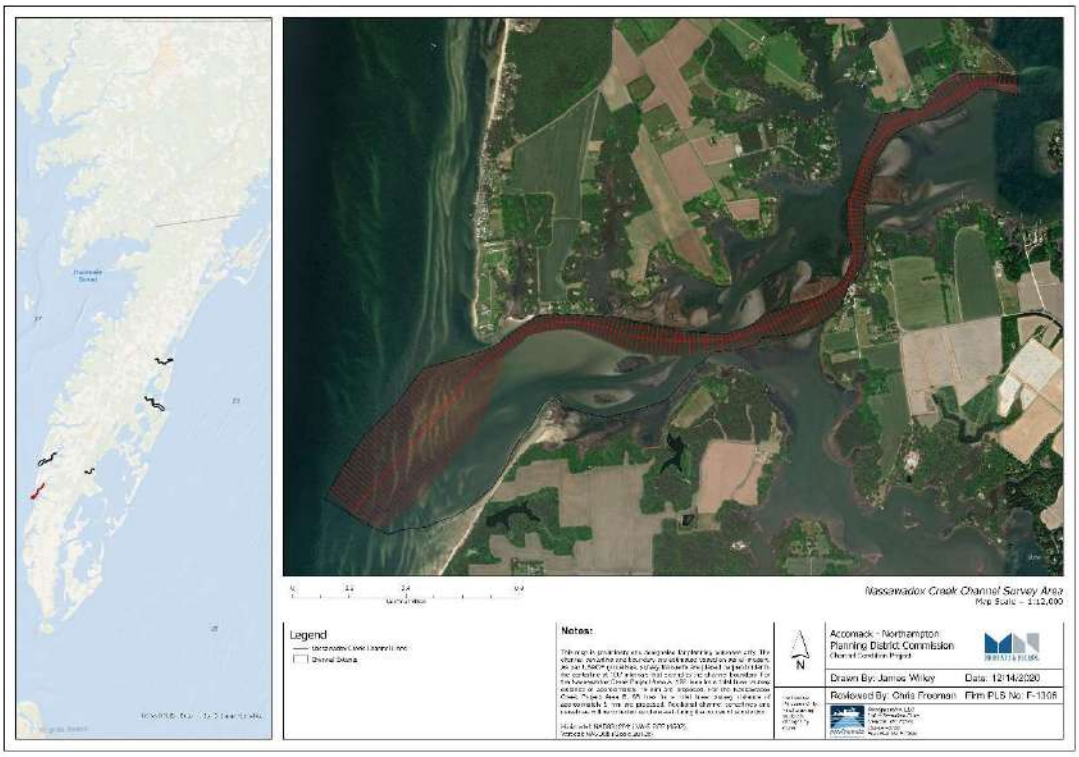


Figure 3. Planning map overview of the Nassawadox Creek Survey Area.

Figure 4. Planning map overview of the Hungars Creek Survey Area.

1.3 Survey Objectives

As outlined in the official Scope of Work (SOW) (Appendix F), the specific goals of the survey were to provide the following data products:

- ASCII text files of all soundings.
- Shapefiles for all SBES lines.

1.4 Report Purpose

The purpose of this document is to summarize the survey activities and report on the acquisition and processing methodology performed during the project. This report also serves to provide illustrations and descriptions of deliverable items. For any additional information regarding survey activities, contact Geodynamics (252) 247-5785.

1.5 Survey Logistics

Survey activity was conducted during 3/1-3/2 and 4/2-4/7. Listed below is a generalized timeline of data acquisition (Table 1). A detailed summary of daily field activities related to the survey is presented in Appendix A.

Table 1. Summary of Survey Activities

Date	Julian Day	Activity
3/01/21	60	Crew mobilized R/V Echo and traveled to Exmore, VA.
3/02/21	61	R/V Echo conducted SBES survey in Red Bank Creek. Crew demobilized after survey completion.
4/02/21	92	R/V War Eagle was mobilized to Exmore, VA.
4/03/21	93	R/V War Eagle conducted SBES survey in Folly Creek and collected a SBES centerline in Nassawadox Creek.
4/04/21	94	R/V War Eagle conducted SBES in Hungars Creek.
4/05/21	95	R/V War Eagle conducted SBES survey in Nassawadox Creek.
4/06/21	96	R/V War Eagle conducted SBES survey in Nassawadox Creek.
4/07/21	97	Crew demobilized to Newport, NC.

1.6 Survey Conditions

Figure 5 displays graphs of NOAA predicted and verified tides for the nearest station located at Wachapreague, VA (Station ID# 8631044) as well as surface wind and air temperature throughout the survey.

03/01/2021 – 03/02/2021: Accomack and Northampton County

04/02/2021 – 04/07/2021: Accomack and Northampton County

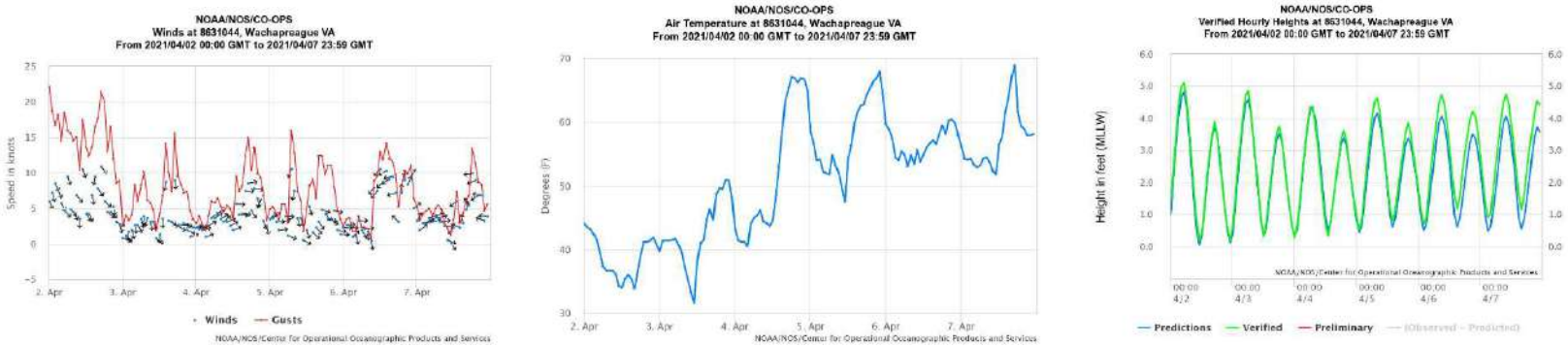


Figure 5. Atmospheric and tidal records for survey days.

1.7 Survey Personnel

All survey crew throughout the survey were provided by Geodynamics. These personnel contributed to the vessel mobilization, data collection, vessel demobilization efforts, processing, reporting, QA-QC and final certification (Table 2).

Table 2. List of Survey Personnel and Responsibilities

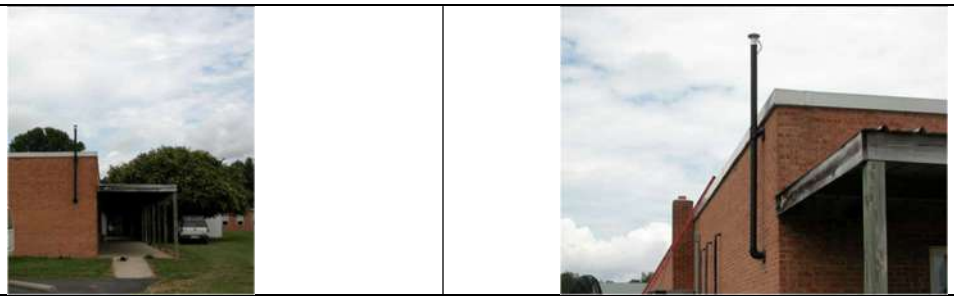
Survey Participant	Title	Affiliation
Dave Bernstein	Project Manager / PLS	Geodynamics
Kurt Baker	Data Manager / GIS Analyst	Geodynamics
Ben Sumners	Data Manager / GIS Analyst	Geodynamics
James Willey	Field Surveyor	Geodynamics
Anna Atencio	Field Surveyor	Geodynamics
Zach Gray	Field Surveyor	Geodynamics

1.8 Navigation and Positioning

All data points obtained during the hydrographic and topographic survey activities have a geographic location associated with them to facilitate database entry and display of these data within a GIS framework. To accurately position data, elevations/soundings were collected with Real Time Kinematic (RTK) Virtual Reference Station (VRS) GNSS corrections to provide < +/- 0.20 ft vertical and < +/-1.0 ft horizontal accuracy. RTK-VRS corrections were generated via the Virginia LEICA GNSS SmartNet was used to provide real-time kinematic corrections via the internet. A Global Navigation Satellite System (GNSS) enabled, Trimble Zephyr Model 2 with ground plane receiver installed by Geodynamics was used to collect static GNSS observations to provide additional quality assurance during post-processing. HYPACK utilized an X/Y grid system based on the North American Datum of 1983 (NAD83), Virginia-South State Plane Feet Zone 4502 (VA-South SPF83) and reduced from the ellipsoid using Geoid 2012b. Data were collected in the North American Vertical Datum of 1988 (NAVD88), and final deliverable data were transformed to Mean Low Water and Mean Lower Low Water vertical reference frames.

Table 3. RTK-VRS GNSS base station coordinates.

Base station Name	Latitude	Longitude	Ellipsoid Height (NAD83)
LOYOLA LOYW CORS ARP	37 31 40.99507	075 50 52.66304	-22.441



LOYOLA LOYW CORS ARP

Figure 6. Photos showing sources of survey control used throughout survey operations.

2.0 Singlebeam Sonar Bathymetric Survey Methodology

2.1 Equipment and Control

2.1.1 Vessels

2.1.1.1 R/V Echo

The R/V Echo served as the initial survey platform for nearshore singlebeam data acquisition (Figure 7, Table 4). The R/V Echo is specifically designed to be a vessel of opportunity for shallow water inshore and coastal ocean mapping. The R/V Echo is equipped with a thru-hull transducer that is tightly coupled with inertial navigation system (INS) for positioning and elevation. On-the-fly sound speed sensors and customized computer systems allow seamless logging of bathymetric data.

Figure 7. R/V Echo.

Table 4. R/V Echo Vessel Specifications

Dimensions:	21' x 9' x 1.2’
USCG:	Designated Research Vessel
Flag:	U.S.
Registry:	North Carolina
Official Number:	NC 7341 DT
Tonnage:	1
Lab space:	1 open console operator station
Max Speed:	30 knots
Min. survey speed:	2.5 knots
Propulsion:	1 x 140 HP Suzuki 4-Stroke Outboard Motor -2011
Auxiliary Power:	24v DC battery bank and 12v DC parallel battery banks
Fuel capacity:	60 gallons
GPS:	Simrad
Sounder:	Lowrance StructureScan
Compass:	n/a
Radar:	n/a
Autopilot:	n/a
VHF:	Icom 25 watt
Internet:	Verizon 4G Jetpack

2.1.1.2 R/V War Eagle

The R/V War Eagle served the survey platform for shallow water singlebeam data acquisition during the second mobilization (Figure 8, Table 5). The R/V War Eagle is specifically designed to be a vessel of opportunity for inshore shallow water and close-quarters mapping. The R/V War Eagle is equipped with a pole-mounted transducer that is tightly coupled with inertial navigation system (INS) for positioning and elevation. On-the-fly sound speed sensors and customized computer systems allow seamless logging of bathymetric data.

Figure 8. R/V War Eagle.

Table 5. R/V War Eagle Vessel Specifications

Dimensions:	15' x 5' x 1’
USCG:	Designated Research Vessel
Flag:	U.S.
Registry:	North Carolina
Official Number:	NC 9625 EC
Tonnage:	1
Lab space:	1 open console operator station
Max Speed:	20 knots
Min. survey speed:	2.5 knots
Propulsion:	1 x 15 HP Yamaha 4-Stroke Outboard Motor
Auxiliary Power:	24v DC battery bank and 12v DC parallel battery banks
Fuel capacity:	5 gallons
GPS:	n/a
Sounder:	n/a
Compass:	n/a
Radar:	n/a
Autopilot:	n/a
VHF:	iCom Handheld
Internet:	Verizon 4G Jetpack

2.1.1.3 Software Systems Inventory

Software utilized throughout the project can be seen in Table 6.

Table 6. Singlebeam Software Systems Inventory

	Software	Version
Data Acquisition	HYPACK	2018
	Odom E-Chart	1.4.0
	POSView	10.2
	CastAway-CTD	V1.5
Data Processing	HYPACK	2018
	POSPac	8.3 SP3
	ArcGIS Pro	2.5.1
	MS Office	2018

2.1.1.4 Hardware Systems Inventory

Hardware utilized throughout the project can be seen in Table 7.

Table 7. Singlebeam Hardware Systems Inventory

	Hardware Equipment	Manufacturer	Model
Horizontal & Vertical Control	RTK Radio Modem	Trimble	TDL 450H
	RTK Radio Antenna	Pacific Crest	n/a
	GNSS Antenna	Trimble	Zephyr Model 2
	Cellular Internet Card	Verizon	4G LTE JetPack
	POS MV	Applanix	WaveMaster, SurfMaster One
Echo Sounding	StructureScan (while in transit)	Simrad	1.7.0
	ODOM CV100	ODOM	CV100
	Operator Station	OnLogic	Karbon 700
Attitude Positioning	Inertial Motion Unit (IMU)	Applanix	WaveMaster, SurfMaster One
	Position Compute System (PCS)	Applanix	WaveMaster, SurfMaster One
	Primary GNSS Antenna (port)	Trimble	Zephyr Model 2
	Secondary GNSS Antenna	Trimble	Zephyr Model 2
Sound Speed	Sound Profile Velocimeter	SonTek	CastAway-CTD

2.1.1.5 Sonar Equipment

An Odom CV100 singlebeam sonar system was used to acquire singlebeam bathymetry data during the survey (Figure 9). The CV100 system operates at frequencies in the 200 kHz band: ideal for shallow depths. The transducer forms a 4-degree conical beam. With an operational depth range from <30 cm to 600 m and a ping rate up to 20 Hz, the CV100 is ideal for shallow water surveys (Table 8).

Table 8. CV100 specification

Frequencies.	200 kHz / 33 kHz
Maximum ping rate.	up to 20 Hz
Heave compensation	Yes
Depth resolution	1 cm
Transducer	Airmar SMSW200-4a

Figure 9. Odom CV100 digital echosounder mounted on the R/V Echo and R/V War Eagle.

2.1.2 Vertical Control

The vertical datum for the final survey data is NAVD88. The ellipsoid-based real-time vertical water level corrections were reduced by integrating a local Geoid 2012b model in the singlebeam data processing stage. An additional transformation to Mean Low Water and Mean Lower Low Water were completed using NOAA's online Vertical Datum Transformation (VDatum) conversion utility at the request of the client.

2.1.3 Horizontal Control

Horizontal positioning and vessel attitude for singlebeam data was provided by the POS MV system and was corrected using Inertial-Aided Real-Time Kinematic (IARTK) technology. This system provides roll and pitch accuracy to 0.01°, heading to 0.02° (with a 2 m antenna baseline), and heave accuracy to 5 cm or 5% (whichever is greater).

2.2 Singlebeam Data Acquisition

2.2.1 Data Acquisition Software

The HYPACK software suite was used during survey preparation to create survey line plans and evaluate the overall survey scheme. The initial line plan was created in HYPACK using a line spacing designed to acquire survey data sufficient for DEM development. HYPACK was also used during the survey to record sounding and position data, log targets of importance, and provide the captain with line tracking.

The ODOM eChart software was used as a start-up interface to establish communications with the echosounder, check/verify essential echosounder settings and provide transmit and receive gain controls of the singlebeam echosounder.

The POSView software by Applanix was used with the POS MV system. The software provides the interface to view, monitor, and record tightly coupled integration of the attitude measurements from the IMU and position and heading measurements recorded by the GNSS. The recorded POSPac file which contains all attitude, positioning, heading, and error estimates provides a method to post-process attitude and navigation data in the event of RTK-GNSS cycle slips. Additionally, this software provides an access point to RTK-VRS corrections.

2.3 Singlebeam Data Processing

2.3.1 Processing Workflow

Figure 10 illustrates the workflow for singlebeam sonar data processing.

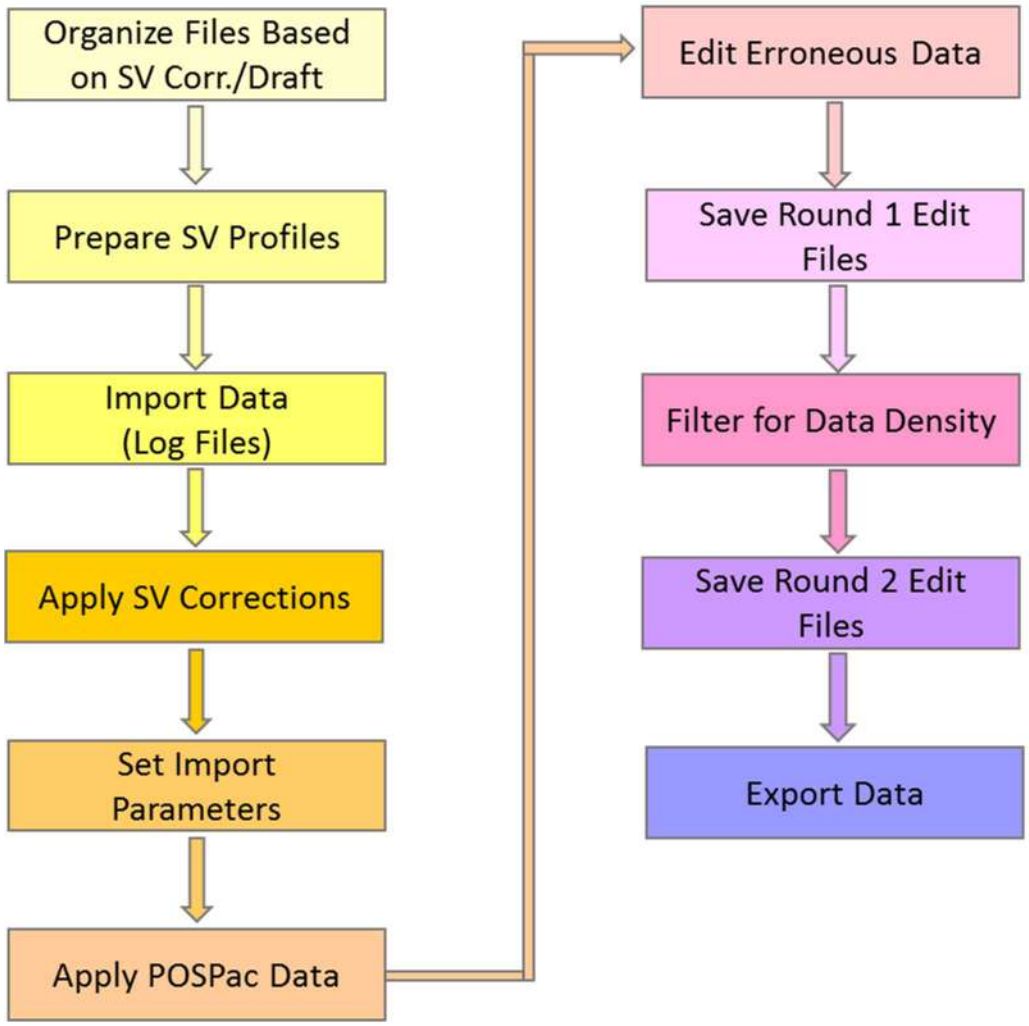


Figure 10. HYPACK singlebeam data processing workflow.

2.4 Corrections to Echo Soundings

2.4.1.1 POS MV SM Correctors

The Applanix POS MV unit was setup to receive phase-differential RTK position offsets from the RTK-GNSS base station. This configuration allowed the POS MV to integrate decimeter positional solutions with highly accurate vessel attitude positions obtained from the IMU. When the GAMS is online, positional solutions were being received from 5 or more satellite fixes with a Positional Dilution of Precision (PDOP) equal to or less than 3. When these conditions were not satisfied, the GAMS solution becomes dormant. The GAMS program continues to track satellites while in this state but does not process the phase-differential corrections real-time.

A verification of the GAMS system was conducted prior to the start of the project for each vessel. The values in use for this survey were obtained from GAMS calibrations that followed the auto-start procedure laid out in the POS MV V5 Installation and Operation Guide. The GAMS parameters in the setup menu were initially set to zero, except for the heading calibration threshold which was set to 0.500°. The vessel then made aggressive figure-8 maneuvers until the GAMS solution came online and the values in the parameter setup menu were automatically updated. This calibration remains valid until vessel offsets are changed.

Due to inherent and common problems associated with RTK-VRS, such as cycle slips, high DOP periods, and data gaps, the POSPac data is routinely post-processed in the Applanix POSPac software suite. While RTK-VRS quality was acceptable during hydrographic data collection, adding the processed POSPac data to the final hydro data was done as a precaution to verify and provide quality assurance for Real-Time corrections.

2.4.1.2 Dynamic Draft Correctors

Dynamic draft is the summation of the static draft, settlement and squat corrections and is a required corrector for echo sounders. Dynamic draft was accounted for in the echo soundings by using RTK-VRS ellipsoid-based vertical corrections. The combined correctors work to continuously factor out the static draft, settlement, and squat of the survey vessel.

2.4.1.3 Sound Speed Correctors

The SonTek CastAway-CTD was used during the survey obtain accurate sound velocity profiles throughout the survey area (Figure 11). The unit acquires latitude and longitude internally before and after each profile. Conductivity, temperature, salinity, and sound speed are plotted versus depth on the unit, and it transmits data wirelessly for processing. Additionally, sound speed data can be exported into a Hypack compatible format (.vel file). Sound speed profiles were taken at the start of each survey day, and again throughout the day as warranted by the survey area and water properties. Sound speed profiles were also acquired when the survey vessel moved to a different location in the survey area. Each sound speed cast was assessed in processing to determine water properties in a specific zone of the survey area.

Figure 11. SonTek CastAway-CTD sound speed profiler.

2.4.1.4 Water Level Correctors

RTK-GNSS based tidal measurements were continuously recorded throughout the survey by HYPACK Survey. The GPS height determined by the POS MV was integrated into the raw singlebeam sonar data during data acquisition in real-time. After importing the raw singlebeam data in HYPACK, the GPS tide was merged with the heave to provide accurate tidal corrections and subtract vessel heave from the final elevations.

2.5 Quality Control

2.5.1 Singlebeam Data Acquisition and Monitoring

At the start of each acquisition day, a series of pre-survey protocols were run to aid in quality control and to determine any possible errors/issues prior to surveying. For hydro, the GAMS parameters and POS MV installation parameters located under the installation settings of the POS MV were all checked prior to enabling Ethernet logging of POSPac data.

Data were collected at vessel speeds of approximately 3 - 7 kt. The HYPACK data acquisition software provides data waterfalls and coverage indicators, which allowed for real-time monitoring of the data quality and coverage. Data displays in HYPACK Survey were used to monitor all survey parameters and the quality of data being recorded.

Sound speed profiles were acquired routinely and when the survey vessel moved to a different survey area. Each successive sound speed cast was compared and assessed to determine the optimal casts per survey reach.

2.5.2 Singlebeam Calibration Checks

Geodetic and mechanical bar index checks have been performed to calibrate for a constant, electronic offset, inherent in all singlebeam systems (Figure 12). Please refer to Appendix C: Singlebeam Echosounder Calibration Report for more details.

Figure 12. Image illustrating the mechanical bar check of sonar index.

A more recent technique to calibrate sonars for sound velocity is a digital bar check, or sound speed cast. Digital bar checks, which are similar in theory to mechanical bar checks, are a safer and more efficient alternative to traditional bar checks, and are critical to sonar data acquisition in shallow, inter-tidal, coastal zones. Therefore, in order to maintain the best data quality across vast areas in this dynamic coastal environment, the traditional mechanical bar check (Figure 12) is only used to verify the sonar system index since corrections are made to the transducer (not

the waterline) and sound speed profiles correct the sounder for speed of sound in the water column.

3.0 Bathymetric Survey Results

3.1 Sounding Data

Sounding data acquired during the survey are displayed below in figures Figure 13 - Figure 16. Soundings were collected relative to the North American Vertical Datum of 1988 (NAVD88) and are presented in NAVD88 below. Per the client's request, data were transformed during post processing to Mean Low Water and Mean Lower Low Tidal datums and included in the data deliverable. Refer to Appendix E for a comprehensive explanation of this transformation.

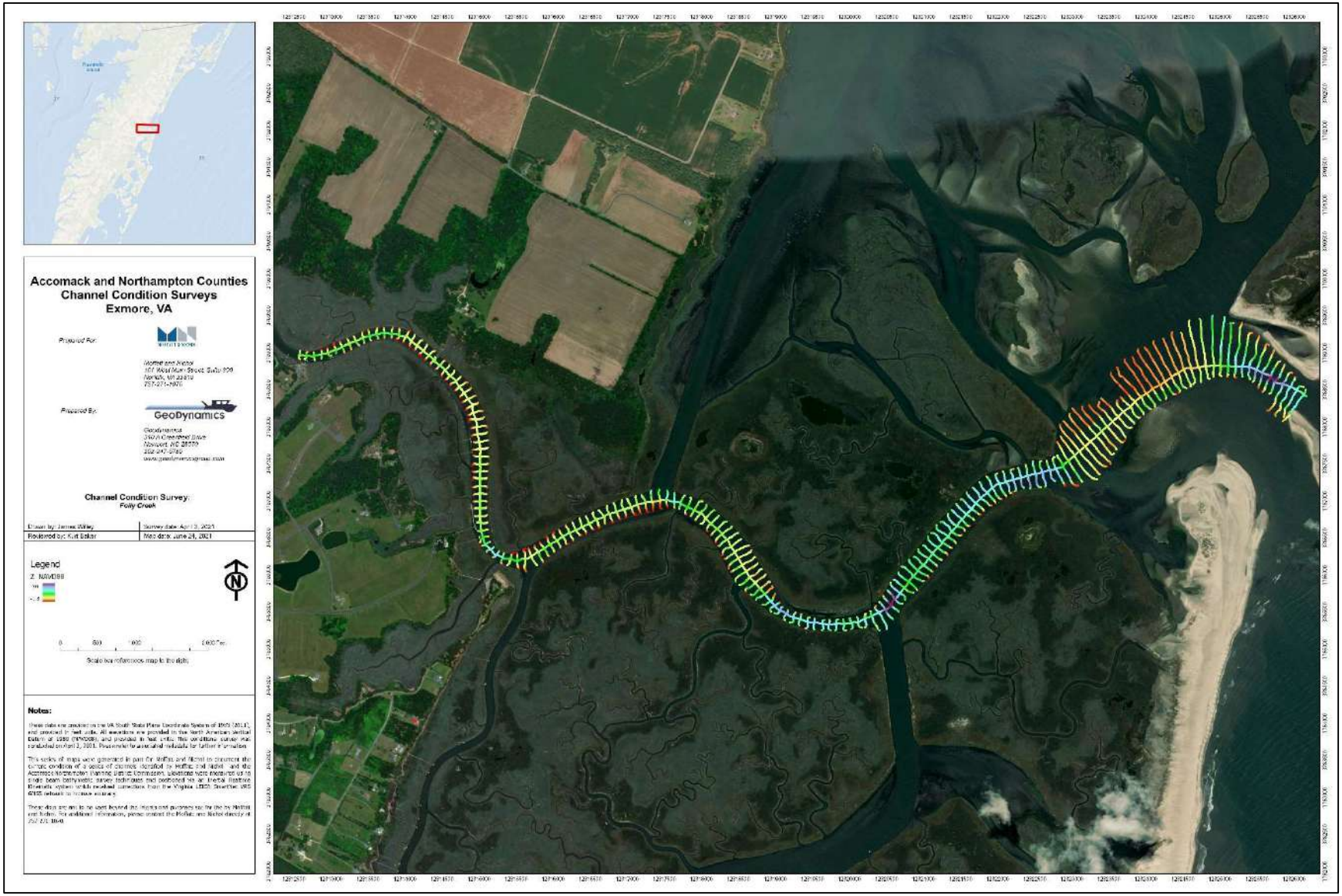


Figure 13. Bathy survey coverage for Folly Creek.

Figure 14. Bathy survey coverage for Red Bank Creek.

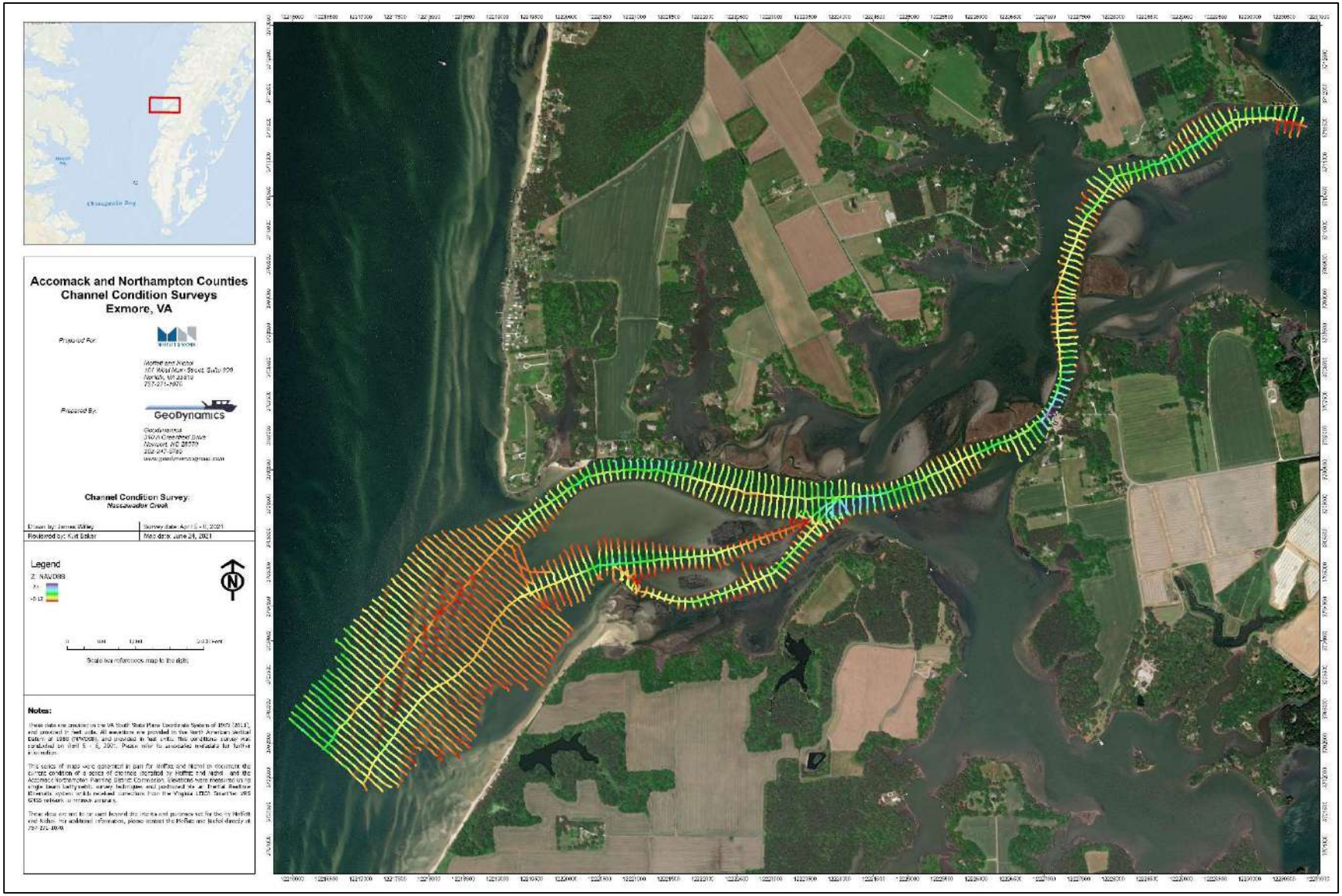


Figure 15. Bathy survey coverage for Nassawadox Creek.

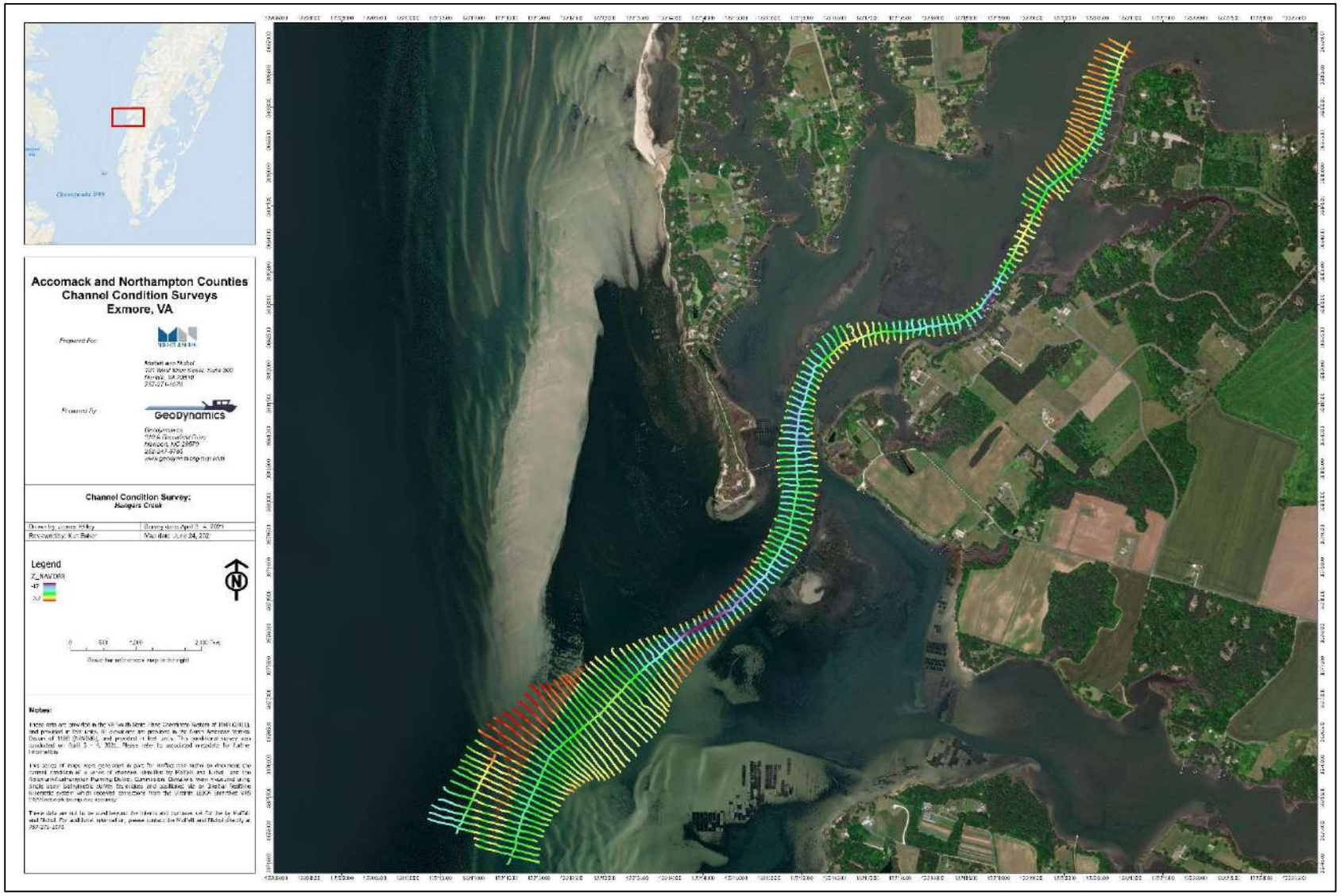


Figure 16. Topo-bathy survey coverage of Hungars Creek.

4.0 Quality Assurance and Control Methodology

After final processing, a rigorous review was completed to ensure the accuracy of all soundings set to be used in the final products.

4.1 Crossing Data Review

To demonstrate consistency throughout the survey, crossing data from each survey site were analyzed. Any bias in vessel installation parameters, erroneous or missing corrections, or other source of error would be apparent as a large average difference between crossing data. Results for the R/V Echo in Red Bank Creek are shown in Figure 17, and the R/V War Eagle in Folly Creek, Nassawadox Creek, and Hungars Creek are presented in Figure 18 through Figure 20. The averages and stand deviations from each site are acceptable and demonstrate the overall accuracy and quality of these data.

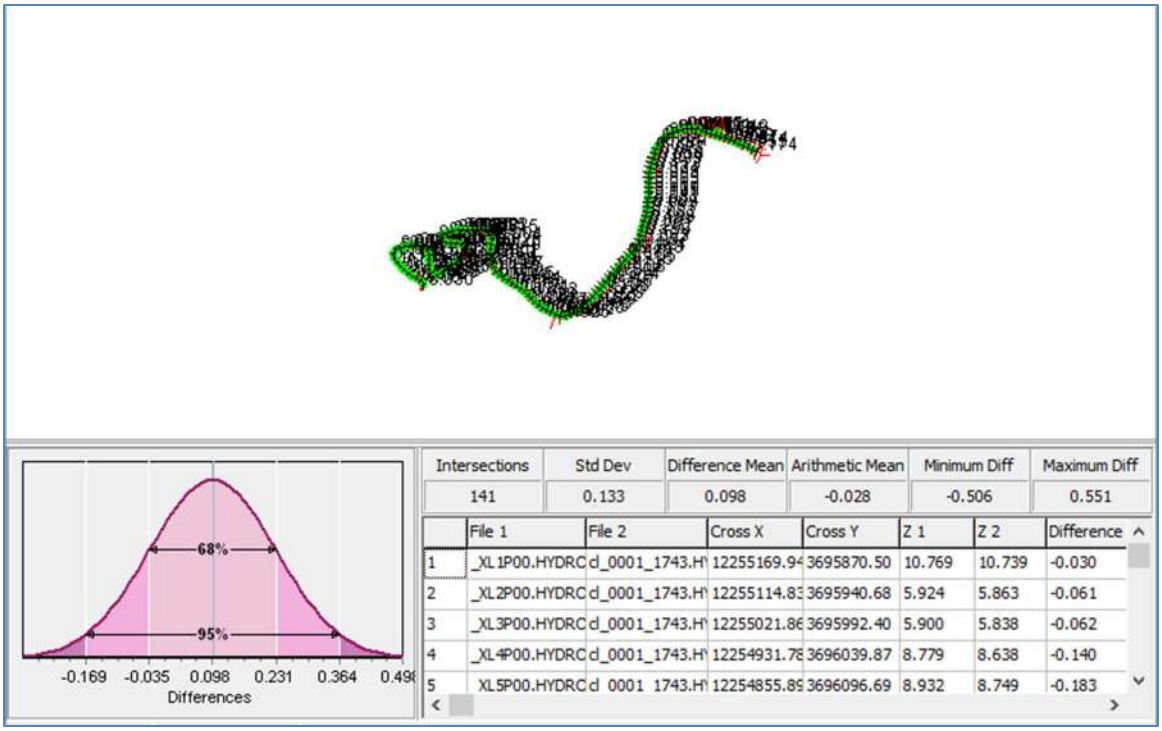


Figure 17. Image illustrating crossing data statistics from Red Bank Creek.

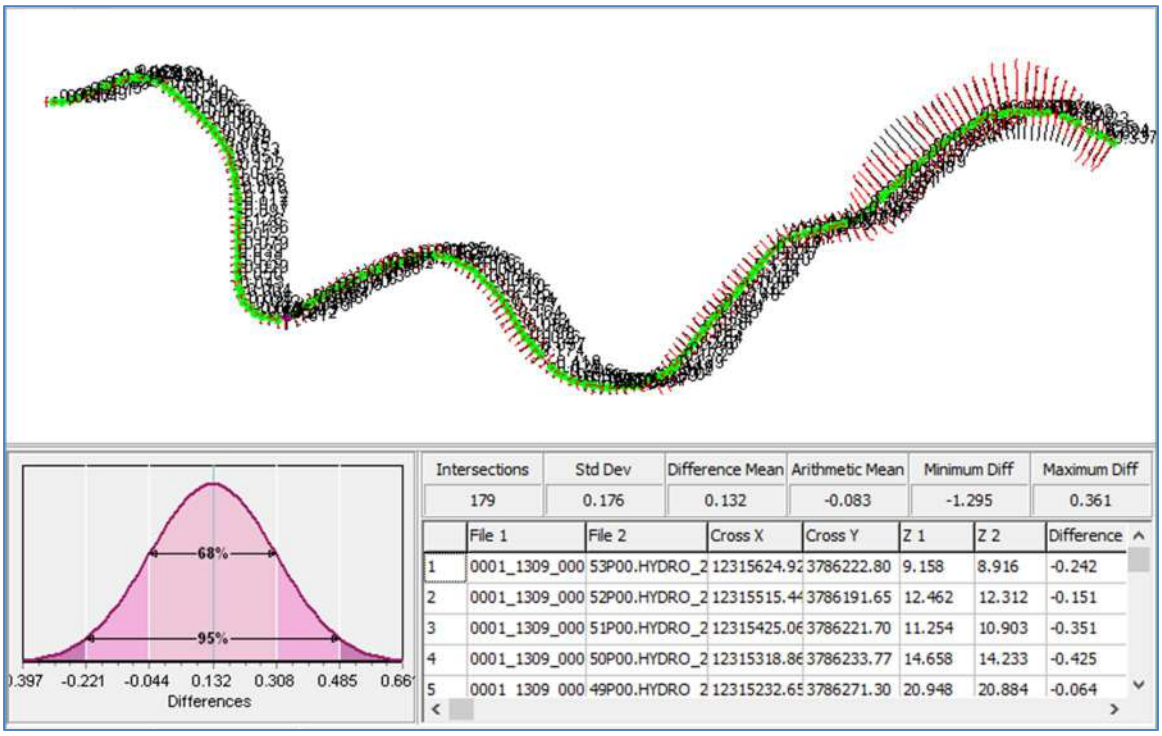


Figure 18. Image illustrating crossing data statistics from Folly Creek.

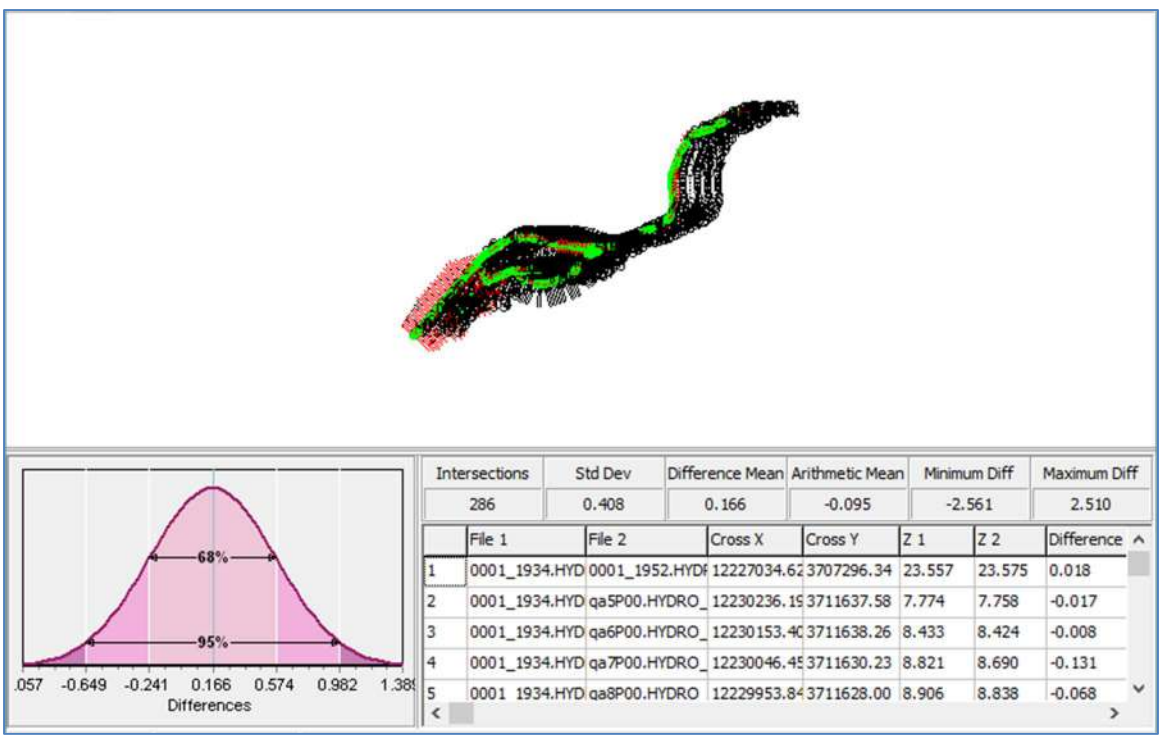


Figure 19. Image illustrating crossing data statistics from Nassawadox Creek.

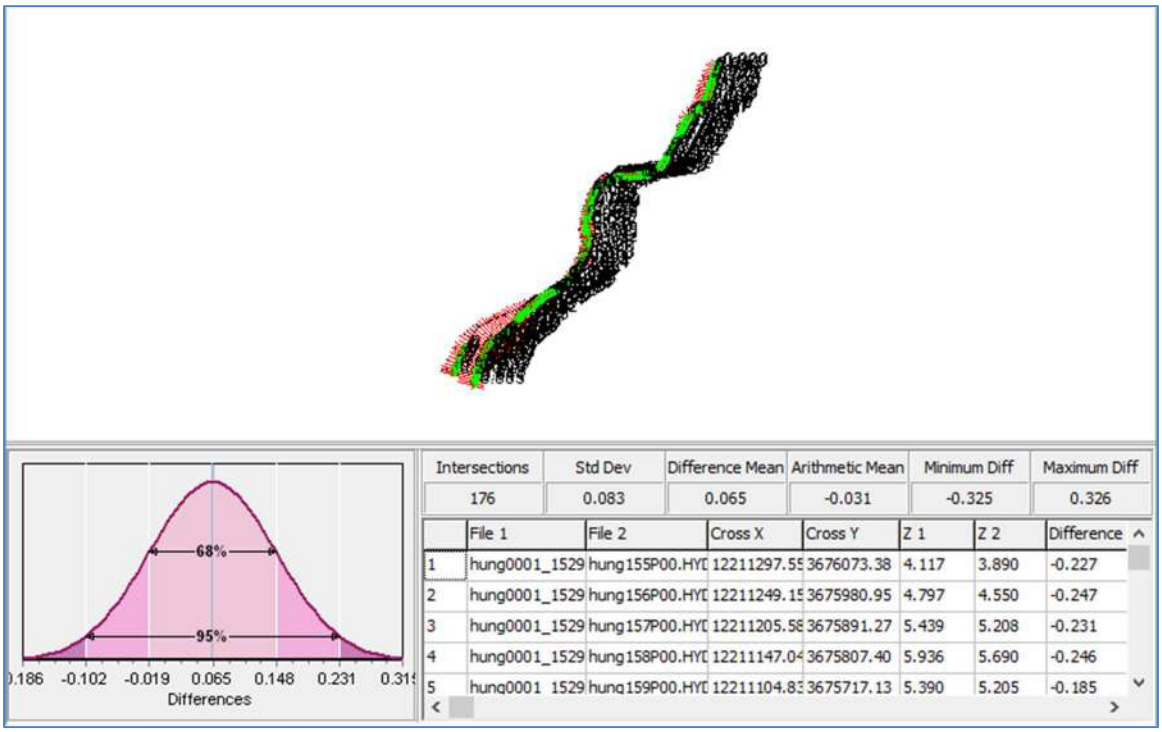


Figure 20. Image illustrating crossing data statistics from Hungars Creek.

A. CONCLUDING REMARKS

All bathymetric data were checked for consistency and accuracy. Data are delivered in ASCII format. Also included are shapefiles of soundings/elevations with the following attributes: X (Easting), Y (Northing), and Z in NAVD88. Additional ASCII formatted files are provided for each survey site which include a file with X (Easting), Y (Northing), and Z in Mean Low Water attributes and a file with X (Easting), Y (Northing), and Z in Mean Lower Low Water attributes.

The extents set forth in the scope of work were achieved or exceeded, and the quality of the data is sufficient.

APPENDIX A: SURVEY ACTIVITY LOGS

Daily Survey Field Notes

Date:	3/1/2021	**Day of Year:**	60
Time SOS (local):	8:00	**Time EOS (local):**	18:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Red Bank Creek, Virginia		
Hydro Crew:	James Willey	Anna Atencio	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Overcast	**Swell:**	0 - 0.5 ft
Wind Speed:	15-20 KT	**Chop:**	1-2 ft
Wind Direction:	N	**Temp:**	40-50 F
Temp:	40-50 F		

Survey Activities

Control

Temporary benchmark was installed at the Barrier Island Center and static observations were collected. Tankard RM2 was located and verified using the Virgina Leica Network.

Topo

N/A

Hydro

Hydro crew mobilized the R/V Echo from Geodynamics Headquarters in Newport, NC to Exmore, VA, established control, and conducted a site visit to the Red Bank Boat Ramp.

Daily Survey Field Notes

Date:	3/2/2021	**Day of Year:**	61
Time SOS (local):	5:30	**Time EOS (local):**	20:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Red Bank Creek, VA		
Hydro Crew:	James Willey	Anna Atencio	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	0.5 - 1.0 ft
Wind Speed:	10-15 KT	**Chop:**	0.5 - 1.0 ft
Wind Direction:	N	**Temp:**	40-50 F
Temp:	40-50 F		

Survey Activities

Control

TANKARD RM2 checked with good results.

Topo

N/A

Hydro

R/V Echo was launched from the Red Bank Boat Ramp in Red Bank, VA and collected SBES for the channel centerline and 100' cross sections for the length of the survey area. After completing acquisition, the vessel was trailered and the crew demobilized to Geodynamics Headquarters in Newport, NC.

Daily Survey Field Notes

Date:	4/2/2021	**Day of Year:**	92
Time SOS (local):	7:00	**Time EOS (local):**	18:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Exmore, VA		
Hydro Crew:	James Willey	Zach Gray	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	1-2 ft
Wind Speed:	15-20 KT	**Chop:**	1-2 ft
Wind Direction:	N	**Temp:**	50-60 F
Temp:	30-40 F		

Survey Activities

Control

Benchmarks 863 1044 G 1981, 863 1044 J TIDAL, 863 1044 K TIDAL, WILLIS, and TANKARD RM 2 were checked with good results. Static data collected on the temporary benchmark installed at the Barrier Islands Center.

Topo

N/A

Hydro

Hydro crew mobilized the R/V War Eagle from Geodynamics Headquarters in Newport, NC to Exmore, VA. Control was established and all sites were visited.

Daily Survey Field Notes

Date:	4/3/2021	**Day of Year:**	93
Time SOS (local):		**Time EOS (local):**	
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Folley Creek, VA		
Hydro Crew:	James Willey	Zach Gray	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	0.5 - 1.0 ft
Wind Speed:	10-15 KT	**Chop:**	0.5 - 1.0 ft
Wind Direction:	N	**Temp:**	40-50 F
Temp:	40-50 F		

Survey Activities

Control

Benchmark 863 1044 K TIDAL was checked with good results.

Topo

N/A

Hydro

R/V War Eagle was launched from the Folly Creek Boat Ramp. A channel centerline was collected for the survey reach, and then transects spaced at 100'. After completing survey operations for Folly Creek, the War Eagle was loaded and mobilized to the Nassawadox Creek survey site. The War Eagle was launched from the Bayford Boat Ramp, and collected a centerline along the primary channel for the entire survey reach.

Daily Survey Field Notes

Date:	4/4/2021	**Day of Year:**	94
Time SOS (local):	7:00	**Time EOS (local):**	19:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Hungars Creek, VA		
Hydro Crew:	James Willey	Zach Gray	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	1-2 ft
Wind Speed:	5-10 KT	**Chop:**	0.5 - 1.0 ft
Wind Direction:	WNW	**Temp:**	50-60 F
Temp:	50-60 F		

Survey Activities

Control

Benchmark WILLIS was checked with good results.

Topo

N/A

Hydro

R/V War Eagle was launched from the Bayford Boat Ramp, and transited to Hungars Creek. A centerline was collected along the primary channel, and then 100' spaced channel transects were collected for the survey area. R/V War Eagle then transited back to the Bayford Boat Ramp.

Daily Survey Field Notes

Date:	4/5/2021	**Day of Year:**	95
Time SOS (local):	7:00	**Time EOS (local):**	20:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Nassawadox Creek, VA		
Hydro Crew:	James Willey	Zach Gray	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	0.5 - 1.0 ft
Wind Speed:	5-10 KT	**Chop:**	0.5 - 1.0 ft
Wind Direction:	SE	**Temp:**	50-60 F
Temp:	50-60 F		

Survey Activities

Control

Benchmark TANKARD RM2 checked with good results.

Topo

N/A

Hydro

R/V War Eagle was launched from the Bayford Boat Ramp. Acquisition began in Nassawadox Creek on channel cross lines spaces every 100' along the survey area. After completing section B, the crew transitioned to Section B and continued 100' spaced crosslines working towards the mouth of the creek.

Daily Survey Field Notes

Date:	4/6/2021	**Day of Year:**	96
Time SOS (local):	6:30	**Time EOS (local):**	5:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Nassawadox Creek, VA		
Hydro Crew:	James Willey	Zach Gray	
Topo Crew:			

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	0 - 0.5 ft
Wind Speed:	5-10 KT	**Chop:**	0 - 0.5 ft
Wind Direction:	WSW	**Temp:**	50-60 F
Temp:	60-70 F		

Survey Activities

Control

Benchmark TANKARD RM2 checked with good results.

Topo

N/A

Hydro

R/V Echo was launched from the Bayford Boat Ramp. Channel centerlines were collected for the various branches of the main channel near the mouth of the creek in section A. After completing the centerlines, the crew collected all remaining cross lines, spaced a 100',

Daily Survey Field Notes

Date:	4/7/2021	**Day of Year:**	97
Time SOS (local):	6:30	**Time EOS (local):**	5:00
Project:	Accomack and Northampton County Channel Condition Survey		
Survey Location:	Red Bank Creek, VA		
Hydro Crew:			
Topo Crew:	Zach Gray	James Willey	

Atmospheric Conditions		**Water Conditions**	
Sky:	Clear	**Swell:**	0 - 0.5 ft
Wind Speed:	0-5 KT	**Chop:**	0 - 0.5 ft
Wind Direction:	SW	**Temp:**	50-60 F
Temp:	70-80 F		

Survey Activities

Control

Benchmark TANKARD RM2 was checked with good results.

Topo

Additional static LiDAR data was collected near the public boat launch on Red Bank Creek, VA. After completing control and the static laser acquisition, the crew demobilized from the site and returned to Geodynamics Headquarters in Newport, NC.

Hydro

N/A

APPENDIX B: HYDROGRAPHIC SURVEY CONRTOL

Survey Control

Project Timeframe:	3/2/2021, 4/2/2021 - 4/7/2021
Project:	Accomack – Northampton Channel Condition Surveys
Survey Location:	Accomack County, Virginia
Survey Crew:	James Willey, Anna Atencio, Zach Gray
Coordinate System/Units:	NAD83 VA State Plane — *Units:* SPF — *Repeater Use:* No
Vertical:	NAVD88 — **Geoid:** 2012b
Base Station Equipment:	Receiver: Leica GR30 (1706356); GPS Antenna: Leica AR10 (21009047); Radio: n/a; Radio Broadcasting: n/a

Notes: This project was conducted in March and April of 2021 during times of optimal weather and tidal conditions. VA LEICA GNSS SmartNet corrections were provided via the internet.

Base Station Information

Designation: LOYOLA LOYW CORS ARP
PID: DL3889
H Order: N/A
V order: N/A
Geoid: 2012b
State Plane Coordinates
Easting (X): 12251869.085
Northing (Y): 3726623.396
Ellipsoid HT: -22.441m

Notes: LEICA SmartNet owned and operated RTN station used to provide network corrections and collect static GNSS data.

The following tables display coordinate and site information on any benchmarks checked for this project

Benchmark Station Reference

Designation: TANKARD RM 2
PID: FW0200
H Order: N/A
V order: N/A
Geoid: 2012b
State Plane Coordinates
Easting (X): 12240271.100
Northing (Y): 3680128.775
Z: 40.548

Notes: NGS Benchmark located in Nassawadox, VA used to verify corrections from the Virginia LEICA SmartNet VRS network.

Benchmark Station Reference

Designation: WILLIS
PID: BBDR53
H Order: N/A
V order: N/A
Geoid: 2012b
State Plane Coordinates
Easting (X): 12263943.195
Northing (Y): 3720046.937
Z: 5.397

Notes: NGS Benchmark located in Willis Wharf, VA used to verify corrections from the Virginia LEICA SmartNet VRS network. Images courtesy of OPUS Shared Solution Report.

Benchmark Station Reference

Designation: B63 1044 G 1981
PID: BBDL07
H Order: N/A
V order: N/A
Geoid: 2012b
State Plane Coordinates
Easting (X): 12297701.169
Northing (Y): 3756959.576
Z: 4.229

Notes: Tidal Benchmark located in Wachapreague, VA used to verify corrections from the Virginia LEICA SmartNet VRS network. Images courtesy of OPUS Shared Solution Report.

Benchmark Station Reference

Designation: B63 1044 J TIDAL
PID: AJ4586
H Order: N/A
V order: N/A
Geoid: 2012b
State Plane Coordinates
Easting (X): 12297540.982
Northing (Y): 3756514.013
Z: 3.957

Notes: Tidal Benchmark located in Wachapreague, VA used to verify corrections from the Virginia LEICA SmartNet VRS network. Images courtesy of OPUS Shared Solution Report.

Benchmark Station Reference

Designation: 863 1044 K TIDAL
PID: AJ4587
H Order: N/A
V order: N/A
Geoid: 2012b

State Plane Coordinates

Easting (X):	12297295.300
Northing (Y):	3755575.95
Z:	4.711

Notes: Tidal Benchmark located in Wachapreague, VA used to verify corrections from the Virginia LEICA SmartNet VRS network.

The following tables display GPS consistency throughout the survey

Benchmark Report

Date	Network Check	Weather	Benchmark	N	E	Z	ΔN	ΔE	ΔZ
3/2/2021	LEICA SmartNet	Overcast	TANKARD RM 2	3680128.68	12240271.0	40.454	0.091	0.087	0.094
	Base Station Used: VRS GNSS RTK								
3/2/2021	LEICA SmartNet	Overcast	TANKARD RM 2	3680128.65	12240271.0	40.501	0.125	0.077	0.047
	Base Station Used: VRS GNSS RTK								
4/2/2021	LEICA SmartNet	Clear	WILLIS	3720046.99	12263943.2	5.170	-0.050	0.015	0.227
	Base Station Used: VRS GNSS RTK								
4/2/2021	LEICA SmartNet	Clear	863 1044 G 1981	3756959.56	12297701.2	3.998	0.015	-0.041	0.231
	Base Station Used: VRS GNSS RTK								
4/2/2021	LEICA SmartNet	Clear	863 1044 K TIDAL	3755575.92	12297295.3	4.468	0.034	-0.010	0.243
	Base Station Used: VRS GNSS RTK								
4/2/2021	LEICA SmartNet	Clear	863 1044 J TIDAL	3756513.98	12297541	3.783	0.032	0.012	0.174
	Base Station Used: VRS GNSS RTK								
4/2/2021	LEICA SmartNet	Clear	TANKARD RM 2	3680128.81	12240271.1	40.169	-0.036	-0.040	0.379
	Base Station Used: VRS GNSS RTK								
4/3/2021	LEICA SmartNet	Clear	863 1044 K TIDAL	3755575.94	12297295.3	4.594	0.006	-0.020	0.117
	Base Station Used: VRS GNSS RTK								
4/4/2021	LEICA SmartNet	Clear	WILLIS	3720046.92	12263943.2	5.115	0.015	0.015	0.282
	Base Station Used: VRS GNSS RTK								
4/5/2021	LEICA SmartNet	Clear	TANKARD RM 2	3680128.78	12240271.1	40.576	-0.006	-0.030	-0.028
	Base Station Used: VRS GNSS RTK								
4/6/2021	LEICA SmartNet	Clear	TANKARD RM 2	3680128.81	12240271.1	40.539	-0.032	-0.030	0.009
	Base Station Used: VRS GNSS RTK								
4/7/2021	LEICA SmartNet	Clear	TANKARD RM 2	3680128.78	12240271.1	40.558	-0.003	-0.030	-0.010
	Base Station Used: VRS GNSS RTK								

GPS Consistency (SPF)	
Average Easting (X) error	0.043
Average Northing (Y) error	0.026
Average Elevation error	0.168

APPENDIX C: SINGLEBEAM VESSEL CALIBRATION REPORT

R/V ECHO July 2019

GeoDynamics

ODOM CV100 CALIBRATION

Contact: Geodynamics
910 A Greenfield Drive
Newport, NC 28570
252-247-5785
www.GeoDynamicsGroup.com

SYSTEM INFORMATION

Vessel:	R/V Echo	Sonar Type:	ODOM CV100
Date:	7/26/2019	Sonar Head Serial #(s):	n/a
Personnel:	Willey, J., Rao, R., Gray,Z.	PU Serial #:	26068
		Sonar Software:	eChart
Positioning System	POSMV WM V5	Sonar Frequency:	200 kHz
POSMV Serial #	6577	Swath Width:	4°
GPS Antennas	AT1675-540TS (2 antennas)	Sound Speed Sensor at Sonar:	n/a
IMU Type	37	Sound Speed Profiler:	SontTek Castaway CTD
			Pressure sensor 304496

CALIBRATION DETAILS

Location:	Morehead City Harbor
Weather	Clear skies, 80-90°
Wind	5-10 kts NNE
Seas	0' swell, 0-0.25' chop
Sound Speed (avg)	1540 m/s

Approximate Position:	Deg	Min	Sec
Lat:	34°	43'	06"
Long:	76°	42'	18"

GNSS Corrections

GPS Correction:	RTK-GNSS		
Correction Type:	CMR+		
Station Name	BEAUFORT CORS ARP		
Coordinates:	Deg	Min	Sec
Lat:	34°	43'	08.50895" N
Long:	76°	40'	18.99140" W
Ellips. Height (m) :	-27.858		

Sonar Offsets / Biases

	X (m)	Y (m)	Z (m)
Position	0.000	0.000	0.000
Draft	0.000	0.000	0.000
Index	0.000	0.000	0.090

POSMV Configuration

Lever Arms	X (m)	Y (m)	Z (m)
Ref. to IMU Lever Arm	0.000	0.000	0.070
Ref. to Primary GPS	0.016	-0.01	-2.063
Ref. to Vessel Lever Arm	-0.292	0.745	0.648
Ref. to Sensor 1	-0.292	0.745	0.648
Ref. to COG	0.000	0.000	0.290
	X (deg)	Y (deg)	Z (deg)
IMU w.r.t. Ref. Frame	0.000	0.000	-0.001

Note: The Sensor 1 offset is referenced to the sonar head.

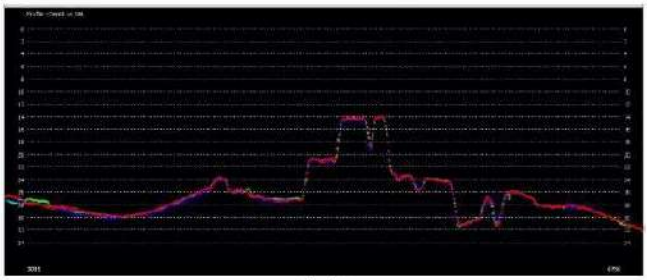
GAMS Parameters

Two Antenna Sep (m)	1.997	Baseline Vector		
Heading Cal.Threshold	0.500	X (m)	Y (m)	Z (m)
Heading Correction (deg)	0.000	1.997	0.015	0.003

Index Check

Bar Value (ft)	Sonar Value (ft)	(Sonar value derived from the mean depth of bar below transducer)
3.0	3.0	
6.0	6.0	
9.0	9.0	
15.0	15.0	

Calibration Check Image

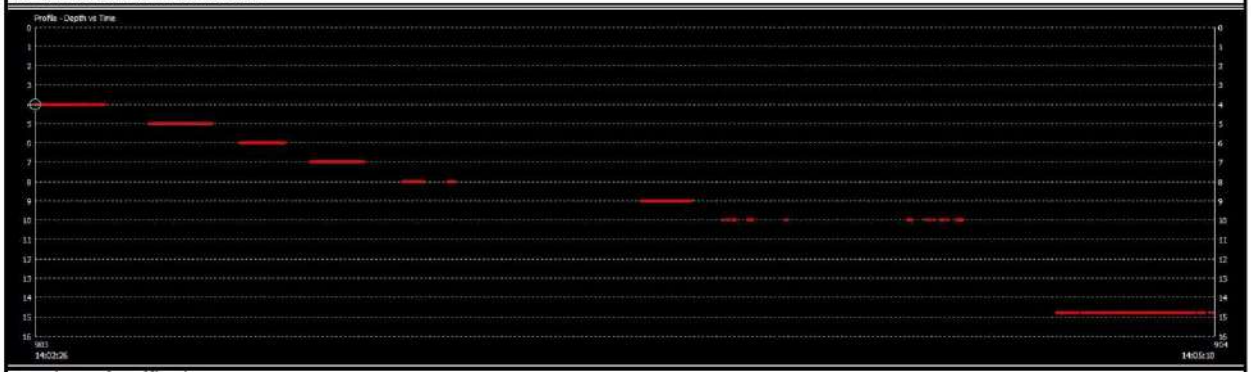


Notes:

The Image above consists of three different singlebeam datasets from 2017-present conducted by Geodynamics on the R/V Echo. Al datasets were collected using an Odom CV100. All singlebeam surveys were collected using RTK-GPS with corrections from a local temporary basestation. A hard bottom feature that does not vary from year to year is found along this profile which is why it was chosen to represent accurate and precise configuration parameters for the vessel's equipment. The three different colors show three consecutive years of surveying this same profile. The dataset comparison produced exceptional results with corrections from the basestation set up on 865 8559 Tidal 1.

Patch Test BIAS Verification Images

Bar Check for Index Verification



R/V War Eagle Spring 2021

GeoDynamics

ODOM CV100 CALIBRATION

Contact: Geodynamics
310 A Greenfield Drive
Newport, NC 28570
252-247-5785
www.GeoDynamicsGroup.com

SYSTEM INFORMATION

Vessel:	R/V Echo	**Sonar Type:**	ODOM CV100
Date:	7/26/2019	**Sonar Head Serial #(s):**	n/a
Personnel:	Willey, J., Gray,Z.	**PU Serial #:**	26010
		Sonar Software:	eChart
Positioning System	POSMV WM V5-1	**Sonar Frequency:**	200 kHz
POSMV Serial #	10182	**Swath Width:**	4°
GPS Antennas	AT1675-540TS (2 antennas)	**Sound Speed Sensor at Sonar:**	n/a
IMU Type	65	**Sound Speed Profiler:**	SontTek Castaway CTD

CALIBRATION DETAILS

Verification Survey Details

Weather	**Clear skies, 60-70°**		
Wind	**5-10 kts SW**		
Seas	**0' swell, 0-0.25' chop**		
Sound Speed (avg)	**1510 m/s**		
Approximate Position:	**Deg**	**Min**	**Sec**
Lat:	**34°**	**43'**	**19"**
Long:	**76°**	**40'**	**10"**

GNSS Corrections

GPS Correction:	RTK-GNSS		
Correction Type:	CMR+		
Station Name	BEAUFORT CORS ARP		
Coordinates:	**Deg**	**Min**	**Sec**
Lat:	34°	43'	08.50895" N
Long:	76°	40'	18.99140" W
Ellips. Height (m):	-27.858		

Sonar Offsets / Biases

	X (m)	Y (m)	Z (m)
Position	0.000	0.000	0.000
Draft	0.000	0.000	0.000
Index	0.000	0.000	0.090

POSMV Configuration

Lever Arms	**X (m)**	**Y (m)**	**Z (m)**
Ref. to IMU Lever Arm	0.004	0.001	0.066
Ref. to Primary GPS	0.045	0.128	-0.895
Ref. to Sensor 1	-0.346	0.000	0.79

Note: The Sensor 1 offset is referenced to the sonar head.

	X (deg)	**Y (deg)**	**Z (deg)**
IMU w.r.t. Ref. Frame	0.000	2.500	0.000

GAMS Parameters

Two Antenna Sep (m)	1.392		
Heading Cal.Threshold	0.500		
Heading Correction (deg)	0.000		
	X (m)	**Y (m)**	**Z (m)**
Baseline Vector	-0.026	1.392	-0.016

CALIBRATION NOTES

The results of this calibration are the culmination of a series of iterative adjustments to the equipment installed on the R/V War Eagle in order to collect the highest possible quality data. GAMS Parameters were ascertained through a series of GAMS calibrations that yielded increasingly tight results and were therefore accepted and utilized in the POS-MV software. All sensor lever arms were established by experienced Geodynamics surveyors and were applied in the POS-MV software and used to accurately position all data points collected by the ODOM CV100. Initial comparison of crossing and reciprocal data recorded during this calibration showed excellent agreement among soundings and confirmed the accuracy of the installation parameters contained in the above table. These soundings were then rigorously compared to a variety of verified datasets also collected by Geodynamics and yielded excellent agreement with data collected with both singlebeam bathymetric techniques and multibeam bathymetric techniques, further confirming the accuracy of these parameters. For further information regarding the results of this calibration, contact Geodynamics at (252) 247-5785.

APPENDIX D: SOUND VELOCITY SENSOR CALIBRATION REPORT

SonTek
a xylem brand

9940 Summers Ridge Road
San Diego, CA 92121
Tel: (858) 546-8327
support@sontek.com

CALIBRATION CERTIFICATE

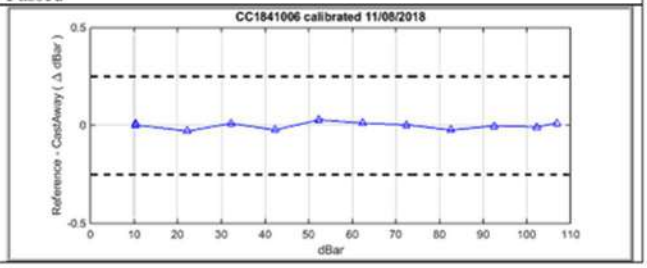
SYSTEM INFO

System Type	CastAway-CTD
Serial Number	CC1841006
Firmware Version	1.63
Date	11/12/2018

POWER CONSUMPTION

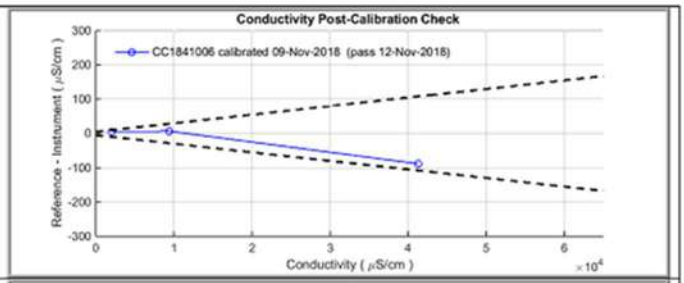
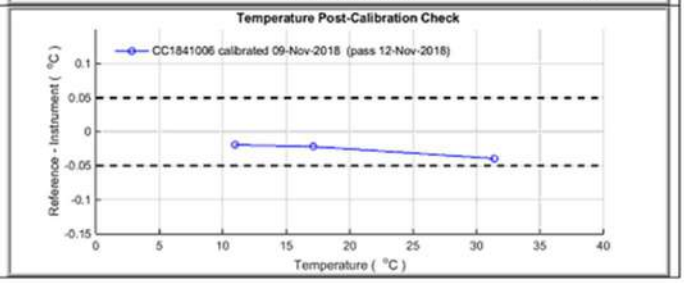
Standby Mode (A)	0.2134 / PASS
Supply Voltage	2.9V

CALIBRATION

GPS	Passed
Pressure	

SonTek
a xylem brand

9949 Summers Ridge Road • San Diego, CA 92121 • Telephone (858) 546-8327 • Fax (858) 546-8150 • Internet: www.sontek.com

Conductivity	
Temperature	

Verified by: ale
This report was generated on: 11/12/2018

APPENDIX E: VERTICAL DATUM CONVERSION

Moffatt & Nichol

Accomack and Northampton Channel Condition Surveys

Vertical Datum Conversion for Folly's Creek, Nassawadox Creek, Hungar's Creek, and Red Bank Creek

Elevation data collected by Geodynamics was processed to the North American Vertical Datum of 1988 (NAVD88) using Geoid 12B as the ellipsoid separation model. The values were further processed to the tidal datums of Mean Lower Low Water (MLLW) and Mean Low Water (MLW) using the NOAA VDatum Online software.

For Nassawadox Creek and Hungars Creek, the tidal datum model fully enclosed the survey data, and the average of all separation values were used to determine a single conversion value.

For Follys Creek, only the offshore portion had a NOAA tidal datum conversion applicable. This portion was averaged to find the single conversion value.

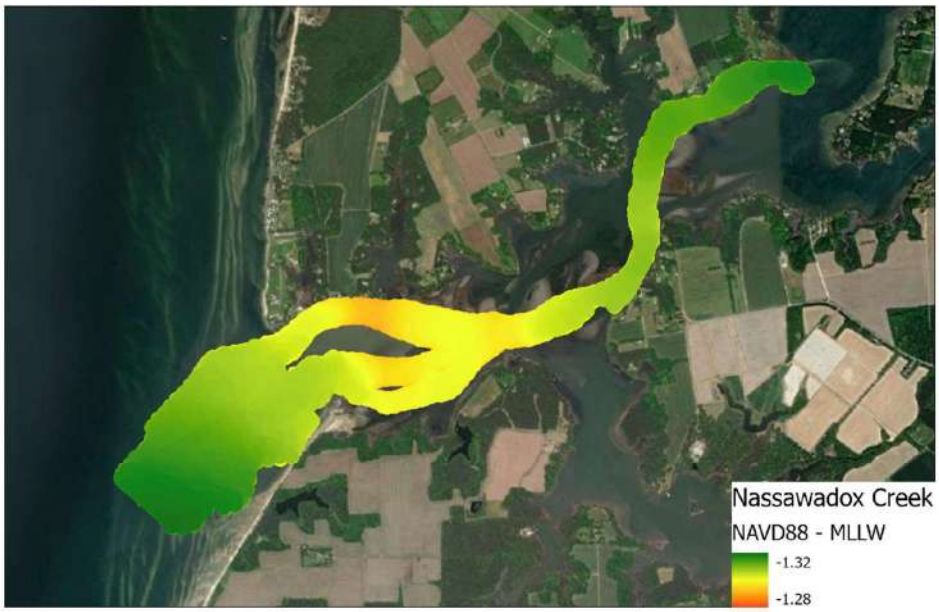
For Red Bank Creek, none of the survey area is within a NOAA tidal datum model. Therefore, the nearest applicable region as shown in the maps below was determined to provide the conversion value. The region chosen is in the creek adjacent to Red Bank Creek.

Table 1: NAVD88 to MLLW and MLW conversion values for the channels surveyed.

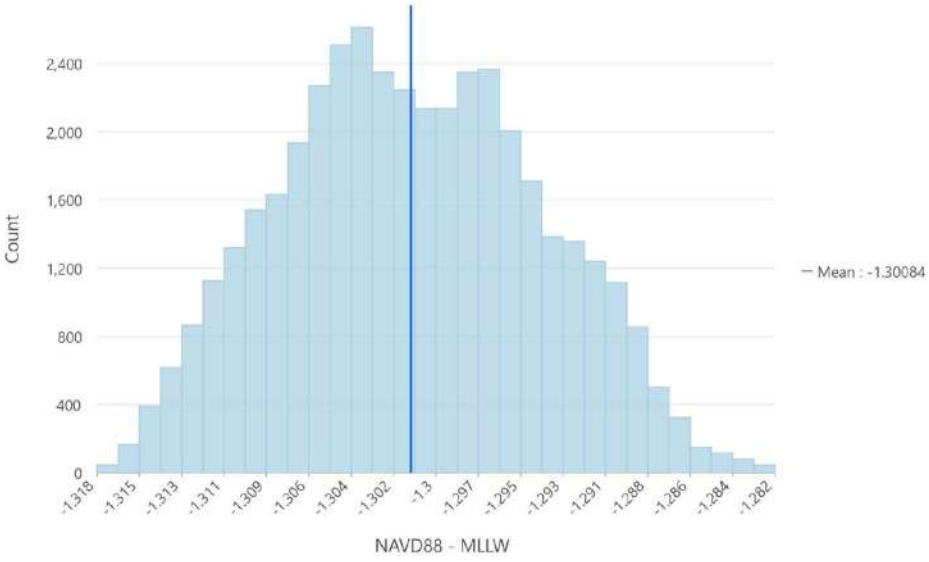
Channel	MLLW Conversion	MLW Conversion
Nassawadox Creek	1.30	1.20
Hungars Creek	1.43	1.32
Follys Creek	2.37	2.22
Red Bank Creek	2.59	2.44

In the table above, the conversion values are equivalent to the "0" elevation in NAVD88, meaning that in these regions the MLLW and MLW values are "shoaler" than NAVD88. The rest of this document contains images justifying the conversion values found in the table.

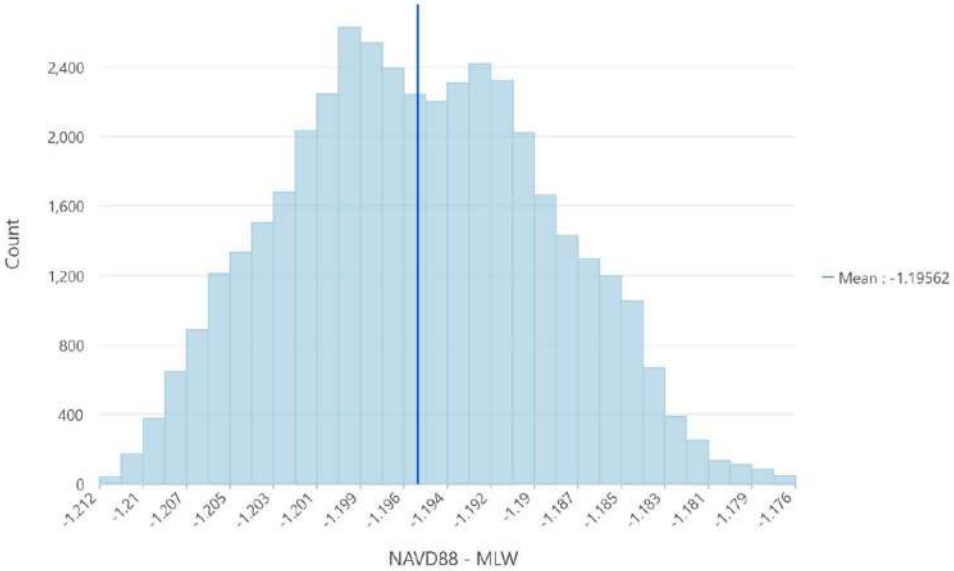
1.0 NASSAWADOX CREEK



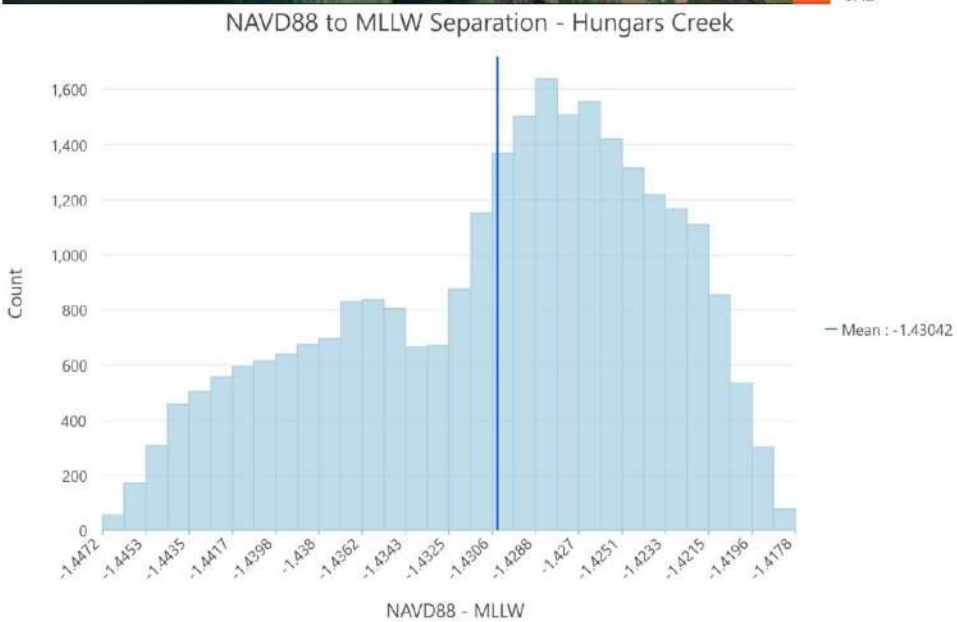
NAVD88 to MLLW Separation - Nassawadox Creek



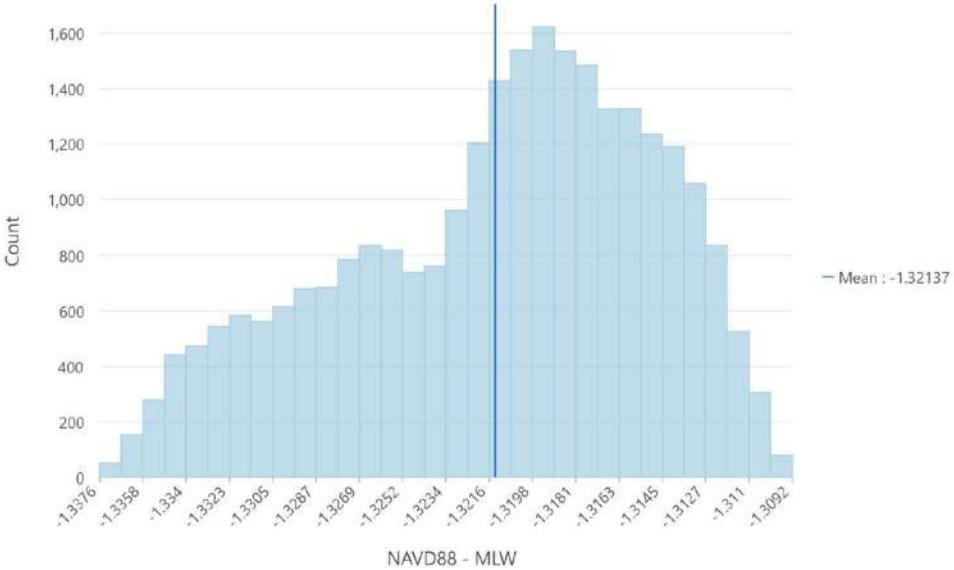
NAVD88 to MLW Separation - Nassawadox Creek



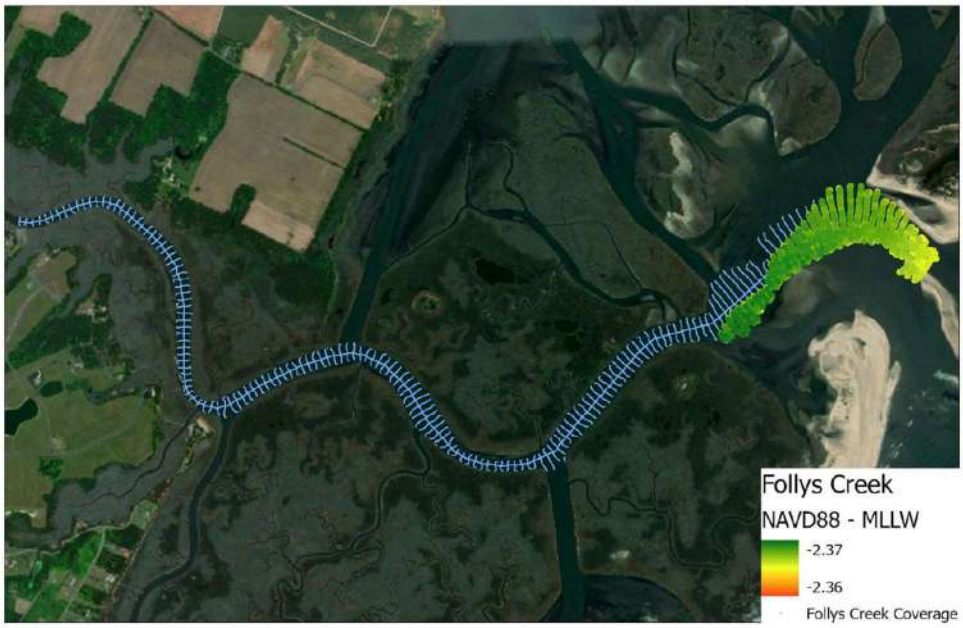
2.0 HUNGARS CREEK

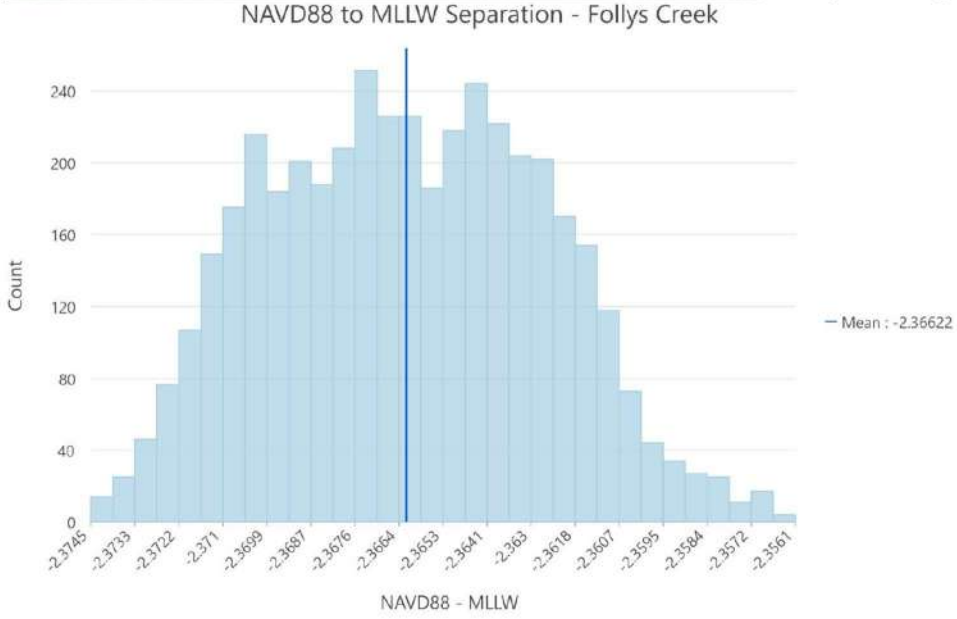


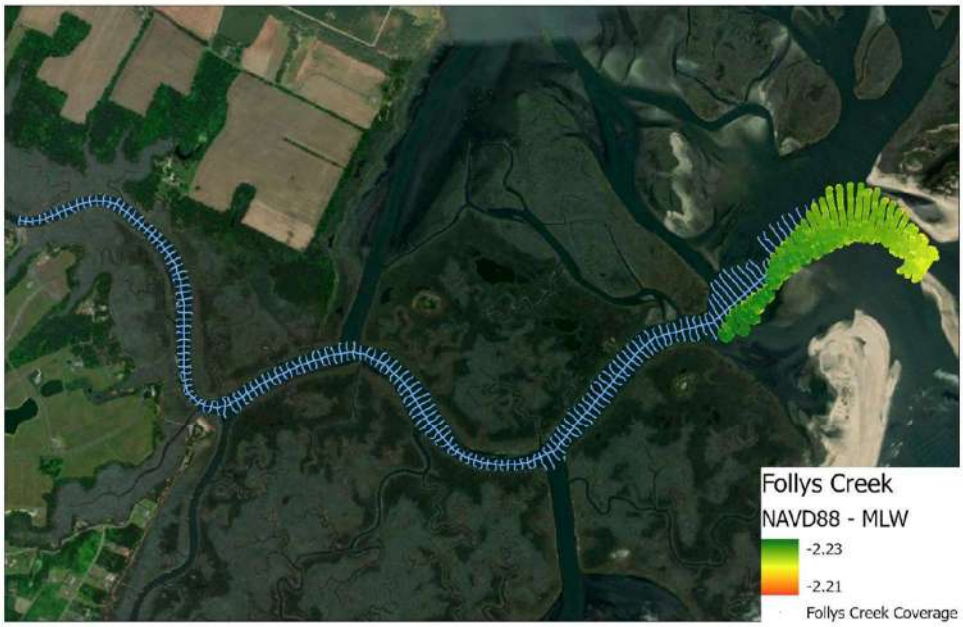
NAVD88 to MLW Separation - Hungars Creek

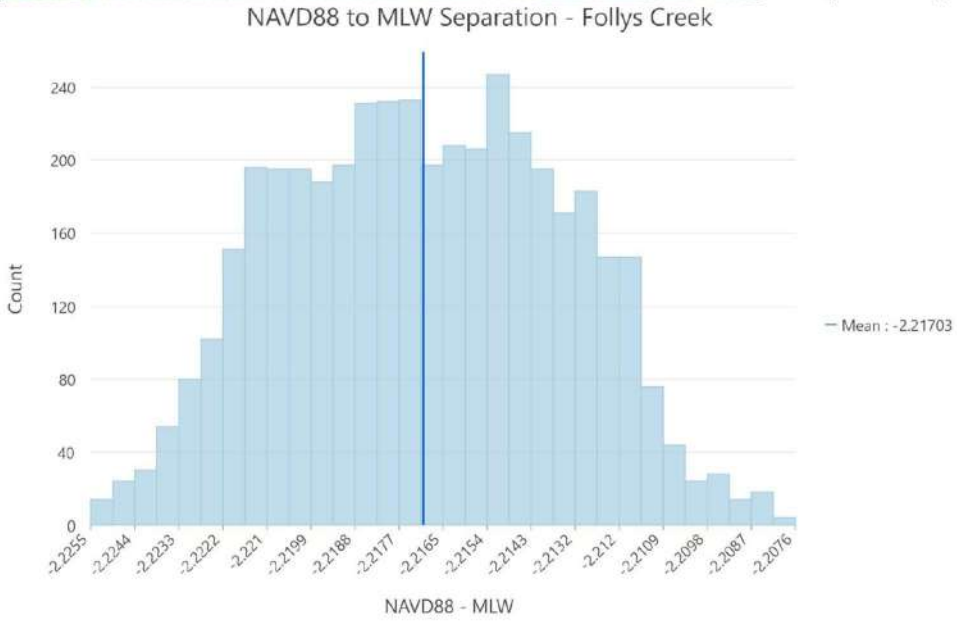


3.0 FOLLYS CREEK

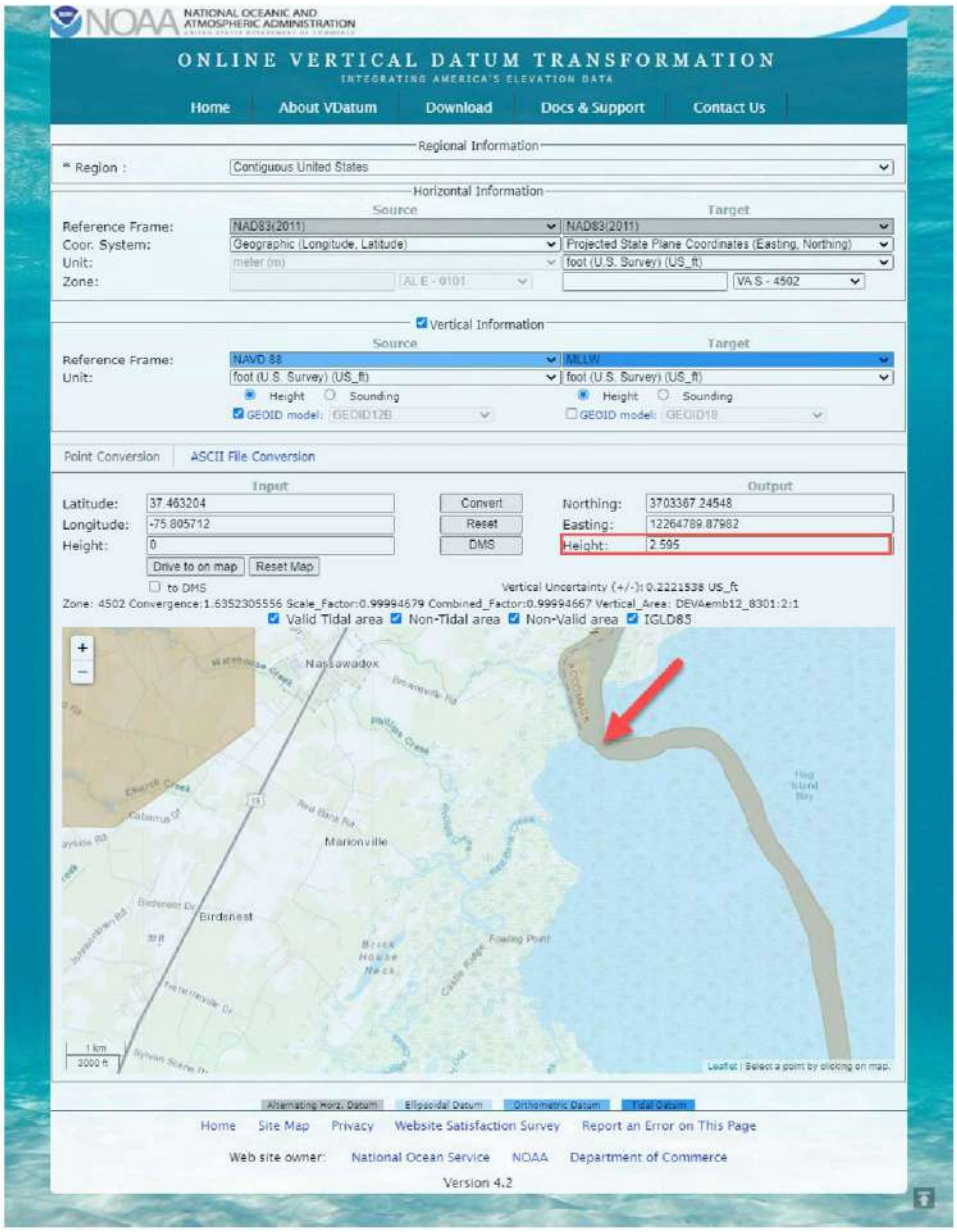


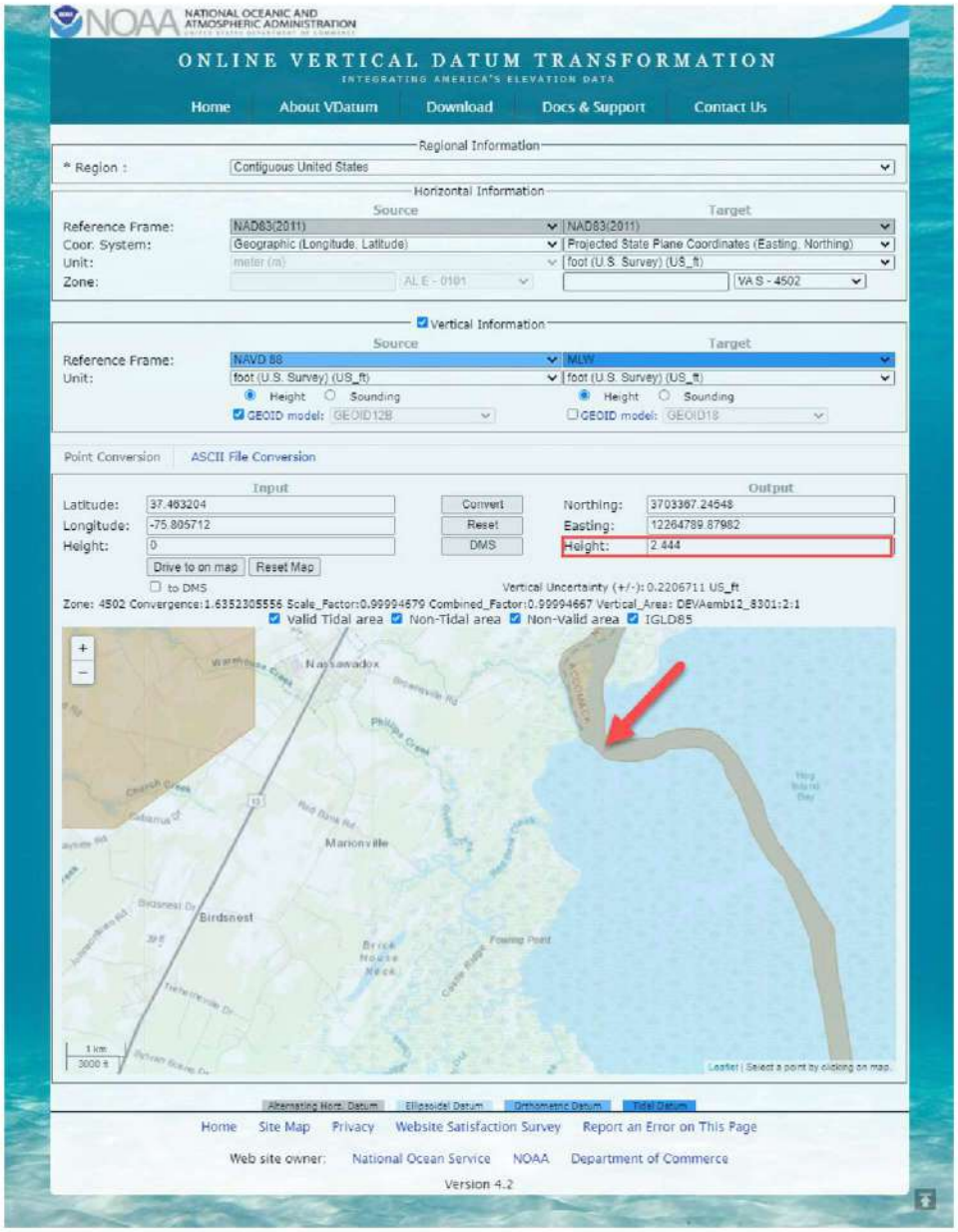



Follys Creek
NAVD88 - MLW
-2.23
-2.21
Follys Creek Coverage


NAVD88 to MLW Separation - Follys Creek
Count
240
200
160
120
80
40
0
-2.2255
-2.2244
-2.2233
-2.2222
-2.221
-2.2199
-2.2188
-2.2177
-2.2165
-2.2154
-2.2143
-2.2132
-2.212
-2.2109
-2.2098
-2.2087
-2.2076
NAVD88 - MLW
Mean : -2.21703

4.0 RED BANK CREEK




NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ONLINE VERTICAL DATUM TRANSFORMATION
INTEGRATING AMERICA'S ELEVATION DATA
Home
About VDatum
Download
Docs & Support
Contact Us
Regional Information
* Region :
Contiguous United States
Horizontal Information
Source
Target
Reference Frame:
NAD83(2011)
NAD83(2011)
Coor. System:
Geographic (Longitude, Latitude)
Projected State Plane Coordinates (Easting, Northing)
Unit:
meter (m)
foot (U.S. Survey) (US_ft)
Zone:
AL E - 0101
VA S - 4502
Vertical Information
Source
Target
Reference Frame:
NAVD 88
MLW
Unit:
foot (U.S. Survey) (US_ft)
foot (U.S. Survey) (US_ft)
Height
Sounding
Height
Sounding
GEOID model:
GEOID12B
GEOID model:
GEOID18
Point Conversion
ASCII File Conversion
Input
Output
Latitude:
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Longitude:
-75.805712
Height:
0
Convert
Reset
DMS
Northing:
3703367.24648
Easting:
12264789.87982
Height:
2.444
Drive to on map
Reset Map
to DMS
Vertical Uncertainty (+/-): 0.2206711 US_ft
Zone: 4502 Convergence:1.6352305556 Scale_Factor:0.99994679 Combined_Factor:0.99994667 Vertical_Area: DEVAemb12_8301:2:1
Valid Tidal area
Non-Tidal area
Non-Valid area
IGLD85
Nassawadox
Marionville
Birdsnest
Leaflet | Select a point by clicking on map.
Alternating Horz. Datum
Ellipsoidal Datum
Orthometric Datum
Tidal Datum
Home
Site Map
Privacy
Website Satisfaction Survey
Report an Error on This Page
Web site owner:
National Ocean Service
NOAA
Department of Commerce
Version 4.2

APPENDIX F: SCOPE OF WORK

Accomack – Northampton Channel Condition Surveys

Moffatt & Nichol

March 2020

1.0 PROJECT SUMMARY

1.1 Name

Accomack – Northampton Channel Condition Surveys

1.2 Client

Geodynamics is the survey subcontractor for Moffatt and Nichol. The client is the Accomack-Northampton Planning District Commission (A-NPDC).

1.3 Description of Work

Geodynamics been contracted to perform channel condition surveys as part of the Planning and Surveying Services project for Nassawadox Creek, Hungars Creek, and Red Bank Creek along the Eastern Shore of Virginia.

2.0 SURVEY CONTROL

2.1 Horizontal Coordinate System (HCS)

Virginia South State Plane, 4502, NAD83 (2011), EPSG: 6595

2.1.1 HCS Units

Feet

2.2 Vertical Coordinate System (VCS)

North American Vertical Datum of 1988 (NAVD88) using Geoid 2012B

2.2.1 VCS Units

Feet, Elevation (Positive up)

2.3 Methodology

All survey work shall be performed utilizing RTK-GNSS corrections from either a locally installed and verified base station or using the Leica SmartNet network. Post processing techniques such as Applanix POSPac shall be available and may be applied as necessary.

2.4 Standards and Requirements

Survey control will be established prior to the collection of topographic points on a known and verified benchmark within the NGS or NCGS network through use of a Trimble R10 or similar survey grade receiver and antenna fixed to a 2 meter pole. Survey control will be verified at least once daily throughout the duration of the project.

3.0 SURVEY COMPONENTS

3.1 Hydrographic Survey

3.1.1 Purpose

Singlebeam hydrographic data is required to be collected within each survey area for the purpose of verifying channel location and condition, as well as identification of alternate channels that may exist.

3.1.2 Equipment and Accuracy Requirements

Singlebeam data shall be conducted using an Odom CV100, and shall be set to achieve the maximum ping rate given the survey conditions. The sonar data will be attitude and positionally adjusted using the Inertially Aided Real Time Kinematic Applanix POS Surfmaster One receiving real time GNSS corrections as defined in Survey Control. Singlebeam data shall be verified by at least one crossline collected along the length of the survey area. Digital echograms shall be recorded for post-processing and survey validation.

Geodynamics shall utilize hydrographic surveying techniques that meet or exceed the criteria for Navigation and Dredging Support Surveys of Hard Bottoms as outlined in the U.S. Army Corps of Engineers (USACE) Hydrographic Surveying Manual, EM 1110-2-1003 and in the CETN II-38 Beach and Nearshore Survey Technology Technical Note.

3.1.3 Coverage Requirements – All Sites

Survey extents have been provided by the A-NPDC and are not definitive. The survey will consist of a single channel centerline through the "marked" navigation channel with crosslines every 100' throughout each project extent. The "marked" navigation channel is defined by having either state or federally maintained navigation markers consisting of numbered, colored, daybeacons, flashing lights, or buoys.

3.1.3.1 Nassawadox Creek

Hungars Creek is located along the western coast of the Eastern Shore and connects to the Chesapeake Bay. Offshore survey will cease at ATON Navigation Warning Beacon "A" and inshore data collection will extend to the Salt works (along the north shore of Nassawadox Creek as it splits from Warehouse Creek. In addition to the primary "marked" channel, a known alternative channel exists at Nassawadox Creek marked with PVC pilings exists to the south of the primary channel as the creek enters into the Chesapeake Bay. Survey of this channel should be attempted if practical and followed out to the offshore survey extent. A potential dredge spoil area (shoal) is located between the primary and alternative channel and attempt to extend the crosslines over this region shall be made. See attached map for more information.

The following text is provided from the A-NPDC as per the project instructions:

"Nassawadox Creek- Primary attention to maintenance needs to be at the mouth of the creek, thus the short length of maintenance, 0.1 miles, or approximately 500 feet but surveying will need to extend from Aid to Navigation Warning Beacon "A" out in the Bay to the general area of Bayford or an alternate survey path to the Salt works. The survey length to the general area of Bayford is approximately 3.75 miles and the survey length to the Saltworks is approximately 4.8 miles. The awarded offeror will collaborate with the A-NPDC and local stakeholders to determine the appropriate survey area. The northern channel section entering the Bay has about a 100 feet section of 3.5 feet depth at low tide (as of August 28, 2016). Inside the 100-feet length of 3.5 feet depth, there is between 5 and 10 feet channel depth to Warehouse Creek. There is also a southern channel which is partially marked by PVC pipes along shellfish lease areas and has a minimum depth of 4 to 6 feet. Smaller-scale dredging was accomplished in 2008 with a permit from VMRC (#2005-4-92) for the organization. Friends of Nassawadox Creek."

3.1.3.2 Hungars Creek

Hungars Creek is located along the western coast of the Eastern Shore and connects to the Chesapeake Bay. Offshore survey will cease at ATON "1MC" and will continue inland along the "marked" channel to ATON "WR9" near the Salt works. The region of Hungars Creek as it approaches the Chesapeake Bay has a complex and dynamic series of shoals and the actual channel location may not be coincident with the "marked" channel location. The hydrodynamic survey data collection shall take place in effort to accurately locate the most feasible deep water entrance to Hungars Creek, whether within or outside of the "marked" channel. Due to the complexity of the nearshore environment at this location, full ensonification along strict 100' line spacing may not be feasible and Geodynamics shall not be held liable for data gaps in areas deemed too shoal or dangerous for data collection. See attached map for more information.

The following text is provided from the A-NPDC as per the project instructions:

"Hungars Creek- Primary attention to maintenance needs to be from Aid to Navigation 1MC out in the Bay up the creek to Aid to Navigation WR9 at the mouth of the creek but surveying will extend an approximate 3.5 miles in a northeasterly direction to the general area of the Saltworks. Hungars Creek has a common outlet to the Bay 8 miles northward of Cape Charles Harbor. Hungars Creek is marked by lights, day beacons, and bush stakes. According to a local assessment completed in 2016, there is a good water level in the channel just north of Masden Gut. There may need to be increased public awareness on this project as the area has numerous aquaculture beds for both clams and oysters. The aquaculture industry could become concerned about silting due to dredging and the recreational boaters equally concerned about the channel maintenance. There has been an increase in new waterfront property in the area which seem to all have piers and recreational boats moored alongside."

3.1.3.3 Red Bank Creek

Red Bank Creek is located along the eastern side of the Eastern Shore and connects the mainland of the Eastern Shore to Hog Island Bay as it approaches the Atlantic Ocean. The

survey shall extend from the boat ramp at Red Bank Creek and proceed along the channel for approximately 2.3 miles to Hog Island Bay.

Red Bank- This state waterway is approximately 2.3 miles in length from the boat ramp to Hog Island Bay. There is shoaling as the creek enters Hog Island Bay and the guts that lead through Fowling Point and Castle Ridge to Ramshorn Bay are extremely narrow and do not provide adequate water depth for many vessels. There are at least two small fishery businesses working along the waterfront of Red Bank Creek near the public boat ramp. These operations source their water from the Creek and use the Creek to access beds in the seaside bays beyond, and thus their input in conditions, channel alignments, maintenance scheduling, and potential beneficial use sites for dredge sediment are paramount in developing Part A of Phase I for this project. Adjacent property owners and aquaculture operators support this slower approach to managing sensitive areas and communication will be vital amongst these stakeholders to coordinate an effective beneficial use plan.

4.0 DELIVERABLES

4.1 Data Deliverables

All data deliverables shall be provided in the format and description provided in the table below.

Item	Format	Description
Singlebeam Bathymetry Data		
XYZ	ASCII, point shapefile	Bathymetry data shall be tidally and positionally corrected to elevation values and delivered in ASCII plain text format (tab or comma delimited) with the minimum attributes of Easting (X), Northing (Y), and Elevation (Z_NAVD88).
Ancillary Items		
Summary Report	PDF	Written report with detailed information regarding systems and integration, survey dates, weather and personnel, and quality control procedures and analysis.
Survey Control Report	PDF	Written report providing information regarding survey control measures taken, including local or internet based correction sources, quality control measures taken and documented.

Survey Notes	PDF	Written survey notes generated by the data acquisition crew regarding survey activities, encounters, and overall project progress.
Equipment Calibration Reports	PDF	Verification of survey systems and equipment calibrations.
Site Maps	PDF / JPEG	Print quality maps containing channel condition survey results.

4.2 Points of Contact

4.2.1 Moffatt and Nichol

Ira Brotman, PE

101 West Main Street, Suite 3000

Norfolk, VA 23510

Office: (757) 271-1070

Direct: (757) 285-6600

ibrotman@moffattnichol.com

4.2.2 A-NPDC

Grayson Williams

Project Manager

Accomack-Northampton

Planning District Commission

23372 Front Street

Accomac, VA 23301

(757) 787-2396 x 129

4.3 Period of Performance

4.3.1 Survey Notice to Proceed

March 1, 2021

4.3.2 Survey Complete By

March 20, 2021

4.3.3 Deliverable Due

March 31, 2021

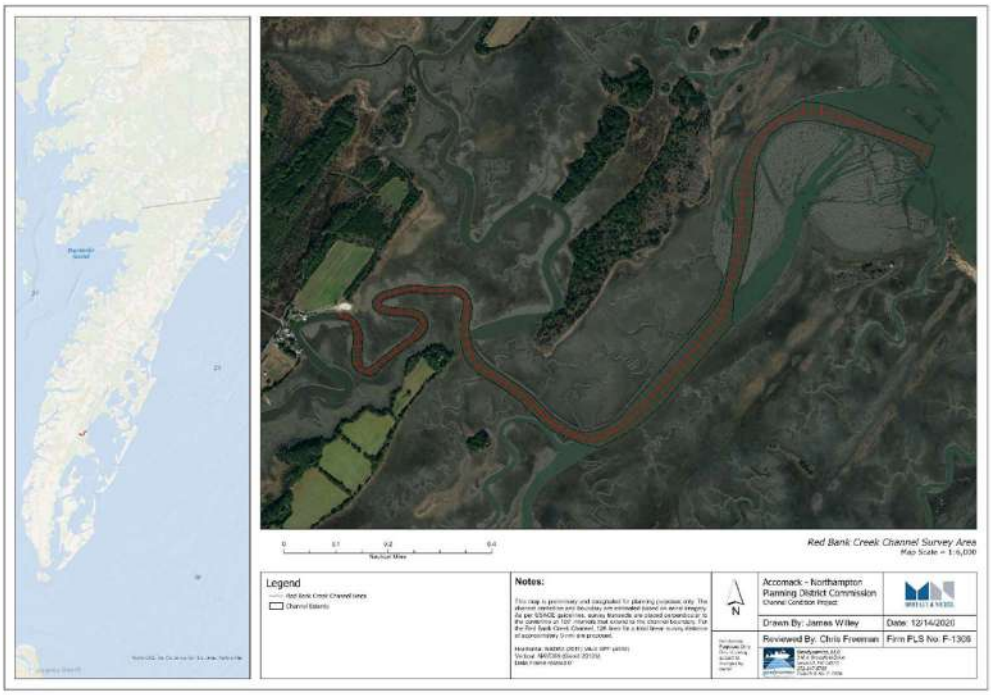


Figure 1: Red Bank Creek estimate of survey coverage and extents.

Figure 2: Hungars Creek estimate of coverage and extent.

Nassawadox Creek Channel Survey Area
Map Scale = 1:12,000
Legend
Notes:
N
Accomack - Northampton
Planning District Commission
Channel Condition Project
Drawn By: James Willey
Date: 12/14/2020
Reviewed By: Chris Freeman
Firm PLS No: F-1308

Figure 3: Nassawadox Creek estimate of coverage and extent.

Saltmarsh Restoration Priorities for the Saltmarsh Sparrow

Virginia

Last Updated August 2023

Saltmarsh Sparrow. Ray Hennessy

Saltmarsh Sparrow. Ray Hennessy

Goal Statement

The Saltmarsh Sparrow (*Ammospiza caudacuta*) is a Species of Greatest Conservation Need in Virginia. This document is intended to provide those interested in the conservation of salt marsh and Saltmarsh Sparrows with information that will help with conservation implementation. It identifies areas containing salt marshes that are suitable for restoration, enhancement, and/or conservation actions designed to provide persistent, high-quality Saltmarsh Sparrow nesting habitat over the next 10 years and to enhance long-term salt marsh resilience. In most cases, ground-truthing will be required to assess or confirm site characteristics (e.g., hydrological dynamics) prior to the development of restoration approaches and eventual implementation.

Saltmarsh Sparrow Objectives from the Atlantic Coast Joint Venture (ACJV)

The ACJV's Saltmarsh Sparrow Conservation Plan (Hartley and Weldon, 2020) identifies state-by-state population and habitat goals for the Saltmarsh Sparrow based on a global population goal of 25,000 individuals. This goal is lower than published 2011/2012 population estimates (Wiest et al. 2019) to account for projected impacts of sea-level rise on the species' nesting success (Field et al. 2017). Virginia's breeding Saltmarsh Sparrow population is estimated to be 7.0% (n = 1,753 individuals) of the global population (n = 25,000 individuals). Habitat goals listed in the table below are the minimum acres of habitat (defined below) needed to support the state's population goal.

	2011/12 Population Estimate*	Percent of Global Population	Population Goal (Individuals)	2030 high marsh goals (ac)**	Total tidal marsh needed to meet 2030 high marsh goals (ac)	2069 high marsh goals (ac)	Total tidal marsh needed to meet 2069 high marsh goals (ac)
Virginia	4,200 (+/- 2,600)	7.0%	1,753	2,954	8,206	11,115	30,875
Regional	60,000		25,000			79,605	220,000

**Updated population estimates exist for each marsh patch within the range of the Saltmarsh Sparrow, however they are currently under peer review. When they are published, these figures will be updated to reflect the detections in the maps contained within this document.*

***High marsh goals represent acres of "high quality habitat," defined as having conditions that support a stable or growing population of breeding Saltmarsh Sparrows.*

This document focuses on known breeding Saltmarsh Sparrow habitat which is limited to the seaside and eastern Chesapeake Bay marshes located primarily in Accomack County. These marshes are currently considered the southern extent of the Saltmarsh Sparrow breeding range. A future complementary document will outline opportunities for marsh restoration to support nonbreeding populations of this species beyond the marshes described herein.

High-quality Habitat for Saltmarsh Sparrows

High-quality habitat is defined as conditions that allow sufficient reproductive success to support a stable or growing Saltmarsh Sparrow population. Conservation should focus on preserving, restoring, or enhancing high-quality breeding habitat with the following characteristics:

- High marsh patches with low flooding frequency and provides a window of at least 23 days with very limited flooding.
- Extensive and dense S. patens vegetation with a deep, well-developed thatch layer at times complemented by short to intermediate S. alterniflora.
- The highest quality high marsh habitat is most often found in the least modified marshes, such as those without ditching, or are free of tidal restrictions like road crossings.

High marsh habitat in Virginia. Chesapeake Bay Program

Marsh Identification and Prioritization Process

Marsh parcels were identified using the ACJV Saltmarsh Sparrow Habitat Prioritization Tool (top 10%; ACJV 2020). These parcels were then reviewed and refined by a group of non-governmental, academic, state, and federal partners in 2021, and again in 2023. Summaries of selected marshes were drafted, informed, and finalized by this working group (see Acknowledgements for full partner list). Lastly, the working group sorted the selected marshes into the following subcategories to further refine the state's prioritization process.

> **Priority Marshes**: Marshes prioritized for ongoing restoration planning and implementation to support the Saltmarsh Sparrow in Virginia.
>
> **Honorable Mention**: Marshes identified by the partner group as important to keep in mind for future work.

Please see the overview map for all marshes identified in the state.This document will be updated over time to reflect additional expert input, changes in species conservation status, and implementation efforts that represent collective progress towards habitat goals.

Restoration Technique Definitions

The following defined restoration/enhancement techniques are mentioned repeatedly throughout this document, including the Attributes section for each marsh summary, to provide users of this plan with a menu of appropriate management options at selected marshes. ***This information is meant to identify opportunity and potential for these restoration techniques at each site but is not meant to be prescriptive***. A formal site assessment and design is always necessary to identify specific next steps and restoration strategies within each marsh parcel.

Sediment placement
Placement of material (including sediments from dredging efforts) on the marsh platform. Includes thin-layer placement, thick-layer placement, beneficial use of dredged sediments, formation of hummocks, microtopography, etc.

Repair hydrology - runnelling / channel creation
Small-scale modification of the marsh platform using shallow channel creation to remove standing water.

Repair hydrology - tidal restriction mitigation
Removal or modification of large-scale tidal restrictions such as road crossings, culverts, bridges, etc. to restore tidal flow.

Repair hydrology - address ditch plugs
Adjustment of ditch plugging on marsh platform to improve hydrology.

Repair hydrology - ditch remediation
Adjustment of human-made ditches on the marsh platform to improve hydrology.

Repair hydrology - berm, embankment, or levee modification
Removal of berms or embankments affecting hydrology of marsh platform.

Land acquisition / protection
Purchase or easement of land to protect, including for eventual marsh migration.

Facilitated marsh migration
Active assistance of marsh migration through modification of the environment.

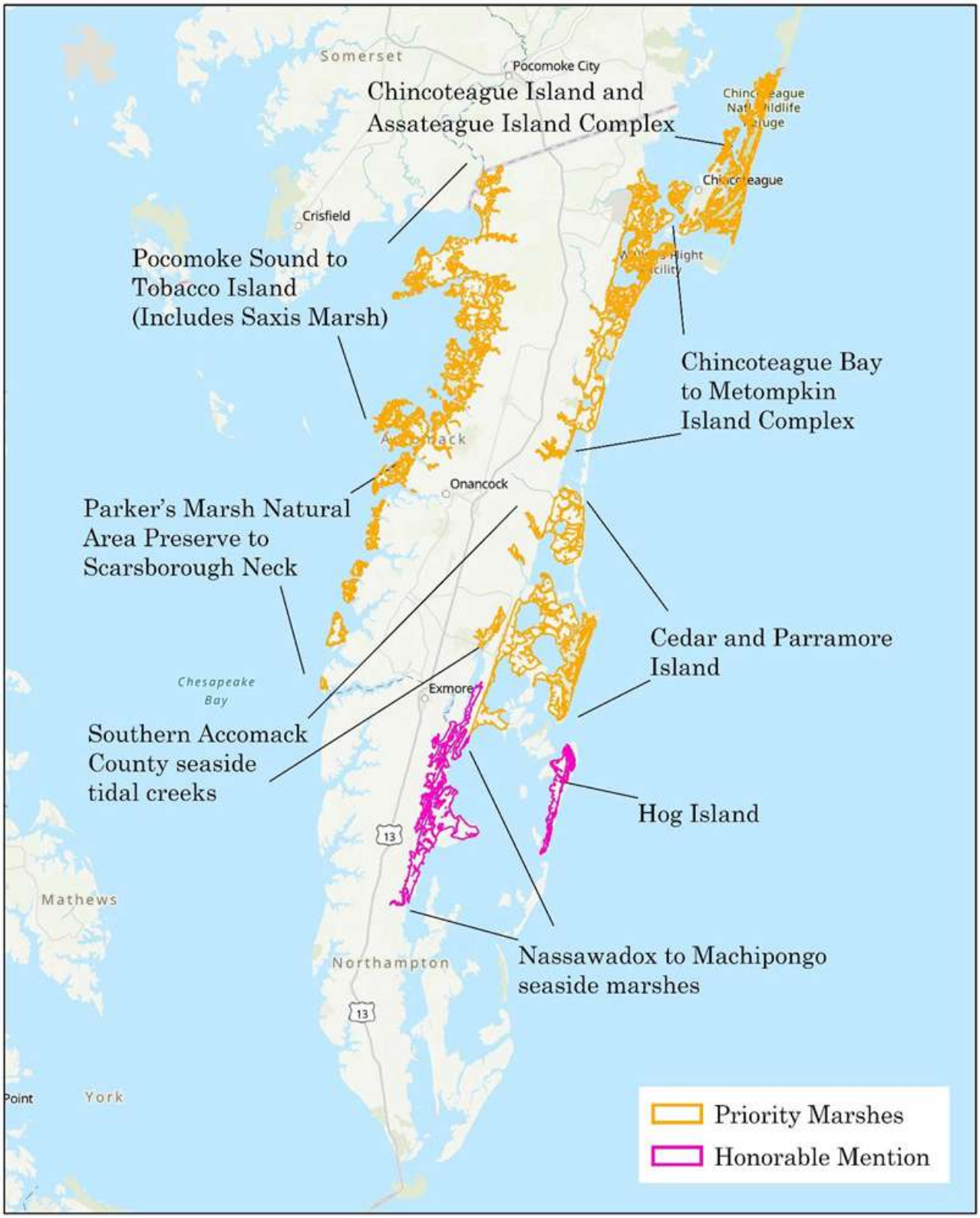
Invasive plant species mitigation (*Phragmites australis,* etc.)
Removal or mitigation of invasive plants.

Living shoreline development
Development of nature-based features to promote shoreline stabilization.

Wildlife herbivory mitigation
Removal or management of wildlife due to overgrazing including deer, horses, crabs, geese, etc.

Additional ecological assessment needed
Additional monitoring and site assessment is necessary to determine specific next steps or assess existing restoration efforts at this site.

Overview Map Of Priority And Honorable Mention Marshes In Virginia



Virginia Priority Saltmarsh Sparrow Marshes

10 Miles

10 Kilometers

Priority Marshes

The following marshes have been prioritized for ongoing restoration planning and action to support the Saltmarsh Sparrow in Virginia.

Chincoteague Island and Assateague Island Complex - 4,755 acres (1,924 ha)

Existing Conditions

Much of the salt marsh restoration efforts in the state of Virginia are centered at this site. It can be broken down into several geographic units, most of which are federally owned but also includes town and private land. All of the refuge impoundments, with one exception, were constructed in the 1950s and 1960s with the primary purpose of providing waterfowl migration and wintering habitat. Chincoteague NWR has resident horses known as Chincoteague ponies on Assateague Island that are owned and managed by the Chincoteague Volunteer Fire Company and that graze in two large, designated areas on the refuge under a special use permit. An exclusion fence was recently added on Assateague Island to protect sections of the salt marsh from grazing ponies.

- Impounded area: These impoundments currently provide many benefits to wildlife including wintering/migratory habitat for waterfowl, food sources for water birds of conservation concern, and shorebird migratory stopover habitat for many species. Ditching occurs within impoundment units and at the outflow of water control structures. There is some trampling of marsh by Chincoteague ponies which is restricted to Black Duck Drain and areas north of the E-pool management unit. These areas also have high nutrient input, but more monitoring is necessary to determine the extent of nutrient input here.
- Bay areas: most marshes are frequently flooded, consisting of short-form S. alterniflora and Distichlis spicata.
- This entire site is important to migratory birds; it supports a diverse suite of breeding and nonbreeding waterbirds in addition to the Saltmarsh Sparrow
- A Saltmarsh Integrity Study Report is available for Chincoteague NWRC
- Sika deer are present at this site; the impacts of sika deer herbivory on marshes has not been formally assessed.

Existing Projects

USFWS: This project aims to enhance elevation through sediment placement in Swan Cove. Implementation will involve a 125 ft bridge and build up the back barrier marsh platform. The project is designed but support is still needed for implementation and monitoring. Best contact: Bart Wilson (bartholomew_wilson@fws.gov)

Saltmarsh Sparrow Data

Saltmarsh Sparrows detected (2021/2022; SHARP 2023); breeding has been confirmed at this site.

Recommended Management / Next Steps To Management Action

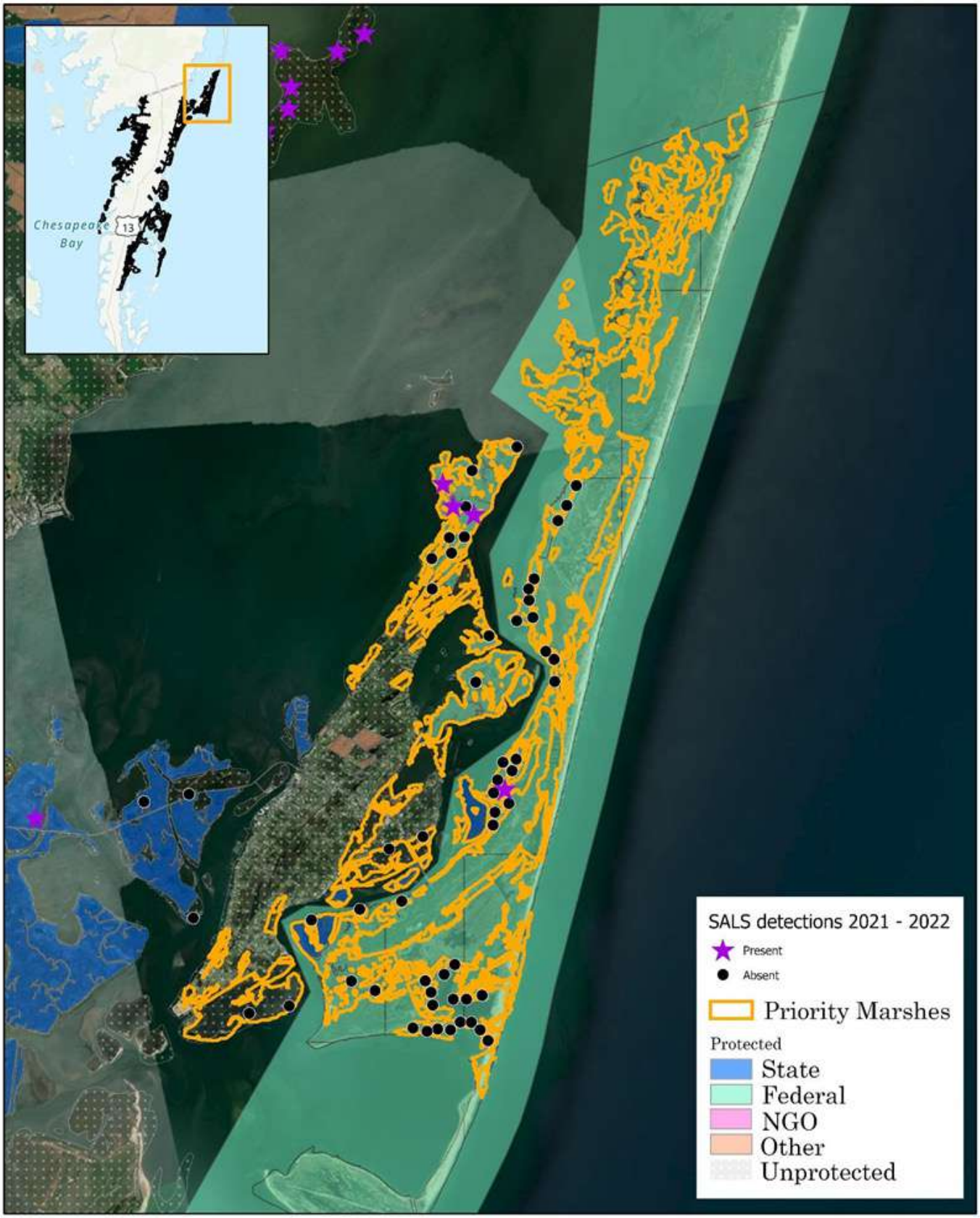
- Lighthouse Meadow, Sow Pond, and Assateague Bay refuge management units are incorporated in a new Salt Marsh Restoration Plan. See this plan for specific next steps in these areas.
- Support implementation of Swan Cove project (see above).
- Review Chincoteague and Wallops Island NWRs Comprehensive Conservation Plan (CCP) for overall ecological goals for the area.

- Review USGS document on optimization of salt marsh management at Chincoteague.
- Assess implications of increasing tidal flow in impounded areas.

Attributes

- Sediment placement - Y
- Repair hydrology - runnelling / channel creation - Y
- Repair hydrology - tidal restriction mitigation - Y
- Repair hydrology – address ditch plugs - N
- Repair hydrology - ditch remediation - N
- Repair hydrology - berm, embankment, or levee modification – Y
- Land acquisition / protection - N
- Facilitated marsh migration – N
- Invasive plant species mitigation (*Phragmites australis*, etc.) – Y
- Living shoreline development - Y
- Wildlife herbivory mitigation – Y
- Additional ecological assessment needed - Y

Sika deer at Chincoteague National Wildlife Refuge. Judy Gallagher Creative Commons



Chincoteague Island and Assateague Island Complex

2 Miles

2.5 Kilometers

Chincoteague Bay to Metompkin Island Complex – 13,375 acres (5,413 ha)

This marsh complex includes Wallops Island NWR, Assawoman Island Unit and Metompkin Island Unit within the Chincoteague National Wildlife Refuge Complex (CNWRC) and portions of Metompkin Island within The Nature Conservancy's Virginia Coast Reserve. This marsh complex is a matrix of federal, state, NGOP, and privately owned land.

Existing Conditions

The National Aeronautics and Space Administration Wallops Flight Facility located on Wallops Island is the biggest source of disturbance for this parcel. Future channel dredging may occur regularly following the construction of a new dock on the north end of the island to accommodate the delivery of rocket parts via the waterway. Additional (but temporary) disturbance may result from the replacement of the existing causeway bridge.

- Areas of unditched marsh shortgrass and *Phragmites australis* (hereafter *Phragmites*) hummocks exist near the Wallops Flight Facility.
- The complex is important to migratory birds; it supports a diverse suite of breeding and nonbreeding waterbirds in addition to the Saltmarsh Sparrows including waterfowl, shorebirds, seabirds, and includes the largest Laughing Gull colony in Virginia.
- Saltmarsh Integrity Study Report is available for Chincoteague NWRC.

Existing Projects

There are no existing restoration projects at this site.

Saltmarsh Sparrow Data

Saltmarsh Sparrows detected (2021/2022; SHARP 2023), breeding has been confirmed at this site.

Recommended Management / Next Steps To Management Action

- Establish working relationship with the Wallops Flight facility for restoring marshes and preserving marsh migration areas (*Phragmites* is currently encroaching inner marsh area along causeway and on the backside of the island).
- Explore the potential for beneficial use of dredged sediments.
- Limit hardening of shorelines.
- Protect adjacent buffers to facilitate marsh migration.
- Causeway could be causing some tidal restrictions to marsh.
- Living shoreline – northern part of the parcel is relatively undeveloped but there is potential for living shoreline work.
- The western side of this marsh complex presents migration opportunities where low-lying agricultural fields may convert quickly. Some of these areas already are experiencing salt water intrusion and S. patens is already growing on former ag fields. Facilitation could also occur on forested lands if trees were girdled.

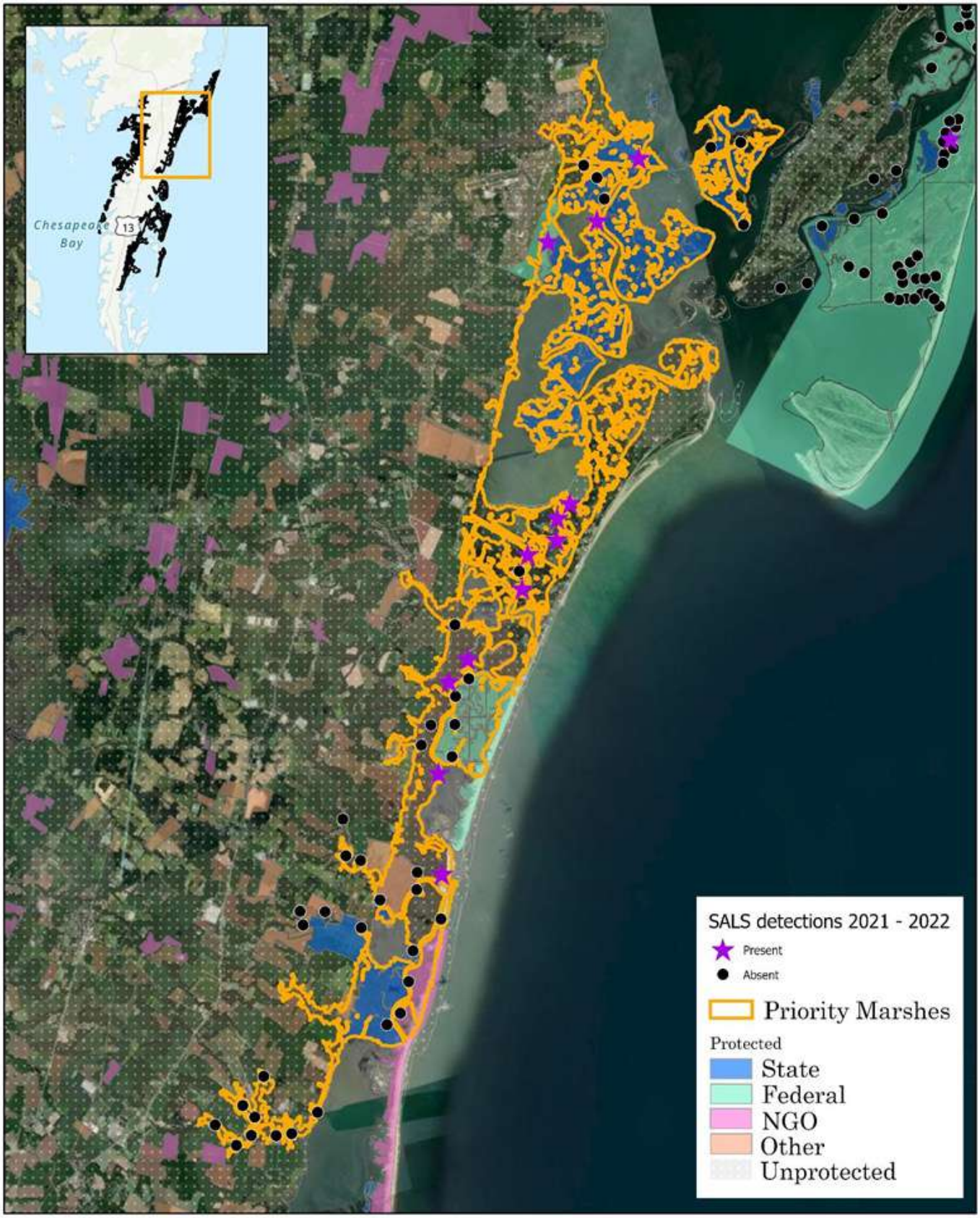
Attributes

- Sediment placement - Y
- Restore hydrology - runnelling / channel creation - N
- Restore hydrology - tidal restriction mitigation - Y
- Restore hydrology - ditch plug remediation - N
- Restore hydrology - ditch remediation - N
- Restore hydrology - berm, embankment, or levee modification – N

- Land acquisition / protection - Y
- Facilitated marsh migration – Y
- Invasive plant species mitigation (*Phragmites australis*, etc.) - Y
- Living shoreline development - Y
- Wildlife herbivory mitigation - N
- Additional ecological assessment needed - Y

Note: extensive patch-level information is available for this site. Please contact maureen_correll@fws.gov ***for additional information.***

Example of a living shoreline project on private property in Virginia. Virginia Sea Grant, Creative Commons



Chincoteague Bay to Metompkin Island Complex

3 Miles

3.5 Kilometers

Cedar Island and Parramore Island – 17,488 acres (7,077 ha)

Existing Conditions

Marsh subsidence is occurring across many patches in this marsh parcel. There is dredging of inshore channels by local towns, and *Phragmites* exists on dredge material deposition sites, along narrow bands in the upland ecotone, and on both barrier islands (including Revels Island) primarily along the backside flats/saltmarsh interface. However, there are no significant ditching or tidal restrictions present at this site.

- This site is important to migratory birds; it supports a diverse suite of breeding and nonbreeding waterbirds in addition to the Saltmarsh Sparrow.
- Both islands are under extensive conservation ownership. Most of Cedar Island is owned and managed by Chincoteague NWR, The Nature Conservancy Virginia Coast Reserve (TNC) and the Virginia Marine Resources Commission. A small portion of Cedar Island is in private ownership. Parramore Island is owned and managed by TNC and is also designated as a VA Department of Conservation and Recreation Natural Area Preserve.

Existing Projects

- Virginia Institute of Marine Science (VIMS): Partnering with VA Department of Wildlife Resources (VA DWR) to place sediment on the backside of south Cedar Island to restore areas of high marsh and to keep the south end of the island from breaching again. The project has encountered an unexpected hurdle; the planned material deposit site is partially on Public Baylor Grounds, which are reserved for public shellfish harvesting and cannot be leased or used for other purposes. Currently, partners are in the permitting phase of this project and are working with the Virginia Marine Resources Commission, which manages the Baylor Grounds, and other regulatory agencies to gain approval for this project. Project is funded by NFWF and a competitive SWG grant. Design is 70% complete, and funding is still needed for implementation and monitoring. Best contact: Christopher Hein (hein@vims.edu) and Ruth Boettcher (ruth.boettcher@dwr.virginia.gov).
- The Nature Conservancy (TNC): Project aims to build and monitor oyster reefs with two types of oyster substrate adjacent to an eroding, state-owned marsh to enhance and protect the seaside town of Wachapreague, VA. Newly established reefs will dampen wave energy and protect the marsh edge from further erosion and may facilitate sediment trapping in order to build marsh acreage. Project is funded by NFWF and scheduled for completion by the end of 2023. No additional support is necessary. Contacts: Bo Lusk (blusk@tnc.org), Alex Wilke (awilke@tnc.org).
- Virginia Institute of Marine Science (VIMS): This project is an eelgrass restoration in Burton's Bay and will plant 60 acres of eelgrass west of the southern end of Cedar Island. Newly established eelgrass habitat may reduce the impact of wave energy on marsh erosion in the vicinity of the project. The project grant was awarded by NOAA with funding from the Bipartisan Infrastructure Law and Inflation Reduction Act. No additional support is necessary. Best contact: Chris Patrick (cpatrick@vims.edu), Bo Lusk (blusk@tnc.org).
- Dredge opportunity: Accomack county has dredging planned for Folly Creek after 2024. County has interest in using the dredge beneficially, but they have not yet found a site to deposit. Best contact: Alex Wilke (awilke@tnc.org)

Saltmarsh Sparrow Data

Saltmarsh Sparrows detected (2021/2022; SHARP 2023); breeding has not been confirmed at this site.

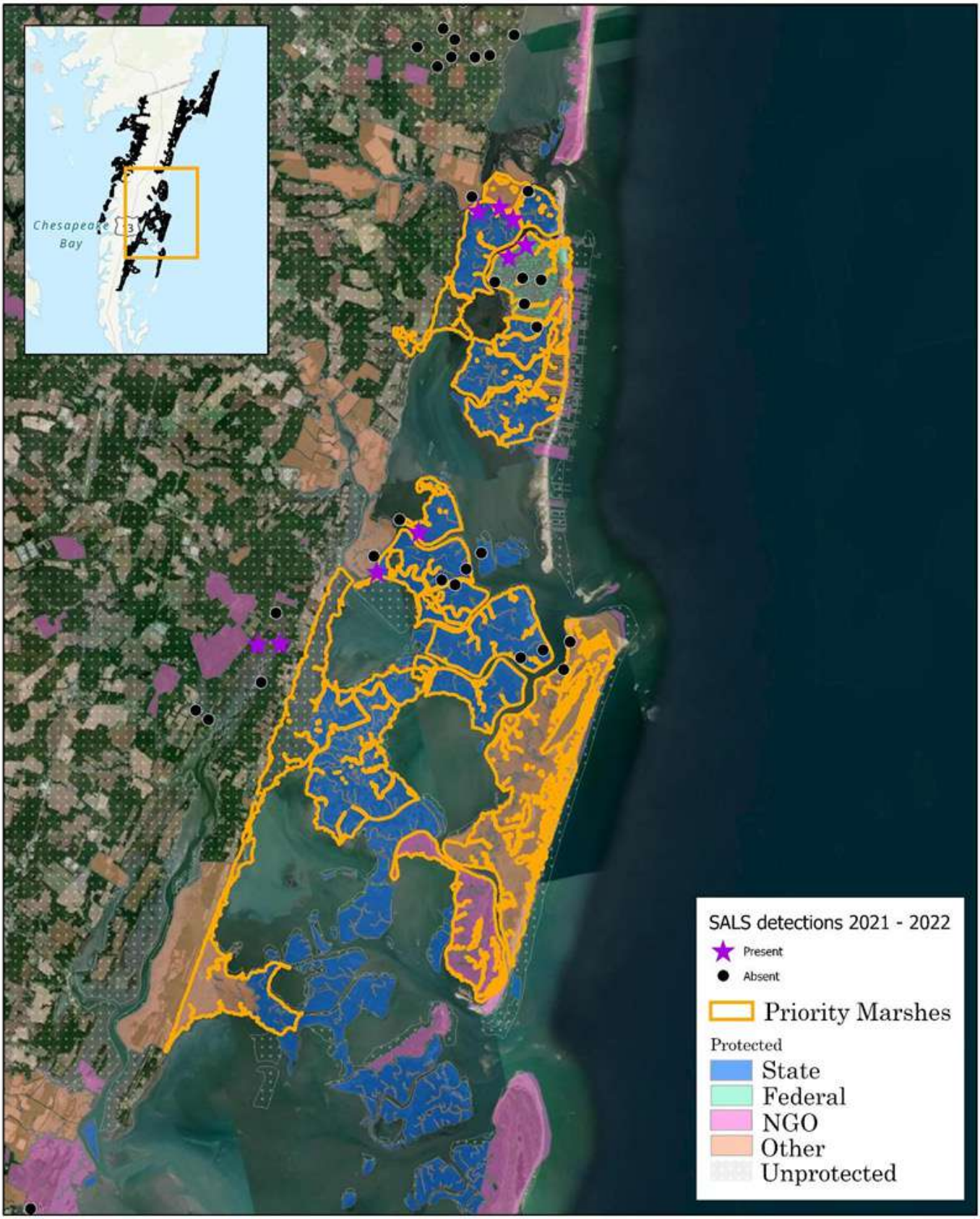
Recommended Management / Next Steps To Management Action

- Develop relationships with local partners and communities for future opportunities related to beneficial use of dredge material. Key partners include the Eastern Shore Navigable Waterways Committee and the Accomack-Northampton Planning District Commission.
- Protect adjacent buffers to facilitate marsh migration. Partnership called the Virginia Eastern Shore Conservation Alliance has prioritized the protection of marsh migration space across the state.

Attributes

- Sediment placement - Y
- Restore hydrology - runnelling / channel creation – N
- Restore hydrology - Tidal restriction mitigation - N
- Restore hydrology – Address ditch plugs - N
- Restore hydrology - ditch remediation - N
- Restore hydrology - Berm, embankment, or levee modification - N
- Land acquisition / protection - Y
- Facilitated marsh migration – N
- Invasive plant species mitigation (*Phragmites australis*, etc.) - Y
- Wildlife herbivory mitigation – N
- Living shoreline development - Y
- Additional ecological assessment needed - Y

Cedar Island is 1 of 12 barrier islands that protect the Virginia Coast. Its annual rate of retreat—already rapid at 6.6 meters per year—is predicted to speed up by as much as 50% by 2100 as the Virginia barrier island system re-equilibrates to the rapid acceleration in sea-level rise observed during the last 50-100 years. VA Institute of Marine Science, Creative Commons



Cedar and Parramore Island

3.5 Miles

3.5 Kilometers

Southern Accomack County Seaside Tidal Creeks - 1,043 acres (422 ha)

Existing Conditions

This marsh parcel is a relatively unditched marsh. A large amount of the surrounding area is already within conservation easement or otherwise protected.

- This site supports a diverse suite of waterbirds year-round, including Laughing Gull colonies that are declining due to frequent flooding events.

Existing Projects

No existing restoration projects are underway at this site.

Saltmarsh Sparrow Data

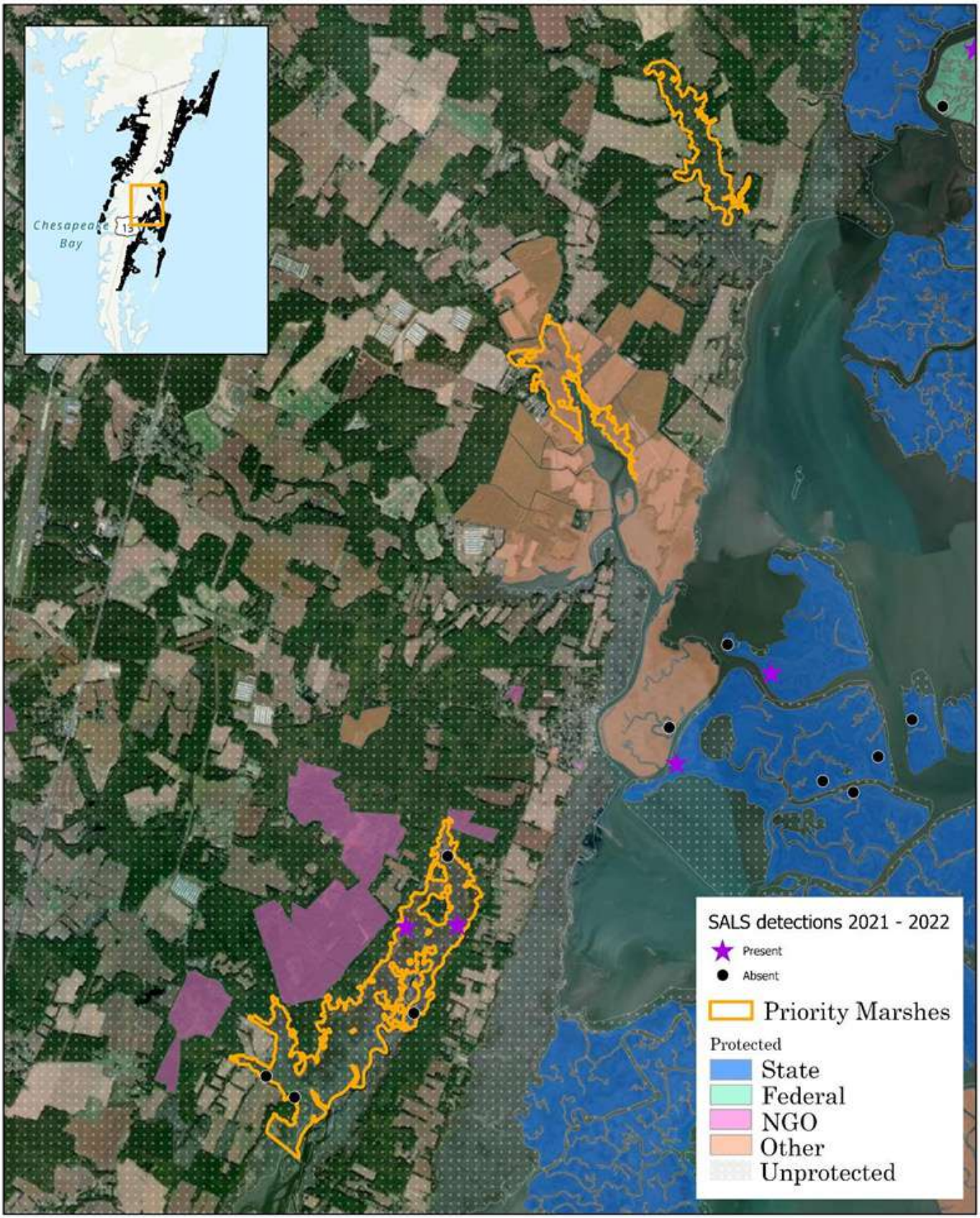
Saltmarsh Sparrows detected (2021/2022; SHARP 2023); breeding has not been confirmed at this site.

Recommended Management / Next Steps To Management Action

- Additional site visits and assessment are needed to assess marsh conditions and suitability.
- There is significant potential for land protection to facilitate marsh migration into areas adjacent to this parcel as several agricultural properties directly border the marsh.

Attributes

- Sediment placement - Y
- Restore hydrology - runnelling / channel creation – N
- Restore hydrology - Tidal restriction mitigation - N
- Restore hydrology – address ditch plug remediation - N
- Restore hydrology - ditch remediation - Y
- Restore hydrology - berm, embankment, or levee modification - N
- Land acquisition / protection - N
- Facilitated marsh migration – N
- Invasive plant species mitigation (*Phragmites australis*, etc.) - Y
- Living shoreline development - N
- Wildlife herbivory mitigation - N
- Additional ecological assessment needed - Y



Southern Accomack County Seaside Tidal Creeks

1.5 Miles

1.5 Kilometers

Pocomoke Sound to Tobacco Island (Including Saxis Marsh) - 17,991 acres (7,281 ha)

Existing Conditions

Saxis Causeway extends into marsh which prevents tidal flow; significant *Phragmites* stands are present along the upland edge.

- This site is important to other migratory birds and supports a diverse suite of breeding marsh birds, seabirds, shorebirds, and waterfowl.
- Saxis marsh is the only marsh in Virginia where breeding Black Rail are reliably detected (2007, 2014, 2022; C. Hines pers. comm)

This site has been partially restored to provide habitat for species like the Eastern Black Rail. Ed Corey

Existing Projects

VA DWR: Black Rail habitat restoration project at Saxis WMA (i.e., Pig Point) funded through a cSWG grant entails reducing the density and extent of *Phragmites* stands through experimental prescribed burning and the application of herbicide. Both treatments will be applied in early 2024. Additional support is needed for long-term monitoring. Best contact: Ruth Boettcher (ruth.boettcher@dwr.virginia.gov)

Saltmarsh Sparrow Data

Saltmarsh Sparrows detected (2021/2022; SHARP 2023); breeding has been confirmed at this site (2023)

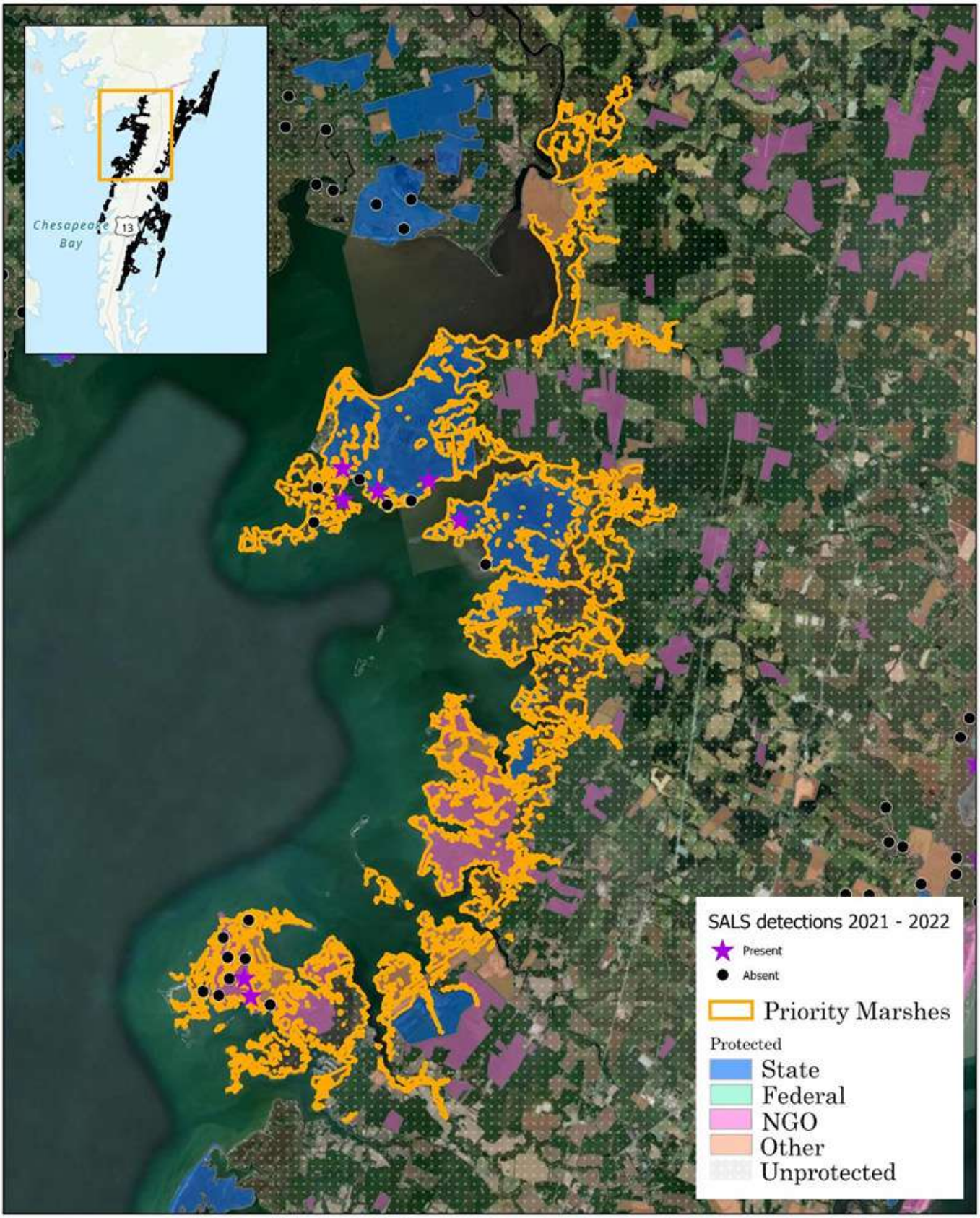
Recommended Management / Next Steps To Management Action

Perhaps one of best opportunities to manage marsh migration in Virginia.

- Protect surrounding land for marsh migration.
- Explore utility of facilitated marsh migration through tree girdling
- Assess potential for sediment placement.
- *Phragmites* control along the upland edge.

Attributes

- Sediment placement - Y
- Restore hydrology - runnelling / channel creation – Y\
- Restore hydrology - tidal restriction mitigation - N
- Restore hydrology – address ditch plugs - N
- Restore hydrology - ditch remediation - Y
- Restore hydrology - Berm, embankment, or levee modification - Y
- Land acquisition / protection – Y
- Facilitated marsh migration – Y
- Invasive plant species mitigation (*Phragmites australis*, etc.) - Y
- Living shoreline development - Y
- Wildlife herbivory mitigation - N
- Additional ecological assessment needed - Y



Pocomoke Sound to Tobacco Island (Includes Saxis Marsh)

3.5 Miles

3.5 Kilometers

Parker's Marsh Natural Area Preserve to Scarsborough Neck – 3,592 acres (1,454 ha)

Existing Conditions

This marsh is unditched and characterized by large areas of S. patens with a well-developed thatch layer. The surrounding land is largely protected through conservation easements or public ownership. This site is important to other migratory birds and supports a diverse suite of waterbirds; historical breeding Black Rail detections occurred here.

This site has been historically important for breeding Eastern Black Rail. Michael Gray

Existing Projects

No marsh restoration projects are currently underway at this site.

Saltmarsh Sparrow Data

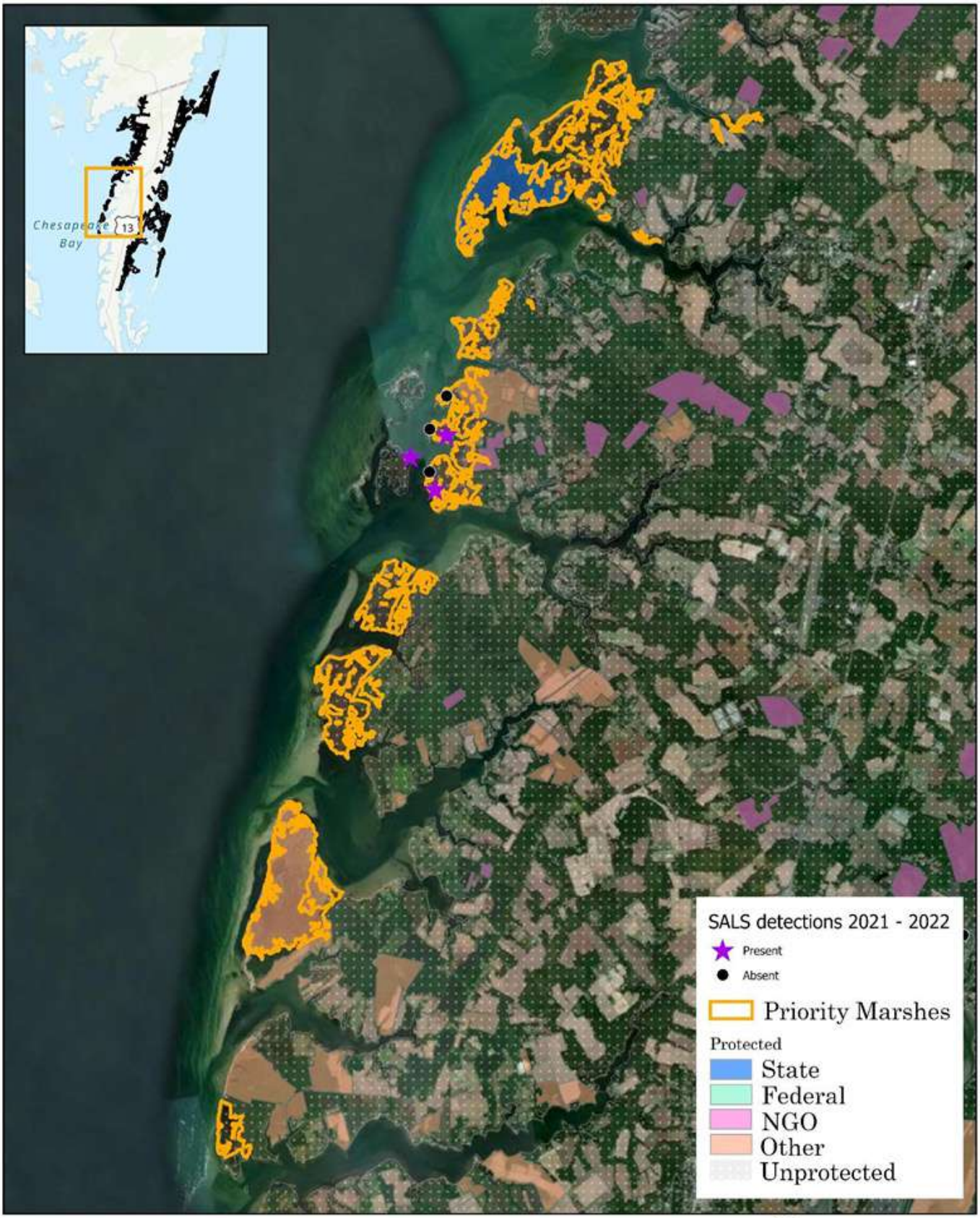
Saltmarsh Sparrows detected (2021/2022; SHARP 2023); breeding has not been confirmed at this site.

Recommended Management / Next Steps To Management Action

- Protect surrounding land for eventual marsh migration.
- Assess potential for sediment placement.
- Assess hydrology for marsh platform restoration.
- Given the shallow elevational gradient on the bayside, marsh migration will be easier than on the seaside. Land acquisition abutting marshes will allow for migration.

Attributes

- Sediment placement - Y
- Restore hydrology - runnelling / channel creation – Y
- Restore hydrology - tidal restriction mitigation - N
- Restore hydrology - Ditch plug remediation - N
- Restore hydrology - Ditch remediation - Y
- Restore hydrology - berm, embankment, or levee modification - Y
- Land acquisition / protection - Y
- Facilitated marsh migration – Y
- Living shoreline development – Y
- Invasive plant species mitigation (*Phragmites australis*, etc.) - Y
- Wildlife herbivory mitigation – N
- Additional ecological assessment needed - Y



Parkers Marsh Natural Area
Preserve to Scarsborough Neck

2.5 Miles
3 Kilometers

Honorable Mentions

Hog Island/Rogue Island – 1,938 acres (784 ha)

This area has potential for sediment deposition but is a lower priority for breeding Saltmarsh Sparrows.

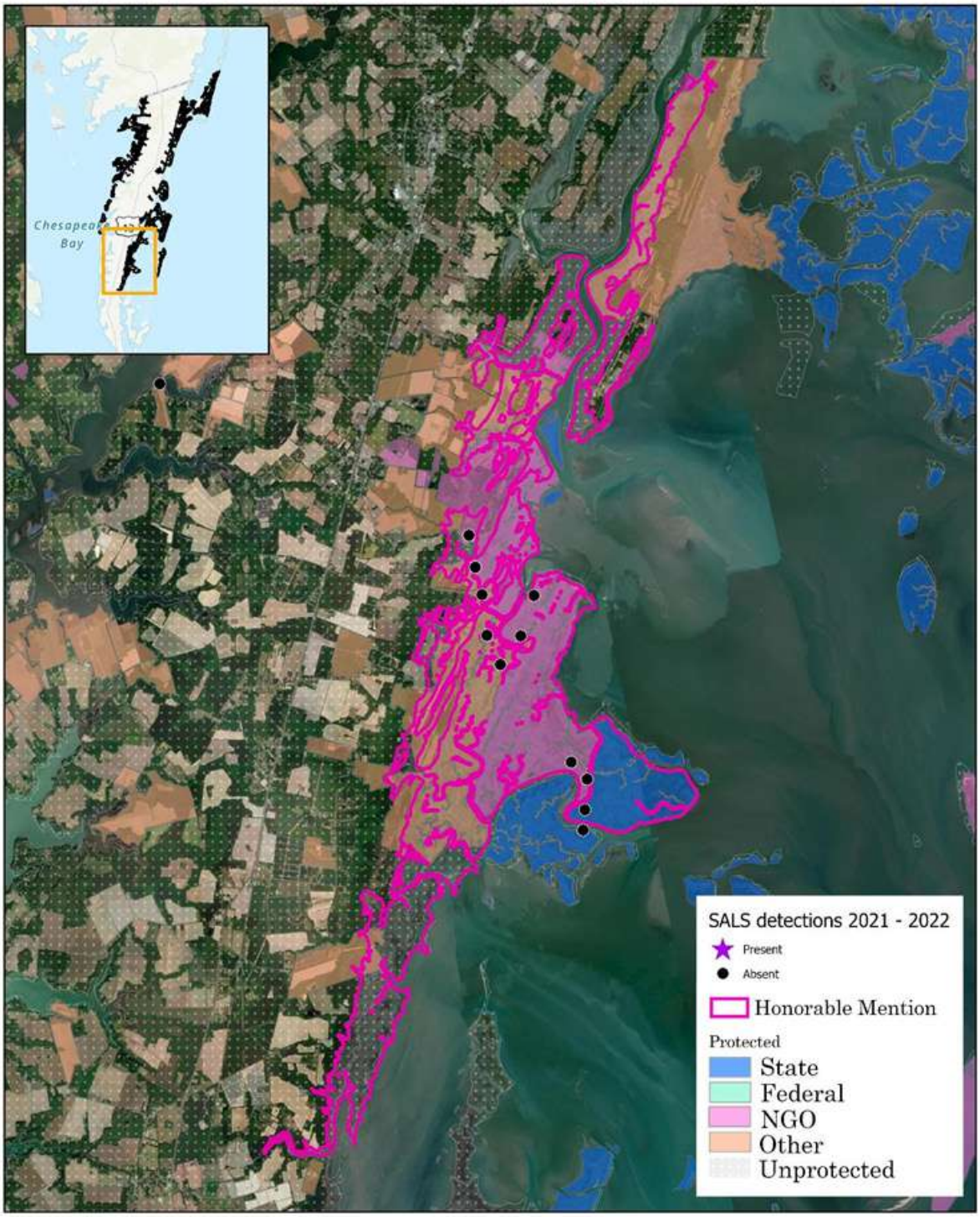
Hog Island

1.5 Miles

1.5 Kilometers

Nassawadox to Machipongo Seaside Marshes - 8,409 acres (3,403 ha)

This marsh parcel is a relatively unditched marsh and much of the surrounding area is already within conservation easement or otherwise protected. Saltmarsh Sparrows have not been detected here recently and the area is a lower priority for breeding Saltmarsh Sparrows. Recent surveys in 2021 and 2022 did not detect Saltmarsh Sparrows in this location, however they were detected in 2014 (SHARP), albeit during the early portion of season when birds could have been migrating.



Nassawadox-Machipongo Seaside Marshes

2.5 Miles

2.5 Kilometers

Best Practices in Marsh Management

Engaging and consulting with landowners, local land managers, and restoration experts should be the first step in the development of a salt marsh conservation project. Before any monitoring or management action is planned, consideration should be given to how management for Saltmarsh Sparrow will be integrated with other priority species or habitats. Any management actions should follow best practices to avoid impacting existing suitable Saltmarsh Sparrow habitat. Necessary precautions include:

- If a management approach is not well understood or hasn't been widely implemented in similar ecological settings, management should be phased and initially limited to a small portion (e.g. <10%) of marshes known to provide valuable Saltmarsh Sparrow habitat.
- Conduct intensive marsh modification work outside the window of the active Saltmarsh Sparrow breeding season and the breeding seasons of other marsh dependent species (April – August).
- The importance of Virginia marshes during migration and winter for Saltmarsh Sparrows is well known, so avoiding impacts during that time of year should be considered as well.

Policy

Challenges

- There is a limited amount of dredge material available for sediment placement projects, especially since the intra-coastal waterway is no longer being dredged.
- Lack of funds for marsh restoration projects and for acquiring lands in suitable marsh migration zones limits the amount of work possible to complete on the ground.
- Lack of capacity to conduct long-term post-restoration monitoring.

Permitting Considerations

For any wetland modification work, regulatory permitting agencies include the VA Marine Resources Commission, VA Dept. of Environmental Quality, and the US Army Corps of Engineers. Any proposed work on protected lands would require a special use permit from the land-owning agency.

Potential Solutions

Establishment of a collaborative working group is underway that will develop a plan identifying and prioritizing habitat restoration opportunities in Virginia's seaside coastal lagoon system for marsh-nesting American Oystercatchers. It is possible for the working group to use the Saltmarsh Sparrow plan as a starting point for its work on the seaside of Virginia. If successful, the working group may decide to expand its scope to include the bayside marshes of the Eastern Shore and incorporate other species such as Saltmarsh Sparrow, eastern Black Rails and other high-priority, marsh-dependent species in its prioritization exercise. The working group will also identify potential funding sources for each project. Many partners have already engaged in cooperative conservation planning for avian communities in coastal Virginia (i.e., Virginia Coast Avian Partnership, Virginia Barrier Island Landowner Working Group) and will likely join this working group. A well-established group of partners committed to working collaboratively on restoring marshes in Virginia will go a long way towards justifying these efforts and finding sufficient funding to implement and evaluate the work.

Monitoring

Any habitat restoration efforts should be monitored both pre-implementation and post-implementation to measure change and determine whether vegetation and elevation goals have been met. This monitoring will ideally include an array of ecological metrics specific to tidal marshes and will build upon the existing knowledge base for salt marsh restoration in this area.

The VA DWR along with partners received SWG funds in 2023 to reassess the breeding distribution of Saltmarsh Sparrows on the lower Delmarva Peninsula and examine reproductive success in occupied seaside and bayside marshes. Results from this work will help guide future breeding Saltmarsh Sparrow monitoring efforts in Virginia.

Acknowledgements

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Monarch butterfly in high marsh habitat at Chincoteague National Wildlife Refuge. Judy Gallagher Creative Commons

Contact & Citation Information

For more information or to update information contained in this document please contact:

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maureen_correll@fws.gov

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BRUNSWICK	Southern Virginia	$10.7	$11.0	$11.2	$11.3	$8.8	$10.1	$10.7	$11.3	6.0%	-0.4%	0.03%
CHARLOTTE	Southern Virginia	$7.2	$7.5	$8.0	$8.3	$5.9	$7.1	$7.4	$8.0	8.5%	-2.7%	0.02%
DANVILLE CITY	Southern Virginia	$91.1	$91.6	$98.7	$103.8	$77.8	$100.0	$112.7	$179.8	59.5%	73.1%	0.54%
EMPORIA CITY	Southern Virginia	$28.8	$29.7	$29.5	$25.6	$18.7	$25.8	$26.6	$28.0	5.3%	9.7%	0.08%
GREENSVILLE	Southern Virginia	$21.7	$23.0	$24.4	$27.0	$20.6	$26.4	$26.6	$27.1	1.6%	0.1%	0.08%
HALIFAX	Southern Virginia	$40.9	$43.3	$46.5	$46.5	$36.8	$49.7	$53.2	$56.6	6.4%	21.7%	0.17%
HENRY	Southern Virginia	$31.9	$33.9	$37.3	$34.8	$29.8	$42.3	$45.4	$46.9	3.2%	34.6%	0.14%
LUNENBURG	Southern Virginia	$4.2	$4.3	$4.5	$4.7	$4.0	$5.3	$5.3	$5.6	5.2%	18.2%	0.02%
MARTINSVILLE CITY	Southern Virginia	$24.3	$24.4	$25.4	$26.0	$20.2	$24.6	$25.0	$25.9	3.7%	-0.3%	0.08%
MECKLENBURG	Southern Virginia	$68.7	$71.2	$73.2	$78.4	$72.6	$100.7	$106.2	$115.0	8.3%	46.8%	0.35%
PITTSYLVANIA	Southern Virginia	$21.5	$23.3	$23.3	$25.0	$21.4	$28.8	$31.5	$35.6	13.0%	42.3%	0.11%
Regional Total	**Southern Virginia**	**$351.0**	**$363.3**	**$382.1**	**$391.4**	**$316.6**	**$420.7**	**$450.7**	**$539.8**	**19.8%**	**37.9%**	**1.6%**
BLAND	Southwest Virginia - Blue Ridge Highlands	$4.0	$4.3	$4.6	$4.8	$4.2	$5.0	$5.1	$5.2	1.8%	7.1%	0.02%
BRISTOL CITY	Southwest Virginia - Blue Ridge Highlands	$63.5	$64.8	$67.8	$70.0	$54.2	$80.8	$94.5	$157.4	66.6%	124.7%	0.47%
CARROLL	Southwest Virginia - Blue Ridge Highlands	$37.9	$41.4	$43.5	$42.0	$33.6	$46.8	$49.9	$52.9	5.9%	25.8%	0.16%
FLOYD	Southwest Virginia - Blue Ridge Highlands	$15.0	$16.1	$16.4	$16.1	$11.2	$16.3	$17.8	$18.3	2.5%	13.2%	0.05%
GALAX CITY	Southwest Virginia - Blue Ridge Highlands	$14.5	$14.7	$15.5	$15.7	$11.6	$15.6	$16.2	$16.8	3.8%	7.0%	0.05%
GILES	Southwest Virginia - Blue Ridge Highlands	$25.5	$26.8	$28.4	$29.6	$21.4	$31.8	$33.3	$35.9	7.7%	21.2%	0.11%
GRAYSON	Southwest Virginia - Blue Ridge Highlands	$9.0	$9.5	$9.6	$10.3	$9.8	$12.9	$13.1	$14.5	11.0%	40.9%	0.04%
MONTGOMERY	Southwest Virginia - Blue Ridge Highlands	$186.3	$193.2	$209.7	$222.1	$145.9	$237.6	$275.9	$279.6	1.3%	25.9%	0.84%
PATRICK	Southwest Virginia - Blue Ridge Highlands	$19.7	$20.6	$22.2	$21.5	$17.3	$22.2	$23.0	$25.6	11.3%	18.9%	0.08%
PULASKI	Southwest Virginia - Blue Ridge Highlands	$65.1	$66.2	$70.3	$74.1	$56.4	$77.6	$81.7	$84.5	3.5%	14.0%	0.25%
RADFORD CITY	Southwest Virginia - Blue Ridge Highlands	$19.9	$20.3	$20.9	$21.4	$13.3	$19.1	$20.2	$23.0	14.1%	7.3%	0.07%
SMYTH	Southwest Virginia - Blue Ridge Highlands	$22.6	$22.4	$23.9	$25.8	$20.6	$27.3	$28.3	$28.6	1.2%	10.8%	0.09%
WASHINGTON	Southwest Virginia - Blue Ridge Highlands	$94.6	$98.2	$102.5	$103.2	$76.4	$115.2	$125.9	$127.5	1.3%	23.6%	0.38%
WYTHE	Southwest Virginia - Blue Ridge Highlands	$103.6	$108.3	$112.3	$114.7	$86.5	$129.9	$144.7	$146.3	1.1%	27.6%	0.44%
Regional Total	**Southwest Virginia - Blue Ridge Highlands**	**$681.2**	**$706.7**	**$747.5**	**$771.6**	**$562.1**	**$838.2**	**$929.7**	**$1,016.2**	**9.3%**	**31.7%**	**3.0%**
BUCHANAN	Southwest Virginia - Heart of Appalachia	$11.6	$11.8	$12.2	$12.3	$8.7	$11.2	$11.8	$12.4	4.7%	0.7%	0.04%
DICKENSON	Southwest Virginia - Heart of Appalachia	$12.1	$12.5	$12.6	$12.9	$9.1	$11.4	$12.9	$13.5	5.4%	4.7%	0.04%
LEE	Southwest Virginia - Heart of Appalachia	$21.3	$21.7	$21.8	$21.7	$16.8	$21.9	$21.8	$22.2	2.0%	2.4%	0.07%
NORTON CITY	Southwest Virginia - Heart of Appalachia	$13.9	$13.9	$14.7	$15.3	$11.1	$14.5	$15.5	$13.0	-16.1%	-15.1%	0.04%
RUSSELL	Southwest Virginia - Heart of Appalachia	$17.1	$17.3	$17.8	$17.7	$12.7	$16.6	$17.5	$18.0	2.9%	1.8%	0.05%
SCOTT	Southwest Virginia - Heart of Appalachia	$26.1	$26.7	$27.4	$27.8	$19.1	$22.5	$23.0	$23.3	1.1%	-16.2%	0.07%
TAZEWELL	Southwest Virginia - Heart of Appalachia	$42.0	$42.0	$43.3	$44.1	$34.8	$44.9	$47.9	$55.2	15.3%	25.3%	0.17%
WISE	Southwest Virginia - Heart of Appalachia	$54.5	$55.4	$55.7	$56.3	$43.2	$54.7	$58.0	$59.8	3.1%	6.2%	0.18%
Regional Total	**Southwest Virginia - Heart of Appalachia**	**$198.6**	**$201.3**	**$205.5**	**$208.0**	**$155.5**	**$197.9**	**$208.2**	**$217.4**	**4.4%**	**4.5%**	**0.7%**
ALLEGHANY	Virginia Mountains	$22.4	$22.9	$24.9	$25.2	$18.7	$25.0	$26.7	$28.5	6.8%	13.1%	0.09%
BATH	Virginia Mountains	$84.7	$87.6	$88.0	$85.4	$50.5	$80.9	$87.9	$100.0	13.8%	17.1%	0.30%
BEDFORD	Virginia Mountains	$53.4	$56.3	$61.6	$65.7	$51.6	$66.7	$71.4	$81.4	13.9%	23.8%	0.24%
BOTETOURT	Virginia Mountains	$50.2	$50.2	$52.5	$53.4	$39.5	$54.2	$60.4	$60.4	0.1%	13.2%	0.18%
COVINGTON CITY	Virginia Mountains	$17.2	$17.7	$17.6	$17.5	$11.8	$15.6	$16.3	$17.2	6.0%	-1.5%	0.05%
CRAIG	Virginia Mountains	$3.0	$3.0	$3.0	$3.0	$2.4	$2.9	$2.9	$3.1	4.6%	0.8%	0.01%
FRANKLIN	Virginia Mountains	$50.3	$52.2	$55.4	$56.9	$48.5	$65.6	$67.9	$72.2	6.3%	26.8%	0.22%
HIGHLAND	Virginia Mountains	$1.7	$1.8	$1.9	$1.9	$1.2	$1.7	$1.9	$1.9	-0.2%	-2.0%	0.01%
ROANOKE	Virginia Mountains	$94.3	$95.7	$103.3	$107.0	$79.1	$103.6	$115.1	$123.3	7.1%	15.3%	0.37%
ROANOKE CITY	Virginia Mountains	$381.4	$393.8	$427.8	$439.0	$267.8	$363.4	$471.6	$508.3	7.8%	15.8%	1.53%
SALEM CITY	Virginia Mountains	$74.5	$74.3	$80.8	$83.0	$58.2	$90.9	$112.2	$118.0	5.2%	42.3%	0.35%
Regional Total	**Virginia Mountains**	**$832.9**	**$855.6**	**$916.9**	**$938.0**	**$629.3**	**$870.4**	**$1,034.3**	**$1,114.3**	**7.7%**	**18.8%**	**3.3%**
VIRGINIA	**Statewide Totals**	**$25,194.5**	**$26,364.8**	**$27,873.8**	**$29,064.7**	**$17,516.3**	**$25,219.1**	**$30,344.3**	**$33,326.59**	**9.8%**	**14.7%**	**100.0%**

Regional Total	**Coastal Virginia - Eastern Shore**	**$161.1**	**$165.5**	**$170.9**	**$183.2**	**$159.4**	**$236.8**	**$232.4**	**$247.9**	**6.7%**	**35.3%**	**0.7%**
CHARLES CITY	Coastal Virginia - Hampton Roads	$5.0	$5.3	$5.5	$5.5	$5.0	$7.2	$7.6	$7.8	2.7%	43.2%	0.02%
CHESAPEAKE CITY	Coastal Virginia - Hampton Roads	$375.1	$392.3	$414.2	$438.1	$359.7	$466.7	$511.5	$514.7	0.6%	17.5%	1.54%
FRANKLIN CITY	Coastal Virginia - Hampton Roads	$15.1	$15.2	$15.9	$16.2	$12.3	$16.5	$17.9	$18.5	3.1%	13.6%	0.06%
HAMPTON CITY	Coastal Virginia - Hampton Roads	$192.6	$203.5	$208.2	$218.8	$182.7	$268.2	$300.6	$303.7	1.0%	38.8%	0.91%
ISLE OF WIGHT	Coastal Virginia - Hampton Roads	$37.9	$40.5	$41.3	$41.3	$34.2	$46.7	$49.6	$52.1	5.1%	26.1%	0.16%
JAMES CITY	Coastal Virginia - Hampton Roads	$459.8	$484.7	$509.7	$518.9	$335.3	$521.9	$562.0	$601.6	7.0%	16.0%	1.81%
NEW KENT	Coastal Virginia - Hampton Roads	$20.3	$21.2	$23.5	$25.0	$19.9	$27.9	$29.9	$29.4	-1.7%	17.6%	0.09%
NEWPORT NEWS CITY	Coastal Virginia - Hampton Roads	$281.3	$292.2	$310.6	$336.0	$220.5	$302.2	$333.4	$332.9	-0.1%	-0.9%	1.00%
NORFOLK CITY	Coastal Virginia - Hampton Roads	$909.6	$965.8	$1,051.7	$1,152.1	$726.9	$1,126.6	$1,344.2	$1,435.0	6.8%	24.6%	4.31%
POQUOSON CITY	Coastal Virginia - Hampton Roads	$9.9	$10.1	$10.3	$10.6	$7.9	$11.3	$12.2	$13.2	8.2%	24.6%	0.04%
PORTSMOUTH CITY	Coastal Virginia - Hampton Roads	$57.1	$58.5	$58.9	$61.4	$37.0	$58.3	$63.3	$138.3	118.6%	125.3%	0.41%
SOUTHAMPTON	Coastal Virginia - Hampton Roads	$7.8	$7.8	$8.3	$9.0	$6.3	$8.4	$8.8	$8.8	1.0%	-1.3%	0.03%
SUFFOLK CITY	Coastal Virginia - Hampton Roads	$98.3	$102.1	$111.5	$112.5	$88.2	$120.0	$133.8	$139.9	4.6%	24.3%	0.42%
SURRY	Coastal Virginia - Hampton Roads	$3.2	$3.3	$3.5	$3.7	$3.5	$3.9	$3.9	$3.8	-1.7%	3.3%	0.01%
VIRGINIA BEACH CITY	Coastal Virginia - Hampton Roads	$1,484.3	$1,594.2	$1,692.4	$1,790.6	$1,420.1	$2,121.8	$2,428.6	$2,501.4	3.0%	39.7%	7.51%
WILLIAMSBURG CITY	Coastal Virginia - Hampton Roads	$405.4	$410.2	$430.2	$445.7	$228.2	$359.7	$442.5	$459.3	3.8%	3.0%	1.38%
YORK	Coastal Virginia - Hampton Roads	$253.4	$263.3	$276.9	$280.8	$166.4	$264.9	$292.3	$297.5	1.8%	5.9%	0.89%
Regional Total	**Coastal Virginia - Hampton Roads**	**$4,616.1**	**$4,870.2**	**$5,172.6**	**$5,466.3**	**$3,853.9**	**$5,732.2**	**$6,542.1**	**$6,858.1**	**4.8%**	**25.5%**	**20.6%**
ALEXANDRIA CITY	Northern Virginia	$770.4	$800.0	$832.3	$867.2	$445.4	$613.2	$800.7	$941.5	17.6%	8.6%	2.82%
ARLINGTON	Northern Virginia	$3,836.7	$4,013.5	$4,184.2	$4,404.3	$1,905.8	$2,834.8	$3,859.8	$4,494.1	16.4%	2.0%	13.48%
CAROLINE	Northern Virginia	$37.2	$40.1	$42.2	$44.2	$35.1	$47.4	$52.0	$54.9	5.6%	24.2%	0.16%
CULPEPER	Northern Virginia	$51.0	$53.4	$56.6	$58.9	$48.8	$64.8	$73.5	$76.6	4.3%	30.2%	0.23%
FAIRFAX	Northern Virginia	$3,148.7	$3,309.2	$3,502.3	$3,657.7	$1,959.4	$2,395.4	$3,075.1	$3,624.5	17.9%	-0.9%	10.88%
FAIRFAX CITY	Northern Virginia	$114.9	$115.5	$119.0	$120.1	$65.5	$80.2	$104.3	$118.7	13.7%	-1.2%	0.36%
FALLS CHURCH CITY	Northern Virginia	$50.5	$54.1	$58.2	$59.4	$32.3	$46.1	$50.8	$58.0	14.2%	-2.4%	0.17%
FAUQUIER	Northern Virginia	$138.9	$141.7	$147.2	$139.3	$95.0	$143.3	$182.5	$182.1	-0.2%	30.7%	0.55%
FREDERICKSBURG CITY	Northern Virginia	$140.0	$145.0	$148.5	$146.6	$94.6	$131.5	$145.3	$151.2	4.1%	3.1%	0.45%
LOUDOUN	Northern Virginia	$3,326.1	$3,571.2	$3,777.7	$3,945.8	$1,888.6	$3,040.8	$4,013.8	$4,516.9	12.5%	14.5%	13.55%
MANASSAS CITY	Northern Virginia	$45.3	$46.2	$46.3	$46.2	$34.5	$54.0	$60.4	$60.5	0.2%	31.0%	0.18%
MANASSAS PARK CITY	Northern Virginia	$5.5	$5.6	$4.9	$4.7	$3.1	$4.0	$4.1	$4.6	10.6%	-2.2%	0.01%
PRINCE WILLIAM	Northern Virginia	$601.1	$608.2	$645.4	$650.3	$452.4	$619.2	$674.3	$753.9	11.8%	15.9%	2.26%
RAPPAHANNOCK	Northern Virginia	$38.7	$39.8	$44.1	$48.1	$41.9	$62.6	$69.7	$72.9	4.7%	51.6%	0.22%
SPOTSYLVANIA	Northern Virginia	$159.7	$162.6	$169.3	$182.2	$155.1	$212.1	$221.3	$239.0	8.0%	31.2%	0.72%
STAFFORD	Northern Virginia	$161.4	$166.0	$173.8	$183.2	$144.4	$200.0	$220.3	$224.6	2.0%	22.6%	0.67%
Regional Total	**Northern Virginia**	**$12,626.0**	**$13,271.9**	**$13,952.0**	**$14,558.2**	**$7,401.9**	**$10,549.5**	**$13,607.9**	**$15,574.0**	**14.4%**	**7.0%**	**46.7%**
AUGUSTA	Shenandoah Valley	$100.3	$103.9	$109.2	$109.3	$83.8	$123.4	$137.1	$141.0	2.9%	29.0%	0.42%
BUENA VISTA CITY	Shenandoah Valley	$5.8	$6.0	$6.1	$6.1	$4.3	$5.8	$6.1	$6.3	3.0%	2.9%	0.02%
CLARKE	Shenandoah Valley	$14.4	$15.1	$15.8	$16.3	$11.4	$15.0	$15.8	$13.8	-12.9%	-15.4%	0.04%
FREDERICK	Shenandoah Valley	$126.3	$130.6	$142.1	$143.9	$110.1	$164.2	$179.8	$184.6	2.6%	28.3%	0.55%
HARRISONBURG CITY	Shenandoah Valley	$170.1	$179.7	$192.7	$207.6	$140.7	$214.7	$239.0	$242.2	1.4%	16.7%	0.73%
LEXINGTON CITY	Shenandoah Valley	$39.5	$39.9	$42.2	$44.0	$30.8	$52.8	$62.8	$64.8	3.1%	47.4%	0.19%
PAGE	Shenandoah Valley	$79.6	$81.4	$87.2	$90.1	$72.9	$111.1	$108.1	$108.7	0.5%	20.7%	0.33%
ROCKBRIDGE	Shenandoah Valley	$131.7	$135.7	$141.9	$142.3	$101.0	$139.9	$147.9	$147.7	-0.1%	3.8%	0.44%
ROCKINGHAM	Shenandoah Valley	$128.9	$133.8	$141.7	$150.3	$123.4	$177.7	$181.7	$200.4	10.3%	33.3%	0.60%
SHENANDOAH	Shenandoah Valley	$114.9	$119.7	$125.6	$127.5	$100.8	$130.6	$138.8	$145.4	4.7%	14.1%	0.44%
STAUNTON CITY	Shenandoah Valley	$51.7	$51.5	$57.5	$66.4	$45.2	$63.1	$77.6	$79.2	2.0%	19.2%	0.24%
WARREN	Shenandoah Valley	$63.4	$65.5	$68.9	$69.7	$54.5	$77.8	$81.5	$87.4	7.3%	25.4%	0.26%
WAYNESBORO CITY	Shenandoah Valley	$55.1	$57.2	$60.0	$60.6	$47.3	$66.9	$73.0	$77.8	6.5%	28.2%	0.23%
WINCHESTER CITY	Shenandoah Valley	$92.6	$95.8	$103.5	$106.6	$71.7	$96.1	$107.7	$103.5	-3.9%	-2.9%	0.31%
Regional Total	**Shenandoah Valley**	**$1,174.4**	**$1,215.7**	**$1,294.4**	**$1,340.5**	**$997.8**	**$1,439.2**	**$1,557.0**	**$1,602.8**	**2.9%**	**19.6%**	**4.8%**

Economic Impact of Tourism on Virginia Localities, 2016-2023 Direct Visitor Spending

Source: Tourism Economics

Locality	Region	Direct Visitor Spending (in millions)										
		2016	2017	2018	2019	2020	2021	2022	2023	Percent Change (2023/2022)	Percent Change (2023/2019)	Share of State (2023)
ALBEMARLE	Central Virginia	$378.7	$394.9	$399.6	$429.2	$263.5	$421.5	$511.4	$551.3	7.8%	28.5%	1.65%
AMELIA	Central Virginia	$5.1	$5.3	$5.6	$5.7	$4.1	$4.8	$5.1	$5.2	1.4%	-8.8%	0.02%
AMHERST	Central Virginia	$33.0	$34.0	$36.0	$36.6	$31.0	$43.3	$44.7	$43.0	-3.9%	17.5%	0.13%
APPOMATTOX	Central Virginia	$15.2	$16.1	$17.0	$17.1	$13.7	$17.2	$18.6	$19.2	2.9%	12.2%	0.06%
BUCKINGHAM	Central Virginia	$6.6	$7.0	$7.4	$7.7	$6.0	$7.3	$7.6	$7.5	-1.2%	-2.3%	0.02%
CAMPBELL	Central Virginia	$86.4	$89.1	$92.9	$95.8	$71.8	$112.0	$119.0	$119.9	0.7%	25.1%	0.36%
CHARLOTTESVILLE CITY	Central Virginia	$307.9	$311.4	$333.4	$349.2	$220.8	$346.8	$392.0	$405.9	3.5%	16.2%	1.22%
CHESTERFIELD	Central Virginia	$483.1	$500.1	$532.5	$548.3	$388.9	$535.9	$582.6	$601.3	3.2%	9.7%	1.80%
COLONIAL HEIGHTS CITY	Central Virginia	$79.1	$81.7	$86.8	$83.6	$65.5	$96.5	$102.8	$105.1	2.3%	25.8%	0.32%
CUMBERLAND	Central Virginia	$2.6	$2.8	$3.0	$3.1	$2.5	$3.1	$3.2	$3.5	10.6%	15.9%	0.01%
DINWIDDIE	Central Virginia	$20.7	$20.7	$21.6	$21.0	$15.9	$19.5	$20.6	$21.0	2.0%	0.1%	0.06%
FLUVANNA	Central Virginia	$8.4	$9.1	$8.8	$9.0	$6.8	$9.6	$10.4	$10.5	0.5%	16.8%	0.03%
GOOCHLAND	Central Virginia	$38.3	$40.7	$41.4	$42.8	$31.3	$44.8	$48.0	$51.4	7.2%	20.1%	0.15%
GREENE	Central Virginia	$24.8	$25.8	$27.5	$27.4	$21.4	$30.6	$31.0	$31.7	2.2%	15.6%	0.10%
HANOVER	Central Virginia	$174.1	$181.5	$192.8	$198.4	$132.1	$204.2	$223.0	$229.2	2.8%	15.5%	0.69%
HENRICO	Central Virginia	$1,321.9	$1,367.5	$1,487.6	$1,558.3	$926.5	$1,350.4	$1,718.2	$1,876.0	9.2%	20.4%	5.63%
HOPEWELL CITY	Central Virginia	$35.0	$34.5	$38.6	$37.1	$29.7	$41.1	$45.1	$47.5	5.4%	28.0%	0.14%
LOUISA	Central Virginia	$47.4	$49.8	$52.6	$52.6	$48.7	$60.6	$69.9	$72.6	3.9%	37.9%	0.22%
LYNCHBURG CITY	Central Virginia	$200.2	$199.6	$214.4	$206.2	$159.8	$217.7	$240.0	$255.1	6.3%	23.7%	0.77%
MADISON	Central Virginia	$16.6	$16.4	$16.3	$16.7	$15.0	$20.7	$21.8	$22.9	4.8%	37.2%	0.07%
NELSON	Central Virginia	$70.6	$73.6	$75.3	$79.5	$65.0	$83.0	$86.4	$90.9	5.2%	14.3%	0.27%
NOTTOWAY	Central Virginia	$15.4	$15.7	$16.1	$16.6	$11.8	$17.2	$18.3	$20.7	13.2%	24.3%	0.06%
ORANGE	Central Virginia	$42.2	$42.6	$46.3	$45.6	$37.6	$50.5	$52.8	$54.4	3.1%	19.3%	0.16%
PETERSBURG CITY	Central Virginia	$35.3	$36.2	$35.5	$37.8	$30.6	$39.3	$41.2	$41.1	-0.3%	8.6%	0.12%
POWHATAN	Central Virginia	$16.4	$17.6	$19.3	$20.1	$13.8	$17.9	$19.4	$20.3	4.7%	1.1%	0.06%
PRINCE EDWARD	Central Virginia	$34.5	$36.1	$40.3	$43.2	$33.9	$52.9	$56.4	$57.0	1.2%	32.1%	0.17%
PRINCE GEORGE	Central Virginia	$63.4	$65.7	$71.4	$71.3	$64.2	$97.6	$104.2	$105.2	1.0%	47.5%	0.32%
RICHMOND CITY	Central Virginia	$712.2	$749.8	$809.3	$835.4	$464.8	$643.5	$833.3	$908.0	9.0%	8.7%	2.72%
SUSSEX	Central Virginia	$18.9	$19.1	$18.9	$18.2	$12.4	$17.4	$18.0	$20.6	14.1%	13.0%	0.06%
Regional Total	**Central Virginia**	**$4,294.0**	**$4,444.3**	**$4,748.1**	**$4,913.6**	**$3,189.3**	**$4,606.7**	**$5,444.9**	**$5,798.1**	**6.5%**	**18.0%**	**17.4%**
ESSEX	Chesapeake Bay	$27.3	$27.7	$29.9	$29.7	$26.6	$34.1	$35.7	$41.9	17.3%	41.1%	0.13%
GLOUCESTER	Chesapeake Bay	$33.2	$35.1	$37.3	$39.3	$33.1	$43.0	$43.2	$47.3	9.4%	20.4%	0.14%
KING AND QUEEN	Chesapeake Bay	$3.6	$3.7	$3.9	$4.1	$3.4	$4.1	$4.2	$4.3	2.2%	5.6%	0.01%
KING GEORGE	Chesapeake Bay	$25.7	$27.3	$30.7	$33.7	$26.0	$36.3	$36.7	$38.7	5.3%	14.6%	0.12%
KING WILLIAM	Chesapeake Bay	$18.2	$19.1	$20.8	$21.7	$14.9	$19.4	$20.4	$21.6	5.7%	-0.3%	0.06%
LANCASTER	Chesapeake Bay	$51.5	$55.7	$56.2	$57.8	$49.8	$75.3	$77.1	$81.3	5.4%	40.6%	0.24%
MATHEWS	Chesapeake Bay	$13.3	$13.8	$13.9	$14.4	$13.6	$16.7	$17.6	$18.2	3.2%	26.3%	0.05%
MIDDLESEX	Chesapeake Bay	$23.6	$24.7	$25.9	$26.5	$24.8	$29.2	$30.0	$30.0	0.2%	13.4%	0.09%
NORTHUMBERLAND	Chesapeake Bay	$17.3	$17.7	$17.7	$19.0	$17.5	$20.9	$22.5	$24.4	8.5%	28.6%	0.07%
RICHMOND	Chesapeake Bay	$10.6	$10.7	$11.4	$11.8	$8.7	$11.0	$12.0	$12.6	5.5%	7.4%	0.04%
WESTMORELAND	Chesapeake Bay	$34.9	$35.1	$36.1	$35.9	$32.5	$37.6	$37.6	$37.8	0.5%	5.3%	0.11%
Regional Total	**Chesapeake Bay**	**$259.2**	**$270.4**	**$283.8**	**$293.8**	**$250.6**	**$327.6**	**$337.1**	**$358.1**	**6.2%**	**21.9%**	**1.1%**
ACCOMACK	Coastal Virginia - Eastern Shore	$117.8	$123.0	$126.3	$134.7	$118.2	$168.5	$166.4	$179.6	8.0%	33.3%	0.54%
NORTHAMPTON	Coastal Virginia - Eastern Shore	$43.2	$42.4	$44.6	$48.5	$41.2	$68.3	$66.0	$68.3	3.5%	40.9%	0.20%

Direct Economic Impact and Spending Shares by Industries, 2024

Source: Tourism Economics

Locality	Region	2024 Direct Impacts											
		Direct Visitor Spending, 2024 (in millions)								Employment	Labor Income (in millions)	State Taxes (in millions)	Local Taxes (in millions)
		Lodging*	F&B	Retail	Recreation	Transport**	Total Spending	Total Spending % Change (2024/2023)	Spending Share of State				
ALBEMARLE	Central Virginia	$126.1	$179.9	$58.4	$97.1	$125.7	$587.2	6.5%	1.7%	3,835	$250.8	$18.0	$27.7
AMELIA	Central Virginia	$1.5	$1.3	$0.3	$0.5	$1.8	$5.5	7.1%	0.0%	54	$1.5	$0.1	$0.3
AMHERST	Central Virginia	$6.9	$10.2	$17.9	$3.3	$8.8	$47.0	9.3%	0.1%	423	$12.7	$1.3	$1.7
APPOMATTOX	Central Virginia	$3.9	$4.4	$6.0	$2.1	$3.1	$19.5	1.7%	0.1%	202	$5.4	$0.6	$0.7
BUCKINGHAM	Central Virginia	$2.9	$1.4	$0.3	$0.3	$1.6	$6.6	-12.7%	0.0%	65	$1.7	$0.1	$0.2
CAMPBELL	Central Virginia	$14.1	$22.7	$30.8	$8.0	$52.0	$127.6	6.4%	0.4%	886	$77.4	$4.2	$6.6
CHARLOTTESVILLE CITY	Central Virginia	$88.7	$168.9	$49.0	$61.5	$34.5	$402.6	-0.8%	1.1%	3,337	$124.9	$12.5	$20.8
CHESTERFIELD	Central Virginia	$117.5	$217.8	$83.2	$88.5	$133.0	$640.0	6.4%	1.8%	6,474	$187.7	$19.7	$31.5
COLONIAL HEIGHTS CITY	Central Virginia	$23.0	$40.0	$22.9	$9.9	$12.3	$108.1	2.8%	0.3%	1,085	$28.5	$3.4	$5.3
CUMBERLAND	Central Virginia	$1.6	$1.0	$0.2	$0.2	$0.6	$3.5	-1.3%	0.0%	37	$0.7	$0.1	$0.2
DINWIDDIE	Central Virginia	$4.6	$7.2	$1.5	$2.6	$5.7	$21.6	3.0%	0.1%	197	$5.6	$0.5	$1.0
FLUVANNA	Central Virginia	$4.0	$2.8	$0.5	$1.1	$1.9	$10.3	-1.8%	0.0%	77	$2.7	$0.2	$0.5
GOOCHLAND	Central Virginia	$7.1	$8.9	$11.7	$17.0	$14.5	$59.2	15.1%	0.2%	450	$18.1	$1.7	$2.4
GREENE	Central Virginia	$8.8	$7.8	$9.2	$2.3	$3.4	$31.4	-0.9%	0.1%	290	$7.7	$0.9	$1.6
HANOVER	Central Virginia	$34.3	$62.3	$15.6	$70.1	$58.1	$240.4	4.9%	0.7%	2,407	$78.7	$7.4	$11.4
HENRICO	Central Virginia	$239.9	$464.3	$172.8	$174.7	$872.5	$1,924.2	2.6%	5.5%	10,577	$628.0	$46.7	$83.1
HOPEWELL CITY	Central Virginia	$12.1	$20.4	$3.8	$4.9	$9.4	$50.7	6.6%	0.1%	511	$15.3	$1.6	$2.7
LOUISA	Central Virginia	$25.2	$12.1	$20.6	$4.7	$10.3	$73.0	0.5%	0.2%	358	$15.7	$1.6	$2.6
LYNCHBURG CITY	Central Virginia	$54.2	$108.7	$31.3	$31.1	$36.1	$261.5	2.5%	0.7%	3,062	$79.6	$8.3	$12.8
MADISON	Central Virginia	$8.4	$7.5	$1.5	$2.5	$5.2	$25.0	9.3%	0.1%	243	$7.5	$0.7	$1.2
NELSON	Central Virginia	$35.2	$20.7	$9.8	$12.7	$11.1	$89.5	-1.5%	0.3%	636	$19.2	$2.0	$3.7
NOTTOWAY	Central Virginia	$3.5	$6.1	$7.0	$1.2	$5.0	$22.7	9.9%	0.1%	181	$5.0	$0.6	$0.8
ORANGE	Central Virginia	$13.8	$17.0	$3.3	$9.1	$14.4	$57.7	6.0%	0.2%	520	$17.1	$1.6	$2.5
PETERSBURG CITY	Central Virginia	$7.4	$13.6	$2.3	$2.7	$12.7	$38.6	-6.1%	0.1%	360	$11.4	$1.1	$2.1
POWHATAN	Central Virginia	$2.7	$4.9	$0.7	$4.7	$8.3	$21.2	4.3%	0.1%	235	$6.7	$0.6	$1.0
PRINCE EDWARD	Central Virginia	$17.8	$23.0	$4.7	$4.8	$8.9	$59.2	3.8%	0.2%	566	$15.4	$1.7	$2.4
PRINCE GEORGE	Central Virginia	$18.9	$35.0	$23.0	$12.7	$16.5	$106.1	0.8%	0.3%	857	$26.6	$3.1	$4.8
RICHMOND CITY	Central Virginia	$217.5	$389.3	$110.2	$152.3	$112.8	$982.1	8.2%	2.8%	8,868	$380.3	$32.1	$51.2
SUSSEX	Central Virginia	$4.7	$3.1	$5.6	$2.3	$5.4	$21.1	2.6%	0.1%	153	$4.7	$0.6	$0.8
Regional Total	**Central Virginia**	**$1,106.5**	**$1,862.1**	**$703.9**	**$784.9**	**$1,585.6**	**$6,042.9**	**4.2%**	**17.2%**	**46,945**	**$2,036.8**	**$173.0**	**$283.6**
ESSEX	Chesapeake Bay	$10.5	$8.5	$14.0	$2.4	$5.5	$40.8	-2.5%	0.1%	278	$8.2	$0.9	$1.2
GLOUCESTER	Chesapeake Bay	$14.2	$16.8	$3.8	$3.9	$10.2	$48.8	3.4%	0.1%	427	$12.8	$1.2	$2.1
KING AND QUEEN	Chesapeake Bay	$2.5	$0.6	$0.5	$0.2	$0.6	$4.4	3.2%	0.0%	30	$0.8	$0.1	$0.1
KING GEORGE	Chesapeake Bay	$8.4	$13.1	$2.5	$3.5	$10.9	$38.4	-0.7%	0.1%	447	$10.7	$1.1	$1.8
KING WILLIAM	Chesapeake Bay	$3.9	$4.9	$7.4	$1.6	$5.5	$23.3	7.9%	0.1%	202	$5.4	$0.6	$0.9
LANCASTER	Chesapeake Bay	$30.9	$22.3	$7.9	$12.3	$10.0	$83.4	2.5%	0.2%	656	$24.4	$2.2	$3.0
MATHEWS	Chesapeake Bay	$13.9	$2.1	$0.3	$1.2	$1.8	$19.2	5.9%	0.1%	70	$1.9	$0.2	$1.1
MIDDLESEX	Chesapeake Bay	$16.8	$3.3	$4.5	$3.2	$2.9	$30.8	2.4%	0.1%	132	$4.5	$0.4	$1.0
NORTHUMBERLAND	Chesapeake Bay	$20.2	$2.0	$0.2	$0.7	$2.0	$25.0	2.5%	0.1%	67	$1.9	$0.2	$1.5
RICHMOND	Chesapeake Bay	$4.2	$2.4	$3.2	$1.3	$2.0	$13.1	3.5%	0.0%	90	$2.8	$0.3	$0.4
WESTMORELAND	Chesapeake Bay	$21.7	$5.7	$5.7	$2.9	$2.7	$38.7	2.3%	0.1%	158	$4.9	$0.6	$2.3
Regional Total	**Chesapeake Bay**	**$147.2**	**$81.7**	**$49.9**	**$33.1**	**$54.1**	**$366.0**	**2.2%**	**1.0%**	**2,558**	**$78.3**	**$7.7**	**$15.4**
ACCOMACK	Coastal Virginia - Eastern Shore	$72.4	$55.0	$17.3	$19.9	$27.6	$192.2	7.0%	0.5%	1,468	$44.5	$4.5	$7.4
NORTHAMPTON	Coastal Virginia - Eastern Shore	$25.4	$21.1	$4.9	$9.3	$8.7	$69.5	1.7%	0.2%	402	$12.0	$1.7	$3.1
Regional Total	**Coastal Virginia - Eastern Shore**	**$97.9**	**$76.2**	**$22.2**	**$29.1**	**$36.3**	**$261.6**	**5.5%**	**0.7%**	**1,869**	**$56.5**	**$6.2**	**$10.5**
CHARLES CITY	Coastal Virginia - Hampton Roads	$2.8	$3.0	$0.5	$1.1	$1.4	$8.9	13.2%	0.0%	55	$1.8	$0.2	$0.3
CHESAPEAKE CITY	Coastal Virginia - Hampton Roads	$98.9	$195.1	$60.3	$76.7	$86.9	$517.9	0.6%	1.5%	5,077	$152.8	$16.0	$26.8
FRANKLIN CITY	Coastal Virginia - Hampton Roads	$2.9	$5.5	$1.7	$2.0	$4.8	$17.0	-8.0%	0.0%	215	$5.5	$0.5	$0.9
HAMPTON CITY	Coastal Virginia - Hampton Roads	$78.5	$122.7	$35.4	$39.5	$45.1	$321.2	5.8%	0.9%	2,965	$86.1	$10.1	$17.4
ISLE OF WIGHT	Coastal Virginia - Hampton Roads	$10.3	$16.9	$11.4	$5.3	$6.5	$50.4	-3.3%	0.1%	527	$14.7	$1.6	$2.3
JAMES CITY	Coastal Virginia - Hampton Roads	$174.4	$104.1	$113.2	$151.5	$52.7	$595.8	-1.0%	1.7%	5,219	$203.9	$18.1	$27.7
NEW KENT	Coastal Virginia - Hampton Roads	$2.6	$5.9	$10.3	$3.4	$8.9	$31.1	5.7%	0.1%	220	$9.8	$0.9	$1.3
NEWPORT NEWS CITY	Coastal Virginia - Hampton Roads	$56.0	$113.8	$49.1	$41.7	$69.6	$330.2	-0.8%	0.9%	3,263	$141.6	$10.8	$20.4
NORFOLK CITY	Coastal Virginia - Hampton Roads	$216.8	$383.3	$128.7	$126.0	$650.1	$1,504.9	4.9%	4.3%	8,651	$432.1	$36.7	$65.5
POQUOSON CITY	Coastal Virginia - Hampton Roads	$3.1	$5.6	$1.0	$1.4	$2.2	$13.4	0.8%	0.0%	133	$4.3	$0.4	$0.6
PORTSMOUTH CITY	Coastal Virginia - Hampton Roads	$9.1	$26.2	$7.4	$91.8	$16.9	$151.4	9.5%	0.4%	1,133	$38.8	$19.2	$6.0
SOUTHAMPTON	Coastal Virginia - Hampton Roads	$2.0	$2.4	$0.6	$0.9	$2.7	$8.6	-2.4%	0.0%	117	$3.0	$0.3	$0.4
SUFFOLK CITY	Coastal Virginia - Hampton Roads	$29.9	$56.9	$13.8	$17.2	$25.2	$142.9	2.1%	0.4%	1,456	$42.9	$4.5	$8.1
SURRY	Coastal Virginia - Hampton Roads	$2.9	$0.7	$0.1	$0.2	$0.1	$4.0	5.1%	0.0%	23	$0.7	$0.0	$0.3
VIRGINIA BEACH CITY	Coastal Virginia - Hampton Roads	$688.9	$981.7	$269.4	$329.0	$282.1	$2,551.1	2.0%	7.3%	20,129	$674.4	$74.0	$135.4
WILLIAMSBURG CITY	Coastal Virginia - Hampton Roads	$106.9	$123.6	$54.7	$137.2	$38.3	$460.7	0.3%	1.3%	3,208	$155.4	$14.1	$22.3
YORK	Coastal Virginia - Hampton Roads	$86.5	$111.5	$28.4	$44.3	$26.1	$296.8	-0.2%	0.8%	1,870	$62.3	$8.2	$14.7
Regional Total	**Coastal Virginia - Hampton Roads**	**$1,572.5**	**$2,258.8**	**$785.9**	**$1,069.4**	**$1,319.7**	**$7,006.3**	**2.2%**	**19.9%**	**54,260**	**$2,030.0**	**$215.7**	**$350.0**
ALEXANDRIA CITY	Northern Virginia	$241.4	$385.6	$108.4	$149.2	$130.9	$1,015.6	7.9%	2.9%	5,773	$289.1	$28.3	$53.8
ARLINGTON	Northern Virginia	$597.3	$882.6	$245.0	$346.8	$2,692.4	$4,764.1	6.0%	13.6%	17,141	$1,063.8	$86.3	$177.3
CAROLINE	Northern Virginia	$8.7	$10.3	$15.5	$4.0	$13.2	$51.7	-5.8%	0.1%	291	$9.1	$1.3	$1.8
CULPEPER	Northern Virginia	$18.6	$29.7	$7.0	$9.1	$13.4	$77.9	1.6%	0.2%	764	$24.0	$2.2	$3.6
FAIRFAX	Northern Virginia	$838.2	$1,484.7	$555.0	$600.1	$440.2	$3,918.1	8.1%	11.2%	24,024	$1,190.4	$116.1	$189.1
FAIRFAX CITY	Northern Virginia	$28.0	$49.7	$10.3	$16.4	$16.3	$120.7	1.7%	0.3%	1,155	$43.8	$3.8	$5.8
FALLS CHURCH CITY	Northern Virginia	$12.8	$29.4	$10.5	$9.3	$4.1	$66.1	14.0%	0.2%	472	$22.2	$2.1	$3.7
FAUQUIER	Northern Virginia	$48.3	$63.0	$14.6	$25.9	$36.4	$188.1	3.3%	0.5%	1,298	$51.2	$5.1	$7.3
FREDERICKSBURG CITY	Northern Virginia	$34.9	$71.7	$23.8	$21.8	$18.6	$170.8	12.9%	0.5%	1,622	$54.4	$5.5	$8.8
LOUDOUN	Northern Virginia	$441.5	$741.5	$230.6	$572.0	$2,939.9	$4,925.5	9.0%	14.0%	18,856	$1,205.2	$87.3	$157.3
MANASSAS CITY	Northern Virginia	$10.4	$34.7	$3.4	$6.9	$8.5	$63.8	5.5%	0.2%	535	$17.6	$2.0	$3.1
MANASSAS PARK CITY	Northern Virginia	$0.2	$0.4	$2.3	$0.1	$1.7	$4.6	-0.2%	0.0%	18	$0.8	$0.1	$0.2
PRINCE WILLIAM	Northern Virginia	$127.5	$264.1	$137.9	$108.2	$142.2	$779.9	3.5%	2.2%	5,713	$484.5	$31.6	$49.7
RAPPAHANNOCK	Northern Virginia	$31.5	$8.1	$6.6	$14.2	$9.9	$70.4	-3.4%	0.2%	403	$17.7	$1.8	$2.3
SPOTSYLVANIA	Northern Virginia	$51.9	$75.2	$34.6	$30.7	$53.4	$245.9	2.9%	0.7%	2,143	$58.9	$6.9	$11.4
STAFFORD	Northern Virginia	$48.1	$84.9	$18.4	$32.6	$52.8	$236.8	5.4%	0.7%	2,194	$64.3	$7.0	$11.4
Regional Total	**Northern Virginia**	**$2,539.3**	**$4,215.6**	**$1,423.9**	**$1,947.2**	**$6,574.0**	**$16,700.0**	**7.2%**	**47.5%**	**82,402**	**$4,597.2**	**$387.5**	**$686.4**
AUGUSTA	Shenandoah Valley	$38.1	$46.8	$15.7	$16.5	$27.3	$144.4	2.4%	0.4%	1,212	$37.3	$4.1	$5.5
BUENA VISTA CITY	Shenandoah Valley	$1.5	$2.5	$0.5	$1.1	$1.3	$6.9	9.5%	0.0%	76	$2.0	$0.2	$0.3
CLARKE	Shenandoah Valley	$2.7	$2.5	$3.5	$1.1	$3.6	$13.4	-2.7%	0.0%	103	$3.8	$0.4	$0.6
FREDERICK	Shenandoah Valley	$41.6	$66.3	$16.8	$22.1	$43.5	$190.4	3.1%	0.5%	1,487	$54.2	$5.6	$7.8
HARRISONBURG CITY	Shenandoah Valley	$56.4	$108.6	$26.7	$28.1	$23.4	$243.1	0.4%	0.7%	2,677	$80.6	$8.3	$13.1
LEXINGTON CITY	Shenandoah Valley	$20.0	$27.6	$6.1	$10.2	$4.8	$68.8	6.1%	0.2%	558	$22.4	$2.2	$3.2
PAGE	Shenandoah Valley	$40.2	$15.0	$18.2	$21.0	$10.5	$104.9	-3.5%	0.3%	1,051	$31.1	$3.0	$5.5
ROCKBRIDGE	Shenandoah Valley	$37.5	$21.4	$29.7	$18.8	$41.1	$148.5	0.5%	0.4%	1,273	$44.3	$4.1	$7.9
ROCKINGHAM	Shenandoah Valley	$68.1	$68.6	$15.9	$25.1	$32.4	$210.1	4.9%	0.6%	1,550	$47.0	$5.5	$8.6
SHENANDOAH	Shenandoah Valley	$38.7	$35.9	$35.8	$15.7	$26.4	$152.5	4.9%	0.4%	1,287	$38.8	$4.0	$6.0
STAUNTON CITY	Shenandoah Valley	$19.2	$33.4	$6.2	$9.3	$9.3	$77.5	-2.2%	0.2%	864	$25.9	$2.4	$4.2
WARREN	Shenandoah Valley	$23.8	$35.2	$8.5	$14.2	$14.2	$95.8	9.6%	0.3%	837	$25.4	$2.7	$4.2
WAYNESBORO CITY	Shenandoah Valley	$20.4	$38.3	$9.2	$8.0	$10.0	$85.9	10.4%	0.2%	895	$25.1	$2.8	$4.1
WINCHESTER CITY	Shenandoah Valley	$19.7	$44.8	$21.8	$13.1	$14.0	$113.5	9.7%	0.3%	1,112	$34.2	$3.5	$5.7
Regional Total	**Shenandoah Valley**	**$428.0**	**$546.9**	**$214.5**	**$204.5**	**$261.9**	**$1,655.7**	**3.3%**	**4.7%**	**14,983**	**$472.1**	**$48.8**	**$76.7**
BRUNSWICK	Southern Virginia	$5.9	$2.0	$0.4	$0.8	$2.9	$12.0	6.7%	0.0%	94	$2.8	$0.2	$0.4
CHARLOTTE	Southern Virginia	$2.7	$1.3	$2.7	$0.6	$1.1	$8.4	4.9%	0.0%	79	$2.0	$0.2	$0.3

DANVILLE CITY	Southern Virginia	$32.0	$52.5	$19.3	$107.7	$22.0	$233.6	29.9%	0.7%	1,903	$60.2	$22.1	$9.7
EMPORIA CITY	Southern Virginia	$5.3	$9.9	$3.9	$4.1	$4.5	$27.6	-1.5%	0.1%	342	$9.6	$0.9	$1.5
GREENSVILLE	Southern Virginia	$9.1	$3.0	$4.7	$3.3	$7.5	$27.6	2.0%	0.1%	249	$6.3	$0.8	$1.0
HALIFAX	Southern Virginia	$15.1	$18.1	$4.3	$8.1	$9.5	$55.1	-2.7%	0.2%	637	$17.3	$1.6	$2.4
HENRY	Southern Virginia	$9.6	$14.6	$4.1	$7.5	$14.7	$50.5	7.8%	0.1%	526	$15.5	$1.5	$2.0
LUNENBURG	Southern Virginia	$2.2	$1.0	$0.2	$0.4	$1.5	$5.2	-6.4%	0.0%	48	$1.1	$0.1	$0.2
MARTINSVILLE CITY	Southern Virginia	$5.6	$10.8	$4.5	$3.3	$3.4	$27.7	6.9%	0.1%	308	$8.3	$0.9	$1.1
MECKLENBURG	Southern Virginia	$48.3	$36.0	$8.1	$10.0	$27.5	$129.9	12.9%	0.4%	879	$22.7	$2.7	$4.6
PITTSYLVANIA	Southern Virginia	$10.0	$12.1	$2.4	$3.1	$14.0	$41.6	17.1%	0.1%	318	$9.2	$1.0	$1.4
Regional Total	**Southern Virginia**	**$145.8**	**$161.4**	**$54.6**	**$148.8**	**$108.7**	**$619.3**	**14.7%**	**1.8%**	**5,382**	**$154.9**	**$32.0**	**$24.5**
MONTGOMERY	Southwest Virginia - Blue Ridge Highlands	$73.7	$113.2	$33.5	$40.3	$33.0	$293.7	5.1%	0.8%	3,044	$148.9	$11.1	$18.0
BRISTOL CITY	Southwest Virginia - Blue Ridge Highlands	$32.3	$50.7	$11.1	$69.8	$15.9	$179.7	14.2%	0.5%	1,272	$38.3	$14.3	$6.8
WYTHE	Southwest Virginia - Blue Ridge Highlands	$30.5	$47.3	$12.9	$22.4	$40.0	$153.1	4.7%	0.4%	1,482	$43.7	$4.5	$7.2
WASHINGTON	Southwest Virginia - Blue Ridge Highlands	$30.2	$41.8	$13.2	$18.3	$25.5	$129.0	1.2%	0.4%	1,320	$43.0	$4.2	$8.7
PULASKI	Southwest Virginia - Blue Ridge Highlands	$17.1	$26.0	$24.4	$9.6	$13.3	$90.5	7.1%	0.3%	789	$20.4	$2.7	$3.4
CARROLL	Southwest Virginia - Blue Ridge Highlands	$17.8	$15.4	$4.6	$5.7	$11.4	$54.8	3.8%	0.2%	472	$12.0	$1.3	$2.2
GILES	Southwest Virginia - Blue Ridge Highlands	$7.3	$9.7	$11.7	$2.9	$5.9	$37.5	4.5%	0.1%	268	$8.4	$1.0	$1.4
SMYTH	Southwest Virginia - Blue Ridge Highlands	$6.4	$10.9	$2.8	$3.5	$7.7	$31.3	9.3%	0.1%	329	$9.6	$0.9	$1.4
PATRICK	Southwest Virginia - Blue Ridge Highlands	$6.2	$4.2	$11.0	$2.9	$5.6	$30.0	17.1%	0.1%	138	$4.4	$0.6	$1.7
RADFORD CITY	Southwest Virginia - Blue Ridge Highlands	$4.4	$9.3	$6.4	$2.2	$3.4	$25.6	11.3%	0.1%	296	$9.5	$0.9	$1.4
FLOYD	Southwest Virginia - Blue Ridge Highlands	$4.5	$4.4	$4.3	$1.6	$3.4	$18.3	0.3%	0.1%	128	$3.9	$0.4	$0.7
GALAX CITY	Southwest Virginia - Blue Ridge Highlands	$2.6	$6.7	$2.5	$1.2	$5.1	$18.0	6.9%	0.1%	209	$5.5	$0.6	$0.9
GRAYSON	Southwest Virginia - Blue Ridge Highlands	$6.6	$2.0	$2.8	$0.6	$2.0	$13.9	-4.6%	0.0%	74	$1.9	$0.2	$0.4
BLAND	Southwest Virginia - Blue Ridge Highlands	$3.1	$0.6	$0.1	$0.1	$1.3	$5.2	0.7%	0.0%	24	$0.7	$0.1	$0.1
Regional Total	**Southwest Virginia - Blue Ridge Highlands**	**$242.7**	**$342.2**	**$141.3**	**$181.1**	**$173.4**	**$1,080.7**	**6.3%**	**3.1%**	**9,845**	**$350.2**	**$42.9**	**$54.5**
BUCHANAN	Southwest Virginia - Heart of Appalachia	$2.9	$4.1	$1.2	$1.3	$2.8	$12.4	-0.1%	0.0%	148	$3.8	$0.3	$0.5
DICKENSON	Southwest Virginia - Heart of Appalachia	$2.3	$2.5	$4.3	$1.1	$2.8	$12.9	-5.0%	0.0%	137	$3.2	$0.4	$0.5
LEE	Southwest Virginia - Heart of Appalachia	$6.1	$3.8	$7.8	$1.7	$3.8	$23.2	4.6%	0.1%	196	$4.8	$0.5	$0.8
NORTON CITY	Southwest Virginia - Heart of Appalachia	$2.8	$5.1	$1.9	$1.8	$2.5	$14.2	9.5%	0.0%	191	$4.8	$0.5	$0.7
RUSSELL	Southwest Virginia - Heart of Appalachia	$2.8	$4.5	$4.4	$1.7	$4.1	$17.5	-2.7%	0.0%	161	$4.6	$0.5	$0.7
SCOTT	Southwest Virginia - Heart of Appalachia	$6.5	$4.3	$6.4	$1.9	$4.1	$23.1	-0.8%	0.1%	208	$5.0	$0.6	$0.8
TAZEWELL	Southwest Virginia - Heart of Appalachia	$8.3	$19.6	$14.2	$3.5	$15.3	$60.9	10.3%	0.2%	516	$20.4	$1.6	$2.7
WISE	Southwest Virginia - Heart of Appalachia	$10.8	$14.8	$21.1	$3.4	$11.4	$61.5	2.8%	0.2%	429	$9.8	$1.6	$2.1
Regional Total	**Southwest Virginia - Heart of Appalachia**	**$42.5**	**$58.7**	**$61.3**	**$16.4**	**$46.8**	**$225.7**	**3.8%**	**0.6%**	**1,986**	**$56.4**	**$6.0**	**$8.8**
ALLEGHANY	Virginia Mountains	$6.7	$7.4	$6.1	$3.3	$2.9	$26.4	-7.4%	0.1%	248	$7.3	$0.8	$1.2
BATH	Virginia Mountains	$71.4	$25.3	$2.4	$13.8	$3.6	$116.6	16.7%	0.3%	452	$23.3	$3.0	$6.0
BEDFORD	Virginia Mountains	$29.3	$23.5	$6.6	$9.6	$13.2	$82.2	1.1%	0.2%	583	$18.6	$1.7	$3.0
BOTETOURT	Virginia Mountains	$12.1	$16.7	$11.9	$4.5	$14.7	$59.8	-0.9%	0.2%	607	$20.9	$1.8	$3.0
COVINGTON CITY	Virginia Mountains	$2.3	$4.1	$6.8	$1.8	$2.4	$17.4	0.7%	0.0%	182	$5.3	$0.5	$0.7
CRAIG	Virginia Mountains	$1.9	$0.6	$0.1	$0.3	$0.3	$3.2	3.3%	0.0%	31	$1.0	$0.1	$0.2
FRANKLIN	Virginia Mountains	$29.4	$16.5	$3.9	$8.1	$16.7	$74.7	3.4%	0.2%	547	$15.9	$1.5	$2.9
HIGHLAND	Virginia Mountains	$0.4	$0.4	$0.5	$0.2	$0.7	$2.2	16.5%	0.0%	25	$0.7	$0.1	$0.1
ROANOKE	Virginia Mountains	$27.1	$52.0	$14.1	$19.3	$19.8	$132.3	7.3%	0.4%	1,326	$38.4	$3.9	$7.3
ROANOKE CITY	Virginia Mountains	$85.9	$147.2	$53.3	$62.4	$186.0	$534.8	5.2%	1.5%	3,804	$190.7	$14.6	$25.5
SALEM CITY	Virginia Mountains	$30.0	$44.5	$10.7	$21.2	$15.1	$121.5	2.9%	0.3%	1,134	$33.6	$3.6	$5.9
Regional Total	**Virginia Mountains**	**$296.4**	**$338.2**	**$116.3**	**$144.5**	**$275.6**	**$1,171.1**	**5.1%**	**3.3%**	**8,940**	**$355.7**	**$31.4**	**$55.8**
VIRGINIA	**Statewide Totals**	**$6,618.6**	**$9,941.8**	**$3,573.8**	**$4,559.1**	**$10,435.9**	**$35,129.3**	**5.4%**	**100.0%**	**229,170**	**$10,188.2**	**$951.1**	**$1,566.2**

*Lodging includes short-term rentals and second home spending

**Transportation includes both ground and air transportation

Economic Impact of Tourism on Virginia Localities, 2016-2024 Direct Visitor Spending

Source: Tourism Economics

Locality	Region	Direct Visitor Spending (in millions)											
		2016	2017	2018	2019	2020	2021	2022	2023	2024	Percent Change (2024/2023)	Percent Change (2024/2019)	Share of State (2024)
ALBEMARLE	Central Virginia	$378.7	$394.9	$399.6	$429.2	$263.5	$421.5	$511.4	$551.3	$587.2	6.5%	36.8%	1.7%
AMELIA	Central Virginia	$5.1	$5.3	$5.6	$5.7	$4.1	$4.8	$5.1	$5.2	$5.5	7.1%	-2.3%	0.0%
AMHERST	Central Virginia	$33.0	$34.0	$36.0	$36.6	$31.0	$43.3	$44.7	$43.0	$47.0	9.3%	28.4%	0.1%
APPOMATTOX	Central Virginia	$15.2	$16.1	$17.0	$17.1	$13.7	$17.2	$18.6	$19.2	$19.5	1.7%	14.1%	0.1%
BUCKINGHAM	Central Virginia	$6.6	$7.0	$7.4	$7.7	$6.0	$7.3	$7.6	$7.5	$6.6	-12.7%	-14.7%	0.0%
CAMPBELL	Central Virginia	$86.4	$89.1	$92.9	$95.8	$71.8	$112.0	$119.0	$119.9	$127.6	6.4%	33.2%	0.4%
CHARLOTTESVILLE CITY	Central Virginia	$307.9	$311.4	$333.4	$349.2	$220.8	$346.8	$392.0	$405.9	$402.6	-0.8%	15.3%	1.1%
CHESTERFIELD	Central Virginia	$483.1	$500.1	$532.5	$548.3	$388.9	$535.9	$582.6	$601.3	$640.0	6.4%	16.7%	1.8%
COLONIAL HEIGHTS CITY	Central Virginia	$79.1	$81.7	$86.8	$83.6	$65.5	$96.5	$102.8	$105.1	$108.1	2.8%	29.3%	0.3%
CUMBERLAND	Central Virginia	$2.6	$2.8	$3.0	$3.1	$2.5	$3.1	$3.2	$3.5	$3.5	-1.3%	14.3%	0.0%
DINWIDDIE	Central Virginia	$20.7	$20.7	$21.6	$21.0	$15.9	$19.5	$20.6	$21.0	$21.6	3.0%	3.0%	0.1%
FLUVANNA	Central Virginia	$8.4	$9.1	$8.8	$9.0	$6.8	$9.6	$10.4	$10.5	$10.3	-1.8%	14.7%	0.0%
GOOCHLAND	Central Virginia	$38.3	$40.7	$41.4	$42.8	$31.3	$44.8	$48.0	$51.4	$59.2	15.1%	38.3%	0.2%
GREENE	Central Virginia	$24.8	$25.8	$27.5	$27.4	$21.4	$30.6	$31.0	$31.7	$31.4	-0.9%	14.6%	0.1%
HANOVER	Central Virginia	$174.1	$181.5	$192.8	$198.4	$132.1	$204.2	$223.0	$229.2	$240.4	4.9%	21.2%	0.7%
HENRICO	Central Virginia	$1,321.9	$1,367.5	$1,487.6	$1,558.3	$926.5	$1,350.4	$1,718.2	$1,876.0	$1,924.2	2.6%	23.5%	5.5%
HOPEWELL CITY	Central Virginia	$35.0	$34.5	$38.6	$37.1	$29.7	$41.1	$45.1	$47.5	$50.7	6.6%	36.5%	0.1%
LOUISA	Central Virginia	$47.4	$49.8	$52.6	$52.6	$48.7	$60.6	$69.9	$72.6	$73.0	0.5%	38.6%	0.2%
LYNCHBURG CITY	Central Virginia	$200.2	$199.6	$214.4	$206.2	$159.8	$217.7	$240.0	$255.1	$261.5	2.5%	26.8%	0.7%
MADISON	Central Virginia	$16.6	$16.4	$16.3	$16.7	$15.0	$20.7	$21.8	$22.9	$25.0	9.3%	50.0%	0.1%
NELSON	Central Virginia	$70.6	$73.6	$75.3	$79.5	$65.0	$83.0	$86.4	$90.9	$89.5	-1.5%	12.6%	0.3%
NOTTOWAY	Central Virginia	$15.4	$15.7	$16.1	$16.6	$11.8	$17.2	$18.3	$20.7	$22.7	9.9%	36.6%	0.1%
ORANGE	Central Virginia	$42.2	$42.6	$46.3	$45.6	$37.6	$50.5	$52.8	$54.4	$57.7	6.0%	26.5%	0.2%
PETERSBURG CITY	Central Virginia	$35.3	$36.2	$35.5	$37.8	$30.6	$39.3	$41.2	$41.1	$38.6	-6.1%	2.0%	0.1%
POWHATAN	Central Virginia	$16.4	$17.6	$19.3	$20.1	$13.8	$17.9	$19.4	$20.3	$21.2	4.3%	5.4%	0.1%
PRINCE EDWARD	Central Virginia	$34.5	$36.1	$40.3	$43.2	$33.9	$52.9	$56.4	$57.0	$59.2	3.8%	37.2%	0.2%
PRINCE GEORGE	Central Virginia	$63.4	$65.7	$71.4	$71.3	$64.2	$97.6	$104.2	$105.2	$106.1	0.8%	48.7%	0.3%
RICHMOND CITY	Central Virginia	$712.2	$749.8	$809.3	$835.4	$464.8	$643.5	$833.3	$908.0	$982.1	8.2%	17.6%	2.8%
SUSSEX	Central Virginia	$18.9	$19.1	$18.9	$18.2	$12.4	$17.4	$18.0	$20.6	$21.1	2.6%	15.9%	0.1%
Regional Total	**Central Virginia**	**$4,294.0**	**$4,444.3**	**$4,748.1**	**$4,913.6**	**$3,189.3**	**$4,606.7**	**$5,444.9**	**$5,798.1**	**$6,042.9**	**4.2%**	**23.0%**	**17.2%**
ESSEX	Chesapeake Bay	$27.3	$27.7	$29.9	$29.7	$26.6	$34.1	$35.7	$41.9	$40.8	-2.5%	37.5%	0.1%
GLOUCESTER	Chesapeake Bay	$33.2	$35.1	$37.3	$39.3	$33.1	$43.0	$43.2	$47.3	$48.8	3.4%	24.4%	0.1%
KING AND QUEEN	Chesapeake Bay	$3.6	$3.7	$3.9	$4.1	$3.4	$4.1	$4.2	$4.3	$4.4	3.2%	9.0%	0.0%
KING GEORGE	Chesapeake Bay	$25.7	$27.3	$30.7	$33.7	$26.0	$36.3	$36.7	$38.7	$38.4	-0.7%	13.8%	0.1%
KING WILLIAM	Chesapeake Bay	$18.2	$19.1	$20.8	$21.7	$14.9	$19.4	$20.4	$21.6	$23.3	7.9%	7.5%	0.1%
LANCASTER	Chesapeake Bay	$51.5	$55.7	$56.2	$57.8	$49.8	$75.3	$77.1	$81.3	$83.4	2.5%	44.2%	0.2%
MATHEWS	Chesapeake Bay	$13.3	$13.8	$13.9	$14.4	$13.6	$16.7	$17.6	$18.2	$19.2	5.9%	33.8%	0.1%
MIDDLESEX	Chesapeake Bay	$23.6	$24.7	$25.9	$26.5	$24.8	$29.2	$30.0	$30.0	$30.8	2.4%	16.1%	0.1%
NORTHUMBERLAND	Chesapeake Bay	$17.3	$17.7	$17.7	$19.0	$17.5	$20.9	$22.5	$24.4	$25.0	2.5%	31.8%	0.1%
RICHMOND	Chesapeake Bay	$10.6	$10.7	$11.4	$11.8	$8.7	$11.0	$12.0	$12.6	$13.1	3.5%	11.1%	0.0%
WESTMORELAND	Chesapeake Bay	$34.9	$35.1	$36.1	$35.9	$32.5	$37.6	$37.6	$37.8	$38.7	2.3%	7.7%	0.1%
Regional Total	**Chesapeake Bay**	**$259.2**	**$270.4**	**$283.8**	**$293.8**	**$250.6**	**$327.6**	**$337.1**	**$358.1**	**$366.0**	**2.2%**	**24.6%**	**1.0%**
ACCOMACK	Coastal Virginia - Eastern Shore	$117.8	$123.0	$126.3	$134.7	$118.2	$168.5	$166.4	$179.6	$192.2	7.0%	42.6%	0.5%
NORTHAMPTON	Coastal Virginia - Eastern Shore	$43.2	$42.4	$44.6	$48.5	$41.2	$68.3	$66.0	$68.3	$69.5	1.7%	43.3%	0.2%
Regional Total	**Coastal Virginia - Eastern Shore**	**$161.1**	**$165.5**	**$170.9**	**$183.2**	**$159.4**	**$236.8**	**$232.4**	**$247.9**	**$261.6**	**5.5%**	**42.8%**	**0.7%**
CHARLES CITY	Coastal Virginia - Hampton Roads	$5.0	$5.3	$5.5	$5.5	$5.0	$7.2	$7.6	$7.8	$8.9	13.2%	62.2%	0.0%

CHESAPEAKE CITY	Coastal Virginia - Hampton Roads	$375.1	$392.3	$414.2	$438.1	$359.7	$466.7	$511.5	$514.7	$517.9	0.6%	18.2%	1.5%
FRANKLIN CITY	Coastal Virginia - Hampton Roads	$15.1	$15.2	$15.9	$16.2	$12.3	$16.5	$17.9	$18.5	$17.0	-8.0%	4.6%	0.0%
HAMPTON CITY	Coastal Virginia - Hampton Roads	$192.6	$203.5	$208.2	$218.8	$182.7	$268.2	$300.6	$303.7	$321.2	5.8%	46.8%	0.9%
ISLE OF WIGHT	Coastal Virginia - Hampton Roads	$37.9	$40.5	$41.3	$41.3	$34.2	$46.7	$49.6	$52.1	$50.4	-3.3%	21.9%	0.1%
JAMES CITY	Coastal Virginia - Hampton Roads	$459.8	$484.7	$509.7	$518.9	$335.3	$521.9	$562.0	$601.6	$595.8	-1.0%	14.8%	1.7%
NEW KENT	Coastal Virginia - Hampton Roads	$20.3	$21.2	$23.5	$25.0	$19.9	$27.9	$29.9	$29.4	$31.1	5.7%	24.3%	0.1%
NEWPORT NEWS CITY	Coastal Virginia - Hampton Roads	$281.3	$292.2	$310.6	$336.0	$220.5	$302.2	$333.4	$332.9	$330.2	-0.8%	-1.7%	0.9%
NORFOLK CITY	Coastal Virginia - Hampton Roads	$909.6	$965.8	$1,051.7	$1,152.1	$726.9	$1,126.6	$1,344.2	$1,435.0	$1,504.9	4.9%	30.6%	4.3%
POQUOSON CITY	Coastal Virginia - Hampton Roads	$9.9	$10.1	$10.3	$10.6	$7.9	$11.3	$12.2	$13.2	$13.4	0.8%	25.5%	0.0%
PORTSMOUTH CITY	Coastal Virginia - Hampton Roads	$57.1	$58.5	$58.9	$61.4	$37.0	$58.3	$63.3	$138.3	$151.4	9.5%	146.7%	0.4%
SOUTHAMPTON	Coastal Virginia - Hampton Roads	$7.8	$7.8	$8.3	$9.0	$6.3	$8.4	$8.8	$8.8	$8.6	-2.4%	-3.7%	0.0%
SUFFOLK CITY	Coastal Virginia - Hampton Roads	$98.3	$102.1	$111.5	$112.5	$88.2	$120.0	$133.8	$139.9	$142.9	2.1%	27.0%	0.4%
SURRY	Coastal Virginia - Hampton Roads	$3.2	$3.3	$3.5	$3.7	$3.5	$3.9	$3.9	$3.8	$4.0	5.1%	8.5%	0.0%
VIRGINIA BEACH CITY	Coastal Virginia - Hampton Roads	$1,484.3	$1,594.2	$1,692.4	$1,790.6	$1,420.1	$2,121.8	$2,428.6	$2,501.4	$2,551.1	2.0%	42.5%	7.3%
WILLIAMSBURG CITY	Coastal Virginia - Hampton Roads	$405.4	$410.2	$430.2	$445.7	$228.2	$359.7	$442.5	$459.3	$460.7	0.3%	3.4%	1.3%
YORK	Coastal Virginia - Hampton Roads	$253.4	$263.3	$276.9	$280.8	$166.4	$264.9	$292.3	$297.5	$296.8	-0.2%	5.7%	0.8%
Regional Total	**Coastal Virginia - Hampton Roads**	**$4,616.1**	**$4,870.2**	**$5,172.6**	**$5,466.3**	**$3,853.9**	**$5,732.2**	**$6,542.1**	**$6,858.1**	**$7,006.3**	**2.2%**	**28.2%**	**19.9%**
ALEXANDRIA CITY	Northern Virginia	$770.4	$800.0	$832.3	$867.2	$445.4	$613.2	$800.7	$941.5	$1,015.6	7.9%	17.1%	2.9%
ARLINGTON	Northern Virginia	$3,836.7	$4,013.5	$4,184.2	$4,404.3	$1,905.8	$2,834.8	$3,859.8	$4,494.1	$4,764.1	6.0%	8.2%	13.6%
CAROLINE	Northern Virginia	$37.2	$40.1	$42.2	$44.2	$35.1	$47.4	$52.0	$54.9	$51.7	-5.8%	17.0%	0.1%
CULPEPER	Northern Virginia	$51.0	$53.4	$56.6	$58.9	$48.8	$64.8	$73.5	$76.6	$77.9	1.6%	32.3%	0.2%
FAIRFAX	Northern Virginia	$3,148.7	$3,309.2	$3,502.3	$3,657.7	$1,959.4	$2,395.4	$3,075.1	$3,624.5	$3,918.1	8.1%	7.1%	11.2%
FAIRFAX CITY	Northern Virginia	$114.9	$115.5	$119.0	$120.1	$65.5	$80.2	$104.3	$118.7	$120.7	1.7%	0.5%	0.3%
FALLS CHURCH CITY	Northern Virginia	$50.5	$54.1	$58.2	$59.4	$32.3	$46.1	$50.8	$58.0	$66.1	14.0%	11.3%	0.2%
FAUQUIER	Northern Virginia	$138.9	$141.7	$147.2	$139.3	$95.0	$143.3	$182.5	$182.1	$188.1	3.3%	35.1%	0.5%
FREDERICKSBURG CITY	Northern Virginia	$140.0	$145.0	$148.5	$146.6	$94.6	$131.5	$145.3	$151.2	$170.8	12.9%	16.5%	0.5%
LOUDOUN	Northern Virginia	$3,326.1	$3,571.2	$3,777.7	$3,945.8	$1,888.6	$3,040.8	$4,013.8	$4,516.9	$4,925.5	9.0%	24.8%	14.0%
MANASSAS CITY	Northern Virginia	$45.3	$46.2	$46.3	$46.2	$34.5	$54.0	$60.4	$60.5	$63.8	5.5%	38.2%	0.2%
MANASSAS PARK CITY	Northern Virginia	$5.5	$5.6	$4.9	$4.7	$3.1	$4.0	$4.1	$4.6	$4.6	-0.2%	-2.4%	0.0%
PRINCE WILLIAM	Northern Virginia	$601.1	$608.2	$645.4	$650.3	$452.4	$619.2	$674.3	$753.9	$779.9	3.5%	19.9%	2.2%
RAPPAHANNOCK	Northern Virginia	$38.7	$39.8	$44.1	$48.1	$41.9	$62.6	$69.7	$72.9	$70.4	-3.4%	46.5%	0.2%
SPOTSYLVANIA	Northern Virginia	$159.7	$162.6	$169.3	$182.2	$155.1	$212.1	$221.3	$239.0	$245.9	2.9%	34.9%	0.7%
STAFFORD	Northern Virginia	$161.4	$166.0	$173.8	$183.2	$144.4	$200.0	$220.3	$224.6	$236.8	5.4%	29.3%	0.7%
Regional Total	**Northern Virginia**	**$12,626.0**	**$13,271.9**	**$13,952.0**	**$14,558.2**	**$7,401.9**	**$10,549.5**	**$13,607.9**	**$15,574.0**	**$16,700.0**	**7.2%**	**14.7%**	**47.5%**
AUGUSTA	Shenandoah Valley	$100.3	$103.9	$109.2	$109.3	$83.8	$123.4	$137.1	$141.0	$144.4	2.4%	32.1%	0.4%
BUENA VISTA CITY	Shenandoah Valley	$5.8	$6.0	$6.1	$6.1	$4.3	$5.8	$6.1	$6.3	$6.9	9.5%	12.7%	0.0%
CLARKE	Shenandoah Valley	$14.4	$15.1	$15.8	$16.3	$11.4	$15.0	$15.8	$13.8	$13.4	-2.7%	-17.7%	0.0%
FREDERICK	Shenandoah Valley	$126.3	$130.6	$142.1	$143.9	$110.1	$164.2	$179.8	$184.6	$190.4	3.1%	32.3%	0.5%
HARRISONBURG CITY	Shenandoah Valley	$170.1	$179.7	$192.7	$207.6	$140.7	$214.7	$239.0	$242.2	$243.1	0.4%	17.1%	0.7%
LEXINGTON CITY	Shenandoah Valley	$39.5	$39.9	$42.2	$44.0	$30.8	$52.8	$62.8	$64.8	$68.8	6.1%	56.4%	0.2%
PAGE	Shenandoah Valley	$79.6	$81.4	$87.2	$90.1	$72.9	$111.1	$108.1	$108.7	$104.9	-3.5%	16.5%	0.3%
ROCKBRIDGE	Shenandoah Valley	$131.7	$135.7	$141.9	$142.3	$101.0	$139.9	$147.9	$147.7	$148.5	0.5%	4.4%	0.4%
ROCKINGHAM	Shenandoah Valley	$128.9	$133.8	$141.7	$150.3	$123.4	$177.7	$181.7	$200.4	$210.1	4.9%	39.8%	0.6%
SHENANDOAH	Shenandoah Valley	$114.9	$119.7	$125.6	$127.5	$100.8	$130.6	$138.8	$145.4	$152.5	4.9%	19.6%	0.4%
STAUNTON CITY	Shenandoah Valley	$51.7	$51.5	$57.5	$66.4	$45.2	$63.1	$77.6	$79.2	$77.5	-2.2%	16.7%	0.2%
WARREN	Shenandoah Valley	$63.4	$65.5	$68.9	$69.7	$54.5	$77.8	$81.5	$87.4	$95.8	9.6%	37.5%	0.3%
WAYNESBORO CITY	Shenandoah Valley	$55.1	$57.2	$60.0	$60.6	$47.3	$66.9	$73.0	$77.8	$85.9	10.4%	41.6%	0.2%
WINCHESTER CITY	Shenandoah Valley	$92.6	$95.8	$103.5	$106.6	$71.7	$96.1	$107.7	$103.5	$113.5	9.7%	6.5%	0.3%
Regional Total	**Shenandoah Valley**	**$1,174.4**	**$1,215.7**	**$1,294.4**	**$1,340.5**	**$997.8**	**$1,439.2**	**$1,557.0**	**$1,602.8**	**$1,655.7**	**3.3%**	**23.5%**	**4.7%**
BRUNSWICK	Southern Virginia	$10.7	$11.0	$11.2	$11.3	$8.8	$10.1	$10.7	$11.3	$12.0	6.7%	6.2%	0.0%
CHARLOTTE	Southern Virginia	$7.2	$7.5	$8.0	$8.3	$5.9	$7.1	$7.4	$8.0	$8.4	4.9%	2.1%	0.0%
DANVILLE CITY	Southern Virginia	$91.1	$91.6	$98.7	$103.8	$77.8	$100.0	$112.7	$179.8	$233.6	29.9%	125.0%	0.7%
EMPORIA CITY	Southern Virginia	$28.8	$29.7	$29.5	$25.6	$18.7	$25.8	$26.6	$28.0	$27.6	-1.5%	8.1%	0.1%
GREENSVILLE	Southern Virginia	$21.7	$23.0	$24.4	$27.0	$20.6	$26.4	$26.6	$27.1	$27.6	2.0%	2.2%	0.1%

HALIFAX	Southern Virginia	$40.9	$43.3	$46.5	$46.5	$36.8	$49.7	$53.2	$56.6	$55.1	-2.7%	18.4%	0.2%
HENRY	Southern Virginia	$31.9	$33.9	$37.3	$34.8	$29.8	$42.3	$45.4	$46.9	$50.5	7.8%	45.1%	0.1%
LUNENBURG	Southern Virginia	$4.2	$4.3	$4.5	$4.7	$4.0	$5.3	$5.3	$5.6	$5.2	-6.4%	10.6%	0.0%
MARTINSVILLE CITY	Southern Virginia	$24.3	$24.4	$25.4	$26.0	$20.2	$24.6	$25.0	$25.9	$27.7	6.9%	6.7%	0.1%
MECKLENBURG	Southern Virginia	$68.7	$71.2	$73.2	$78.4	$72.6	$100.7	$106.2	$115.0	$129.9	12.9%	65.7%	0.4%
PITTSYLVANIA	Southern Virginia	$21.5	$23.3	$23.3	$25.0	$21.4	$28.8	$31.5	$35.6	$41.6	17.1%	66.6%	0.1%
Regional Total	**Southern Virginia**	**$351.0**	**$363.3**	**$382.1**	**$391.4**	**$316.6**	**$420.7**	**$450.7**	**$539.8**	**$619.3**	**14.7%**	**58.2%**	**1.8%**
MONTGOMERY	Southwest Virginia - Blue Ridge Highlands	$186.3	$193.2	$209.7	$222.1	$145.9	$237.6	$275.9	$279.6	$293.7	5.1%	32.3%	0.8%
BRISTOL CITY	Southwest Virginia - Blue Ridge Highlands	$63.5	$64.8	$67.8	$70.0	$54.2	$80.8	$94.5	$157.4	$179.7	14.2%	156.6%	0.5%
WYTHE	Southwest Virginia - Blue Ridge Highlands	$103.6	$108.3	$112.3	$114.7	$86.5	$129.9	$144.7	$146.3	$153.1	4.7%	33.5%	0.4%
WASHINGTON	Southwest Virginia - Blue Ridge Highlands	$94.6	$98.2	$102.5	$103.2	$76.4	$115.2	$125.9	$127.5	$129.0	1.2%	25.1%	0.4%
PULASKI	Southwest Virginia - Blue Ridge Highlands	$65.1	$66.2	$70.3	$74.1	$56.4	$77.6	$81.7	$84.5	$90.5	7.1%	22.0%	0.3%
CARROLL	Southwest Virginia - Blue Ridge Highlands	$37.9	$41.4	$43.5	$42.0	$33.6	$46.8	$49.9	$52.9	$54.8	3.8%	30.5%	0.2%
GILES	Southwest Virginia - Blue Ridge Highlands	$25.5	$26.8	$28.4	$29.6	$21.4	$31.8	$33.3	$35.9	$37.5	4.5%	26.6%	0.1%
SMYTH	Southwest Virginia - Blue Ridge Highlands	$22.6	$22.4	$23.9	$25.8	$20.6	$27.3	$28.3	$28.6	$31.3	9.3%	21.1%	0.1%
PATRICK	Southwest Virginia - Blue Ridge Highlands	$19.7	$20.6	$22.2	$21.5	$17.3	$22.2	$23.0	$25.6	$30.0	17.1%	39.2%	0.1%
RADFORD CITY	Southwest Virginia - Blue Ridge Highlands	$19.9	$20.3	$20.9	$21.4	$13.3	$19.1	$20.2	$23.0	$25.6	11.3%	19.5%	0.1%
FLOYD	Southwest Virginia - Blue Ridge Highlands	$15.0	$16.1	$16.4	$16.1	$11.2	$16.3	$17.8	$18.3	$18.3	0.3%	13.5%	0.1%
GALAX CITY	Southwest Virginia - Blue Ridge Highlands	$14.5	$14.7	$15.5	$15.7	$11.6	$15.6	$16.2	$16.8	$18.0	6.9%	14.4%	0.1%
GRAYSON	Southwest Virginia - Blue Ridge Highlands	$9.0	$9.5	$9.6	$10.3	$9.8	$12.9	$13.1	$14.5	$13.9	-4.6%	34.4%	0.0%
BLAND	Southwest Virginia - Blue Ridge Highlands	$4.0	$4.3	$4.6	$4.8	$4.2	$5.0	$5.1	$5.2	$5.2	0.7%	7.8%	0.0%
Regional Total	**Southwest Virginia - Blue Ridge Highlands**	**$681.2**	**$706.7**	**$747.5**	**$771.6**	**$562.1**	**$838.2**	**$929.7**	**$1,016.2**	**$1,080.7**	**6.3%**	**40.1%**	**3.1%**
BUCHANAN	Southwest Virginia - Heart of Appalachia	$11.6	$11.8	$12.2	$12.3	$8.7	$11.2	$11.8	$12.4	$12.4	-0.1%	0.6%	0.0%
DICKENSON	Southwest Virginia - Heart of Appalachia	$12.1	$12.5	$12.6	$12.9	$9.1	$11.4	$12.9	$13.5	$12.9	-5.0%	-0.6%	0.0%
LEE	Southwest Virginia - Heart of Appalachia	$21.3	$21.7	$21.8	$21.7	$16.8	$21.9	$21.8	$22.2	$23.2	4.6%	7.2%	0.1%
NORTON CITY	Southwest Virginia - Heart of Appalachia	$13.9	$13.9	$14.7	$15.3	$11.1	$14.5	$15.5	$13.0	$14.2	9.5%	-7.1%	0.0%
RUSSELL	Southwest Virginia - Heart of Appalachia	$17.1	$17.3	$17.8	$17.7	$12.7	$16.6	$17.5	$18.0	$17.5	-2.7%	-0.9%	0.0%
SCOTT	Southwest Virginia - Heart of Appalachia	$26.1	$26.7	$27.4	$27.8	$19.1	$22.5	$23.0	$23.3	$23.1	-0.8%	-16.8%	0.1%
TAZEWELL	Southwest Virginia - Heart of Appalachia	$42.0	$42.0	$43.3	$44.1	$34.8	$44.9	$47.9	$55.2	$60.9	10.3%	38.2%	0.2%
WISE	Southwest Virginia - Heart of Appalachia	$54.5	$55.4	$55.7	$56.3	$43.2	$54.7	$58.0	$59.8	$61.5	2.8%	9.2%	0.2%
Regional Total	**Southwest Virginia - Heart of Appalachia**	**$198.6**	**$201.3**	**$205.5**	**$208.0**	**$155.5**	**$197.9**	**$208.2**	**$217.4**	**$225.7**	**3.8%**	**8.5%**	**0.6%**
ALLEGHANY	Virginia Mountains	$22.4	$22.9	$24.9	$25.2	$18.7	$25.0	$26.7	$28.5	$26.4	-7.4%	4.8%	0.1%
BATH	Virginia Mountains	$84.7	$87.6	$88.0	$85.4	$50.5	$80.9	$87.9	$100.0	$116.6	16.7%	36.6%	0.3%
BEDFORD	Virginia Mountains	$53.4	$56.3	$61.6	$65.7	$51.6	$66.7	$71.4	$81.4	$82.2	1.1%	25.2%	0.2%
BOTETOURT	Virginia Mountains	$50.2	$50.2	$52.5	$53.4	$39.5	$54.2	$60.4	$60.4	$59.8	-0.9%	12.1%	0.2%
COVINGTON CITY	Virginia Mountains	$17.2	$17.7	$17.6	$17.5	$11.8	$15.6	$16.3	$17.2	$17.4	0.7%	-0.8%	0.0%
CRAIG	Virginia Mountains	$3.0	$3.0	$3.0	$3.0	$2.4	$2.9	$2.9	$3.1	$3.2	3.3%	4.1%	0.0%
FRANKLIN	Virginia Mountains	$50.3	$52.2	$55.4	$56.9	$48.5	$65.6	$67.9	$72.2	$74.7	3.4%	31.1%	0.2%
HIGHLAND	Virginia Mountains	$1.7	$1.8	$1.9	$1.9	$1.2	$1.7	$1.9	$1.9	$2.2	16.5%	14.1%	0.0%
ROANOKE	Virginia Mountains	$94.3	$95.7	$103.3	$107.0	$79.1	$103.6	$115.1	$123.3	$132.3	7.3%	23.7%	0.4%
ROANOKE CITY	Virginia Mountains	$381.4	$393.8	$427.8	$439.0	$267.8	$363.4	$471.6	$508.3	$534.8	5.2%	21.8%	1.5%
SALEM CITY	Virginia Mountains	$74.5	$74.3	$80.8	$83.0	$58.2	$90.9	$112.2	$118.0	$121.5	2.9%	46.5%	0.3%
Regional Total	**Virginia Mountains**	**$832.9**	**$855.6**	**$916.9**	**$938.0**	**$629.3**	**$870.4**	**$1,034.3**	**$1,114.3**	**$1,171.1**	**5.1%**	**24.8%**	**3.3%**
VIRGINIA	**Statewide Totals**	**$25,194.5**	**$26,364.8**	**$27,873.8**	**$29,064.7**	**$17,516.3**	**$25,219.1**	**$30,344.3**	**$33,326.59**	**$35,129.3**	**5.4%**	**20.9%**	**100.0%**

*Lodging includes short-term rentals and second home spending

**Transportation includes both ground and air transportation

FOR AGENCY USE ONLY	
	Notes:
JPA#	

APPLICANTS

PLEASE PRINT OR TYPE ALL ANSWERS. If a question does not apply to your project, please print N/A (not applicable) in the space provided. ***If additional space is needed, attach extra 8 ½ x 11 inch sheets of paper.***

Check all that apply			
☐ Pre-Construction Notification ☐ (PCN) NWP # _____ *(For Nationwide Permits ONLY - No DEQ-VWP permit writer will be assigned)*	☐ SPGP ☐ PASDO-PGP SELF VERIFICATION *(Replaces Regional Permit 17 (RP-17))*	☐ DEQ Reapplication Existing permit number: _____	☐ Receiving federal funds Agency providing funding: _____

PREVIOUS ACTIONS RELATED TO THE PROPOSED WORK (Include all federal, state, and local pre application coordination, site visits, previous permits, or applications whether issued, withdrawn, or denied)

Historical information for past permit submittals can be found online with VMRC - https://webapps.mrc.virginia.gov/public/habitat/ - or VIMS - http://ccrm.vims.edu/perms/newpermits.html

Agency	Action / Activity	Permit/Project number, including any non-reporting Nationwide permits previously used (e.g., NWP 13)	Date of Action	If denied, give reason for denial

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION
The applicant(s) is/are the legal entity to which the permit may be issued (see How to Apply at beginning of form). The applicant(s) can either be the property owner(s) or the person/people/company(ies) that intend(s) to undertake the activity. The agent is the person or company that is representing the applicant(s). If a company, please also provide the company name that is registered with the State Corporation Commission (SCC), or indicate no registration with the SCC.

Legal Name(s) of Applicant(s)			Agent (if applicable)		
Accomack County, Attn: Michael T. Mason			Moffatt & Nichol, Attn: Ira Brotman		
Mailing address P.O. Box 388			Mailing address 101 West Main Street, Suite 3000		
City Accomac	State VA	ZIP Code 23301	City Norfolk	State VA	ZIP Code 23510
Phone number w/area code (757)787-5700	Fax		Phone number w/area code (757)628-8222	Fax	
Mobile	E-mail		Mobile	E-mail ibrotman@moffattnichol.com	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name and ID number (if applicable)		

Certain permits or permit authorizations may be provided via electronic mail. If the applicant wishes to receive their permit via electronic mail, please provide an e-mail address here: _____

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION (Continued)

Property owner(s) legal name, if different from applicant			Contractor, if known		
Mailing address			Mailing address		
City	State	ZIP code	City	State	ZIP code
Phone number w/area code	Fax		Phone number w/area code	Fax	
Mobile	E-mail		Mobile	E-mail	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name ID number (if applicable)		

2. PROJECT LOCATION INFORMATION

(Attach a copy of a detailed map, such as a USGS topographic map or street map showing the site location and project boundary, so that it may be located for inspection. Include an arrow indicating the north direction. Include the drainage area if the SPGP box is checked on Page 7.)

Street Address (911 address if available)	City/County/ZIP Code Accomack County
Subdivision	Lot/Block/Parcel #

Name of water body(ies) within project boundaries and drainage area (acres or square miles).
Folly Creek

Tributary(ies) to: Atlantic Ocean
Basin: _____ Sub-basin: _____
(*Example: Basin: James River Sub-basin: Middle James River*)

Special Standards (based on DEQ Water Quality Standards 9VAC25-260 et seq.): _____

Project type (check one)
_____ Single user (private, non-commercial, residential)
x Multi-user (community, commercial, industrial, government)
_____ Surface water withdrawal

Latitude and longitude at center of project site (decimal degrees): 37.69352 / -75.62528
(Example: 37.33164/-77.68200)

USGS topographic map name: Accomac/Metompkin Inlet

8-digit USGS Hydrologic Unit Code (HUC) for your project site (See http://cfpub.epa.gov/surf/locate/index.cfm): 02040304
If known, indicate the 10-digit and 12-digit USGS HUCs (see http://consapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm) :
0204030401 020403040103

Name of your project (*Example: Water Creek driveway crossing*) Folly Creek Maintenance Dredging

Is there an access road to the project? ☐ Yes ☑ No. If yes, check all that apply: ☐ public ☐ private ☐ improved ☐ unimproved

Total size of the project area (in acres): 5.65

2. PROJECT LOCATION INFORMATION (Continued)

Provide driving directions to your site, giving distances from the best and nearest visible landmarks or major intersections:

The site is accessible by boat, with the closest public ramp at the Folly Creek Public Boat Ramp off of Folly Creek Rd. on Folly Creek

Does your project site cross boundaries of two or more localities (i.e., cities/counties/towns)? ☐ Yes ☑ No

If so, name those localities:

3. DESCRIPTION OF THE PROJECT, PROJECT PRIMARY AND SECONDARY *PURPOSES*, PROJECT *NEED*, INTENDED USE(S), AND ALTERNATIVES CONSIDERED (Attach additional sheets if necessary)

- The purpose and need must include any new development or expansion of an existing land use and/or proposed future use of residual land.
- Describe the physical alteration of surface waters, including the use of pilings (#, materials), vibratory hammers, explosives, and hydraulic dredging, when applicable, and *whether or not tree clearing will occur* (include the area in square feet and time of year).
- Include a description of alternatives considered and measures taken to avoid or minimize impacts to surface waters, including wetlands, to the maximum extent practicable. Include factors such as, but not limited to, alternative construction technologies, alternative project layout and design, alternative locations, local land use regulations, and existing infrastructure
- For utility crossings, include both alternative routes and alternative construction methodologies considered
- For surface water withdrawals, public surface water supply withdrawals, or projects that will alter in stream flows, include the water supply issues that form the basis of the proposed project.

The project is to perform dredging of Folly Creek from the public boat ramp out towards the Atlantic Ocean with dredge extents ending around the pier for 24531 Ocean View Court, Accomac, VA. The dredged material will be placed uplands at a suitable area to be determined by the contractor.

Date of proposed commencement of work (MM/DD/YYYY) 6/1/2025	Date of proposed completion of work (MM/DD/YYYY) 6/1/2026
Are you submitting this application at the direction of any state, local, or federal agency? x Yes ____ No	Has any work commenced or has any portion of the project for which you are seeking a permit been completed? ____ Yes x No

If you answered "yes" to either question above, give details stating when the work was completed and/or when it commenced, who performed the work, and which agency (if any) directed you to submit this application. In addition, you will need to clearly differentiate between completed work and proposed work on your project drawings.

Are you aware of any unresolved violations of environmental law or litigation involving the property? ____ Yes X No

(If yes, please explain)

4. PROJECT COSTS

Approximate cost of the entire project, including materials and labor: $ 1,900,000

Approximate cost of only the portion of the project affecting state waters (channelward of mean low water in tidal areas and below ordinary high water mark in nontidal areas): $ 450,000

5. PUBLIC NOTIFICATION (Attach additional sheets if necessary)

Complete information for all property owners adjacent to the project site and across the waterway, if the waterway is less than 500 feet in width. If your project is located within a cove, you will need to provide names and mailing addresses for all property owners within the cove. If you own the adjacent lot, provide the requested information for the first adjacent parcel beyond your property line. Per Army Regulation (AR 25-51) outgoing correspondence must be addressed to a person or business.

Failure to provide this information may result in a delay in the processing of your application by VMRC.

Property owner's name	Mailing address	City	State	ZIP code
Upon Request				

Name of newspaper having general circulation in the area of the project: Eastern Shore Pilot

Address and phone number (including area code) of newspaper P.O. Box 517, Onley , VA, 23418 (757)446-2848

Have adjacent property owners been notified with forms in Appendix A? _____Yes X _____No (attach copies of distributed forms)

6. THREATENED AND ENDANGERED SPECIES INFORMATION

Please provide any information concerning the potential for your project to impact state and/or federally threatened and endangered species (listed or proposed). Attach correspondence from agencies and/or reference materials that address potential impacts, such as database search results or confirmed waters and wetlands delineation/jurisdictional determination. Include information when applicable regarding the location of the project in Endangered Species Act-designated or -critical habitats. Contact information for the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Virginia Dept. of Game and Inland Fisheries, and the Virginia Dept. of Conservation and Recreation-Division of Natural Heritage can be found on page 4 of this package.

7. HISTORIC RESOURCES INFORMATION

Note: Historic properties include but are not limited to archeological sites, battlefields, Civil War earthworks, graveyards, buildings, bridges, canals, etc. Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

Are any historic properties located within or adjacent to the project site? ____ Yes ____ No X _____ Uncertain

If Yes, please provide a map showing the location of the historic property within or adjacent to the project site.

Are there any buildings or structures 50 years old or older located on the project site? ____ Yes X ____ No _____ Uncertain

If Yes, please provide a map showing the location of these buildings or structures on the project site.

Is your project located within a historic district? ____ Yes X ____ No ____ Uncertain

If Yes, please indicate which district: _____

7. HISTORIC RESOURCES INFORMATION (Continued)

Has a survey to locate archeological sites and/or historic structures been carried out on the property?
___ Yes ___ No _x_ Uncertain

If Yes, please provide the following information: Date of Survey: _____

Name of firm: _____

Is there a report on file with the Virginia Department of Historic Resources? ____ Yes ____ No ___Uncertain

Title of Cultural Resources Management (CRM) report: _____

Was any historic property located? ____ Yes ____ No __ Uncertain

8. WETLANDS, WATERS, AND DUNES/BEACHES IMPACT INFORMATION

Report each impact site in a separate column. If needed, attach additional sheets using a similar table format. Please ensure that the associated project drawings clearly depict the location and footprint of each numbered impact site. For dredging, mining, and excavating projects, use Section 17.

	Impact site number 1	Impact site number 2	Impact site number 3	Impact site number 4	Impact site number 5
Impact description (use all that apply): F=fill EX=excavation S=Structure T=tidal NT=non-tidal TE=temporary PE=permanent PR=perennial IN=intermittent SB=subaqueous bottom DB=dune/beach IS=hydrologically isolated V=vegetated NV=non-vegetated MC=Mechanized Clearing of PFO (*Example: F, NT, PE, V)*	Transfer Area: T, TE, V, NV				
Latitude / Longitude (in decimal degrees)	~37.69404/-75.63212				
Wetland/waters impact area (square feet / acres)	975 sq ft /0.2 ac				
Dune/beach impact area (square feet)					
Stream dimensions at impact site (length and average width in linear feet, and area in square feet)					
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)					

8. WETLANDS/WATERS IMPACT INFORMATION (Continued)					
Cowardin classification of impacted wetland/water or geomorphological classification of stream *Example wetland: PFO; Example stream: 'C' channel and if tidal, whether vegetated or non-vegetated wetlands per Section 28.2-1300 of the Code of Virginia*					
Average stream flow at site (flow rate under normal rainfall conditions in cubic feet per second) and method of deriving it (gage, estimate, etc.)					
Contributing drainage area in acres or square miles (*VMRC cannot complete review without this information*)					
DEQ classification of impacted resource(s): Estuarine Class II Non-tidal waters Class III Mountainous zone waters Class IV Stockable trout waters Class V Natural trout waters Class VI Wetlands Class VII https://law.lis.virginia.gov					
For DEQ permitting purposes, also submit as part of this section a wetland and waters boundary delineation map – see (3) in the Footnotes section in the form instructions.					
For DEQ permitting purposes, also submit as part of this section a written disclosure of all wetlands, open water, or streams that are located within the proposed project or compensation areas that are also under a deed restriction, conservation easement, restrictive covenant, or other land-use protective instrument.					

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS

READ ALL OF THE FOLLOWING CAREFULLY BEFORE SIGNING

PRIVACY ACT STATEMENT: The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972. These laws require that individuals obtain permits that authorize structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters prior to undertaking the activity. Information provided in the Joint Permit Application will be used in the permit review process and is a matter of public record once the application is filed. Disclosure of the requested information is voluntary, but it may not be possible to evaluate the permit application or to issue a permit if the information requested is not provided.

CERTIFICATION: I am hereby applying for permits typically issued by the DEQ, VMRC, USACE, and/or Local Wetlands Boards for the activities I have described herein. I agree to allow the duly authorized representatives of any regulatory or advisory agency to enter upon the premises of the project site at reasonable times to inspect and photograph site conditions, both in reviewing a proposal to issue a permit and after permit issuance to determine compliance with the permit.

In addition, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS (Continued)

Is/Are the Applicant(s) and Owner(s) the same? ☑ *Yes* ☐ *No*

Legal name & title of Applicant Accomack County, Attn: Michael T. Mason	Second applicant's legal name & title, if applicable
Applicant's signature	Second applicant's signature
Date	Date
Property owner's legal name, if different from Applicant	Second property owner's legal name, if applicable
Property owner's signature, if different from Applicant	Second property owner's signature
Date	Date

CERTIFICATION OF AUTHORIZATION TO ALLOW AGENT(S) TO ACT ON APPLICANT'S(S') BEHALF (IF APPLICABLE)

I (we), Michael T. Mason (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

hereby certify that I (we) have authorized Moffatt & Nichol (and) _____
AGENT'S NAME(S) – *complete the second blank if more than one Agent*
to act on my (our) behalf and take all actions necessary to the processing, issuance, and acceptance of this permit and any and all standard and special conditions attached. I (we) hereby certify that the information submitted in this application is true and accurate to the best of my (our) knowledge.

Applicant's signature	Second applicant's signature, if applicable
Date	Date
Agent's signature and title	Second agent's signature and title, if applicable
Date	Date

CONTRACTOR ACKNOWLEDGEMENT (IF APPLICABLE)

I (we), _____ (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

have contracted _____ (and) _____
CONTRACTOR'S NAME(S) – *complete the second blank if more than one Contractor*

to perform the work described in this Joint Permit Application, signed and dated _____.

I (we) will read and abide by all conditions as set forth in all federal, state, and local permits as required for this project. I (we) understand that failure to follow the conditions of the permits may constitute a violation of applicable federal, state, and local statutes and that we will be liable for any civil and/or criminal penalties imposed by these statutes.
In addition, I (we) agree to make available a copy of any permit to any regulatory representative visiting the project site to ensure permit compliance. If I (we) fail to provide the applicable permit upon request, I (we) understand that the representative will have the option of stopping our operation until it has been determined that we have a properly signed and executed permit and are in full compliance with all of the terms and conditions.

Contractor's name or name of firm (printed/typed) n/a	Contractor's or firm's mailing address	
Contractor's signature and title	Contractor's license number	Date
Applicant's signature	Second applicant's signature, if applicable	
Date	Date	

END OF GENERAL INFORMATION

The following sections are activity-specific. Fill out only the sections that apply to your particular project.

10. PRIVATE PIERS, MARGINAL WHARVES, AND UNCOVERED BOAT LIFTS

~~Regional Permit 17 (RP-17), authorizes the installation and/or construction of open-pile piers, mooring structures/devices, fender piles, covered boathouses/boatslips, boatlifts, osprey pilings/platforms, accessory pier structures, and certain devices associated with shellfish gardening, for private use, subject to strict compliance with all conditions and limitations further set out in the RP-17 enclosure located at http://www.nao.usace.army.mil/Missions/Regulatory/RBregional/. In addition to the information required in this JPA, prospective permittees seeking authorization under RP-17 must complete and submit the 'Regional Permit 17 Checklist' with their JPA. A copy of the 'Regional Permit 17 Checklist' is found in Appendix B of this application package. If the prospective permittee answers "yes" (or "N/A", where applicable) to all of the questions on the 'Regional Permit 17 Checklist', the permittee is in compliance with RP-17 and will not receive any other written authorization from the Corps but may not proceed with construction until they have obtained all necessary state and local permits. **Note: If the prospective permittee answers "no" to any of the questions on the 'Regional Permit 17 Checklist' then their proposed structure(s) does not meet the terms and conditions of RP-17 and written authorization from the Corps is required before commencement of any work.**~~

~~If the prospective permittee answers "no" to any of the questions on the 'Regional Permit 17 Checklist' then their proposed structure(s) does not meet the terms and conditions of RP-17 and written authorization from the Corps is required before commencement of any work. In those circumstances, the following information must be included in the application and/or on the drawings in order for the application to be considered complete:~~

1. ~~The applicant **MUST** provide written justification/need for the encroachment if the proposed structure(s) will extend greater than one-fourth of the distance across the waterway measured from either mean high water to mean high water (including all channelward wetlands) or ordinary high water to ordinary high water (including all channelward wetlands). The measurement should be based on the narrowest distance across the waterway regardless of the orientation of the proposed structure(s).~~
2. ~~The applicant **MUST** provide written justification/need if the proposed structure(s) is greater than five (5) feet wide or there will be less than four (4) feet elevation between the decking and the vegetated wetlands substrate.~~
3. ~~The Corps **MAY** require depth soundings across the waterway at increments designated by the Corps project manager. Inclusion of depth sounding data in the original JPA submittal is highly recommended in order to expedite permit evaluation. Depth soundings are typically taken at 10-foot increments for waterways less than 200 feet wide and 20-foot increments for waterways greater than 200 feet wide. Please include the date and time the measurements were taken, whether the data was collected at mean low water (MLW) or MHW, and how the soundings were taken (e.g., tape, range finder, etc.).~~

Number of vessels to be moored at the pier or wharf: _____	Do you have an existing pier on your property? ____Yes____ No If yes, will it be removed? ____Yes ____No Is your lot platted to the mean low water shoreline? ____Yes ____No

In the spaces provided below, give the type (e.g., sail, power, skiff, etc.), size, and registration number of the vessel(s) to be moored

TYPE	LENGTH	WIDTH	DRAFT	REGISTRATION #

11. BOATHOUSES, GAZEBOS, COVERED BOAT LIFTS, AND OTHER ROOFED STRUCTURES OVER WATERWAYS

Number of vessels to be moored at the proposed structure: _____	Will the sides of the structure be enclosed? _____Yes _____No Area covered by the roof structure _____ square feet

In the spaces provided below, give the type (e.g., sail, power, skiff, etc.), size, and registration number of the vessel(s) to be moored

TYPE	LENGTH	WIDTH	DRAFT	REGISTRATION #

12. MARINAS AND COMMERCIAL, GOVERNMENTAL, AND COMMUNITY PIERS

Have you obtained the Virginia Department of Health's approval for sanitary facilities? _____Yes _____No
You will need to obtain this authorization or a variance before a VMRC permit will be issued.

Will petroleum products or other hazardous materials be stored or handled at the facility? _____Yes _____No
If your answer is yes, please attach your spill contingency plan.

Will the facility be equipped to off-load sewage from boats? _____Yes _____No

EXISTING: wet slips: _____ dry storage: _____	*PROPOSED:* wet slips: _____ dry storage: _____

13. FREE STANDING MOORING PILES, OSPREY NESTING POLES, MOORING BUOYS, AND DOLPHINS (not associated with piers)

Number of vessels to be moored: _____	Type and number of mooring(s) proposed: _____

In the spaces provided below, give the type (e.g., sail, power, skiff, etc.), size, and registration number of the vessel(s) to be moored

TYPE	LENGTH	WIDTH	DRAFT	REGISTRATION #

Give the name and complete mailing address(es) of the owner(s) of the vessel(s) if not owned by applicant (attach extra sheets if needed):

Do you plan to reach the mooring from your own upland property? _____Yes _____No
If "no," explain how you intend to access the mooring.

14. BOAT RAMPS

Will excavation be required to construct the boat ramp? _____Yes _____No. If "yes," will any of the excavation occur below the plane of the ordinary high water mark/mean high water line or in wetlands? _____Yes _____No. If "yes," you will need to fill out Section 17 for this excavation.
Where will you dispose of the excavated material?

_____

What type of design and materials will be used to construct the ramp (open pile design with salt treated lumber, concrete slab on gravel bedding, etc.)?

Location of nearest public boat ramp	Driving distance to that public ramp _____miles

Will other structures be constructed concurrent with the boat ramp installation? _____Yes _____No
If "yes," please fill out the appropriate sections of this application associated with those other activities.

15. TIDAL/NONTIDAL SHORELINE STABILIZATION STRUCTURES (INCLUDING BULKHEADS AND ASSOCIATED BACKFILL, RIPRAP REVETMENTS AND ASSOCIATED BACKFILL, MARSH TOE STABILIZATION, GROINS, JETTIES, AND BREAKWATERS, ETC.) Information on non structural, vegetative alternatives (i.e., Living Shoreline) for shoreline stabilization is available at http://ccrm.vims.edu/coastal_zone/living_shorelines/index.html.

Is any portion of the project maintenance or replacement of an existing and currently serviceable structure? _____Yes _____No
If yes, give length of existing structure: _____ linear feet

If your maintenance project entails replacement of a bulkhead, is it possible to construct the replacement bulkhead within 2 feet channelward of the existing bulkhead? _____Yes _____No If not, please explain below:

Length of proposed structure, including returns: _____linear feet

Average channelward encroachment of the structure from Mean high water/ordinary high water mark: _____ feet Mean low water: _____feet	*Maximum* channelward encroachment of the structure from Mean high water/ordinary high water mark: _____ feet Mean low water: _____feet
Maximum channelward encroachment form the back edge of the Dune _____feet	*Maximum* channelward encroachment from the back edge of the Beach _____feet

Describe the type of construction including all materials to be used (including all fittings). Will filter cloth be used? ____Yes ____No

What is the source of the backfill material? _____

What is the composition of the backfill material? _____

If rock is to be used, give the average volume of material to be used for every linear foot of construction: _____cubic yards
What is the volume of material to be placed below the plane of ordinary high water mark/mean high water? _____cubic yards

For projects involving stone:
Average weight of core material (bottom layers): _____pounds per stone (Class_____)
Average weight of armor material (top layers): _____pounds per stone (Class_____)

Are there similar shoreline stabilization structures in the vicinity of your project site? _____Yes _____No
If so, describe the type(s) and location(s) of the structure(s):

If you are building a groin or jetty, will the channelward end of the structure be marked to show a hazard to navigation? _____Yes _____No	Has your project been reviewed by the Shoreline Erosion Advisory Service (SEAS)? _____Yes _____No If yes, please attach a copy of their comments.

16. BEACH NOURISHMENT

Source of material and composition (percentage sand, silt, clay): _____	Volume of material: _____cubic yards

Area to be covered _____ square feet channelward of mean low water _____square feet channelward of mean high water

_____ square feet landward of mean low water _____square feet channelward of mean high water

Mode of transportation of material to the project site (truck, pipeline, etc.):

16. BEACH NOURISHMENT (Continued)

Describe the type(s) of vegetation proposed for stabilization and the proposed planting plan, including schedule, spacing, monitoring, etc. Attach additional sheets if necessary.

17. DREDGING, MINING, AND EXCAVATING

FILL OUT THE FOLLOWING TABLE FOR DREDGING PROJECTS

	NEW dredging				MAINTENANCE dredging			
	Hydraulic		Mechanical (clamshell, dragline, etc.)		Hydraulic		Mechanical (clamshell, dragline, etc.)	
	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet	Cubic yards	Square feet
Vegetated wetlands								
Non-vegetated wetlands								
Subaqueous land	17,150	246,000						
Totals								

Is this a one-time dredging event? ☐ Yes _____ No If "no", how many dredging cycles are anticipated: _____
(____ initial cycle in cu. yds.) (_____ subsequent cycles in cu. yds.)

Composition of material (percentage sand, silt, clay, rock):
Provide documentation (i.e., laboratory results or analytical reports) that *dredged* material from on-site areas is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site).

Fine grained material, Clay and sandy clay - See attached vibracore report for VC-FC- 8, 9, 10, 11 & 13

Please include a dredged material management plan that includes specifics on how the dredged material will be handled and retained to prevent its entry into surface waters or wetlands. If on-site dewatering is proposed, please include plan view and cross-sectional drawings of the dewatering area and associated outfall.

See attached DMMP.

Will the dredged material be used for any commercial purpose or beneficial use? _____Yes x_____No
If yes, please explain:

If this is a maintenance dredging project, what was the date that the dredging was last performed? _____
Permit number of original permit: _____ *(It is important that you attach a copy of the original permit.)*

17. DREDGING, MINING, AND EXCAVATING (Continued)

For mining projects: On separate sheets of paper, explain the operation plans, including: 1) the frequency (e.g., every six weeks), duration (i.e., April through September), and volume (in cubic yards) to be removed per operation; 2) the temporary storage and handling methods of mined material, including the dimensions of the containment berm used for upland disposal of dredged material and the need (or no need) for a liner or impermeable material to prevent the leaching of any identified contaminants into ground water; 3) how equipment will access the mine site; and 4) verification that dredging: a) will not occur in water body segments that are currently on the effective Section 303(d) Total Maximum Daily Load (TMDL) priority list (available at http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/TMDLProgramPriorities.aspx) or that have an approved TMDL; b) will not exacerbate any impairment; and c) will be consistent with any waste load allocation/limit/conditions imposed by an approved TMDL (see, "What's in my backyard" or subsequent spatial files at http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx to determine the extent of TMDL watersheds and impairment segments).

Have you applied for a permit from the Virginia Department of Mines, Minerals and Energy? _____Yes _____No If Yes:
Existing permit number:_____ Date permit issued: _____

Contributing drainage area: _____square miles	Average stream flow at site (flow rate under normal rainfall conditions): _____cfs

18. FILL (not associated with backfilled shoreline structures) AND OTHER STRUCTURES (other than piers and boathouses) IN WETLANDS OR WATERS, OR ON DUNES/BEACHES

Source and composition of fill material (percentage sand, silt, clay, rock):

_____

Provide documentation (i.e., laboratory results or analytical reports) that *fill* material from *off-site* locations is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site). Documentation is not necessary for fill material obtained from on-site areas.

Explain the purpose of the filling activity and the type of structure to be constructed over the filled area (if any):

Describe any structure that will be placed in wetlands/waters or on a beach dune and its purpose:

Will the structure be placed on pilings? ____ Yes ____ No	Total area occupied by any structure. _____ Square Feet
How far will the structure be placed channelward from the back edge of the dune? _____feet	How far will the structure be placed channelward from the back edge of the beach? _____feet

19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS

If proposed activities are being conducted for the purposes of compensatory mitigation, please attach separate sheets of paper providing all information required by the most recent version of the stream assessment methodology approved by the Norfolk District of the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality, in lieu of completing the questions below. Required information outlined by the methodology can be found at: http://www.nao.usace.army.mil/Missions/Regulatory/UnifiedStreamMethodology.aspx *or* http://www.deq.virginia.gov/Programs/Water/WetlandsStreams/Mitigation.aspx.

For all projects proposing stream restoration provide a completed Natural Channel Design Review Checklist and Selected Morphological Characteristics form. These forms and the associated manual can be located at: https://www.fws.gov/chesapeakebay/StreamReports/NCD%20Review%20Checklist/Natural%20Channel%20Design%20Checklist%20Doc%20V2%20Final%2011-4-11.pdf

Has the stream restoration project been designed by a local, state, or federal agency? ____ Yes ____ No. If yes, please include the name of the agency here: _____.

Is the agency also providing funding for this project? _____ Yes _____ No

Stream dimensions at impact site (length and average width in linear feet, and area in square feet):
L: _____(feet) AW:_____ (feet) Area:_____ (square feet)

Contributing drainage area: _____acres *or* _____square miles

19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS (Continued) 19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS (Continued)19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS (Continued)

Existing average stream flow at site (flow rate under normal rainfall conditions): _____cfs	Proposed average stream flow at site after modifications (flow rate under normal rainfall conditions): _____cfs

Explain, in detail, the method to be used to stabilize the banks:

Explain the composition of the existing stream bed (percent cobble, rock, sand, etc.):

Will low-flow channels be maintained in the modified stream channel? _____Yes _____No.
Describe how:

Will any structure(s) be placed in the stream to create riffles, pools, meanders, etc.? _____Yes _____No
If yes, please explain:

20. UTILITY CROSSINGS

Type of crossing: _____overhead _____trenched _____directionally-drilled

Method of clearing corridor of vegetation (check all that apply): ☐ mechanized land clearing that disturbs the soil surface
☐ cutting vegetation above the soil surface

Describe the materials to be used in the installation of the utility line (including gravel bedding for trenched installations, bentonite slurries used during direction-drilling, etc.) and a sequence of events to detail how the installation will be accomplished (including methods used for in-stream and dry crossings).

Will the proposed utility provide empty conduits for any additional utilities that may propose to co-locate at a later date? ____Yes ____ No.

For overhead crossings over navigable waterways (including all tidal waterways), please indicate the height of other overhead crossings or bridges over the waterway relative to mean high water, mean low water, or ordinary high water mark:

Nominal system voltage, if project involves power lines: _____

Total number of electrical circuits: _____

20. UTILITY CROSSINGS (Continued)

Will there be an excess of excavated material? _____Yes _____No
If so, describe the method that will be undertaken to dispose of, and transport, the material to its permanent disposal location and give that location:

Will any excess material be stockpiled in wetlands? _____Yes _____No
If so, will the stockpiled material be placed on filter fabric or some other type of impervious surface? _____Yes _____No

Will permanent access roads be placed through wetlands/streams? ____Yes _____No
If yes, will the roads be (check one) ☐ at grade ☐ above grade?

Will the utility line through wetlands/waters be continually maintained (e.g. via mowing or herbicide)? ____Yes _____No
If maintained, what is the maximum width? _____feet

21. ROAD CROSSINGS

Have you conducted hydraulic studies to verify the adequacy of the culverts? _____Yes _____No
If so, please attach a copy of the hydraulic study/report.
Virginia Department of Transportation (VDOT) standards require that the backwater for a 100 year storm not exceed 1 foot for all road, culvert, and bridge projects within FEMA-designated floodplains. Virginia Department of Environmental Quality (DEQ) requires pipes and culverts 24 inches or less in diameter to be countersunk three inches below the natural stream bed elevations, and pipes and culverts greater than 24 inches to be countersunk at least six inches below the natural stream bed elevations. Hydraulic capacity is determined based on the reduced capacity due to the countersunk position.

Will the culverts be countersunk below the stream bottom? _____Yes _____No. If no, explain:

If the project entails a bridged crossing and there are similar crossings in the area, what is the vertical distance above mean high water, mean low water, or ordinary high water mark of those similar structures? _____feet above _____
For all bridges proposed over navigable waterways (including all tidal water bodies), you will be required to contact the U.S. Coast Guard to determine if a permit is required of their agency.

On separate sheets of paper, describe the materials to be used, the method of construction (including the use of cofferdams), the sequence of construction events, and if bedrock conditions may be encountered. Include cross-sections and profile plans of the culvert crossings including wing walls or rip rap.

22. IMPOUNDMENTS, DAMS, AND STORMWATER MANAGEMENT FACILITIES

If the impoundment or dam is a component of a water withdrawal project, also complete Sections 24 through 26.

Will the proposed impoundment, dam, or stormwater management facility be used for agricultural purposes (e.g., in the operation of a farm)? For DEQ permitting purposes, a farm is considered to be a property or operation that produces goods for market.
___ Yes ___ No

What type of materials will be used in the construction (earth, concrete, rock, etc.)? _____

What is the source of these materials? _____

Provide the dimensions of proposed impoundment, dam, or stormwater management facility, including the height and width of all structures.

Storage capacity* of impoundment: _____acre-feet *should be given for the normal pool of recreational or farm ponds, or design pool for stormwater management ponds or reservoirs (the elevation the pond will be at for the design storm, e.g., 10-year, 24-hour storm)	Surface area** of impoundment: _____acres **should be given for the normal pool of recreational or farm ponds, or design pool for stormwater management ponds or reservoirs (the elevation the pond will be at for the design storm, e.g., 10-year, 24-hour storm)

22. IMPOUNDMENTS, DAMS, AND STORMWATER MANAGEMENT FACILITIES (Continued)

Is the proposed project excluded from the Virginia Dam Safety Regulations? ___ Yes ___ No ___ Uncertain

If not excluded, does your proposed project comply with the Virginia Dam Safety Regulations? ___ Yes ___ No ___ Uncertain

Does the proposed design include a vegetation management area per §10.1-609.2? ___ Yes ___ No ___ Uncertain
If your answer to these questions is no or uncertain, you should contact the Virginia Department of Conservation and Recreation's Dam Safety Program at (804) 371-6095, or reference the regulations on the Web at http://www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml

For stormwater management and flood control facilities:

Design storm event: _____year storm Retention time: _____hours

Current average flow (flow rate under normal rainfall conditions): _____cfs

Method used to derive average flow: _____

Proposed peak outflow for the design storm provided above: _____cfs

Has the facility been designed as an Enhanced Extended Detention Basin or an Extended Detention Basin in accordance with the Minimum Standard 3.07 of the Virginia Stormwater Management Handbook, Volume I (published by the Virginia Department of Conservation and Recreation, 1999), or in accordance with the latest version of this handbook? _____Yes _____No

Will the impoundment structure be designed to pass a minimum flow at all times? _____Yes _____No

If so, please give the minimum rate of flow: _____cfs

What is the drainage area upstream of the proposed impoundment? _____square miles

How much of your proposed impoundment structure will be located on the stream bed? _____square feet

What is the area of vegetated wetlands that will be excavated and/or back-flooded by the impoundment? _____ square feet

What is the *area and length* of streambed that will be excavated and/or back-flooded by the impoundment? _____ square feet
_____ linear feet

Are fish ladders being proposed to accommodate the passage of fish? _____Yes _____No

23. OUTFALLS NOT ASSOCIATED WITH PROPOSED WATER WITHDRAWAL ACTIVITIES

Type and size of pipe(s): _____

Daily rate of discharge: _____mgd

If the discharge will be thermally-altered, provide the maximum temperature: _____

Contributing drainage area: _____square miles Average daily stream flow at site:_____cfs

Have you received a Virginia Discharge Elimination System (VPDES) permit for the proposed project? ___ Yes ___ No.

If yes, please provide the VPDES permit number: _____.

If no, is there a permit action pending? ___ Yes ___ No. If pending, what is the facility name? _____.

The following sections are typically related to surface water withdrawal activities; Federal Energy Regulatory Commission license projects; or impacts likely to require instream flow limits. Examples of such projects include, but are not limited to, reservoirs, irrigation projects, power generation facilities, and public water supply facilities that may or may not have associated features, such as dams, intake pipes, outfall structures, berms, etc.

If completing these sections, enter "N/A" in any section that does not apply to the project.

24. INTAKES, OUTFALLS, AND WATER CONTROL STRUCTURES (INCLUDING ALL PROPOSED WATER WITHDRAWAL ACTIVITIES)

For intakes:

Type and size of pipe(s): _____

Type and size of pump(s): _____

Average and Maximum daily rate of withdrawal: _____ and _____ mgd

Velocity of withdrawal: _____ fps

Screen mesh size:_____ inches / _____ mm

If other sizing units, please specify:

_____

Contributing drainage area at withdrawal point(s):

_____ square miles

Average daily stream flow at withdrawal point(s) (flow rate under normal rainfall conditions): _____ cfs

Method(s) used to derive average daily stream flow

_____

Average annual stream flow at withdrawal point(s):

_____ cfs

Latitude and longitude of withdrawal point(s) (degrees, minutes, seconds): _____

For outfalls:

Type, size, and hydraulic capacity (under normal conditions) of pipe(s): _____, _____, and _____

Daily rate of discharge: _____ mgd

If the discharge will be thermally-altered, provide the maximum temperature: _____

Contributing drainage area at discharge point(s):

_____ square miles

Average daily stream flow at discharge point(s) (flow rate under normal rainfall conditions): _____cfs

Method(s) used to derive average daily stream flow

_____

Latitude and longitude of discharge point(s) (degrees, minutes, seconds): _____

For intakes and dams, use the table below to provide the median monthly stream flows in cubic feet per second (cfs) at the water intake or dam site (not at the stream gage; if there is not a gage at the intake or dam site, you will need to interpolate flows to the intake or dam site based upon the most closely related watershed in which there is an operational stream gage monitored by the United States Geologic Survey (USGS)). Median flow is the value at which half of the measurements are above and half of the measurements are below. Median is also sometimes referred to as the '50% exceedence flow'. The median flow generally must be calculated from USGS historical data. Please do not provide *mean (average)* flow.

Month	Median flow (cfs)	Month	Median flow (cfs)
January		July	
February		August	
March		September	
April		October	
May		November	
June		December	

24. INTAKES, OUTFALLS, AND WATER CONTROL STRUCTURES (Continued)

Describe the stream flow gages used, USGS stream flow gage site number and site name (e.g., USGS 01671100 Little River near Doswell, VA), the type of calculations used (such as drainage area correction factors), and the period of record that was used to calculate the median flows provided in the table above. Generally, the period of record should span a minimum of 30 years.

For interbasin transfer of water resources proposed from either the Chowan River, New River, Potomac River, Roanoke River, Big Sandy River, or Tennessee River basins to another river basin, provide the following information:

Destination location (discharge point) of the transfer:
8-digit USGS Hydrologic Unit Code (HUC) (See http://cfpub.epa.gov/surf/locate/index.cfm): _____ If known, indicate the 10-digit and 12-digit USGS HUCs (see http://consapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm):

_____ _____

Latitude and Longitude: _____- _____- _____/ _____- _____- _____

Provide any available historical low-flows at the intake or dam site.

Describe how the proposed withdrawal at the intake or dam site will impact stream flows in terms of rates, volumes, frequency, etc. (e.g., percent of the flow to be withdrawn, percent of withdrawal returned to the original source, etc.).

Describe how the withdrawal of water will vary over time. For example, will the withdrawal vary by the time of year, by the time of day, or by the time of week? Examples of projects that should describe variable withdrawals include, but are not limited to: power plant cooling withdrawals that increase and decrease seasonally; golf course irrigation; municipal water supply; nurseries; ski resorts that use water for snowmaking; and resorts with weekend or seasonal variations.

24. INTAKES, OUTFALLS, AND WATER CONTROL STRUCTURES (Continued)

Provide the amount of water that will be lost due to consumptive use. For the purpose of this application, consumptive use means the withdrawal of surface waters without recycling of said waters to their source or basin of origin. Examples of consumptive uses are water that is evaporated in cooling towers or by other means in power plants; irrigation water (all types); residential water use that takes place outside of the home; and residential water use both inside and outside of homes for residences served by septic systems. Projects that propose a transfer of water from one river basin to another and/or localities that sell water to other jurisdictions, should document the portion of the withdrawal that is not returned to the originating watershed.

Proposed monthly consumptive volume (million gallons): _____

Attach a map showing the *location* of the withdrawal and of the return of flow, and provide the *amount* of the return flow (million gallons).

For withdrawals proposed on an impoundment, provide a description of flow or release control structures. Include type of structure, rate of flow, size, capacity, invert elevation of outfall pipes referenced to the normal pool elevation, and the mechanism used to control release. Provide a description of available water storage facilities. Include the volume, depth, normal pool elevation, unusable storage volume and dimensions. If applicable, stage-storage relationship at the impounding structure (the volume of water in the impoundment at varying stages of water depth) and volume or rate of withdrawals from the storage facility.

25. WATER WITHDRAWAL USE(S), NEED, AND ALTERNATIVES *(Attach additional sheets if needed.)*

Describe the proposed use(s) and need for the surface water and information on how demand for surface water was determined. *Golf courses* must provide documentation to justify the amount of water withdrawal, such as the amount of acreage under irrigation, the acreage of fairways versus greens, type of turf grass, evapotranspiration, and irrigation efficiency. *Agricultural* users must supply documentation justifying their requested withdrawal amount, such as type of crop, livestock, or other agriculture animal, number of animals, watering needs, acres irrigated, inches of water applied, and frequency of application. *Other users* of withdrawals for purposes other than those described above must provide sufficient documentation to justify the requested withdrawal amounts.

25. WATER WITHDRAWAL USE(S), NEED, AND ALTERNATIVES (Continued)

Provide the following information at the water intake or dam site. Specify the units of measurement (e.g., million gallons per day, gallons per minute, cubic feet per second, etc.).

Proposed maximum instantaneous withdrawal _____

Proposed average daily withdrawal _____

Proposed maximum daily withdrawal _____

Proposed maximum monthly withdrawal _____

Proposed maximum annual withdrawal _____

Describe how the above withdrawals were calculated, including the relevant assumptions made in that calculation and the documentation or resources used to support the calculations, such as population projections, population growth rates, per-capita use, new uses, changes to service areas, and if applicable, evapotranspiration data and irrigation data.

For surface water withdrawals, public water supply withdrawals, and projects that will alter instream flows, provide information to establish the local water supply need. Attach additional sheets if needed.

EXISTING	PROJECTED
Existing supply sources, yields, and demands: _____ Peak day withdrawal: _____ Average daily withdrawal: _____ Safe yield: _____ Lowest daily flow of record: _____ Types of water uses (residential, public water supply, commercial, industrial, agricultural): _____ Existing water conservation measures and drought response plan, including what conditions trigger implementation: _____	Projected demands over a minimum 30-year planning period: _____ Projected demands in local or regional water supply plan (9VAC25-780 et seq.) or demand for the project service area, if that is smaller in area: _____ Statistical population (growth) trends: _____ Projected demands by type of water use: _____ Projected demands without water conservation measures: _____ Projected demands with long-term water conservation measures: _____

For surface water withdrawals other than public water supply, provide information or documentation that demonstrates alternate sources of water are available for the proposed project during times of reduced instream flow.

25. WATER WITHDRAWAL USE(S), NEED, AND ALTERNATIVES (Continued)

Provide information from the State Water Resources Plan (http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/WaterSupplyPlanning/StateWaterResourcesPlan.aspx) and the local or regional water supply plan that covers the area in which the proposed water withdrawal project is located (http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterSupplyPlanning/SWRP%20Final/App%20A%20Water%20Supply%20Plans%20and%20Participating%20Localities.pdf). Include information from the plan that pertains to projected demand, analysis of alternatives, and water conservation measures. Discuss any discrepancies between the water supply plan and the proposed project. For projects that propose a transfer of water resources from the Chowan River, New River, Potomac River, Roanoke River, Big Sandy River, or Tennessee River basins to another river basin, information should be provided from the water supply plans for both the source and receiving basins. Attach additional sheets if needed.

Provide an alternatives analysis for the proposed water withdrawal project, including the required range of alternatives to be analyzed; a narrative outlining the opportunities and status of regional efforts undertaken; and the criteria used to evaluate each alternative. The analysis must address all of the criteria contained in 9VAC25-360.

Describe any existing, flow-dependent beneficial uses along the affected stream reach. Include both instream and offstream uses. Describe the stream flow necessary to protect existing beneficial uses, how the proposed withdrawal will impact existing beneficial uses, and any measures proposed to mitigate any adverse impacts that may arise. For projects that propose a transfer of water resources from the Chowan River, New River, Potomac River, Roanoke River, Big Sandy River, or Tennessee River basins to another river basin, this analysis should include both the source and receiving basins. For the purposes of this application, beneficial instream uses include, but are not limited to, the protection of fish and wildlife habitat; maintenance of waste assimilation; recreation; navigation; and cultural and aesthetic values. Offstream beneficial uses include, but are not limited to, domestic uses (including public water supply); agricultural uses; electric power generation; commercial uses; and industrial uses.

Describe the aquatic life known to be present along the affected stream reach. Describe aquatic life that may be impacted by the proposed water withdrawal. Include the species' habitat requirements. For projects that propose a transfer of water resources from either the Chowan River, New River, Potomac River, Roanoke River, Big Sandy River, or Tennessee River basins to another river basin, this analysis should include both the source and receiving basins.

26. PUBLIC COMMENTS/ISSUES FOR MAJOR WATER WITHDRAWALS OR INTERBASIN TRANSFERS

For new or expanded surface water supply projects, use separate sheets of paper to summarize the steps taken to seek public input per 9VAC25-210-320, and identify the issues raised during the public information process.

For transfer of water resources proposed from either the Chowan River, New River, Potomac River, Roanoke River, Big Sandy River, or Tennessee River basins to another river basin, if public input was not required per 9VAC25-210-320, summarize on separate sheets of paper any coordination and/or notice provided to the public, local/state government, and interested parties in the affected river basins and identify any issues raised.

APPENDIX A

Adjacent Property Owner's Acknowledgement Form

I, _____, own land next to/ across the water from/ in the same cove
(print adjacent property owner's name)

as the land of _____.
(print applicant's name)

I have reviewed the applicant's project drawings dated _____ to be submitted for all
(date of drawings)

necessary federal, state, and local permits.

_____ I have no comment regarding the proposal

_____ I do not object to the proposal

_____ I object to the proposal

The applicant has agreed to contact me for additional comments if the proposal changes prior to construction of the project.

(Before signing this form, please be sure that you have checked the appropriate option above)

_____
Adjacent property owner's signature

_____
Date

NOTE: IF YOU OBJECT TO THE PROPOSAL, THE REASON(S) YOU OPPOSE THE PROJECT MUST BE SUBMITTED TO VMRC IN WRITING. AN OBJECTION WILL NOT NECESSARILY RESULT IN A DENIAL OF A PERMIT FOR THE PROPOSED WORK. HOWEVER, VALID COMPLAINTS WILL BE GIVEN FULL CONSIDERATION DURING THE PERMIT REVIEW PROCESS.

APPENDIX A

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I, _____, own land next to/ across the water from/ in the same cove
(print adjacent property owner's name)

as the land of _____.
(print applicant's name)

I have reviewed the applicant's project drawings dated _____ to be submitted for all
(date of drawings)

necessary federal, state, and local permits.

_____ I have no comment regarding the proposal

_____ I do not object to the proposal

_____ I object to the proposal

The applicant has agreed to contact me for additional comments if the proposal changes prior to construction of the project.

(Before signing this form, please be sure that you have checked the appropriate option above)

_____
Adjacent property owner's signature

_____
Date

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Dredged Material Management Plan

Folly Creek Maintenance Dredging

Folly Creek, located on the seaside of the Eastern Shore in the County of Accomack, requires maintenance dredging to restore navigability.

This Dredged Material Management Plan (DMMP) summarizes the existing conditions, materials to be dredged, volumes to be dredged, dredging methods and placement of the dredged material. The permit requests dredging an approximate 5,000 linear feet of Folly Creek from Folly Creek boat ramp to the east. The dredged material is proposed to be placed within an upland placement area to be selected by the contractor.

Existing Conditions. Condition surveys, as shown on the permit drawings, show shoaling along this channel and the need for dredging of this shallow draft navigation channel.

Material to be Dredged. Vibracores and soil gradation testing have been completed and are attached for reference. The vibracores, within the vicinity of the proposed dredging reach, consist of predominately fine-grained material classified as clay (CH) and sandy clay (CL), with fines ranging from 70% to 96%.

Channel Dimensions and Volumes. The selected channel bottom width is 60 feet with assumed side slopes of 3:1 (Horizontal:Vertical). The alignment of the dredging extents in plan view can be found in the drawings. A dredge depth of -6 feet MLLW was selected based on other adjacent shallow draft navigation projects. With a 1-foot allowable paid overdepth, and 1-foot of non-pay overdepth shown. Providing for the requested maximum dredging template is to -8 feet MLLW. The estimated volume to be dredged within the paid template (to -7 feet MLLW) is 9,100 Cubic Yards, and 17,200 Cubic Yards if dredged to maximum allowable of -8 feet MLLW.

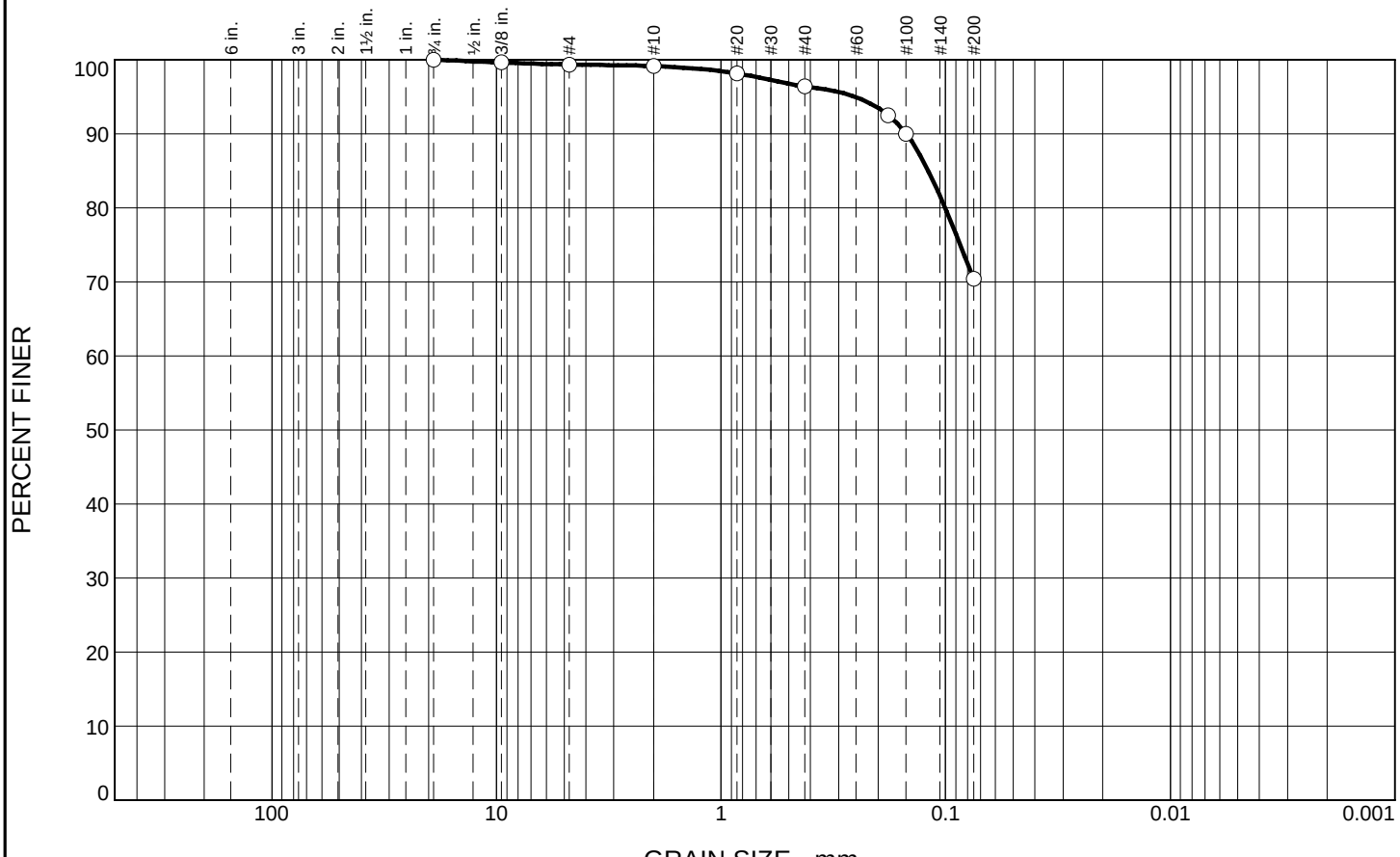
Equipment. Dredging is expected to be completed by mechanical dredging. As shown on the permit, the expected transfer site, to move material from barge/scow to truck, is the Folly Creek boat ramp, owned by the County of Accomack County. Mats will be used for access; the wetlands will be replanted as necessary to restore the existing vegetation.

Mechanical Dredging

- Deck (or flat-top) barges (for excavator) and hopper barges (for transporting dredged material to offload areas)
- Long-reach (estimated up to 60-foot) excavator on barge.
- Powered boat/tug for pushing barges.

Placement Area. Dredge material would be trucked to the permittable contractor selected upland placement area and unloaded within the designated area.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.2	2.7	26.0	70.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.6		
#4	99.3		
#10	99.1		
#20	98.1		
#40	96.4		
#80	92.5		
#100	90.0		
#200	70.4		

* (no specification provided)

Soil Description

Gray, Sandy Lean CLAY

Atterberg Limits

PL= 18 LL= 43 PI= 25

Coefficients

D_{90}= 0.1500 D_{85}= 0.1196 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(16)

Remarks

Natural Moisture = 56.0%

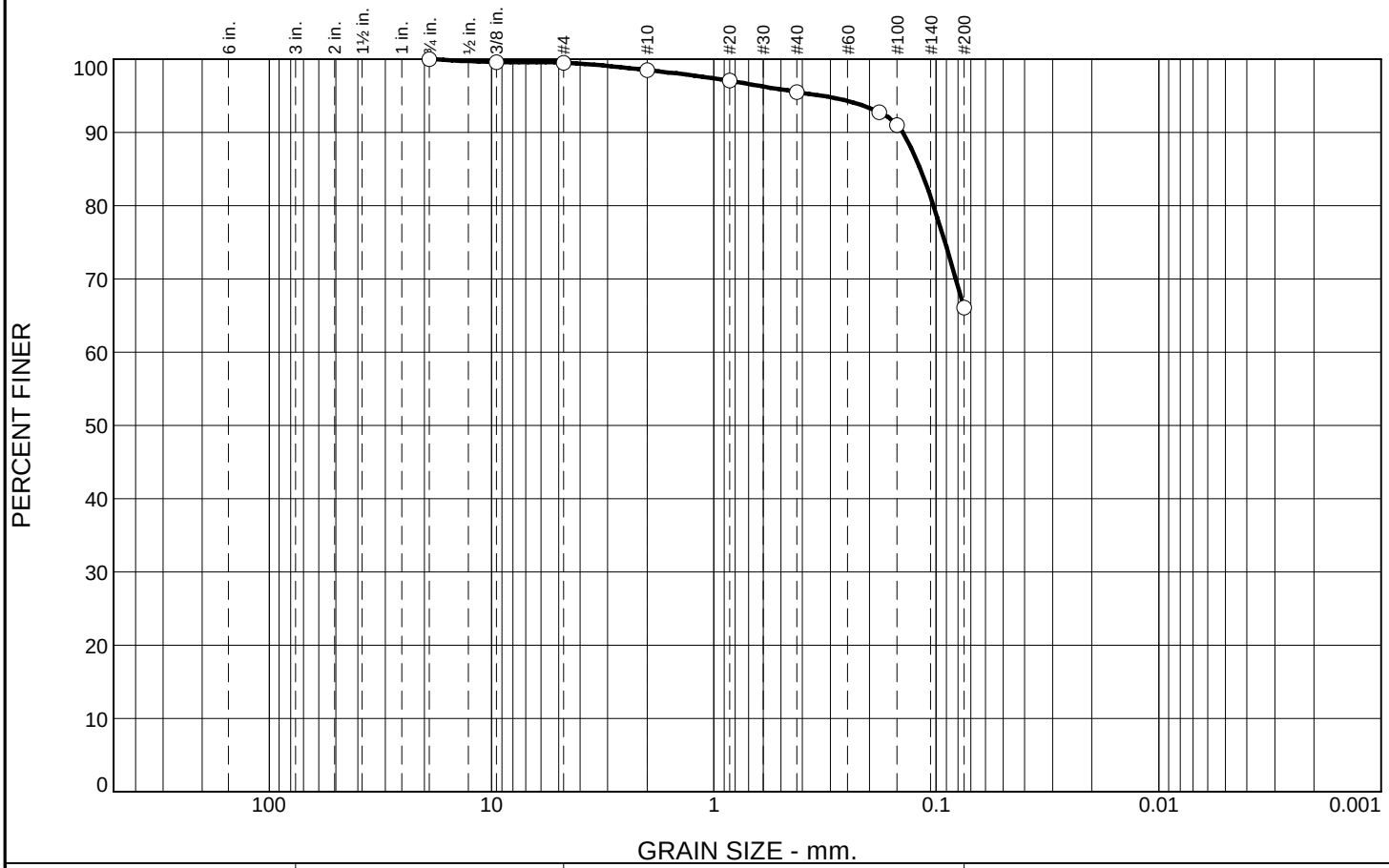
Location: VC-FC-08
Sample Number: VC-FC-08 **Date:**

Terracon

Client: Moffat & Nichol
Project: Folly Creek Dredge

Project No: K3217106 **Figure** 33A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	1.0	3.0	29.4	66.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.6		
#4	99.5		
#10	98.5		
#20	97.0		
#40	95.5		
#80	92.7		
#100	91.0		
#200	66.1		

* (no specification provided)

Soil Description

Gray, Sandy Fat CLAY

Atterberg Limits

PL= 34 LL= 84 PI= 50

Coefficients

D_{90}= 0.1419 D_{85}= 0.1179 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(33)

Remarks

Natural Moisture = 71.2%

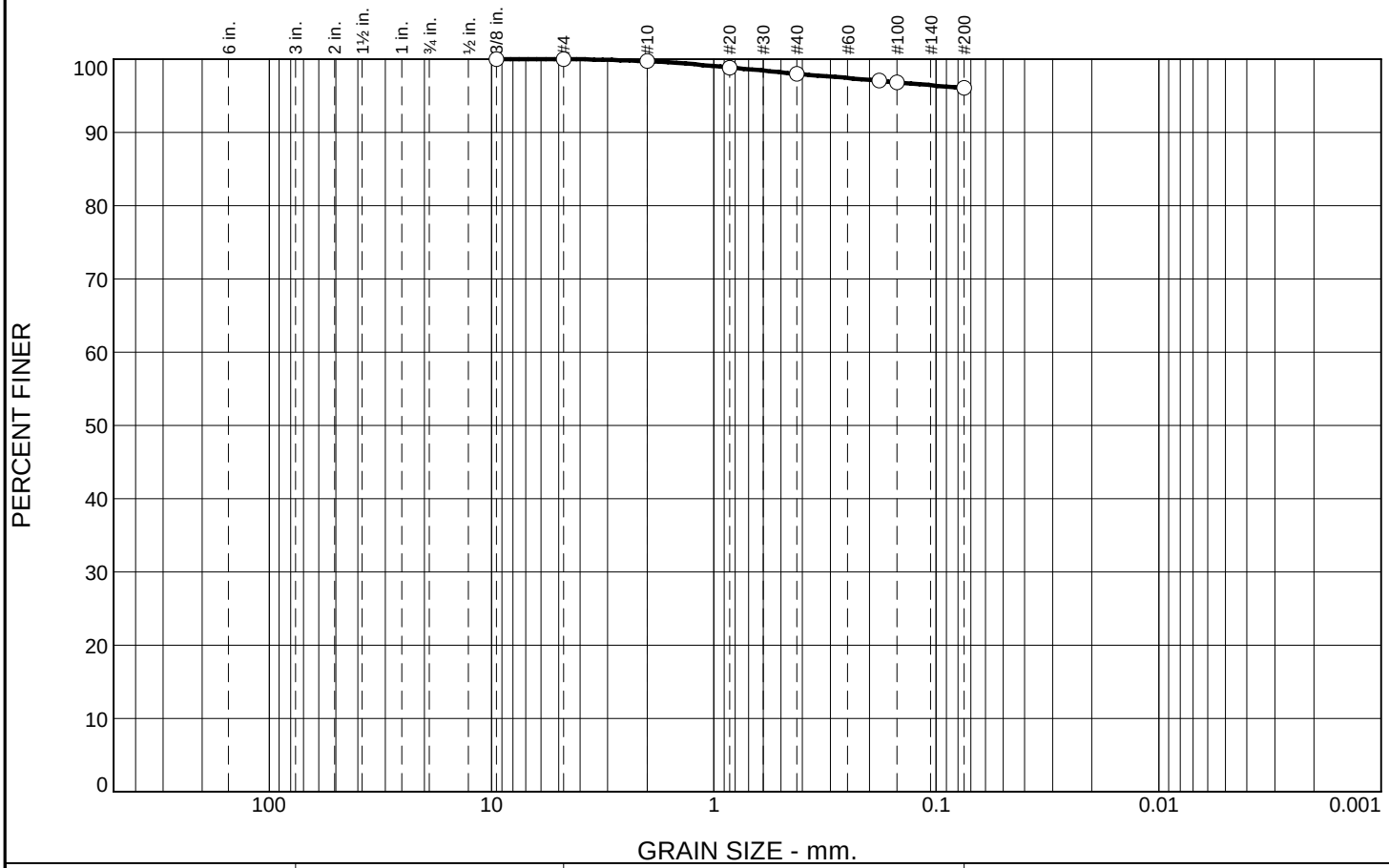
Location: VC-FC-09
Sample Number: VC-FC-09 **Date:**

Terracon

Client: Moffat & Nichol
Project: Folly Creek Dredge

Project No: K3217106 **Figure** 34A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.7	2.0	96.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	100.0		
#10	99.7		
#20	98.8		
#40	98.0		
#80	97.0		
#100	96.8		
#200	96.0		

* (no specification provided)

Soil Description

Gray, Fat CLAY

Atterberg Limits

PL= 29 LL= 68 PI= 39

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(44)

Remarks

Natural Moisture = 63.1%

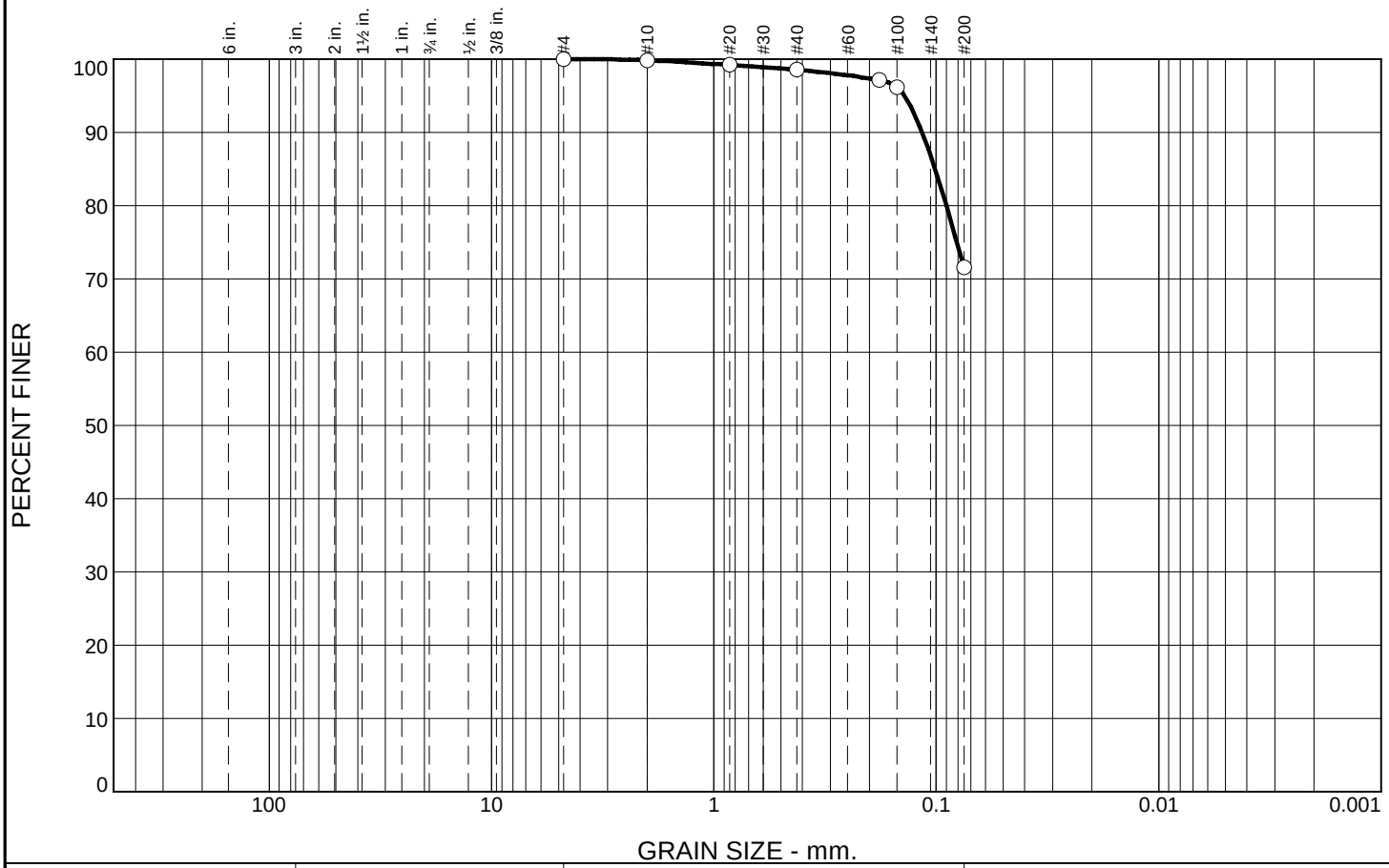
Location: VC-FC-10
Sample Number: VC-FC-10 **Date:**

Terracon

Client: Moffat & Nichol
Project: Folly Creek Dredge

Project No: K3217106 **Figure** 35A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.3	27.0	71.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.2		
#40	98.5		
#80	97.1		
#100	96.1		
#200	71.5		

* (no specification provided)

Soil Description

Gray, Fat CLAY with Sand

Atterberg Limits

PL= 26 LL= 61 PI= 35

Coefficients

D_{90}= 0.1156 D_{85}= 0.1011 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(26)

Remarks

Natural Moisture = 60.2%

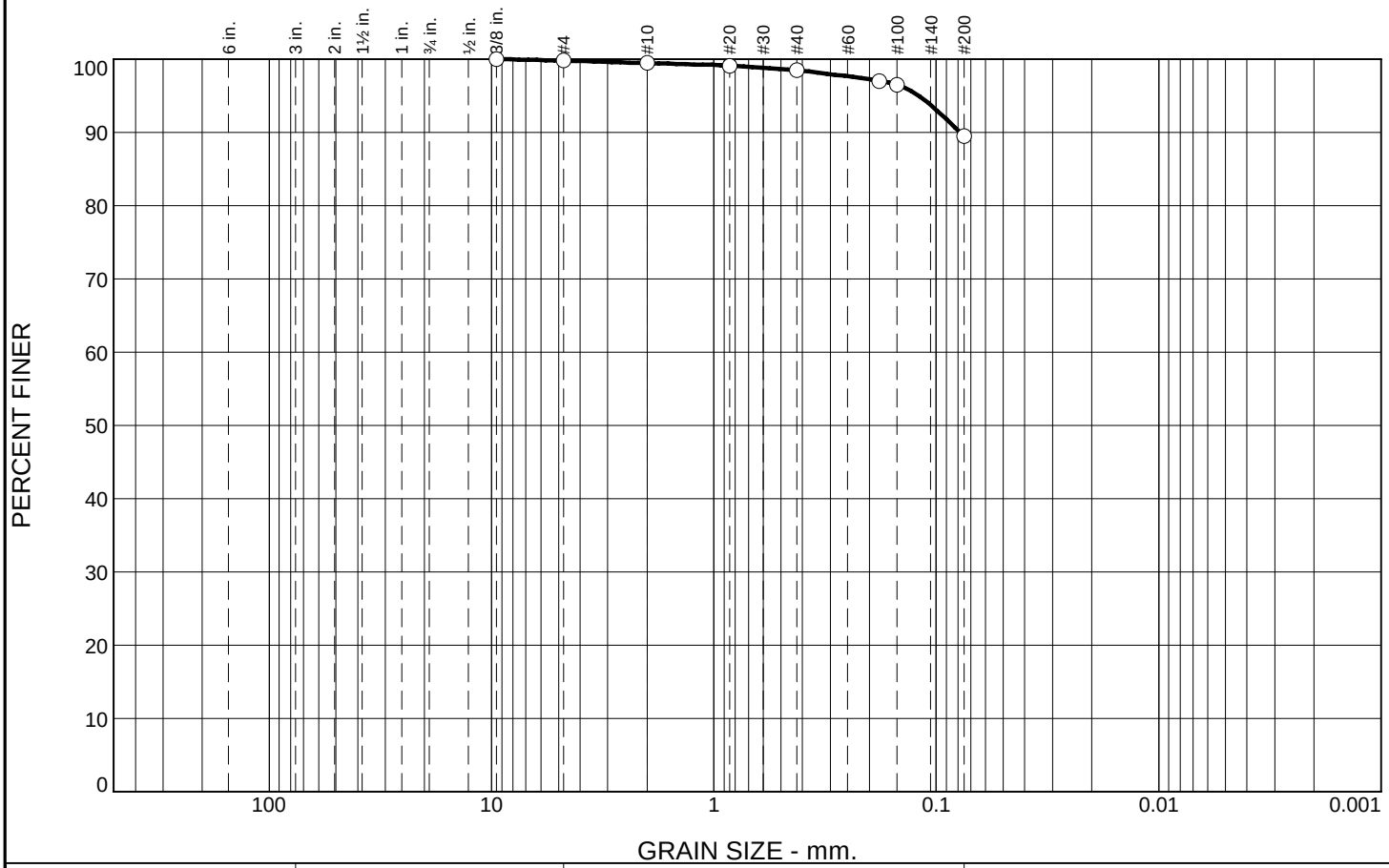
Location: VC-FC-11
Sample Number: VC-FC-11 **Date:**

Terracon

Client: Moffat & Nichol
Project: Folly Creek Dredge

Project No: K3217106 **Figure** 36A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.4	1.0	8.9	89.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.4		
#20	99.1		
#40	98.4		
#80	97.0		
#100	96.5		
#200	89.5		

* (no specification provided)

Soil Description

Gray, Fat CLAY

Atterberg Limits

PL= 33 LL= 82 PI= 49

Coefficients

D_{90}= 0.0782 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(52)

Remarks

Natural Moisture = 76.2%

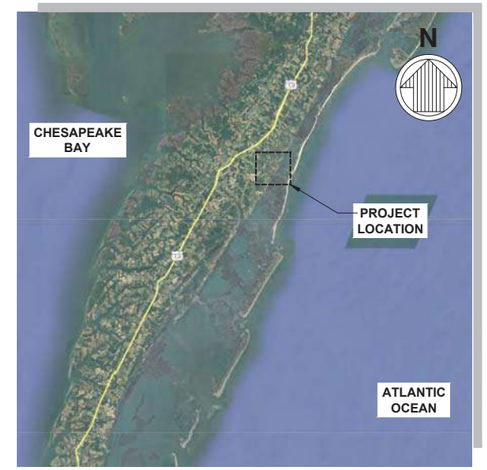
Location: VC-FC-13
Sample Number: VC-FC-13 **Date:**

Terracon

Client: Moffat & Nichol
Project: Folly Creek Dredge

Project No: K3217106 **Figure** 38A

THE COUNTY OF ACCOMACK, VA
DREDGING
FOR
FOLLY CREEK
ACCOMACK-NORTHAMPTON PLANNING DISTRICT COMMISSION (A-NPDC)



VICINITY MAP
NTS

Sheet List Table		
INDEX	SHEET NUMBER	SHEET TITLE
1	G-001	TITLE SHEET, LOCATION MAP AND INDEX OF SHEETS
2	C-100	OVERALL LOCATION MAP
3	C-101	FOLLY CREEK BOAT RAMP TRANSFER AREA
4	C-102	MAINTENANCE DREDGING PLAN - SHEET 1 OF 5
5	C-103	MAINTENANCE DREDGING PLAN - SHEET 2 OF 5
6	C-104	MAINTENANCE DREDGING PLAN - SHEET 3 OF 5
7	C-105	MAINTENANCE DREDGING PLAN - SHEET 4 OF 5
8	C-106	MAINTENANCE DREDGING PLAN - SHEET 5 OF 5
9	C-301	TYPICAL SECTIONS

LOCATION PLAN
NTS

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK
WATERWAY MAINTENANCE/
CHANNEL DREDGING
THE COUNTY OF ACCOMACK , VA

TITLE SHEET, LOCATION
MAP AND INDEX OF SHEETS

moffatt & nichol
101 W. MAIN STREET #3000
NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

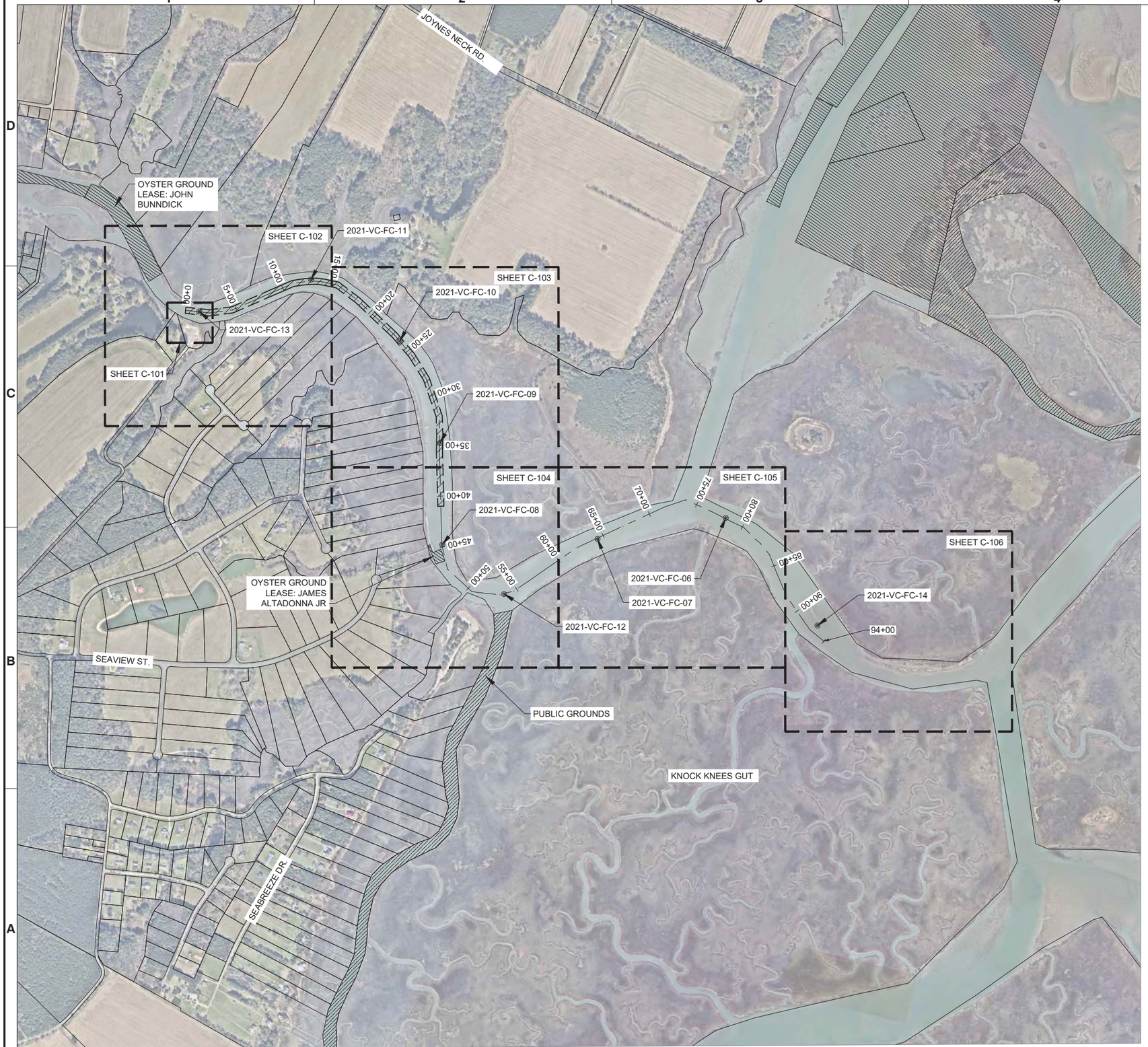
Designed by: GS		Date: DEC 09, 2024	Rev. –
Dwn by: ILC	Ckd by: IB	M&N Project No. 201429--05	
Reviewed by: IB		Drawing code:	
Submitted by: MOFFATT & NICHOL		Drawing Scale: Plot scale:1:1 (0 SHEET)	

SEAL

Sheet
Reference No.
G-001
INDEX: 1 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_SheetSet\201429005G-001 , Plotted: 12/9/2024 12:27 PM by CAMPBELL, IRA , Saved: 12/6/2024 10:45 AM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



LEGEND

- PROPERTY LINES
- CENTERLINE
- DREDGE AREA
- AQUACULTURE LEASE AREA (PRIVATE)
- AQUACULTURE LEASE AREA (PUBLIC)
- 2021-VC-FC-## ◉ VIBRACORE LOCATION, SEE APPENDIX FOR DETAILS

VIBRACORE POINT TABLE

VC	Easting (ft)	Northing (ft)
2021-VC-FC-01	12325037.78	3788806.16
2021-VC-FC-02	12324201.41	3788455.65
2021-VC-FC-03	12323616.12	3787904.23
2021-VC-FC-04	12322926.21	3787365.63
2021-VC-FC-05	12321318.86	3786536.99
2021-VC-FC-06	12317826.30	3786943.99
2021-VC-FC-07	12316569.40	3786737.92
2021-VC-FC-08	12315046.59	3786682.51
2021-VC-FC-09	12315025.70	3787679.69
2021-VC-FC-10	12314631.20	3788679.55
2021-VC-FC-11	12313758.08	3789281.13
2021-VC-FC-12	12315652.90	3786197.90
2021-VC-FC-13	12312663.14	3788969.47
2021-VC-FC-14	12318726.49	3785889.00

N

500' 0' 500' 1000'

SCALE: 1"=500'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

OVERALL LOCATION MAP

Date: DEC. 09, 2024
Rev. –
M&N Project No. 201429–05
Designed by: GS
Cad by: IB
Drawing code:
Dwn by: ILC
Reviewed by: IB
Drawing Scale:
Submitted by: MOFFATT & NICHOL
Plot scale: 1:1 (0 SHEET)

moffatt & nichol
101 W. MAIN STREET #3000
NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-100
INDEX: 2 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_Sheet\Set\20142905 C-100 ; Plotted: 12/9/2024 12:27 PM by: CAMPBELL, IRA ; Saved: 11/15/2024 7:39 AM by: ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

LEGEND

- PROPERTY LINES
- CENTERLINE
- DREDGE AREA,
- TIMBER MATTING
- TRANSFER AREA

WORKING POINT TABLE

(SEE DREDGING PLAN SHEETS FOR LOCATIONS)

WP	Easting (ft)	Northing (ft)
WP-01	12312529.69	3788980.51
WP-02	12312762.85	3788955.39
WP-03	12312989.12	3788984.91
WP-04	12313385.91	3789158.75
WP-05	12313581.83	3789243.48
WP-06	12313700.19	3789261.11
WP-07	12313805.39	3789266.03
WP-08	12313870.83	3789259.43
WP-09	12314020.08	3789228.39
WP-10	12314219.24	3789077.44
WP-11	12314580.55	3788735.69
WP-12	12314747.67	3788539.16
WP-13	12314890.70	3788308.16
WP-14	12315016.95	3787942.40
WP-15	12315020.24	3787786.30
WP-16	12315022.88	3787753.11
WP-17	12315019.10	3787606.12
WP-18	12315033.05	3787059.12

SITE RESTORATION NOTES:

1. TIMBER MATTING AREA. UPON COMPETION OF THE DREDGING, AND REMOVAL OF THE TIMBER MATING, THE IMPACTED AREA SHALL BE RE-GRADED, WITH CLEAN SAND ADDED AS NECESSARY TO RESTORE TO PRE-CONSTRUCTION ELEVATIONS/GRADES. ONCE GRADED THE DISTURBED AREA SHALL BE PLANTED WITH SPARTINA ALTERNIFLORA AT 1.5' ON CENTER SPACING. PLUGS SHALL BE 2" WITH A MIN STEM HEIGHT OF 10".

N

20' 0' 20' 40'

SCALE: 1"=20'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK
WATERWAY MAINTENANCE/
CHANNEL DREDGING
THE COUNTY OF ACCOMACK , VA

FOLLY CREEK
BOAT RAMP
TRANSFER AREA

Designed by: GS
Date: DEC 09, 2024
Rev. -
Dwn by: ILC
Cad by: IB
M&N Project No. 201429-05
Drawing code:
Reviewed by: IB
Submitted by: MOFFATT & NICHOL
Drawing Scale: Plot scale: 1:1 (0 SHEET)

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101 W. MAIN STREET #3000
NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-101
INDEX: 3 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_Sheet\Set\20142905 CG-101 , Plotted: 12/9/2024 12:28 PM by CAMPBELL, IRA , Saved: 12/9/2024 12:27 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

MATCHLINE: SHEET C-103

LEGEND

- CHANNEL CENTERLINE
- PROPERTY LINES
- (X) CONTOUR LINES
- X.XX SPOT ELEVATIONS
- DREDGE AREA
- AQUACULTURE LEASE AREA (PRIVATE)
- WORKING POINTS, SEE SHEET C-101 FOR TABLE

SURVEY NOTES:

1. HORIZONTAL CONTROL IS BASED ON VIRGINIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NAD 1983/1993 (HARN), US SURVEY FEET.
2. ALL ELEVATIONS SHOWN HEREON ARE NEGATIVE VALUES UNLESS OTHERWISE NOTED.
3. ELEVATIONS ARE IN FEET BASED ON NOS MEAN LOWER-LOW WATER (MLLW), 1983-2001 NTDE.
4. THE HYDROGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECT AND RESPONSIBLE CHARGE OF DAVE BERNSTEIN FROM AN ACTUAL SURVEY MADE UNDER HIS SUPERVISION. THAT ORIGINAL DATA WAS OBTAINED IN MARCH AND APRIL OF 2021. THIS MAP DATA INCLUDING METADATA MEETS MINIMUM ACCURACY STANDARDS UNLESS OTHERWISE NOTED.
5. SOURCE OF BACKGROUND IMAGE IS WWW.NEARMAPS.COM.

N

100' 0' 100' 200'

SCALE: 1"=100'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

MAINTENANCE DREDGING PLAN - SHEET 1 OF 5

Date: DEC. 09, 2024 | Rev. –
M&N Project No. 201429–05
Drawing code:
Drawing Scale:
Plot scale: 1:1 (0 SHEET)

Designed by: GS
Dwn by: ILC
Ckd by: IB
Reviewed by: IB
Submitted by: MOFFATT & NICHOL

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757-628-8222

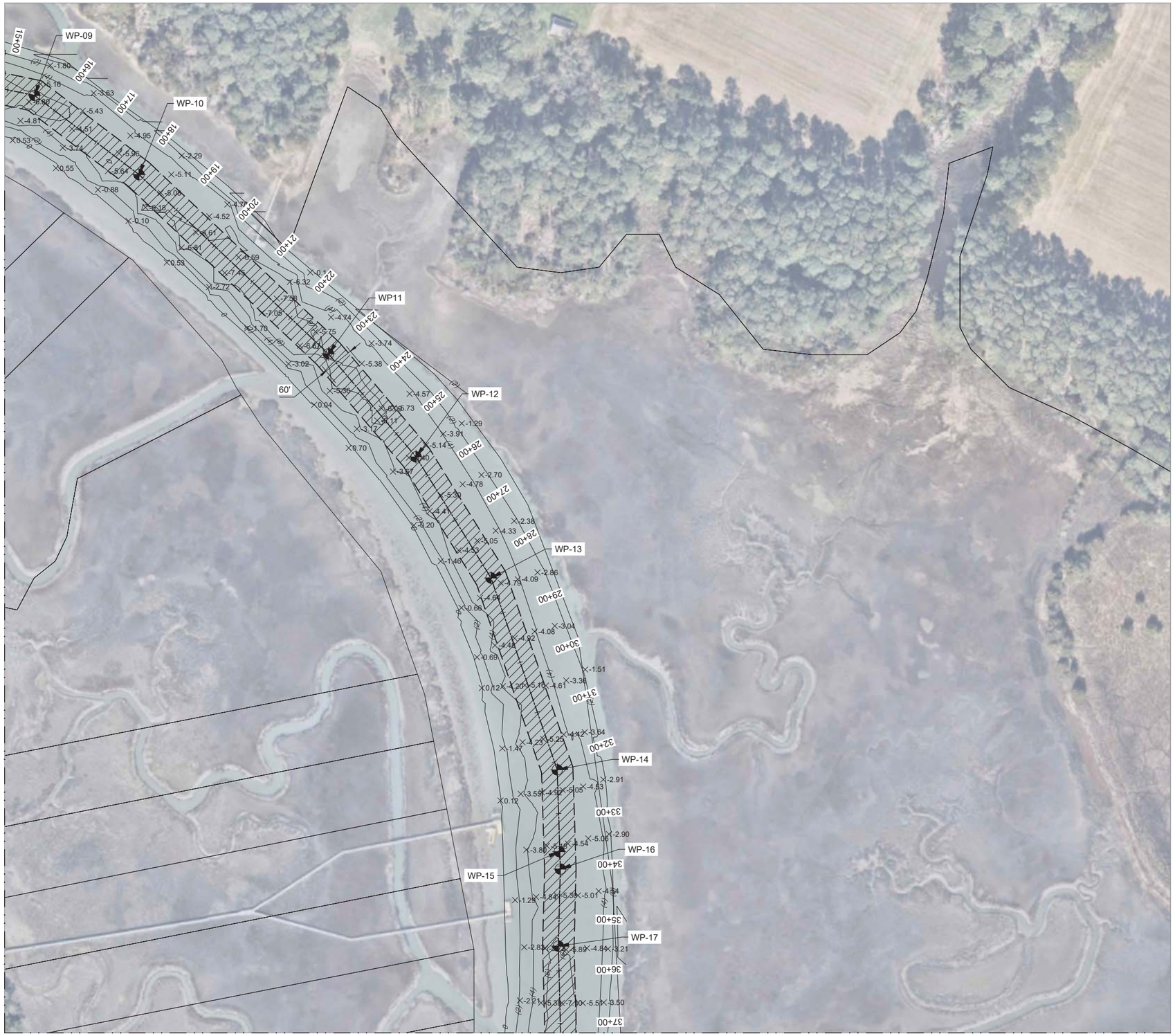
PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-102
INDEX: 4 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_SheetSet\201429\05C-101-107 - Plotted: 12/9/2024 12:28 PM by: CAMPBELL, IRA - Saved: 12/9/2024 12:11 PM by: ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



LEGEND

- CHANNEL CENTERLINE
- PROPERTY LINES
- (X) CONTOUR LINES
- X.XX SPOT ELEVATIONS
- DREDGE AREA
- WORKING POINTS, SEE SHEET C-101 FOR TABLE

N

100' 0' 100' 200'

SCALE: 1"=100'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

MAINTENANCE DREDGING PLAN - SHEET 2 OF 5

Designed by: GS
Date: DEC 09, 2024
Rev. –
Dwn by: ILC
Ckd by: IB
M&N Project No. 201429-05
Reviewed by: IB
Drawing code:
Submitted by: MOFFATT & NICHOL
Drawing Scale: Plot scale: 1:1 (0 SHEET)

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NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-103
INDEX: 5 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_Sheet\Set\201429\05C-101-107 ; Plotted: 12/9/2024 12:28 PM by CAMPBELL, IRA ; Saved: 12/9/2024 12:11 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

MATCHLINE: SHEET C-103

MATCHLINE: SHEET C-105

LEGEND

- CHANNEL CENTERLINE
- PROPERTY LINES
- (X) CONTOUR LINES
- DREDGE AREA
- AQUACULTURE LEASE AREA (PUBLIC)
- AQUACULTURE LEASE AREA (PRIVATE)
- WORKING POINTS, SEE SHEET C-101 FOR TABLE

N

100' 0' 100' 200'

SCALE: 1"=100'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

MAINTENANCE DREDGING PLAN - SHEET 3 OF 5

Designed by: GS
Date: DEC. 09, 2024
Rev. –
Dwn by: ILC
Ckd by: IB
M&N Project No. 201429–05
Reviewed by: IB
Drawing code:
Submitted by: MOFFATT & NICHOL
Drawing Scale: Plot scale: 1:1 (0 SHEET)

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PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-104
INDEX: 6 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_SheetSet\201429005C-101-107. Plotted: 12/9/2024 12:28 PM by CAMPBELL, IRA ; Saved: 12/9/2024 12:11 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

LEGEND

- CHANNEL CENTERLINE
- PROPERTY LINES
- (X) CONTOUR LINES
- X.XX SPOT ELEVATIONS
- DREDGE AREA

N

100' 0' 100' 200'

SCALE: 1"=100'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

MAINTENANCE DREDGING PLAN - SHEET 4 OF 5

Designed by: GS
Date: DEC 09, 2024
Rev. –
Dwn by: ILC
Cad by: IB
M&N Project No. 201429–05
Reviewed by: IB
Drawing code:
Submitted by: MOFFATT & NICHOL
Drawing Scale: Plot scale: 1:1 (0 SHEET)

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101 W. MAIN STREET #3000
NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-105
INDEX: 7 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_Sheets\Set\201429005C-101-107 ; Plotted: 12/9/2024 12:29 PM by CAMPBELL, IRA ; Saved: 12/9/2024 12:11 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

LEGEND

- CHANNEL CENTERLINE
- PROPERTY LINES
- (X) CONTOUR LINES
- X.XX SPOT ELEVATIONS
- DREDGE AREA

N

100' 0' 100' 200'

SCALE: 1"=100'

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

MAINTENANCE DREDGING PLAN - SHEET 5 OF 5

Designed by: GS
Dwn by: ILC
Ckd by: IB
Reviewed by: IB
Submitted by: MOFFATT & NICHOL
Date: DEC 09, 2024
Rev. –
M&N Project No. 201429-05
Drawing code:
Drawing Scale:
Plot scale: 1:1 (0 SHEET)

moffatt & nichol
101 W. MAIN STREET #3000
NORFOLK, VA 23510
757-628-8222

PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

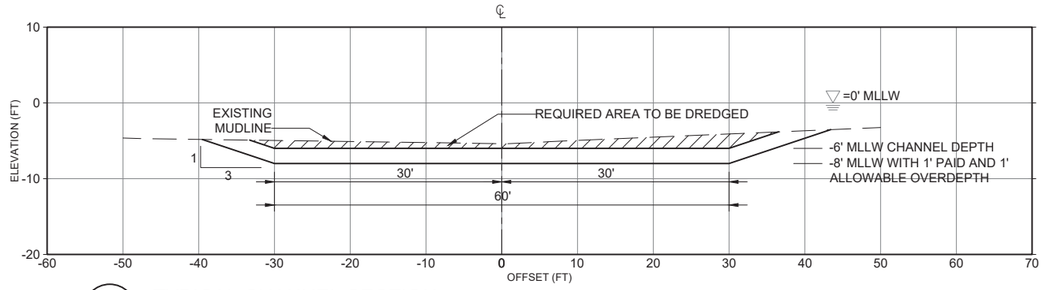
Sheet Reference No.
C-106
INDEX: 8 OF 9

File: Q:\NOR\201429-05\20 CADD_Active_SheetSet\201429\05C-101-107 - Plotted: 12/9/2024 12:29 PM by CAMPBELL, IRA - Saved: 12/9/2024 12:11 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

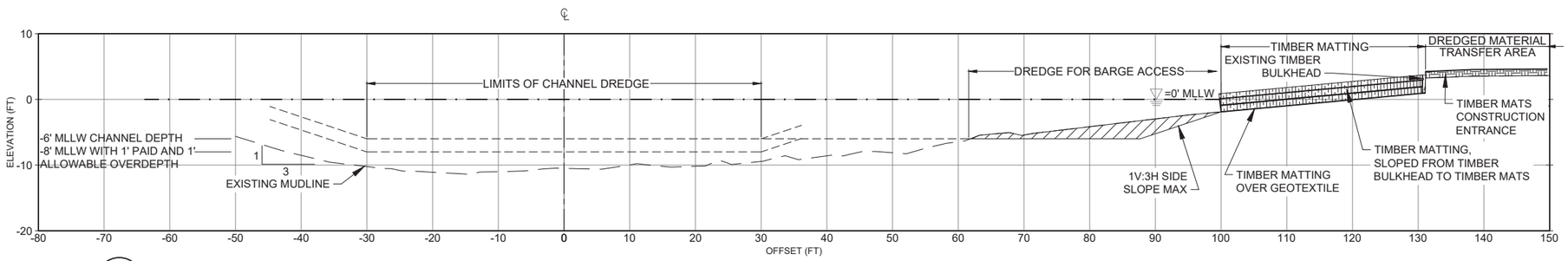
LEGEND

DREDGE AREA



A-A TYPICAL CHANNEL SECTION

SCALE: 1" = 10'



B1 C-101 SECTION - TRANSFER AREA

SCALE: 1" = 10'

NOTE:

1. STABILIZE SLOPE PER BANK & SITE STABILIZATION NOTES ON CG-001.

FOR PERMITS
ISSUED: 2024-12-09
NOT TO BE USED FOR CONSTRUCTION

Mark	Description	Date	Appr.

FOLLY CREEK WATERWAY MAINTENANCE/ CHANNEL DREDGING THE COUNTY OF ACCOMACK , VA

TYPICAL SECTIONS

Designed by: GS | Date: DEC 09, 2024 | Rev. –
Dwn by: ILC | Ckd by: IB | M&N Project No. 201429–05
Reviewed by: IB | Drawing code:
Submitted by: MOFFATT & NICHOL | Drawing Scale: Plot scale:1:1 (0 SHEET)

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NORFOLK, VA 23510
757-628-8222

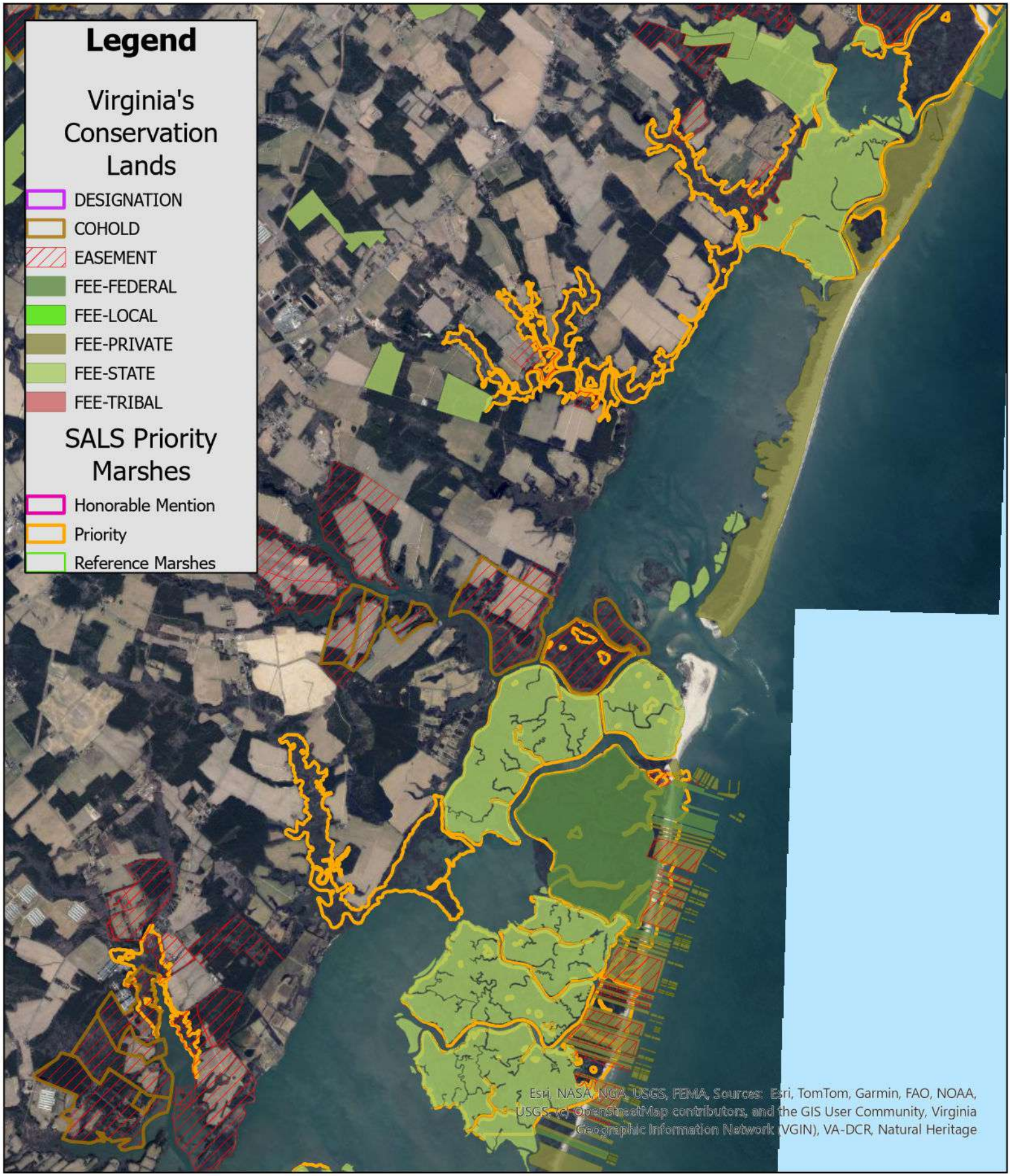
PREPARED FOR:
THE COUNTY OF ACCOMACK, VA

SEAL

Sheet Reference No.
C-301
INDEX: 7 OF 8

File: Q:\NOR\201429-05\20 CADD_Active_SheetSet\201429305C-301 ; Plotted: 12/9/2024 12:30 PM by CAMPBELL, IRA ; Saved: 12/9/2024 12:23 PM by ICAMPBELL

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



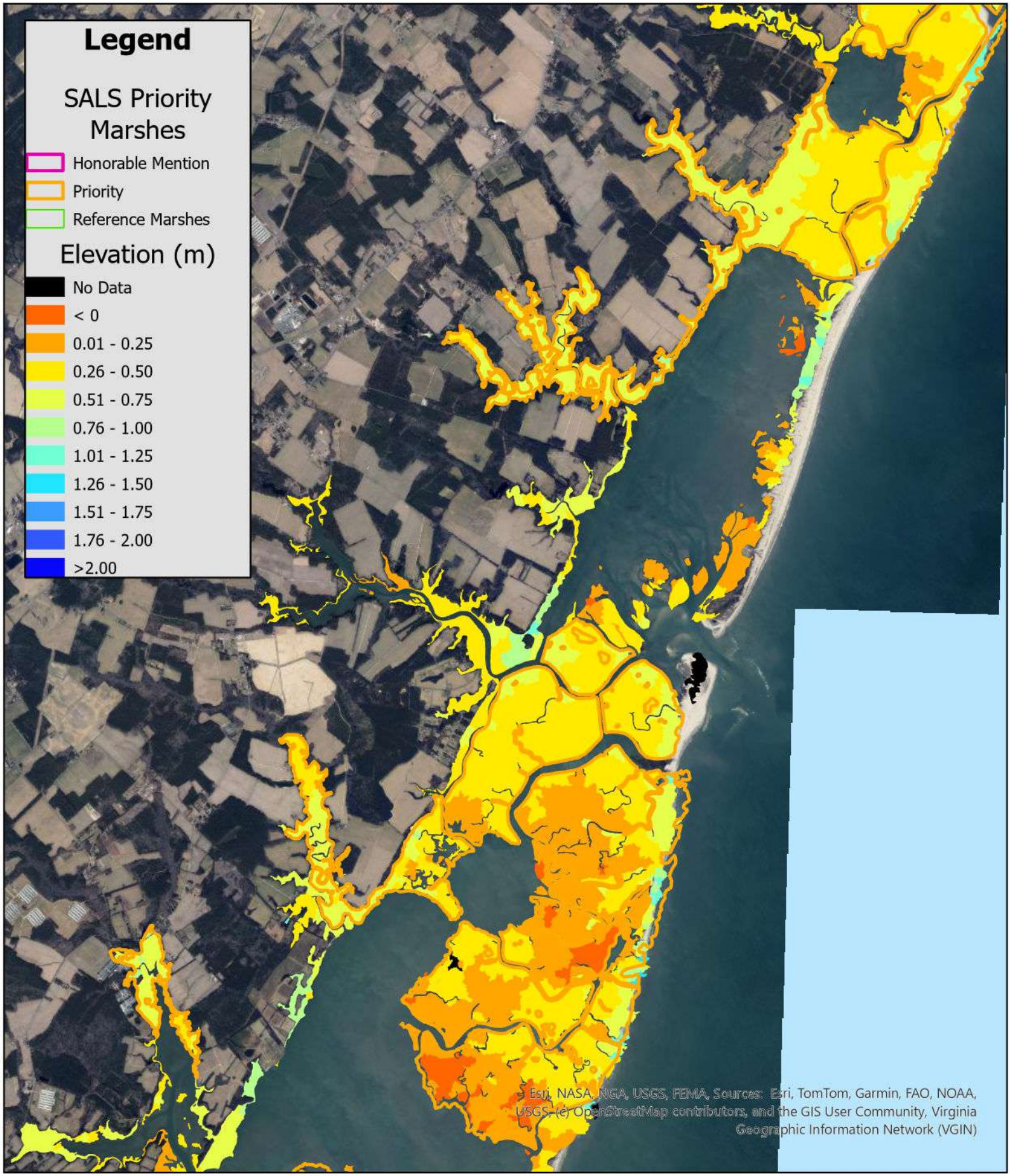
N

0 0.5 1 2 Kilometers

Potential Dredge Material Placement Sites for Parker's Creek and Folly Creek

Map shows priority areas for Saltmarsh Sparrow habitat restoration and landowner information

VIRGINIA DWR

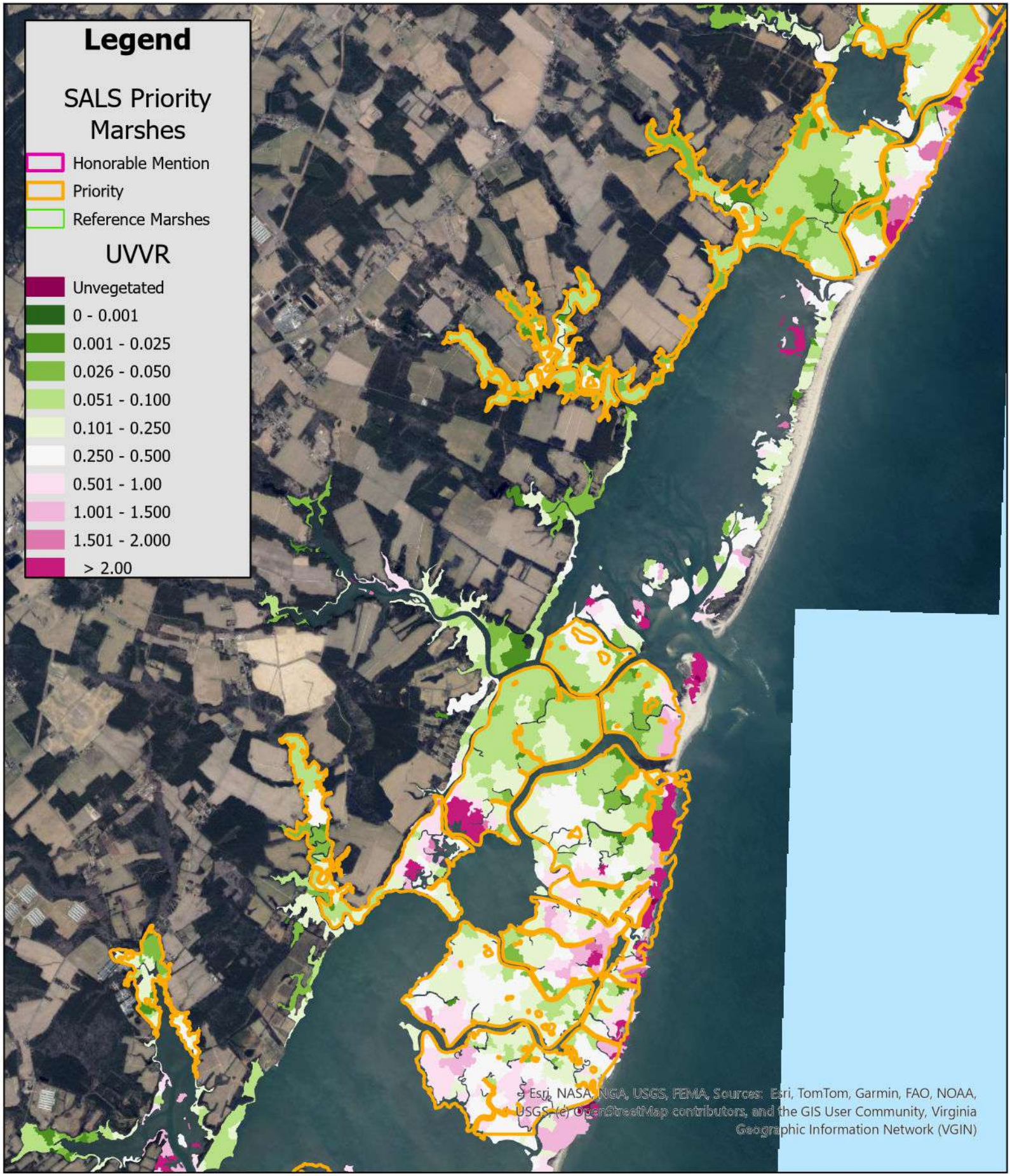


N

0 0.5 1 2 Kilometers

Potential Dredge Material Placement Sites for Parker's Creek and Folly Creek

Marsh elevation map



N

0 0.5 1 2 Kilometers

Potential Dredge Material Placement Sites for Parker's Creek and Folly Creek

Unvegetated-vegetated marsh ratio (UVVR)

Marshes with a value <0.15 are considered unstable