APPENDIX P- AVOIDANCE, MINIMIZATION, AND MITIGATION PLAN, REV 2

I-64 Hampton Roads Bridge-Tunnel Expansion Project

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P.1 INTRODUCTION

The proposed Hampton Roads Bridge Tunnel Expansion (HRBT) Expansion Project will improve a section of Interstate 64 (I-64) that provides an important regional transportation link between the cities of Hampton and Norfolk, Virginia. The Project will address severe traffic congestion and will widen I-64 for approximately 9.9 miles along I-64 from Settlers Landing Road in Hampton, Virginia to the I-64/I-564 interchange in Norfolk, Virginia. The Project will create an eight lane facility with six consistent use lanes. The expanded facility will include four general purpose lanes, two new high-occupancy toll (HOT) lanes, and two new drivable (hard-running) shoulders to be used as HOT lanes during peak usage.

Wetlands are regulated under section 404 of the Clean Water Act (CWA) which is administered by the U.S. Army Corps of Engineers (USACE) with oversight by the U.S. Environmental Protection Agency (EPA). The 404 permitting program indicates that no discharge into Waters of the US (WOUS) shall be permitted if first, a practicable alternative exists that is less damaging to the aquatic environment, or if the discharge would cause the nation's waters to be significantly degraded. For a project to be permitted, it must be demonstrated that, to the extent practicable, steps have been taken to avoid impacts to wetlands and other aquatic resources, potential impacts have been minimized, and compensation will be provided for any remaining unavoidable impacts. Additional regulations are provided by the Commonwealth of Virginia through the state's certification under Section 401, Virginia Water Protection Permit Program Regulation (9 VAC 25 - 210) and Virginia Marine Resources Commission's (VMRC's) wetlands mitigation guidelines (4 VAC 20 - 390). The Hampton Roads Connector Partners (HRCP) identifies the avoidance, minimization, and mitigation steps (see attached) the Project has taken to meet 404 requirements and Virginia regulations.

P.2 AVOIDANCE AND MINIMIZATION OVERVIEW

P.2.1 IMMERSED TUBE TUNNEL VS BORED TUNNEL

Two methods of tunnel construction were considered for the Hampton Roads Bridge-Tunnel (HRBT) Project design. An immersed tube tunnel (ITT) was placed for the existing tunnel and was proposed as an option during the planning and procurement stage for this Project. HRCP incorporated a bored tunnel construction method during the initial stages of design. A tunnel bored underneath the sediment-water interface will avoid substantial in-water impacts related to dredging and avoid direct navigation impacts to the federally- maintained channel. Less disturbance to the channel and open water reduces concerns to commercial ships and military vessels, which will minimize the impact on the economy, tourism, and national security as the tunnel is being constructed.

The bored tunnel construction also reduces overall costs, shortens schedule, and improves worker safety (Table P-1). The use of a bored tunnel approach would substantially reduce the volume of dredging when compared to the ITT approach minimizing the need for ocean disposal. Approximately 1,200,000 cubic yards of dredging are required just for placement of the Immersed Tunnel Tube (ITT). Construction of the bored tunnel under the James River will have less disturbance to the main channel that marine life use as a travel corridor. An ITT approach would require building tunnel sections on land and sinking them in place in a dredged trench, then backfilling the trench and covering with stones to protect it from impacts once the sections are connected. This method is more likely to disturb wildlife due to the increased dredging and back-filling as compared to the bored tunnel construction. Construction of the bored tunnel underground results in a reduction of noise, dust, and visual impacts. Finally, the bored tunnel creates substantially less exposure to weather risks such as wind and wave action during construction as the deeper elevations of the tunnel are constructed under the surface of the James River.

Table P- 1. Impact Comparison for ITT and Bored Tunnel

Resource	Immersed Tube Tunnel (ITT)	JPA Design Bored Tunnel	Difference between Bored Tunnel and ITT
Subaqueous Bottom, EFH, Benthic Habitat	60 acres	0 acres	-60 acres
Hampton Harbor Entrance Reach Navigation Channel	12 acres	0 acres	-12 acres
Dredging (in situ)	1,200,000	0 cubic yards	-1,200,000 cubic yards
Material Excavated by TBM (below WOUS)	N/A	1,416,000 cubic yards	+1,416,000 cubic yards
Project Schedule – Total	77 months – does not fit into the schedule of VDOT. We could not complete the project on time.	62 months until substantial completion	-15 months
Construction Schedule – Tunnels only	61 months	36 months	-25 months
In-water Work between the 2 islands (direct impacts to the navigation channel)*	**24 months** for placing of caissons **+ 12 months** for finishes, including backfilling and armor stones placement (see quantities below)	N/A (apart from TBM delivery)	-36 months
Rock placement for tunnel protection (in addition to the material needed for island expansion)	810,000 cubic yards of fill and 200,000 cubic yards of armor stones to be placed on top of the new ITT	N/A	-810,000 cubic yards of fill -200,000 cubic yards of armor stone

*An ITT is made out of concrete caissons fabricated in a drydock, floated to the project and sunk in place. HRCP calculated 19 caissons during the bid. Lowering them into place is a complicated and lengthy process. The main risk captured during the risks analysis is in case of emergency (a ship or submarine needs to leave immediately), Navy could ask to free the way in less than 2 hours. If HRCP is in the process of sinking a caisson in the middle of the navigation channel, it would be impossible to move in less than 2 hours.

During the initial planning stage following NEPA guidelines, it was determined that an ITT tunnel would require mechanized or hydraulic dredging of approximately 60 acres for a trench the length of the tunnel, which is approximately 6,300 feet. The 1,200,000 cubic yards of dredged material would be removed via barge or truck and disposed of at an offsite location. With the bored tunnel approach, the additional impacts to aquatic resources associated with the tunnel boring machine (TBM) will only be temporary in nature (in place for greater than 6 months, but less than 5 years) for the jet grout trestles,

a TBM platform, and conveyor belt. These structures will be removed upon Project completion. No dredging will be required for the bored tunnel itself.

The tunnel grades, and both vertical and horizontal alignments, were selected to minimize and mitigate construction impacts and schedule risks. The alignments were found to reduce impacts to the existing HRBT infrastructure. The final tunnel grades were selected because they allow:

- A reduced island expansion footprint as compared with a berm solution, with less environmental impact. The slope of the island was increased to 5% to avoid berms which would be required if the island slope was 4%.
- Eliminated marine works in the channel, facilitating Section 408 coordination and minimizing impacts to the Navy and other marine stakeholders.
- Reduced depth and extent of the tunnel approach structures (TAS), minimizing potential for settlement impacts to adjacent existing island infrastructure, and Virginia Department of Transportation (VDOT) operations.
- Minimized tunnel construction risks by maintaining sufficient tunnel cover, controlling tunnel buoyancy, scour protection, and avoiding areas of poor ground conditions. This benefits the overall durability of the tunnel during its service life.

This tunnel alignment also reduces the amount of marine work required, minimizing impacts to marine resources and stakeholders. Specifically, the alignments were selected because they allow for:

- Locating the tunnels and TAS (TBM launch and reception shafts) away from the existing infrastructure, including the existing trestles and existing ITT, to minimize impacts to VDOT infrastructure and day-to-day VDOT operations.
- Avoiding direct impacts to the rock protection above the existing ITT; this allows HRCP to perform ground improvement without needing to remove the rock protection and expose the existing ITTs.
- Providing adequate separation between the new bored tunnels, allowing HRCP to quickly separate the tunnels and therefore avoid unnecessary risks associated with the proximity of the two tunnels.
- Minimizing extent of the island modification work.
- Optimizing the roadway alignment and improving overall traffic flow on and off the islands.
- Considering local ground conditions and efficiently determine the extent of the ground improvement work.

P.2.2 CONSTRUCTION

P.2.2.1 TEMPORARY CONSTRUCTION TRESTLES

Temporary construction trestles will be used to facilitate work over the water and over some wetland locations in shallow areas. The use of temporary construction trestles was chosen over traditional stone or earthen causeways to minimize impacts to Submerged Aquatic Vegetation (SAV) and WOUS. These temporary trestles are designed to occupy less ground space by using a bridge-like support system, unlike stone or earthen causeways, which are typically built entirely on the ground or seafloor. Trestles

ultimately decrease impacts to marine habitat and corridors, even though the cost of construction for trestles is typically higher than stone causeways.

The placement of stone or earthen causeways in wetlands, even temporarily, has greater potential for adverse environmental impact than temporary work trestles. Causeways are unlike bridges in that there is no available space underneath them, as they are built entirely on substrate or existing habitat. Causeways temporarily eliminate the habitat provided by the vegetation and substrate and crush or smother animals such as mollusks within and upon the surface of the substrate covered by the construction materials. Causeways temporarily eliminate water quality enhancement functions provided by vegetation that is displaced. Long-term impacts may remain once causeways are removed. Compaction of the substrate by the causeway can alter the variety and density of fauna living within it as well as change the community structure of the plants living upon it. Upon removal of the causeway, vegetation will have to be re-established. Depending upon the degree of subsidence due to the weight of the causeway materials, re-grading of the substrate may also be required to obtain elevations that restore previous hydrologic conditions. The use of temporary trestles for Mallory Street, Bay Avenue / Oastes Creek, and Mason Creek Bridges will result in avoidance of approximately three (3) acres of fill to vegetated wetlands.

Additionally, temporary trestles minimize impacts to WOUS by reducing the dredging requirement in shallow areas. Work trestles near the Norfolk Shore associated with construction of the South trestle will reduce dredging impacts by approximately one (1) acre. The temporary north shore work trestle will support construction of the permanent eastbound north trestle in the shallow water (< 4-6 feet Mean Low Water) closer to the north shore. Jump trestles will also be used in shallow areas near the Hampton Shore to hold heavy cranes for pile driving and construction of permanent structures. These trestles eliminate at least seven (7) acres of dredging that would be required for barge access. Approximately one (1) of those acres contains a consistent bed of SAV. Primary impacts to SAV will result from shading; however, shading impacts from trestles in place greater than six months are less detrimental to sub-aqueous bottom than direct dredging. It is anticipated the SAV will be able to recolonize once the Project is complete; however, impacts to SAV will be compensated as if they were permanent to ensure there is no net loss of this important habitat (see Attachment P-2). There will be limited disturbance to surface water due to pile placement however all temporary trestle piles will be removed upon completion of construction. Hollow pipe-piles will be used in place of H-piles or solid piles, which reduces surface water impacts since fewer need to be used to accomplish the same task.

P.2.2.2 TUNNEL CONSTRUCTION

All tunneling activities requiring the use of additives, conditioners, slurry, or grout will be designed and planned to prevent leakage into the ground. During construction, operation parameters will be maintained within the calculated ranges with special care taken for the maximum pressures applied to avoid generating ground cracking. Additional details on tunnel construction have been included in Appendix E. These operations will be continuously monitored and compared to the anticipated baseline. In the extreme case of sudden variations in the main parameters, monitoring will trigger different alerts so leakages may be detected. The depth of the TBM below the river bottom also reduces the risk of fluid migrating through the substrate into the James River. In the main channel, the

new tunnels will be under 55 feet of water, and an additional 60 feet of overburden material. The TBM process is a closed system, with its treatment system designed specifically to remove additives from process water. HRCP is currently securing a Virginia Pollution Discharge Elimination System (VPDES) point discharge permit.

Preliminary calculations have assessed maximum TBM operation pressures, preventing blow out and additive leakage into the waterways. These calculations are being refined and the TBM operator will be provided with a clear TBM operation pressure range, station by station, so maximum and minimum pressures are not exceeded to minimize this risk.

HRCP's approach will consist of using environmentally-friendly additives to not adversely impact the environment. Additives have been described in the Materials Management Plan (Appendix L). In order to validate this approach, extensive testing will be required prior to TBM excavation to confirm that the selected additives do not impact the environment according to existing regulations. The TBM Sampling Plan (Appendix L, Section L.2.1.2) describes additive sampling and the VPDES application will provide a detailed narrative for the bench scale testing. A similar approach is currently being used on the Parallel Thimble Shoal Tunnel (PTST) project, and as a result HRCP has gained valuable information regarding the testing and approval process, as well as specific products that could be used. The selected TBM type will not use foaming agents for ground conditioning and will use bentonite and the natural fines existing in the excavated material as ground conditioning. From an environmental perspective choosing this TBM type is a risk mitigation and a minimization of impacts.

P.2.2.3 EROSION AND SEDIMENT CONTROL

Erosion and sedimentation Best Management Practices (BMPs) will be installed under the guidance of an approved construction general permit (CGP) prior to construction in compliance with the Virginia Erosion and Sediment Control Handbook (VESCH) and according to the Project's approved Erosion and Sediment Control Plan. BMPs implement the best possible strategy to mitigate, minimize, or prevent as much erosion as possible. The goal of this project is to avoid and minimize environmental degradation to the utmost extent in the Project site. BMPs provide a guideline of suggested methods to pursue to reach that goal. Water will be diverted around individual work areas (i.e. culvert work) to prevent sedimentation of downstream aquatic resources. Impacts will be minimized by strict enforcement of the requirements of the approved Erosion and Sediment Control Plan for the protection of surface waters, restrictions against the staging of equipment in or adjacent to waters of the U.S., and coordination with the permitting agencies.

BMPs allow for construction operations while minimizing impacts. This will be accomplished by avoiding the removal of existing vegetation to the maximum extent practicable and including the implementation and maintenance of strict erosion and sediment control measures and storm water management BMPs following the direction of VESCH. Construction BMPs must meet VESCH guidelines to ensure the reduction of turbidity and sediment disturbance. Examples of BMPs include: silt fence installation, culvert outlet protection, storm water conveyance channels, soil stabilization blankets and matting, dust control, and temporary and permanent seeding. When seeding, the use of plants with high feed value

that may attract wildlife will be avoided in order to reduce wildlife encounters within the travel lanes. Seeding will follow VDOT guidelines and DEQ specifications.

P.2.2.4 TEMPORARY CONSTRUCTION ACCESS IN WETLANDS

In areas where heavy equipment will temporarily enter wetlands, all equipment will be placed on mats, or other measures of avoidance entirely will be taken to minimize soil disturbance and compaction, such as the use of low ground pressure equipment. Low ground pressure equipment is heavy equipment that has been specially designed to spread the weight of the equipment over a larger area. This allows it to move across terrain that is too soft for regular heavy equipment. BMPs will be used for all wetland crossings such as temporary ground protection wooden mats, prefabricated equipment pads, or washed free-draining aggregate placed on geotextile fabric. Matting will follow the guidelines outlined in the USACE Construction Mat Best Management Practices (USACE 2016). Mats will be monitored to assure that they are functioning correctly and will be inspected after usage. For site restoration, all matted areas within wetland will be restored to their original condition and elevation (e.g. re-seeding of native species, weed-free mulch, etc.) (USACE 2016). During the permitting process, HRCP will coordinate with regulatory agencies to develop practices acceptable for restoration of temporarily impacted vegetated wetlands. Matting will be conducted as follows:

Installation:

- Mats will be in good condition to ensure proper installation, use and removal.
- Mats will not be dragged into position in waters of the U.S.
- Woody vegetation (trees, shrubs, etc.) shall be cut at or above ground level with no grubbing.
- Install adequate erosion and sediment controls at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto mats.
- Where possible individual boards will be placed perpendicular to the direction of traffic. No gaps should exist between mats.
- Where practicable, the existing natural root mat, stumps, and herbaceous vegetation will be used as a base for any temporary access routes, however no grubbing will occur. Woody vegetation will be cut at or above the ground level. Geotextile fabric will be placed on the existing surface and BMPs will be used for all wetland crossings such as temporary ground protection wooden mats, prefabricated equipment pads, or washed free-draining aggregate placed on geotextile fabric.

Maintenance:

- Matted wetland crossings will be monitored to assure correct functioning of the mats. Mats will be inspected after use. Mats which become covered with soils or construction debris will be cleaned and the materials removed and disposed of in an upland location.

Removal:

- Matting will be removed by “backing” out of the site, removing mats one at a time. Any rutting or significant indentations identified during mat removal will be re-graded immediately.
- Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.

Restoration:

- All mats, aggregate, and fabric will be removed after construction is complete. Any compacted or rutted soils within wetlands will be restored to their original contours and elevation. Planting and the broadcast of an appropriate wetland seed mix over the matted area will be completed upon removal and restoration of the wetland area. Temporarily impacted wetlands will be restored to preconstruction elevations once construction is completed and compacted soil will be loosened by ripping or other approved methods. If, after the aforementioned measures have been implemented, the temporary wetland impact areas fail to exhibit all 3 wetland parameters (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) after the first full growing season post-construction, these would be considered to be permanent wetland losses. HRCP would provide additional compensatory mitigation for these areas at standard compensation ratios based on the pre-disturbance cover-type (e.g., 2:1 ratio for former PFO areas, etc.). Additional detail for restoration of temporary impacts is included in Attachment P-2.

P.2.2.5 PILE DRIVING / UNDERWATER NOISE MINIMIZATION

Pile driving creates underwater noise and vibration that can affect marine organisms, in particular fish, marine mammals and turtles. Pile driving acoustics from the Project have been analyzed and minimizing efforts will be implemented to reduce the impact of pile driving to marine life (see Appendices M and R).

The distance between the North and South Islands is approximately 6,300 feet. The installation of temporary piles for support of the Jet Grouting Trestles off the South Island is the only pile driving activity that would encroach on this area. The diameter of the largest isopleth associated with the pile driving for the Jet Grouting Trestle is 630 feet. Therefore even when driving the piles that extend the furthest into the channel, there will still be a continuous approximately one mile wide area between the North and South Islands that will be free from underwater noise at levels with the potential to cause behavior changes to marine organisms. At all times during pile driving at the Project area, a corridor of greater than 5,000 feet will be maintained regardless of the number of locations of concurrent pile driving. A summary of the pile driving mitigation that will be used during construction is listed below:

- Avoid Impact and Down-the-hole Hammer of 42-inch diameter steel pipe piles
- Ramp up (all piles): Gradual increase in pile driving energy which allows aquatic organisms opportunity to move away from the noise source prior to the onset of full energy pile driving.
- Cushion block (impact driven piles as practical and safe) - Blocks of material placed between the top of the pile and the impact hammer. These blocks reduce the noise levels produced during pile driving.
- Bubble Curtains will be used to minimize noise for steel piles located in deeper water (>20 feet) where sturgeon and other anadromous species are most likely to migrate.
- Vibratory hammers, which emit less noise than impact hammers will be used until refusal. If necessary, impact hammers will be implemented to complete pile driving to the desired depth using the minimization methods listed above.
- Any jetting will occur through a hole in the center of a concrete pile, which will reduce turbidity when compared to jetting outside of the pile.

P.2.2.6 DREDGING

Dredging impacts will be minimized by strict enforcement of BMPs for the protection of surface waters, restrictions against the staging of equipment in or adjacent to waters of the U.S., and coordination with the permitting agencies.

During dredging and placement activities, contractors will:

- Use mechanical dredging instead of hydraulic, which reduces localized turbidity and potential entrainment of aquatic organisms.
- Prevent overfilling of bucket to minimize additional loss of material during ascent through the water column.
- Verify that the bucket is completely closed prior to raising it to the surface.
- Will not drop the load at the water surface to dislodge debris, but will complete the dredge pass and place the debris on the barge or scow.
- Pause the bucket after ascent through the water column to allow free water to drain prior to swinging the bucket to the barge.
- Reduce the bucket ascent rate, which minimizes loss of residuals from the clamshell bucket.
- Implement an approved Water Quality Monitoring Plan during dredging activities.

P.2.2.7 MOORINGS

VDOT acquired Willoughby Spit to accommodate docking and stationing necessary for increased vessel traffic. There are no suitable mooring locations east of the HRBT as the mouth of the river opens to the Chesapeake Bay and offers little protection for vessels. The choppy conditions in the bay and heavily trafficked James River do not allow for many adequate mooring locations near the Project area. Figure P-1 depicts private shellfish leases, Baylor Grounds and public clam grounds which would further constrain mooring locations as these areas may not allow mooring. The only suitable mooring location that does not impact the Norfolk Naval Station, Newport News Marine Terminal, Navigation Channels, Port Hampton Flats Clamming Ground, Baylor Grounds, or known shipwrecks, is within Willoughby Bay. The dark blue represents public clamming grounds, teal represents Baylor Grounds, and green depicts Baylor Grounds with open harvest areas 4 VAC 20-720.

Figure P-1: Chesapeake Bay Shellfish Grounds

Possible mooring and anchoring locations have been depicted in Figure P-2. Efforts will be made to avoid and minimize impacts to shellfish grounds and SAV through strategic adjacent construction and placement of mooring locations. Locations around Craney Island have been avoided so there will be no impact to Baylor Grounds.

Figure P-2: Potential Mooring and Anchoring Areas

P.2.3 AVOIDANCE AND MINIMIZATION BY LOCATION

On multiple occasions throughout June to December, 2019, the HRCP environmental team met with the leads of the HRCP design teams and contractors to discuss how impacts to WOUS could be avoided or minimized. This section describes the resulting collaborative approach by location (Table P-2).

Table P- 2 Permanent WOUS Impact Reduction through Design

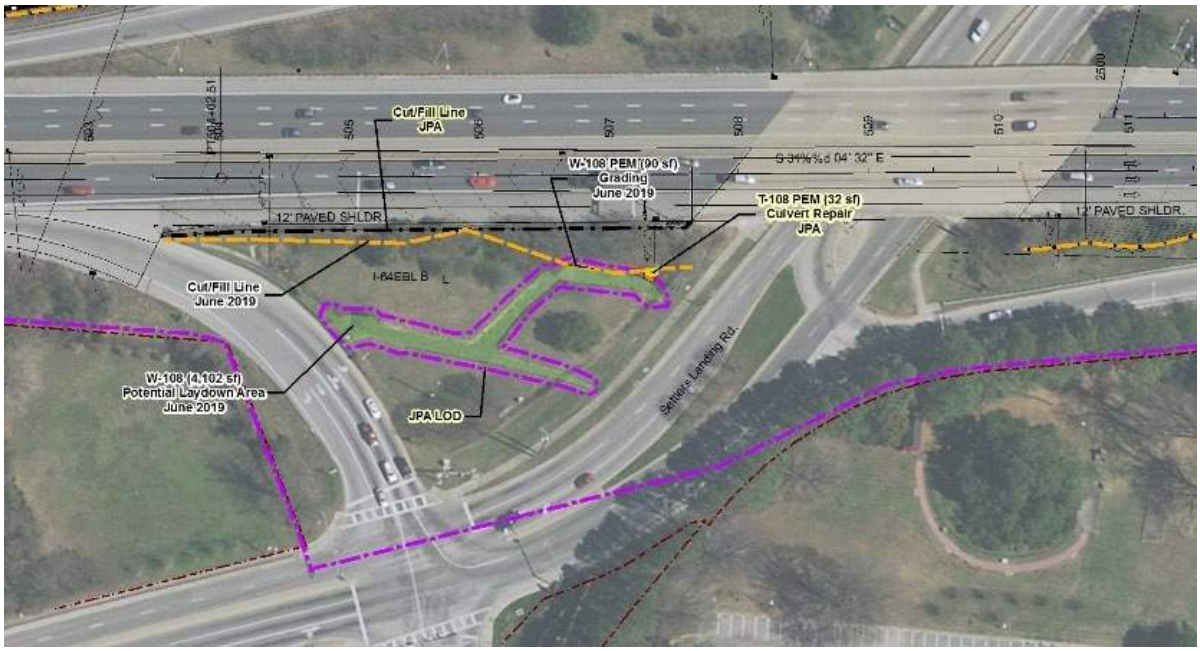
Location	Cowardin Classification	Impact Reduction (square feet)	Impact Reduction (acres)
Settler's Landing Road	PEM	90	0.00
Mallory Street Interchange	E2EM	3,827	0.09
	E2SS	2,457	0.06
Bayville Avenue	E1OW	636	0.01
Willoughby Spit	E2US2	2,613	0.06
Willoughby Bay	E1OW	1,087	0.02
4th View Interchange	E2EM	2,865	0.07
	PEM	8,434	0.19
	PFO	1,611	0.04
	PSS	4,823	0.11
	Total	28,443	0.65

P.2.3.1 HAMPTON

P.2.3.1.1 SETTLER'S LANDING ROAD INTERCHANGE

Through design, the limit of grading was moved closer to the I-64, thus eliminating 90 square feet of permanent impacts to the site, and only requiring 32 square feet of temporary impacts for culvert repair (Figure P-3, Sheet 1 of Attachment G-1).

Figure P-3: Settler's Landing Road



P.2.3.1.2 MALLORY STREET INTERCHANGE / JOHNS CREEK

The temporary trestle will be pile supported, which will cause shading impacts, however there will be minimal ground disturbance as opposed to the alternative, which would consist of placing fill material to reach the existing bridge height. The use of a temporary trestle will reduce fill impacts to WOUS by 7,533 square feet. There will be some extended shading to 3,827 square feet of E2EM and 2,457 square feet of E2SS under the work trestle. Though these areas are anticipated to revegetate post-construction, they will be compensated as if they were permanent (see Attachment P-2). Permanent impacts within the Mallory Street cloverleaf mitigation site will be compensated at higher ratios. E2EM fill impacts will be mitigated at a 2:1 ratio and E2SS fill impacts will be mitigated at a 3:1 ratio. Shading impacts from the extended temporary trestle will be compensated at a 2:1 ratio.

P.2.3.2 BRIDGE/TUNNEL

P.2.3.2.1 NORTH TRESTLES

The north trestles were designed to reduce the amount of impacts to WOUS, minimize overwater crossovers and traffic shifts, shrink the trestle footprint to fit within the existing LOD, limit island expansion, and use the existing eastbound trestle as a main delivery work area once the traffic has been shifted to the new trestle. As discussed previously, the trestles are pile-supported which substantially reduced impacts to subaqueous bottom when compared to a causeway or dredging necessary for barge traffic.

During the bid phase, a Maintenance of Traffic (MOT) trestle was going to be used along the north trestle onto the North Island expansion, which would have resulted in 30 (188 square feet) additional piles being driven in and removed from subaqueous bottom. These piles would have been in place for greater than 6 months, and removed upon project completion. Through design refinement, the decision was made to incorporate the MOT trestle into the permanent eastbound north trestle and North Island expansion. By eliminating this MOT trestle, there will be less disturbance to subaqueous bottom, reduced noise associated with pile driving, and shorter construction duration.

P.2.3.2.2 NORTH ISLAND

The North Island will need to be expanded to accommodate the additional travel lanes. The island will be expanded westward which avoids impacts to approximately 1.60 acres of SAV (eelgrass (*Zostera. marina*)), on the east side of the island. Design includes rocky intertidal shelf for habitat enhancement. A sheetpile wall and retaining rock bund will prevent fill material from entering the water column outside of the island expansion footprint.

Subaqueous bottom will be removed with a mechanical style bucket which will help reduce suspended materials during dredging. A mechanical style grapple bucket will be used to remove any armor stones and obstructions. Dredging BMPs will be performed for site mitigation. Materials will be disposed at an approved and appropriately permitted facility.

P.2.3.2.3 SOUTH ISLAND

Island expansion will be confined to the southwestern portion of the existing island. Expanding the land on the south avoids the need to construct a berm on the channel side on the north side of the island.

Like the North Island, subaqueous bottom will be removed with a mechanical style bucket which will help reduce suspended materials during dredging. Dredging will only occur within the tunnel island footprint. A mechanical style grapple bucket will be used to remove any armor stones and obstructions. Dredging BMPs will be utilized for site mitigation. Materials will be disposed at an approved and appropriately permitted facility.

P.2.3.2.4 SOUTH TRESTLE

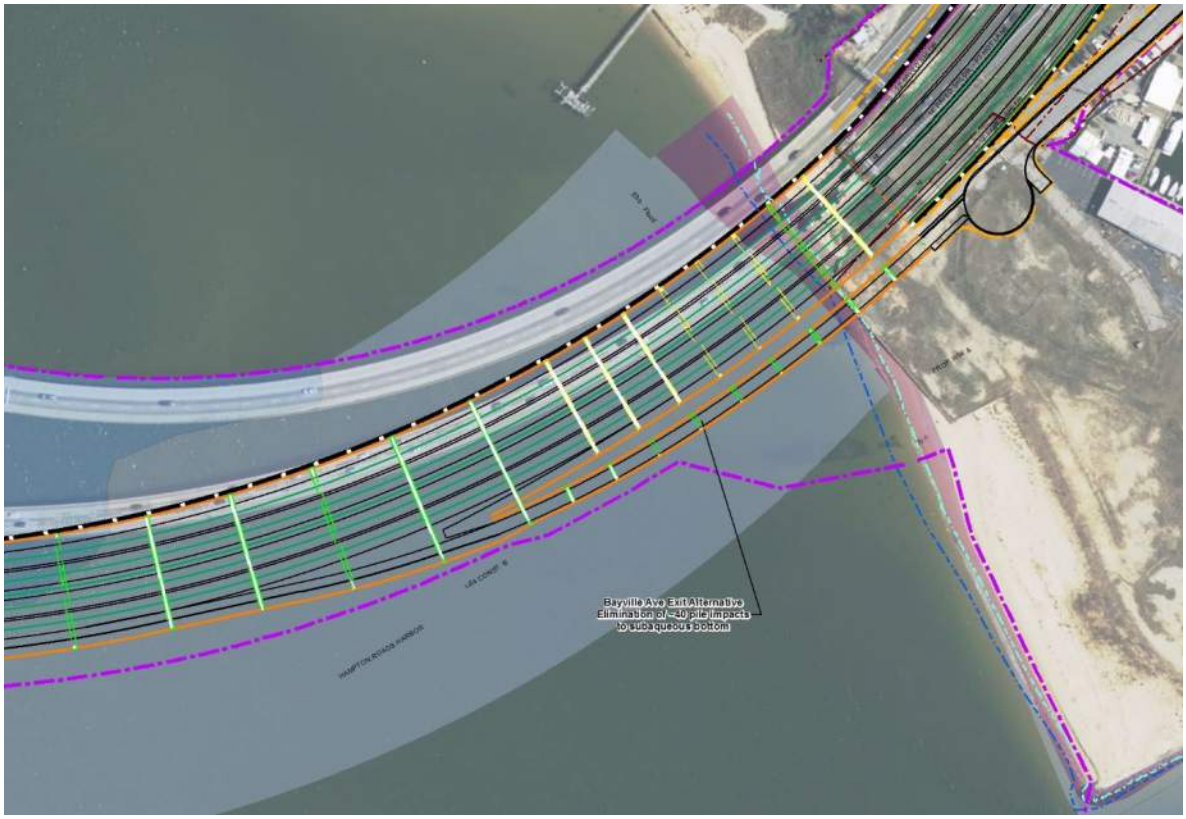
One trestle will be constructed instead of two separate eastbound and westbound trestles. Reduction to impacts from demolition can be attributed to BMPs such as fencing around the demolished site to capture debris, and solid waste removal. Pile removal will be achieved through direct pull, vibratory extraction, clamshell removal, or cutting. Vibratory is the preferred, which in the literal sense means vibrating the pile out of the ground. Clamshell removal is used for broken or damaged pilings that cannot be vibrated out and must be gripped by a steel apparatus similar to a set of jaws. A clamshell is not intended to remove sediments, but will be used to grab the pile and/or large debris and lift it from the bottom. Cutting is the least extractive and is done when the piling breaks off at a point to where it is unable for full removal, which will be done below the mud line.

P.2.3.3 NORFOLK

P.2.3.3.1 BAYVILLE AVENUE

During the design phase, a Bayville exit alternative was considered and has since been removed from the design. This eliminated approximately 40 permanent piles (636 square feet) from impacting subaqueous bottom (Figure P-4).

Figure P- 4: Bayville Avenue Exit



P.2.3.3.2 WILLOUGHBY SPIT

The limit of disturbance (LOD) has been shifted landward from the north shore and south shore of the spit resulting in a reduction of approximately 2,613 square feet of impacts to E2US2 (T-127 and T-247). Willoughby Spit is a previously disturbed area that will be used for staging of construction activities and materials, particularly for small vessel loading and unloading. The existing bulkhead on the south side will be repaired or replaced, causing minimal impacts in open water. A sloping revetment was evaluated at this location, however that would increase bottom impacts and lengthen the piers. The temporary structures for the piers will be removed at the completion of the project, including removal or platforms and associated piles.

P.2.3.3.3 WILLOUGHBY BAY

The Willoughby Bay Bridge structure will be modified by widening existing structures to the outside in both directions to accommodate new travel lanes, shoulders and new sound walls. An outfall impact near the west shore of the bay has been removed, eliminating 1,087 square feet of impacts to open water.

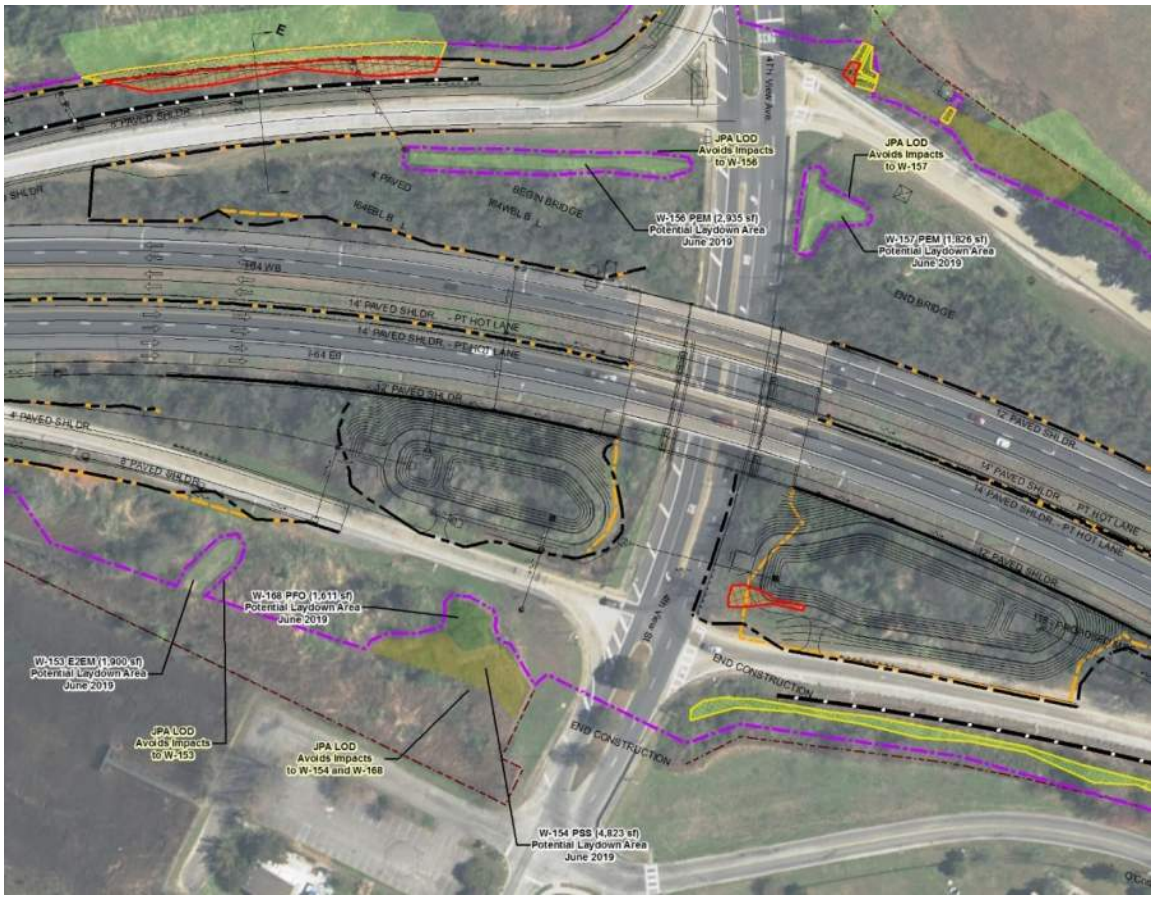
No dredging is required in Willoughby Bay. Additionally, the Willoughby Bay Bridge will remain in place and the existing piles will be rehabilitated instead of replaced. Pile rehabilitation will consist of placing pile jackets around the areas most impacted by wave action.

P.2.3.3.4 4TH VIEW INTERCHANGE

Near the Monkey Bottom Mitigation Site, the grading slope was shifted closer to the interstate to minimize impacts to wetlands. Permanent impacts have been reduced by 4,558 square feet (885 to E2EM and 3,673 square feet to PEM) along the eastbound lanes, and an 80 square feet impact to E2EM has been removed from the westbound lanes.

There was discussion of using the available space adjacent to 4th View Avenue for construction laydown areas, which contain wetlands W-153, W-154, W-156, W-157, and W-168. Due to the presence of wetlands, HRCP has agreed to avoid these locations during construction, which eliminates extended impacts to 13,095 square feet (4,761 square feet to PEM, 1,611 square feet to PFO, 4,823 square feet to PSS, and 1,900 square feet to E2EM) of WOUS. Silt fence will be placed around these wetlands during construction so they will not be impacted (Figure P-5).

Figure P- 5: 4th View Interchange



P.2.3.3.5 BAY AVENUE/OASTES CREEK

The LOD has been reduced along the westbound lanes to the minimum construction access area required for pile rehabilitation on the existing bridge. Impacts from pile rehabilitation will be temporary (less than 6 months) in nature and construction access through wetlands for pile rehabilitation will use temporary matting to provide the least amount of impact possible. The temporary construction methods are discussed further in Attachment P-2. Impacts on the eastbound side will be limited to temporary trestles in place for longer than 6 months, which will be removed at project completion. No dredging or barges are required for Oastes Creek, and bridge demolition will not be needed for Oastes Creek since the piles will be rehabilitated on the existing bridge.

P.2.3.3.6 MASON CREEK

Similar to Bay Avenue, the LOD has been reduced along the westbound lanes to the minimum construction access area required for pile rehabilitation. Construction access through wetlands for pile rehabilitation will use temporary matting to provide the least amount of impact possible. The temporary construction methods are discussed further in Attachment P-2. Impacts on the eastbound side will be limited to temporary trestles in place for longer than 6 months, which will be removed at project completion. No dredging, barges, or bridge demolition is required for Mason Creek.

P.2.3.3.7 GRANBY STREET / I-564 INTERCHANGE

Originally, the LOD by the Norfolk Cemetery was going to be used for both construction access and a laydown area; however, it has been pulled back to give contractors just enough space (20 ft) for construction access. This approach eliminated the need to clear approximately 2.30 acres of trees and as a result, maintains a vegetated buffer between the highway and the cemetery.

P.3 CONCLUSION

Every effort to avoid and minimize impacts to WOUS were taken. The impact reductions to WOUS discussed in this document were achieved through modification of construction methods and design refinements and include:

1. avoidance of approximately 60 acres of dredging (along 6,300 feet) and 1,200,000 cubic yards of dredged material disposal by using a bored tunnel design versus immersed tube tunnel;
2. reduction of in-water work by 36 months when using the bored tunnel design as compared to the immersed tube tunnel;
3. reduction of 810,000 cubic yards of fill and 200,000 cubic yards of armor stones that would be required for placement of the immersed tube tunnel;
4. avoidance of approximately 0.34 acres of non-tidal wetlands and 0.31 acres of tidal wetlands through refinement of the roadway typical section to move the cut/fill line closer to the existing interstate at various locations along the project corridor,
5. use of temporary construction trestles instead of traditional stone or earthen causeways to minimize impacts to over three (3) acres of vegetated wetlands; and,

6. use of temporary trestles minimizes the need to dredge temporary barge access channels in shallow water (< 4-6 feet mean low water) for over seven (7) acres of subaqueous bottom.

Unavoidable permanent impacts will be compensated to ensure no net loss of wetlands or waters. These impacts are discussed in Attachment P-2.

P.4 REFERENCES

U.S. United States Army Corps of Engineers (USACE) New England District. (2016). Construction Mat Best Management Practices (BMPs). Retrieved August 23, 2019, from USACE: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/MA/ConstructionMatBMPs.pdf

ATTACHMENT P-1 – HCA

HABITAT CONDITION ASSESSMENT (HCA), REV 2

I-64 Hampton Roads Bridge-Tunnel Expansion Project

Hampton Roads Connector Partners
240 Corporate Blvd. 4th floor
Norfolk, VA 23502

Hampton-Norfolk, Virginia
December 19, 2019

64 HDR | MOTT MACDONALD
Design Joint Venture

DOCUMENT HISTORY

Issue Date	Description	By	Revision
September 18, 2019	Revised for consistency with Revision 1 of the Appendix G – Impact Tables	R. Wilk	1
December 19, 2019	Revised submittal	R. Wilk	2

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P-1.1 HABITAT CONDITION ASSESSMENT

P-1.1.1 INTRODUCTION

The Commonwealth of Virginia does not provide compensatory mitigation guidance for aquatic habitats within jurisdictional Waters of U.S. (WOUS) other than vegetated intertidal and nontidal wetlands and other waters. That is, there is no guidance for non-vegetated intertidal and vegetated and non-vegetated subtidal waters and wetlands. The Habitat Condition Analysis (HCA) method is commonly used to determine the net loss or gain of aquatic habitat function or value within the Project limits. The HCA is a semi-quantitative approach, similar to the National Oceanic and Atmospheric Administration (NOAA) Habitat Equivalency Analysis (NOAA 2000), to determine the appropriate compensation for loss or conversion of subaqueous lands and shallow water habitat (EA 2017). HCAs have been performed for other projects within the Chesapeake Bay watershed to assess habitat value in relation to out-of-kind mitigation, including the Parallel Thimble Shoals Tunnel Project for the Chesapeake Bay Bridge Tunnel (EA, 2017) and the Downtown/Midtown/MLK Tunnel Project (Elizabeth River, Portsmouth, Virginia) (EA 2012).

The impact of the Hampton Roads Bridge Tunnel (HRBT) expansion Project on intertidal and subtidal estuarine habitat within the James River has been assessed. The compensation strategy for impacts to aquatic habitat resulting from implementation of the HRBT expansion Project will be based on the HCA. Since the pre-and post-scores are different (60.18 HU and 18.79 HU, respectively), proposed compensation was based on the amount of subaqueous bottom converted to upland. Pre- and post-scores are integral in showing the biological success or failure of a site. A pre-construction score can provide framework for what a post-construction habitat should resemble. The purpose of this document is to present the methods developed for the HCA, present pre- and post- habitat conditions expressed as habitat units, and to inform the decision making process to compensate for impacts to aquatic habitat.

P-1.1.2 METHODS

This HCA assigns habitat types to subaqueous and non-vegetated habitats based on the September 19, 2017 and October 18, 2018 Preliminary Jurisdictional Determination (PJD) (NAO-1994-01166), the 2018 Baseline Benthic Survey of the Project area (Wong et al. 2018), and available bathymetric survey data. It also uses studies conducted for the HRBT expansion Project, as well as other existing data, to score the condition of the habitat within the Project area. For both pre-construction and post-construction conditions, scores assigned for each individual factor within each habitat type are used to calculate an average habitat condition score for each habitat type. Pre-construction habitat units are subtracted from post-construction habitat units to determine the relative change in habitat condition/value. A positive number or a zero value indicates either an expected net improvement in habitat function or no change, respectively. A negative number indicates a net loss in habitat function.

The analytical process consists of the following steps:

1. Determine habitat types within the Project area

2. Develop condition factor categories and scores to qualitatively assess habitat conditions within the HRBT Project footprint
3. Estimate the pre-construction habitat conditions by:
    a. Using GIS to estimate the acreage of each habitat type based on the results of the wetland delineation, 2018 Baseline Benthic Survey and bathymetry.
    b. For each habitat type, score the pre-construction habitat conditions based on the habitat factors
4. Estimate the post-construction habitat conditions by:
    a. Use GIS to estimate the acreage of each habitat type based on the results of the wetland delineation, 2018 Baseline Benthic Survey and bathymetry
    b. For each habitat type, score the post construction habitat conditions based on the same habitat factors as the pre-construction conditions.
5. Calculate pre- and post-construction habitat units (multiply habitat scores by habitat acreage).
6. Compare pre- and post-construction habitat units to determine net gain or loss of habitat function/value (i.e., subtract the pre-construction habitat units from the post-construction habitat units).

P-1.1.2.1 HABITAT TYPES IN THE PROJECT AREA

The HRBT Project area was subdivided by categories based on the wetland delineation, 2018 Baseline Benthic Survey, and water depth for the pre-construction analysis as follows:

- Upland (existing non-aquatic habitat and former aquatic habitat converted to upland)
- Intertidal rock substrate (above mean lower low water (MLLW); below mean higher high water (MHHW) tidal datums)
- Intertidal sand substrate (above MLLW; below MHHW tidal datums)
- Shallow Water (MLW – 6.6 ft. deep) (potential to support SAV and shellfish resources) (Cowardin et al. 1979; VIMS 2017, 2018)
- Mid-Depth (6.6 to 15 ft. deep) (potential to support shellfish resources) (CBP 2004, USACE 2012, VIMS 2018)
- Deep Open Water (15 to 30 ft. deep)
- Deeper Open Water(30 to 45 ft. deep)
- Deepest Open Water (greater than 45 ft. deep)

Habitat condition factors were identified based on the known or presumed attributes (i.e., estuarine/coastal ecology literature) of the existing habitats and environmental conditions within the Project area. The condition factors (indicators) identified for the HRBT HCA analysis include:

- Water Quality
- Submerged Aquatic Vegetation (SAV)
- Shellfish Resources
- Epibenthic Habitat
- Benthic Community

- Fish
- Protected Species Habitat

P-1.1.2.2 HABITAT CONDITION FACTOR SCORING APPROACH

P-1.1.2.2.1 PRE-CONSTRUCTION HABITAT CONDITION FACTOR SCORING APPROACH

Habitat conditions are scored based on a factor scale of 0-5, with 5 being of the highest quality and 0 being upland/ non-aquatic habitat (Table P-1).

***Water Quality**:* Water quality scores were based on dissolved oxygen levels and attainment of open-water water quality goals (from the Chesapeake Bay Program, CBP). CBP water quality data was available from 2014-2019. Virginia Estuarine and Coastal Observing System (VECOS) real-time and historic (2005 present) water quality data was also available for the Project area. Using an approach similar to previous HCAs developed in the lower Chesapeake Bay region, scores among depth strata (habitat categories described above) were based on the percentage of values below CBP target values ("restoration goals"). Under pre-construction conditions, all HRBT Project areas achieved 100% attainment of water quality goals, both pre- and post-construction, and are therefore assigned a score of "5"(1-5).

***Submerged Aquatic Vegetation (SAV)**:* Historic and recent SAV distribution maps were sourced from the Natural Resources Technical Appendix to the EIS (VDOT 2016) and via the Virginia Institute of Marine Science's interactive online mapper (Orth et al. 2017). Similar to previous HCAs conducted in the region, SAV scoring considered water depth, historic presence of SAV, and present-day SAV distribution within the Project area. A depth range of <6.6 ft. was established for SAV-supporting conditions (Cowardin et al 1979, Orth et al. 2017), which is consistent with previous HCAs. Shallow water sites within the Project area that currently support stable SAV beds are assigned a score of "5." Areas which historically supported SAV but presently do not are assigned a score of "3." Existing areas >6.6 ft. are assigned a value of "1"; however, if an area >6.6 ft. was reliably documented (via historical maps, survey reports, etc.) to have supported SAV historically, a score of "3" would be assigned. Existing shallow unvegetated habitats <6.6 ft. lacking any historical records of SAV are assigned a value of "2." Score of "4" can occur if sparse vegetation is present <6.6 ft. in depth.

***Shellfish Resources**:* Shellfish habitat was scored based on recent (2018) and historic (2001-2002) hard clam survey results (VIMS 2018), supplemented with information on the blue crab and other shellfish species distribution (e.g., oysters) obtained from the Natural Resources Technical Appendix of the EIS (VDOT 2016). Hampton Roads has long supported a hard clam fishery. Prior to 2018, the last comprehensive survey of hard clam resources in Virginia (which included the HRBT study area) was completed by VIMS in 2001 and 2002. Presently, clams are absent from a 45-acre parcel surveyed in the vicinity of Willoughby Spit. A total of 67,854 clams are estimated to occupy a186-acre parcel surveyed in the vicinity of HRBT South, and a total of 439,731 clams are estimated to be present on a 362-acre parcel in the vicinity of HRBT North. These values generally represent an average density of <1 clam per square meter (VIMS 2018). These values are seen as low, while high average densities range just over 3 clams per square meter (Mann et al., 2005). Furthermore, along with relatively low densities of market-

size clams, the size distributions of the population surveyed were markedly skewed towards older individuals, with relatively few juveniles present, indicating poor clam recruitment in the vicinity of the HRBT Project (VIMS 2018). Limited recent oyster recruitment was observed at HRBT North. However, there is no evidence of a widespread occurrence of oysters throughout the Project area surveyed (VIMS 2018). Throughout most of the HRBT Project area, bottom substrates were well-oxygenated and well-sorted, ranging from sand-to-sand-mud mixes (VIMS 2018). However, south of Willoughby Spit, sediments were characterized as mud-shell mixes or anoxic, poorly sorted muds. In general, throughout the lower Chesapeake Bay region, areas with water depths greater than approximately 20 ft. are often considered unsuitable for oyster recruitment/development, due to the likelihood of seasonal hypoxia at greater depths (CBP 2004, USACE 2012). Historically, prior to the onset of chronic/seasonal hypoxia in the Bay (during the latter half of the 20th Century), oysters were abundant and exhibited successful recruitment at up to approximately 30 ft. depths (Boynton et al. 1995, Kemp et al. 2005). As indicated above (Water Quality), all HRBT Project areas (including those up to and exceeding 30 ft. in depth) achieved 100% attainment of Water Quality goals under pre-construction conditions. Based on existing water quality conditions, as well as historical depth distributions, areas >30 ft. in depth are considered unsuitable for the development of hard clam and oyster populations and are assigned a score of "1." Areas <30 ft. (intertidal, shallow water, and mid-depth) that presently support extensive, viable hard clam or oyster resources are assigned a score of "5." Areas <30 ft. (intertidal, shallow water, and mid-depth) that presently support low-density hard clam or oyster resources are assigned a score of "4." Areas <30 ft. that historically supported shellfish resources (e.g., hard clam and/or oyster), but presently do not, are assigned a score of "3." Areas <30 ft. with no historical records of hard clams or oysters are assigned a score of "2."

***Epibenthic Habitat**:* Epibenthic habitat scores are based on the type of habitat present in a particular depth zone/Project area and the ability of that habitat to provide the necessary hard substrate to support epifauna communities. A site-specific epibenthic habitat survey of the Project area conducted in 2018 provides community composition and secondary production estimates for various hard bottom habitat types present throughout the study area (Wong et al. 2018). The rocky intertidal zone was dominated by barnacles and amphipods, and the inner tip of the north portal island exhibited high density and biomass of oysters and mussels. The rocky subtidal zone was covered by a dense canopy of algae that provided habitat for numerous species of amphipods. Sponges, anemones, amphipods, gastropods, and bryozoans were common in the rocky subtidal. Based on the results of the 2018 epibenthic survey, intertidal sand habitat within the Project area is assigned a score of "3" for epibenthic habitat suitability, and shallow water sand habitat is assigned a score of "2." Existing intertidal and subtidal rock habitat are assigned scores of "5" and "4," respectively. Predominantly silt/clay would earn a value of "1".

***Benthic Community**:* Benthic community scores are based on the type of habitat present in a particular depth zone/Project area and ability of that habitat to provide the necessary soft substrate (sand, silt, mud) to support infaunal communities. A site-specific benthic community survey of the Project area conducted in 2018 provides community composition and secondary production estimates for infaunal assemblages present throughout the study area (Wong et al. 2018). Soft bottom substrate in the Project area was dominated by polychaetes and amphipods, with oligochaetes especially abundant in coarser sediments. High densities of polychaetes were recorded along the south bridge and inner (bridge side) tip of the

south portal island. Benthic community scoring is based on Chesapeake Bay Benthic Index of Biotic Integrity (B-IBI) values calculated as part of a site-specific benthic community survey (Weisberg et al. 1997, Wong et al. 2018). Where data is available (i.e., among the 38 benthic survey stations which occur within the Project impact area boundaries), the site-specific B-IBI values are used directly (i.e. not inferred) as the scoring for this attribute, since IBI and HCA scoring is on the same scale (1-5) with the exception that the HCA has a "0" score for upland habitats. Among the 48 sites sampled during the 2018 survey, 32 sites met CBP Benthic Restoration Goals and 16 failed the goals, with B-IBI scores ranging from 1.3 to 4.0. Of the 16 sites that failed, eight were classified as marginal (score of 2.6 – 3.0), three were classified as degraded (score of 2.0 – 2.6), and five were classified as severely degraded (score of 2.0 or less). Sites were classified as "degraded" or "severely degraded" because of low abundance and biomass overall, low abundance of deep-deposit feeding organisms, low abundance of pollution-sensitive organisms, and/or high biomass of pollution-indicative organisms. Where site-specific B-IBI data are not available (i.e., Project areas not assessed during the 2018 benthic community survey), scores were inferred based on conditions observed in similar areas/depth zones. Intertidal and subtidal rock habitat was not included in the 2018 B-IBI analysis; however, these areas were surveyed for general community attributes and for estimation of secondary production. Rocky intertidal and subtidal areas in the vicinity of the Project are assumed to provide minimally suitable substrate for benthic infauna (vs. epifauna) and are assigned a score of "1." Existing upland (non-aquatic) habitats are assigned a score of "0."

***Fish**:* Four sub-criteria were assessed to evaluate the overall fish community/resources in the Project area - General Fish Community; Anadromous Fish Populations; Essential Fish Habitat (EFH); and designated Habitats of Particular Concern (HAPCs). Each of these four sub-criteria is scored separately, and then an average score is developed in the matrix analysis. Information sources for the HRBT HCA included available data from regional trawl surveys (Tuckey and Fabrizio 2013, 2014, 2015, 2016, and 2017), EFH/HAPC mapping resources (NOAA-NMFS) from the EFH consultations already conducted/underway for various HRBT Project components (Hampton Roads Connector Partners 2019), and information provided in the Natural Resources Technical Appendix of the EIS (VDOT 2016).

> *General Fish Community:* The Lower James River is an important nursery for many commercial and recreational species including spot, Atlantic croaker, Atlantic menhaden, weakfish, striped bass, black seabass, and summer flounder (Schloesser and Fabrizio 2016, 2019, Tuckey and Fabrizio 2017). These species and their various life stages (juveniles, adults) are widely distributed throughout the lower James River, thus a score of "4" was assigned to the general fish community sub-component across all subtidal habitat types/depth strata >6.6 ft. in depth. A "5" was unlikely to be attained due to a slight disparity in diversity and abundance of species in all seasons. Shallow Water Habitat (<6.6 ft. depth) may be limiting for some estuarine fish (Ruiz et al. 1993), notably, large, predatory or open water species, and is therefore assigned a score of "3." Existing Intertidal sand habitat, only available as a forage/refuge area for use by fish when flooded, is assigned a score of "2." Existing rocky intertidal habitat is assigned a score of "1" as this substrate type may be represent less suitable, or sub-optimal foraging habitat for demersal fish such as summer flounder, windowpane flounder, and similar species (Grimes et al. 1989, NOAA 2018). Upland (non-aquatic) habitat was assigned a score of "0."

Anadromous Fish Population: The lower James River is an important migratory corridor for several anadromous fish species including alewife, blueback herring, American shad, hickory shad, striped bass, and white perch (Aunins and Olney 2009, Grant and Olney 1991, Hilton et al. 2017, Kerr and Secor 2012, Olney and Maki 2002, Sadler et al. 2017, Tuckey and Fabrizio 2017). Based on this information, the anadromous fish sub-criteria was assigned a score of "3" for all open-water (subtidal) habitats. Intertidal habitats are less suitable/available as migration corridors for anadromous species due to tidal fluctuations and are assigned a score of "2." Existing (pre-construction) upland habitats are assigned a score of "0". A "5" was not documented because it is not certain they are present during migration season; or suitable spawning habitat is present, and they were not documented spawning in Project area. A "4" was not documented because it is not certain that opportunistic spawning is present in the Project area. A "1" was not documented because anadromous fish are present.

Essential Fish Habitat (EFH): Many EFH-designated species are known to use the southern portion of the Chesapeake Bay and the lower James River. These include Atlantic butterfish, Atlantic herring, Atlantic sharpnose shark, Black sea bass, bluefish, clearnose skate, cobia, king mackerel, little skate, red drum, red hake, sand tiger shark, sandbar shark, scup, Spanish mackerel, summer flounder, windowpane flounder, and winter skate, all of which are known to use the area in the vicinity of the HRBT Project as habitat as adults/spawning adults (NOAA 2018). A subset of this species list may occur in the Project area as early life stages (eggs, larvae, juveniles). Based on the presence of EFH for various species within the HRBT Project area, the EFH sub-criterion was assigned a score of "5" for all depth ranges (excluding intertidal criterion and shallow water) within the Project area under existing (pre-construction) conditions. Table P-1 describes the reasoning behind this determination for the entire Project site.

Habitats of Particular Concern (HAPC): A single EFH species, sandbar shark, is listed as a HAPC species within the HRBT Project area. Based on the potential presence of sandbar shark HAPC within the Project area, the HAPC sub-criterion was assigned a score of "3" for suitable depth ranges where at least one life stage of sandbar is mapped. Suitable depth ranges include inshore shallow coastal waters, including bays, harbors, and estuaries; typically in waters 5-180 ft (2-55 m); also offshore, occasionally to 600-810 ft (183-247 m). The HAPC sub-criterion was assigned a score of "4" for suitable depth ranges for this species (shallow water, mid-depth) within the Project area where at least two life stages are indicated as potential occurrences under existing (pre-construction) conditions OR where mapped HAPC is indicated for all life stages, but sand substrate is not present (or substrate type is unknown). Suitable depth ranges with preferred sand substrate (and mapped HAPC for all life stages of sandbar shark) are scored a "5." Project areas with no mapped HAPC for sandbar shark were assigned a score of "1." Project areas with mapped HAPC, but where existing depths are unsuitable (>15 ft.) were assigned a score of "2."

Protected Species Habitat: Protected species habitat is scored based on information on protected species occurrence/distribution obtained primarily from the Natural Resources Technical Appendix of the EIS (VDOT 2016). Scoring was developed for the following sub-criteria: Suitability for Whales and Dolphins; Use by Seals; Suitability for Sea Turtles; and Suitability for Atlantic sturgeon. Like the Fish

category, each of these four sub-criteria is scored separately, and then an average score is developed in the matrix analysis.

Whales and Dolphins: In general, whales do not occupy preferred habitat within the Chesapeake Bay, but are known to travel into the lower Chesapeake Bay as seasonal transients, straying from nearby Atlantic Ocean migratory corridors during the cooler months (Blaylock 1985, Barco and Swingle 2014). Bottlenose dolphin are also known to occupy the open waters within the Chesapeake Bay region, including the Hampton Roads area, on a seasonal basis (primarily during cooler months) (Blaylock 1985, Barco and Swingle 2014, Barco et al 1999). Under existing (pre-construction) conditions, Upland, Intertidal and Shallow Water habitats are assigned a score of "0" as these areas are not available to marine mammals as habitat. Mid-Depth (or deeper) areas are recognized as potential habitat for dolphins on a seasonal basis, and are assigned a score of "3" for this sub-criterion.

Seals: Seals (primarily harbor seals) are seasonally present in the lower Chesapeake Bay during the colder months and may occur as transients within the HRBT Project area (Barco and Swingle 2014, Mayfield 2016). Their presence in deeper, open water environments as well as the potential for nearshore and/or intertidal areas to provide resting habitat merits consideration of open waters and shorelines in the vicinity of the HRBT Project areas as potential seasonal habitat. Under existing (pre-construction) conditions, Upland habitats are assigned a score of "2" as under certain configurations, these areas may provide suitable "haul-out" or resting areas for seals on a seasonal basis, as can Shallow-Water and Mid-Depth areas. Similarly, intertidal rock and sand habitat may also provide resting areas for seals on a seasonal basis in the Project area and are assigned a score of "3" for this sub-criterion.

Sea Turtles: Sea turtles are seasonally present in the lower Chesapeake Bay region, including the Hampton Roads area (Barco and Lockhart 2015, Swingle et al. 2017, VIMS 2019). Species known to occur in the HRBT study area include the Kemp's ridley, leatherback, loggerhead, and green sea turtles. The leatherback sea turtles are known to occur throughout the lower and middle reaches of Chesapeake Bay; however, they do not nest in Virginia. Kemp's ridley sea turtle is the smallest and rarest of all sea turtles; juveniles comprise a majority of this species' occurrences within the Chesapeake Bay, including the Hampton Roads region (Barco and Lockhart 2015, VIMS 2019). Green sea turtles (primarily juveniles) occur throughout the lower Chesapeake Bay during the late summer and early fall (Barco and Lockhart 2015, VIMS 2019). The loggerhead sea turtle is the most common sea turtle in Chesapeake Bay, including the Hampton Roads region, occurring from May to November. This species has been reported to nest on the barrier beach islands off the Eastern Shore and/or near the Back Bay Wildlife Refuge (Barco and Lockart 2015, VIMS 2019). No nesting beaches occur within the vicinity of the HRBT Project area. While the HRBT Project area does not include nesting or juvenile rearing habitat for these species, their presence in deeper, open water environments merits consideration of open waters in the vicinity of the HRBT Project areas as potential seasonal habitat. Under existing (pre-construction) conditions, Upland and Intertidal habitats are assigned a score of "0" as these areas do not support sea turtles in the HRBT Project area. Shallow-Water and Mid-Depth areas are recognized

as potential foraging habitat for sea turtles on a seasonal basis, and are assigned a score of "1" and "2," respectively, for this sub-criterion.

Atlantic Sturgeon: The federally-listed Atlantic sturgeon is known to occur in the general vicinity of the Project area; however, the HRBT Project area does not represent important staging or feeding habitats for either juvenile or adult life stages of this species (Balazik and Garman 2018). Residence times by individual adult and juvenile sturgeon within the Project area are brief, on the order of hours, rather than days or weeks, as documented upstream from the study area in known spawning areas. However, the HRBT Project area is included within the only pathway for sturgeon movements between the Bay and the James River. During late fall and early winter, sturgeon may spend very brief periods (typically 1-2 hours) within the HRBT Project area (Balazik and Garman 2018). Under existing (pre-construction) conditions, Upland and Intertidal habitats are assigned a score of "0." Shallow-Water and Mid-Depth areas are recognized as only providing very limited foraging habitat for sturgeon on a seasonal basis, and are assigned a score of "1" for this sub-criterion.

P-1.1.2.2.2 POST-CONSTRUCTION HABITAT CONDITION FACTOR SCORING APPROACH

Project construction activities which only result in temporary impacts (e.g., temporary reductions in water quality/clarity, temporary structures, excavated or filled areas which would be later back-filled or dredged to pre-construction conditions) do not result in a change of score for any of the criteria. The post-construction scores generally follow the criteria listed in the pre-construction scores. Below describes how conversion of habitat will be scored that may differ from the pre-construction scoring.

Water Quality: Following construction, water quality in the Project area is not expected to undergo a permanent change from pre-construction conditions, as no major alterations in tidal flushing and hydrodynamics are predicted to occur as a result of Project implementation. Thus, post-construction scores for water quality are the same as pre-construction scores for areas converted to Shallow Water, or Mid-Depth, with the exception of areas converted to non-aquatic (upland) habitat – these were scored as "0."

Submerged Aquatic Vegetation: Post-construction, conversions to Shallow Water habitat (<6.6 ft.) are assigned a value of "2" because those areas have potential to be suitable for SAV. Post-construction conversion of existing shallows to deeper habitats merits a score of "1." Shallow Water areas converted to upland habitat are assigned a score of "0."

Shellfish Resources: Post-construction areas converted from Intertidal, Shallow Water, Mid-Depth, or Deep Open Water conditions to upland (non-aquatic) habitat during construction are scored as "0."

Epibenthic Habitat: For post-construction analyses, conversion of any aquatic habitats to an upland (non-aquatic) substrate will be assigned a score of "0". Conversion of Intertidal or Shallow Water rock habitat to sand habitat >6.6 ft. depth is assigned a score of "2." Conversion of Intertidal or Shallow Water rock or sand substrate to rock substrate >6.6 ft. depth and/or permanent conversion of aquatic habitat (sand substrate) >6.6 ft. depth to rock substrate >6.6 ft. depth is assigned a score of "4." Conversion of

sand substrate <6.6 ft. depth to rock substrate <6.6 ft. depth and/or permanent conversion of aquatic habitat (rock or sand substrate) >6.6 ft. depth to rock substrate <6.6 ft. depth is assigned a score of "5."

Benthic Community: Benthic communities within the Project area are expected to quickly recolonize disturbed areas following Project construction; however recovery rates are known to vary based on several factors, including the duration and initial timing of the impact(s); temperature/latitude, water quality/hydrodynamics, sedimentation post-construction patterns and the life history characteristics of re-colonizing fauna (Newell et al. 1998). Thus, areas converted to Shallow Water or Mid-Depth habitat are assigned a habitat score of 3.5, assuming they will, over time, provide for the development of benthic communities capable of meeting CBP Restoration Goals. As with epibenthic habitat, conversion to non-aquatic (upland) substrate results in a score of "0."

Fish: In general, it was assumed that estuarine fish assemblages in the vicinity of the Project area would generally not be affected by Project implementation because most pelagic and demersal fish move freely throughout the Lower James River and are not restricted to habitats within the Project area (thereby avoiding temporary impacts such as underwater noise, turbidity increases, and temporary substrate disturbance) (Schloesser and Fabrizio 2016, 2019, Tuckey and Fabrizio 2013, 2014, 2015, 2016, 2017). Potential impacts would be temporary since displaced fish would quickly return to the Project areas following cessation of construction activity. Thus, scoring of the pre- and post-construction conditions for this sub-criterion is largely comparable.

General: Permanent conversion of any aquatic habitats to Upland (non-aquatic) habitat as a result of Project implementation scored a "0" for the areas affected. Similarly, permanent conversion of Shallow Water or deeper aquatic habitats to Intertidal sand and rock habitat as a result of Project implementation is scored "2" and "1" for the areas affected, respectively, as fish would only be able to access these habitats when tidally inundated, and rock substrate may represent less suitable, or sub-optimal foraging habitat for demersal fish species such as summer flounder, windowpane flounder, and similar species (Grimes et al. 1989, NOAA 2018) Conversion of Uplands, Intertidal or Mid-Depth aquatic habitat to Shallow Water habitat is assigned a score of "3." Conversion of Uplands, Intertidal or Shallow Water habitat to Mid-Depth aquatic habitat is assigned a score of "4." As described for the pre-construction scoring, a "5" was unlikely to be attained due to a slight disparity in diversity and abundance of species in all seasons.

Anadromous: Permanent conversion of any aquatic habitats to upland (non-aquatic) habitat as a result of Project implementation is scored a "0" for the areas affected. Similarly, permanent conversion of any open water subtidal habitat to intertidal habitat as a result of Project implementation is assigned a score of "2" for the areas affected because intertidal habitats are less suitable/available as migration corridors for anadromous species due to tidal fluctuations.

EFH: Should any habitat conversions to Shallow Water (<6.6 ft. depth) take place as a result of Project implementation, these affected areas would be assigned a score of "2" as certain EFH species would be unlikely to occur in shallow subtidal waters, except as occasional transients (primarily juveniles). Similarly, habitat conversions from areas >6.6 ft. depth to Intertidal sand substrate would be assigned a score of "2." Habitat conversions from >6.6 depth to Intertidal rock

substrate would be assigned a score of “1,” as these areas may represent less suitable, or sub-optimal foraging habitat for demersal EFH species such as summer flounder, windowpane flounder, and similar species (Grimes et al. 1989, NOAA 2018). Habitat conversions from any depth to Upland (non-aquatic) habitat would be assigned a score of “0” for the EFH sub-criterion.

HAPC: Post-construction habitat conversions (either from Upland or Intertidal to Shallow Water or Mid-Depth) are assigned a “4,” assuming these areas would provide suitable habitat for at least two life stages of sandbar shark. Post-construction habitat conversions from deep (or deeper) water habitats (>15 ft.) to Mid-Depth or Shallow Water conditions also merit a score of “4”. Habitat conversions from any depth to Upland (non-aquatic) habitat would be assigned a score of “0” for the HAPC sub-criterion.

Protected Species Habitat: It was assumed that the protected species in the vicinity of the Project area would generally not be affected by temporary construction activities as they are able to move freely through the Lower James River (thereby avoiding temporary impacts such as underwater noise, turbidity increases, and temporary substrate disturbance). Thus, an average scoring of the pre- and post-construction conditions for this sub-criterion is generally comparable, with the exception of permanent habitat conversion impacts, as follows:

Whales and Dolphins: Under post-construction conditions, conversion of Mid-Depth habitats to Upland habitat would merit a score of “0.” Conversion of Mid-Depth habitats to Shallow Water habitat would merit a score of “1” due to lack of habitat presence. Conversion of Upland, Intertidal or Shallow Water habitat to Mid-Depth habitat as a result of construction activity would merit a score of “3” due to the conversion of habitat to transient use.

Seals: Under post-construction conditions, conversion of Intertidal or deeper habitats to Upland habitat suitable as resting areas would merit a score of “2” due to conversion of potential habitat to transient use. However, aquatic habitat be converted to Uplands containing structures of other features deemed unsuitable to provide resting areas for seals would be scored as “0.” Conversion of Upland, Intertidal or Shallow Water habitat to Mid-Depth habitat would also merit a score of “2”, as transient use may be provided.

Sea Turtles: Under post-construction conditions, conversion of Shallow Water or deeper habitats to Upland habitat would merit a score of “0.”

Atlantic Sturgeon: Under post-construction conditions, conversion of Shallow Water or deeper habitats to Upland habitat would merit a score of “0.”

Table P-1.1 provides a brief description of the habitat scores.

P-1.1.2.3 CALCULATION OF TOTAL PRE- AND POST-CONSTRUCTION HCA SCORES AND HABITAT UNITS

Average HCA scores for each category/area of habitat present in the Project area prior to construction and post-construction are calculated as follows:

(Epibenthos + Water Quality + SAV + Benthic Community + Shellfish + Fish + Protected Species) ÷ Number of Condition Factors = Habitat Condition Factor Score

The average score is then multiplied by the by the area of habitat (acres) to provide a final habitat unit value for each habitat type.

Average Score x Acreage = Habitat Units

The final habitat units for each habitat type are summed to create a total score (total habitat units) for the pre-construction and post-construction conditions.

P-1.1.2.4 COMPARISON OF PRE- AND POST-CONSTRUCTION HABITAT UNITS

The total number of pre-construction habitat units is subtracted from the total number of post-construction habitat units to determine the relative change as a result of the Project. A positive number or a zero value indicates either a net improvement or no change, respectively. A negative number indicates a net loss and that mitigation may need to be considered to offset losses. However, since this analysis is semi-quantitative, a minor difference in final habitat unit values may be viewed as an inconsequential change in habitat functional capacity throughout the Project area.

P-1.2 RESULTS

The HCA analysis for the existing (pre-construction) conditions in the HRBT Project area resulted in a total of 60.18 habitat units (Table P-2). The post-construction condition yielded 18.79 habitat units (Table P-3). This is a net loss of 41.39 habitat units as a result of Project implementation. The vast majority (98%) of Project-related impacts occur at 3 areas, the North Trestle (Figure P-1) and the North (Figure P-2) and South islands (Figure P-3), primarily as a result of conversion of mid-depth and deep open water habitat to 14.22 acres of uplands. This conversion provides virtually no habitat value to aquatic organisms with the exception of potential basking/ haul out habitat for seals that may occur seasonally in the vicinity of the Project area. In addition, 0.92 acre of intertidal sand habitat will be lost, while intertidal rock habitat will increase from 0.87 acre to 1.36 acre. Shallow-water habitat, which supports SAV and shellfish resources in the vicinity of the study area, will increase from 1.32 to 2.21 acres, offsetting a portion of the loss in function attributed to the conversion of mid-depth and deeper open water to uplands/intertidal rock habitat. The remaining habitat loss/ conversions occur throughout the Project area at Willoughby Spit (Figure P-4), Willoughby Bay- West Shore (Figure P-5), Fourth View Street (Figure P-6), First View Street (Figure P-7), and Oastes Creek (Figure P-8).

Based on this analysis, and under current regulatory policy, compensatory mitigation will be needed to offset overall projected loss in habitat function associated with Project construction.

P-1.3 RECOMMENDATIONS

Results of the HCA assessment indicated a functional loss of 41.39 habitat units associated with construction of the HRBT Project. As most of the habitat unit loss is due to conversion to upland and the pre and post construction scoring was very similar for remaining habitat, we propose to only mitigate for the conversion to upland. The assessment used available data on estuarine ecological indicators for the geographic region of the Project. It also used conservative assumptions for the habitat condition scoring to ensure that the pre-construction score was not biased low and that the post-construction assessment was not biased high. As the permit process continues, the Project sponsors should coordinate closely with the federal and state regulatory and advisory agencies on an equitable and practicable compensation plan. Elements of the plan may include out-of-kind mitigation options such as purchase of regional mitigation bank credits or purchase of credits within an in-lieu fee program [e.g., TNC's Virginia Aquatic Resources Trust Fund (VARTF) (TNC 2009) or the Elizabeth River Project's Living River Restoration Trust (LRRT], should the number of available regional mitigation credits be insufficient to offset functional loss, or should the mitigation habitat types available through regional banks be deemed inappropriate for estuarine shallow and open water habitat compensation.

Tables

Table P-1. 1. Habitat Condition Scores

Habitat Condition Scores

Indicator or Feature	0	1	2	3	4	5
Water Quality (based on CBP and VECOS data)	Non aquatic habitat	Poor water quality; dissolved oxygen (DO) meets restoration goal up to 50% of the time.	Seasonally low DO; DO meets restoration goal 51 to 75% of the time.	DO usually supports aquatic life year round; DO meets restoration goal 76 to 90% of the time.	DO supports aquatic life year-round; stable foraging habitat; DO meets restoration goal 91 to 99% of the time.	DO supportive of aquatic life; DO meets restoration goal 100% of the time (HRBT pre-construction condition)
Shellfish Resources (based on data in VIMS 2018 clam survey)	Non aquatic habitat	No shellfish habitat (0 live clams m^2); depth >30 ft. and substrate does not support bivalves.	Isolated patches of potential shellfish habitat; No existing or historic shellfish beds; depth <30 ft.	Existing shellfish beds limited or absent (<1 live clams m^2); historic record of shellfish beds; depth <30 ft.	Some/moderate shellfish habitat (1-2 live clams m^2); known moderately productive existing shellfish beds/reefs; depth <30 ft.	Extensive shellfish habitat (2-3 live clams m^2); known highly productive existing shellfish beds/reefs; depth <30 ft.
SAV (based on 2013-2017 VIMS SAV data)	Non aquatic habitat	No suitable SAV habitat present; depth >6.6 ft.	No SAV present; no historic record of SAV; depth <6.6 ft.	No SAV present; depth <6.6 ft.; historic presence of SAV in area documented.	Sparse SAV present; depth <6.6 ft.	Stable SAV population present; depth $\leq$6.6 ft.
Epibenthic Habitat (based on Versar 2018 epibenthic survey and VIMS 2018 clam survey)	Non aquatic habitat	Predominantly silt/clay substrate conditions, habitat does not support epibenthic organisms.	Predominantly soft bottom (sand) substrate in depths of >6.6 ft; limited hard surface for epibenthic organisms.	Predominantly soft bottom substrate in depths of <6.6 ft; some hard surface for epibenthic organisms (e.g., gravel).	Predominantly rock substrate >6.6 ft; majority of the area provides hard substrate for epibenthic organisms.	Predominantly rock substrate <6.6 ft; Varied substrate sizes that provide extensive/diverse habitat for epibenthic organisms.
Benthic Community (based on Versar 2018 benthic survey)	Non aquatic habitat	Severely degraded benthic community; Benthic Index of Biotic Integrity (B-IBI) score of <2.0; poor abundance and diversity of species; populations present only seasonally.	Degraded community; B-IBI score of 2.0 – 2.5; low abundance and diversity of species. Areas encompassing Deepest Water not included in 2018 benthic survey are scored as 2.25 to reflect seasonal DO impairments expected to control benthic community structure at those depths.	Fair community; B-IBI score of 2.6 – 2.9; to account for potential (seasonal) DO reduction, a score of 2.75 is assigned to Deeper Water areas not included in the 2018 benthic survey.	Good community; B-IBI score of 3.0 – 4.0; moderate to high diversity and abundance; populations present year-round.	Excellent community; B-IBI score of 4.1 – 5.0; high diversity and abundance; stable community present year-round.

Habitat Condition Scores

Indicator or Feature	0	1	2	3	4	5
Fish	Non aquatic habitat	General: few or no fish present; present species are irregular transients; habitat does not support fish populations.	General: poor diversity; relatively high abundance of one species; poor habitat for fish populations; population is marginally sustainable.	General: moderate diversity and abundance of species; adequate habitat for fish populations.	General: moderate to high diversity of species; high abundance of several species; good habitat for fish populations; stable fish population.	General: high diversity and abundance of species in all seasons; excellent habitat for fish populations; stable fish population at carrying capacity for available habitat.
	Non aquatic habitat	Anadromous: none present.	Anadromous: historic use; no known current activity.	Anadromous: present during migration season; no known spawning habitat in Project area.	Anadromous: present during migration season; opportunistic spawning documented in Project area.	Anadromous: present during migration season; suitable spawning habitat present, documented spawning in Project area.
	Non aquatic habitat	EFH: no EFH species present.	EFH: transient EFH species.	EFH: seasonal use by EFH species.	EFH: use by transient/ seasonal EFH species in most seasons.	EFH: EFH species present.
	Non aquatic habitat	HAPC: no sandbar shark HAPC present.	HAPC: mapped sandbar shark HAPC present, but depths unsuitable (>15 ft.).	HAPC: mapped HAPC present for at least one life stage of sandbar shark.	HAPC: mapped sandbar shark HAPC present in Shallow Water and Mid-Depth Areas (at least two life stages); OR mapped HAPC for all life stages, but substrate type other than sand (e.g., mud, rock), or unknown.	HAPC: mapped sandbar shark HAPC present in Shallow Water and Mid-Depth Areas (all life stages), with preferred sand substrate, documented sandbar sharks in Project area.

Habitat Condition Scores

Indicator or Feature	0	1	2	3	4	5
Protected Species	Whales/ Dolphins: non- aquatic habitat. Seals: non-aquatic habitat, no haul-out areas. Sea Turtles: non-aquatic habitat. Atlantic Sturgeon: non-aquatic habitat.	Whales/ Dolphins: habitat not present. Seals: suitable habitat not present. Sea Turtles: suitable habitat not present. Atlantic Sturgeon: suitable habitat not present.	Whales/ Dolphins: transient use. Seals: transient/occasional use of Shallow and/or Mid-Depth areas as potential foraging habitat; resting or "haul-out" areas present. Sea Turtles: transient/occasional use. Atlantic Sturgeon: transient use.	Whales/ Dolphins: seasonal use. Seals: seasonal use; a variety of water depths available as potential habitat. Sea Turtles: seasonal use. Atlantic Sturgeon: seasonal use.	Whales/ Dolphins: species present year-round. Seals: species present all year-round. Sea Turtles: year-round use. Atlantic Sturgeon: species present all year-round.	Whales/ Dolphins: species present year-round; breeding grounds present. Seals: breeding grounds and species present. Sea Turtles: year-round use; beach/nesting habitat and species present. Atlantic Sturgeon: spawning habitat and species present.

Table P-1. 2. Pre-Construction Habitat Impact Factor Scores and Habitat Units

Pre-Construction Habitat Impact Factor Scores and Habitat Units

	Habitat Type	Area (acres)	Epibenthic Habitat	Water Quality	Shellfish Resources	SAV	Benthos	Fish	Protected Species	Average Score	Existing Habitat Unit (Average Score x Acres)
1	Upland	0	0	0	0	0	0	0	0.5	0.07	0.00
2	Intertidal Rock	0.87	5	5	4	0	1	1.25	1	2.46	2.14
3	Intertidal Sand	0.92	3	5	4	0	3	2	0.75	2.54	2.34
4	Intertidal Mud	0	1	5	4	0	2	1.5	0.75	2.04	0.00
5	Shallow Water	1.32	2	5	4	3	2.8	3.25	1	3.01	3.97
6	Mid-Depth	13.41	2	5	4	1	3.1	4.25	2	3.05	40.90
7	Deep Open Water	3.99	2	5	1	1	3.1	3.75	2.75	2.66	10.61
8	Deeper Open Water	0.08	2	5	1	1	3.1	3.75	3	2.69	0.22
9	Deepest Open Water	0	2	5	1	1	2.25	3.75	3	2.57	0.00
										Habitat Units	60.18

Table P-1. 3. Post-Construction Habitat Impact Factor Scores and Habitat Units

Post-Construction Habitat Impact Factor Scores and Habitat Units

	Habitat Type	Area (acres)	Epibenthic Habitat	Water Quality	Shellfish Resources	SAV	Benthos	Fish	Protected Species	Average Score	Existing Habitat Units (Average Score x Acres)
1	Upland	14.22	0	0	0	0	0	0	0.5	0.07	1.00
2	Intertidal Rock	1.36	5	5	4	0	1	1.25	1	2.46	3.35
3	Intertidal Sand	0	3	5	4	0	3	2	0.75	2.54	0.00
4	Intertidal Mud	0	1	5	4	0	2.75	1.5	0.75	2.14	0.00
5	Shallow Water	2.21	2	5	4	3	3	3.25	1	3.04	6.72
6	Mid-Depth	0.98	2	5	4	1	3	4.25	2	3.04	2.98
7	Deep Open Water	1.82	2	5	1	1	3	3.75	2.75	2.61	4.75
8	Deeper Open Water	0	2	5	1	1	2.75	3.75	3	2.64	0.00
9	Deepest Open Water	0	2	5	1	1	2.25	3.75	3	2.57	0.00
										Habitat Units	18.79

Figures

Figure P-1. 1: Habitat Conversion - North Trestle

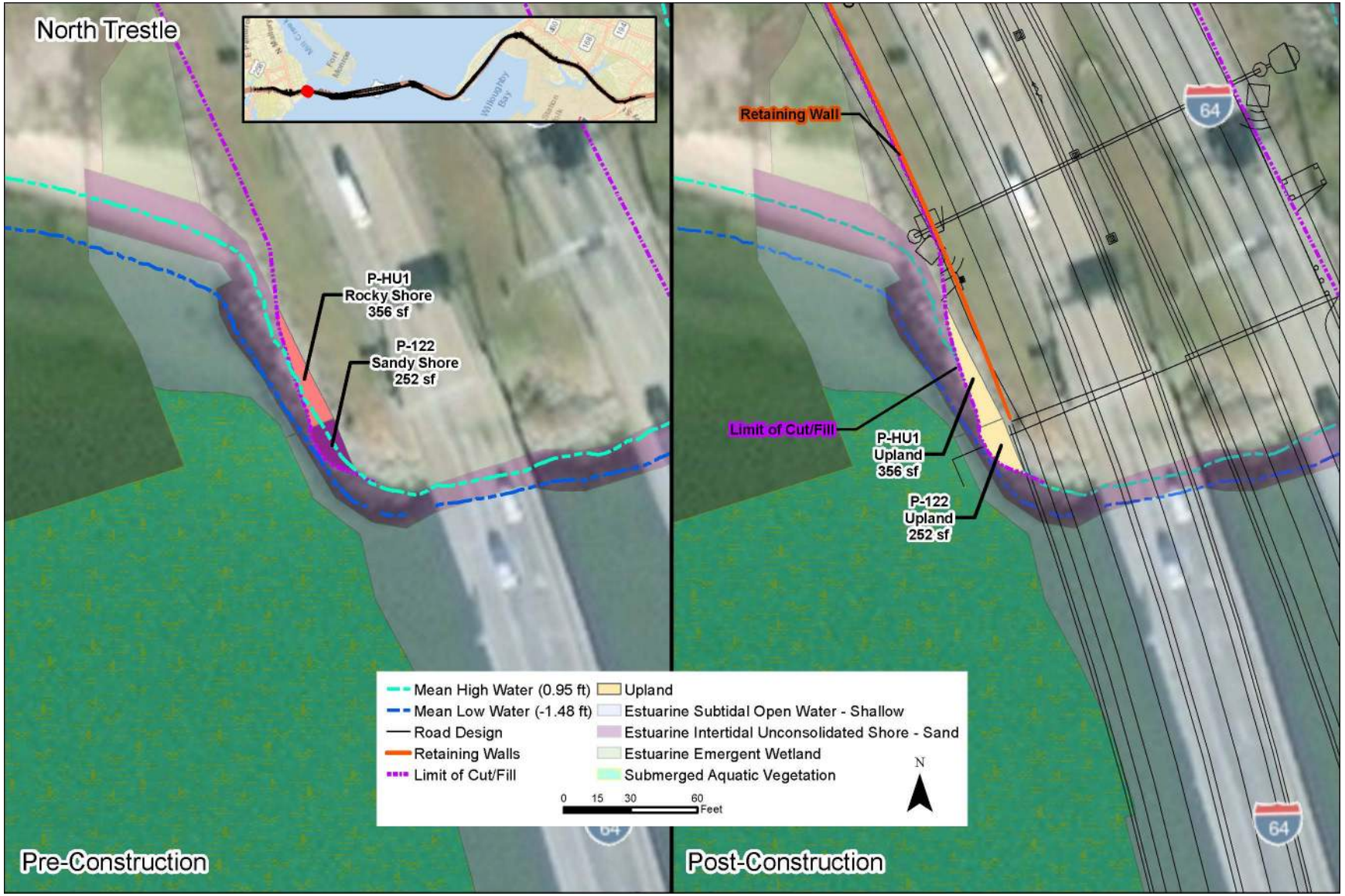


Figure P-1. 2: Habitat Conversion - North Island

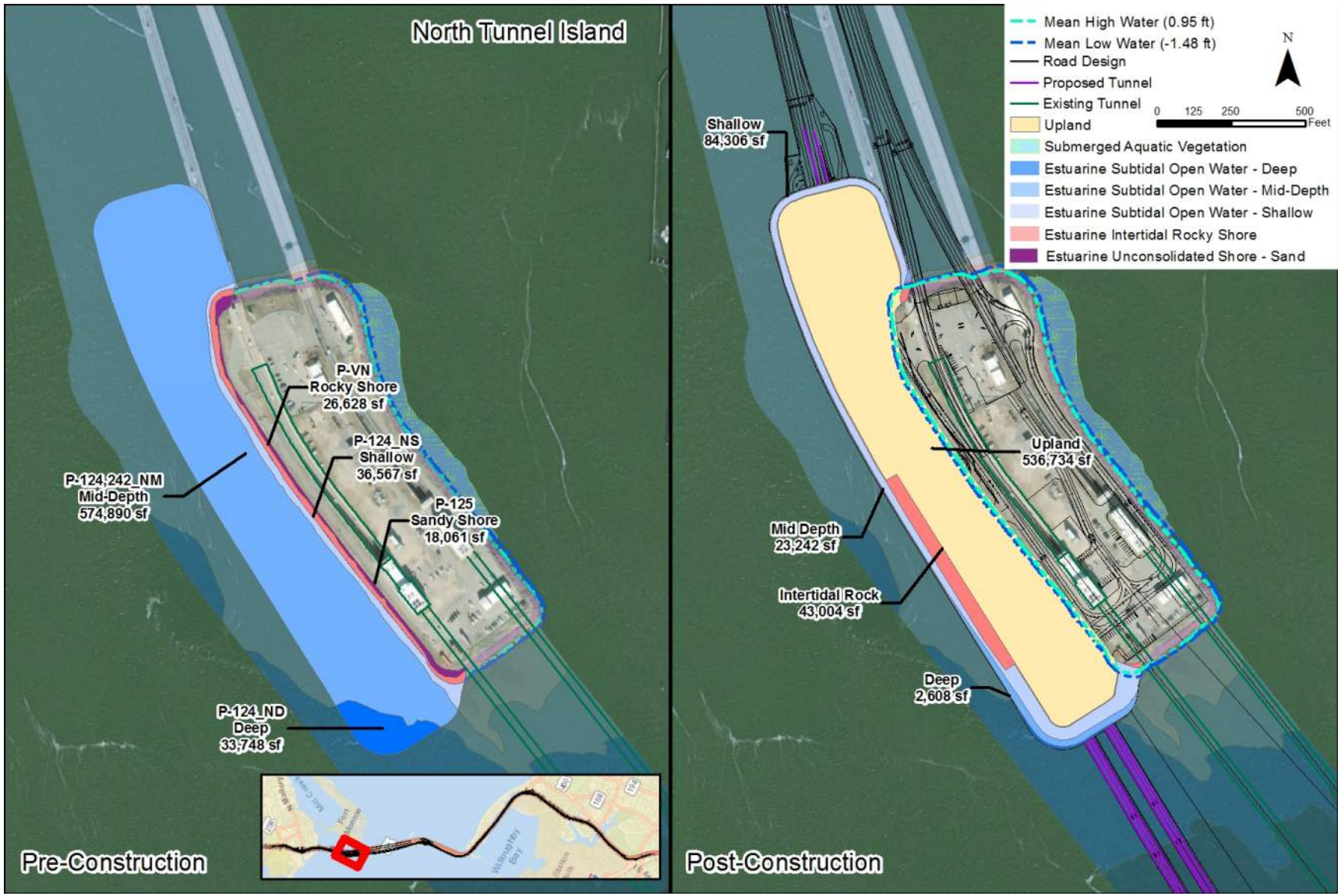


Figure P-1. 3: Habitat Conversion - South Island

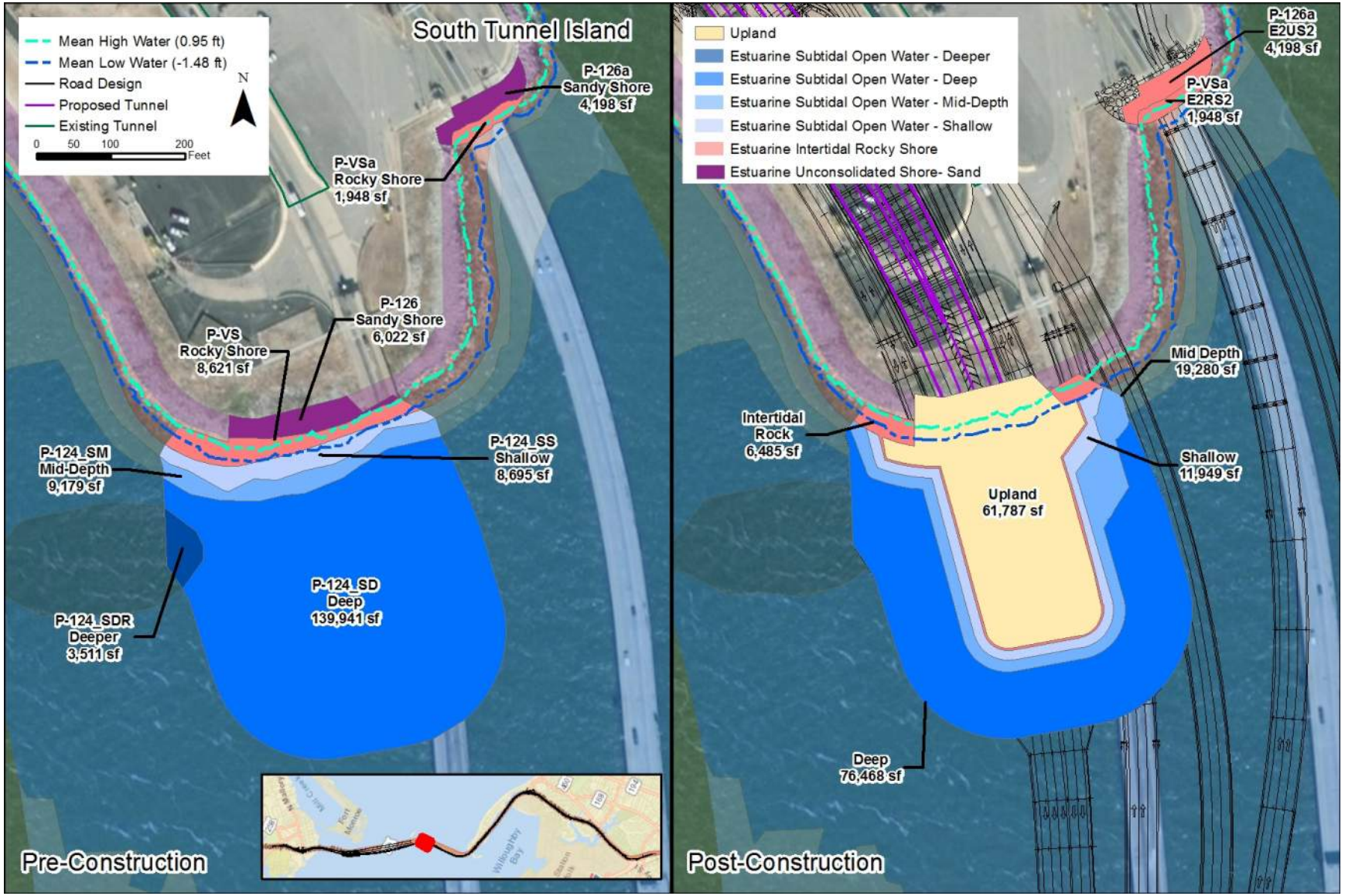


Figure P-1. 4: Habitat Conversion - Willoughby Spit

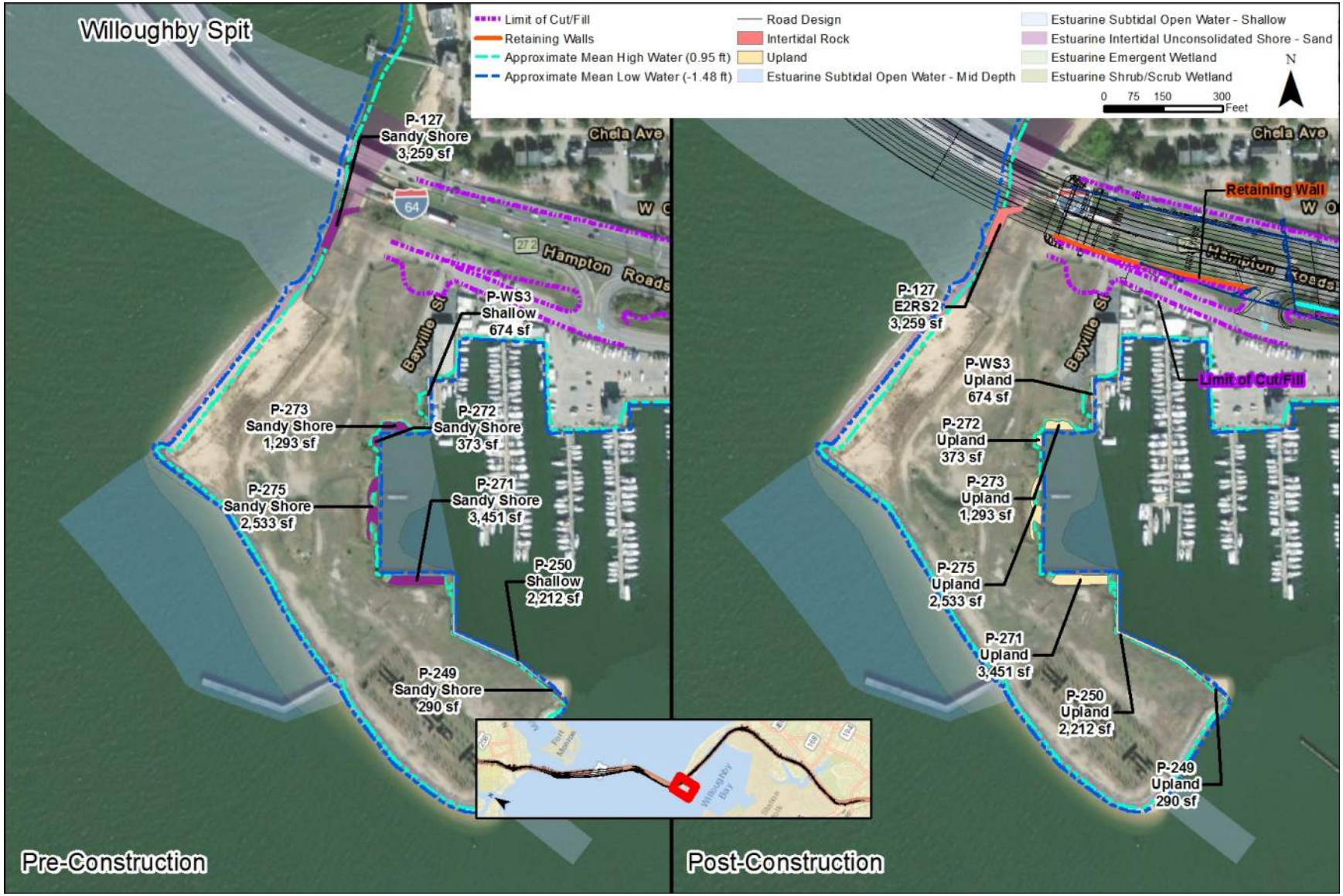


Figure P-1. 5: Habitat Conversion - Willoughby Bay, West Shore

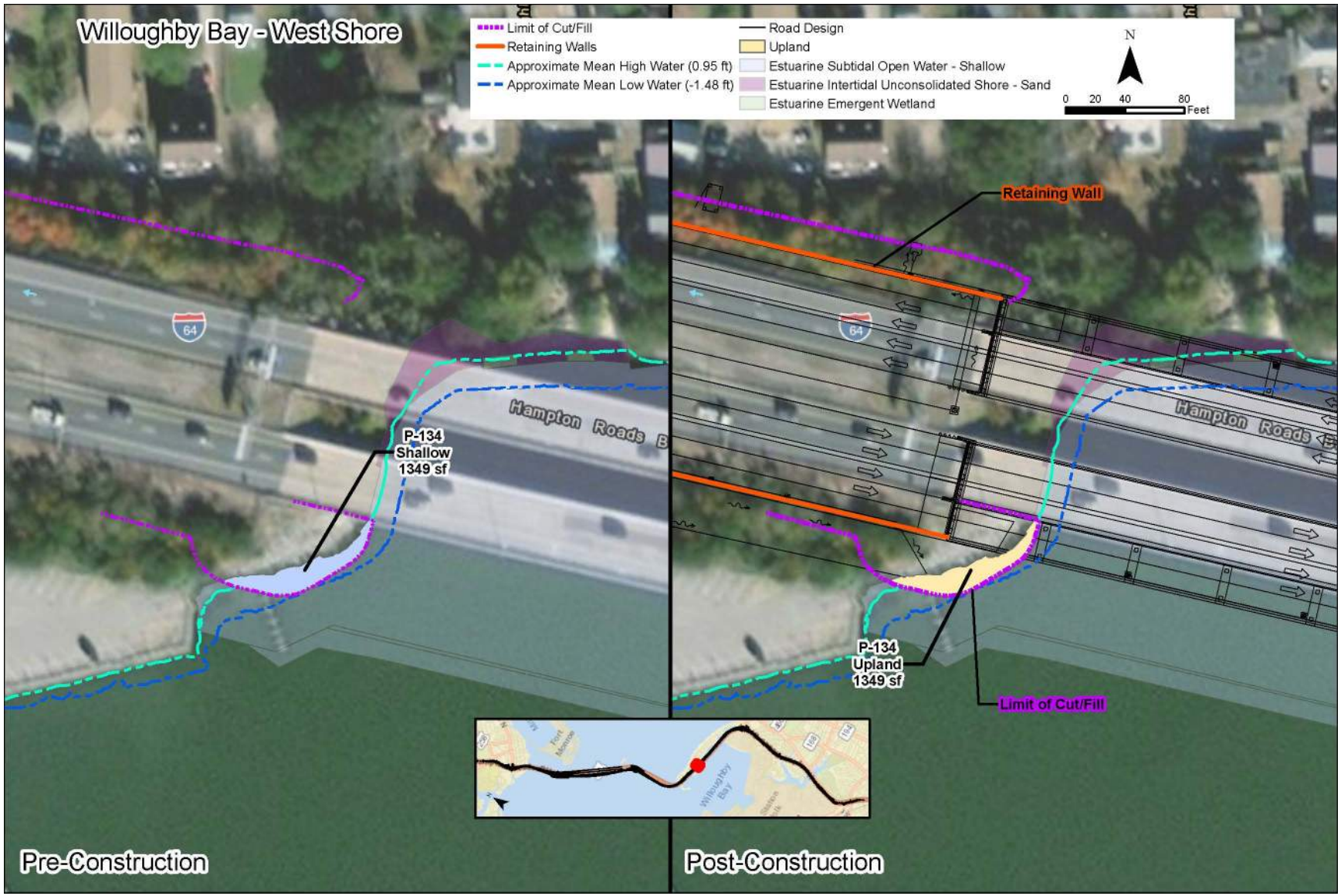


Figure P-1. 6: Habitat Conversion - Fourth View Street

Figure P-1. 7: Habitat Conversion - First View Street

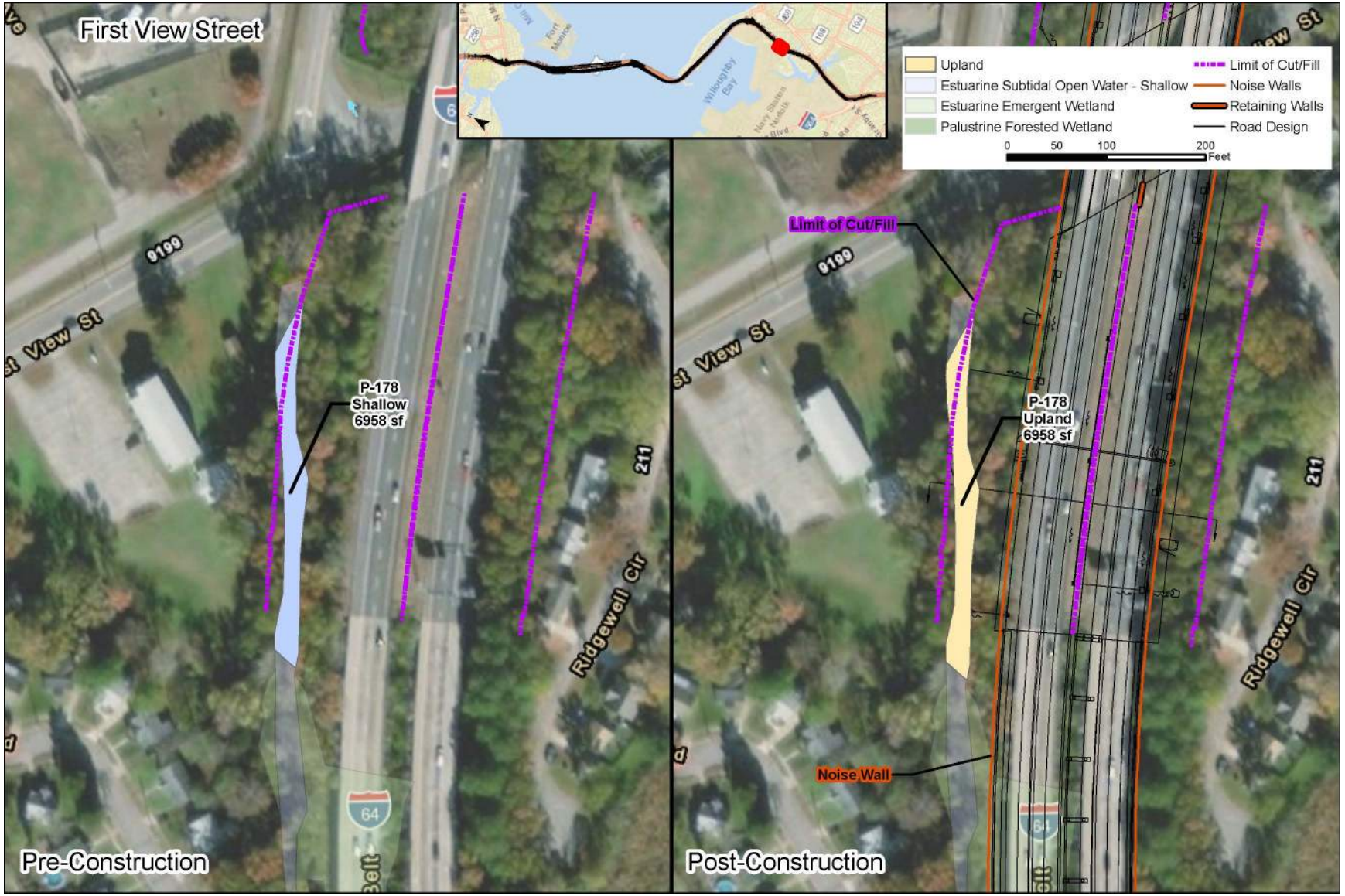
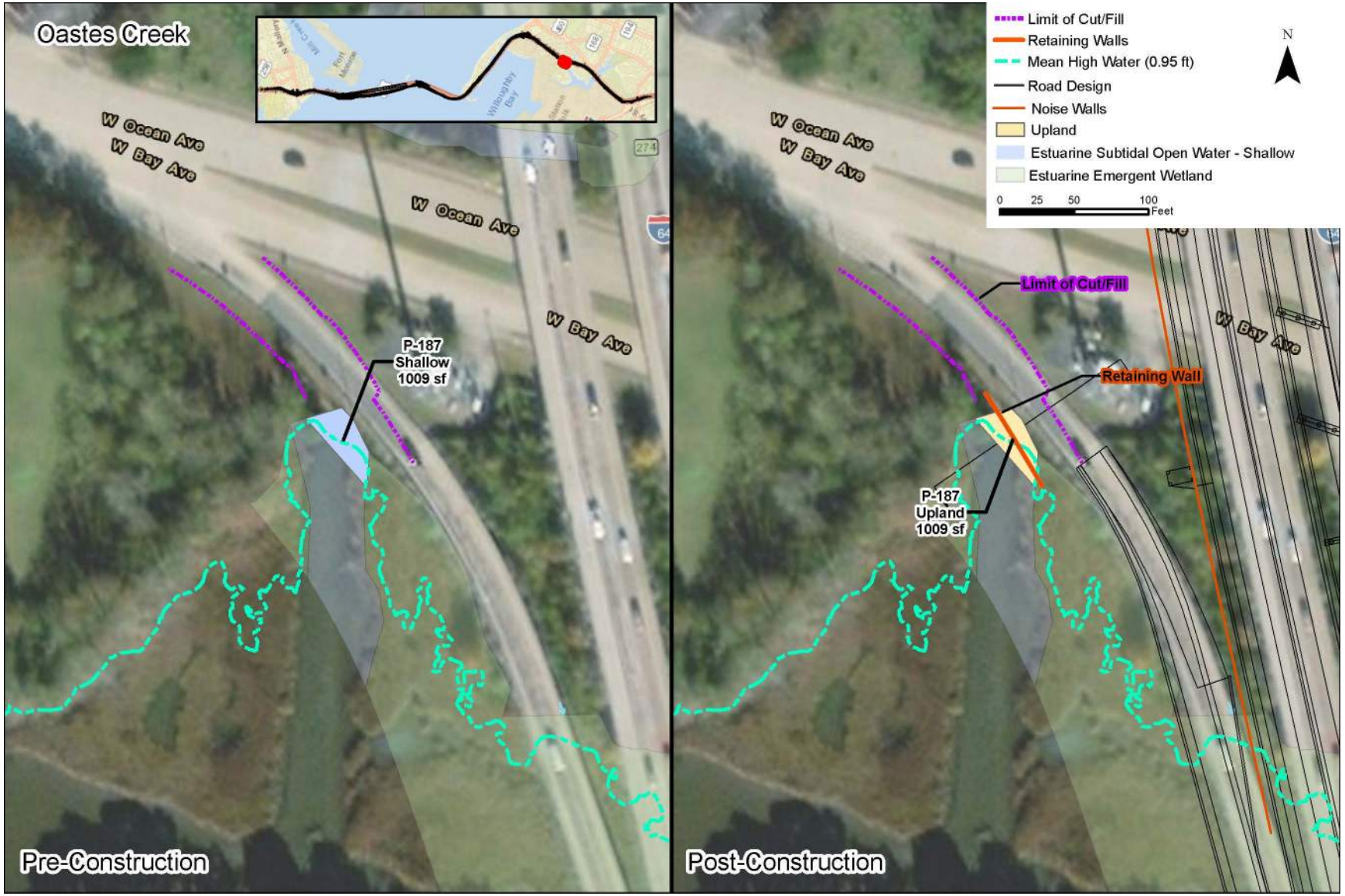


Figure P-1. 8: Habitat Conversion - Oastes Creek



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ATTACHMENT P-2 – MITIGATION PLAN

MITIGATION PLAN, REV 2

I-64 Hampton Roads Bridge-Tunnel Expansion Project

Hampton Roads Connector Partners
240 Corporate Blvd. 4th floor
Norfolk, VA 23502

Hampton-Norfolk, Virginia
December 19, 2019

DOCUMENT HISTORY

Issue Date	Description	By	Revision
September 18, 2019	Revised for consistency with Revision 1 of the Appendix G – Impact Tables	R. Wilk	1
December 19, 2019	Revised for JPA re-submittal	R. Wilk	2

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Tables

P-2.1 COMPENSATORY MITIGATION PLAN

This compensatory mitigation plan has been developed in accordance with applicable state and federal mitigation policies and practices generally accepted in Virginia by regulatory agencies. Compensatory mitigation options were considered and prioritized pursuant to the April 10, 2008 final federal regulations entitled "Compensatory Mitigation for Losses of Aquatic Resources; Final Rule" (USACE regulation 33 CFR Parts 325 and 332 and EPA regulation 40 CFR Part 230; "Final Rule").

As stated in the Final Rule:

> *For impacts authorized under section 404, compensatory mitigation is not considered until after all appropriate and practicable steps have been taken to first avoid and then minimize adverse impacts to the aquatic ecosystem pursuant to 40 CFR part 230 (i.e., the Clean Water Act Section 404(b)(1) Guidelines).*

Typically, required compensatory mitigation should be located within the same watershed as the impact site and should be located where it is most likely to successfully replace the lost functions and services of impacted aquatic resources, taking into account such watershed scale features as aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources (including the availability of water rights), trends in land use, ecological benefits, and compatibility with adjacent land uses. The Final Rule emphasizes a watershed approach to compensatory mitigation and presents the following "preference hierarchy" for compensatory mitigation (in order of preference):

- Mitigation Banking
- In-Lieu Fee Mitigation
- Permittee-Responsible Mitigation

This compensatory mitigation plan uses the Final Rule's preferred hierarchy as the guiding principal objective by proposing a combination of mitigation methods to compensate for the unavoidable impacts resulting from the Project.

P-2.1.1 PROPOSED COMPENSATION

Compensation will be provided for impacts to wetlands and other waters resulting from permanent cut/fill, permanent shading, extended temporary shading lasting more than six months (from temporary work trestles), and permanent conversion. Temporary impacts lasting less than six months and extended temporary impacts greater than six months to non-vegetated aquatic resources will be restored to preexisting conditions after construction completion, thus no compensatory mitigation is proposed.

P-2.1.1.1 STREAMS

The Project will not permanently impact streams but will result in 27 linear feet of temporary impacts to a single perennial stream. The temporarily impacted stream will be restored to original elevations and contours and the banks will be seeded or planted with the same vegetative cover type originally present

along the banks, including supplemental erosion control grasses, if necessary. No compensatory mitigation is proposed for temporary impacts to streams.

P-2.1.1.2 OTHER WATERS OF THE US

Permanent impacts to other waters of the US include 0.16 acres of palustrine unconsolidated bottom (PUB). The Project will also result in temporary impacts to 0.21 acres of PUB. The majority of the Project's PUB impacts are to ditches that were constructed along roads for the purpose of conveying stormwater from the road surface. The Project has been designed to adequately convey all water in and around the road and is, therefore, compensating for any impact to the primary function of the ditches, which is to convey water.

Virginia Water Protection Permit Program (VWPPP) Regulations state: Compensatory mitigation for open water impacts may be required to protect state waters and fish and wildlife resources from significant impairment, as appropriate. Compensation shall not be required for permanent or temporary impacts to open waters that are identified as palustrine by the Cowardin classification method, but compensation may be required when such open waters are located in areas of karst topography in Virginia and are formed by the natural solution of limestone (9VAC25-210-116). The VWPP Regulations define "open water" as an area that, during a year with normal patterns of precipitation, has standing water for sufficient duration to establish an ordinary high water mark. The term "open water" includes lakes and ponds but does not include ephemeral waters, stream beds, or wetlands. (9VAC25-210-10. Definitions) Cowardin et al. (1979) do not include the term "palustrine open water" as a formal classification type; however, they do acknowledge that the Palustrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie, which are found throughout the United States. It also includes small, shallow, or permanent or intermittent water bodies often called ponds. The palustrine unconsolidated bottom wetlands being impacted by the Project are equivalent to palustrine "open water" referenced in the VWPPP Regulations and are not in areas of karst topography. Therefore, no compensation is proposed for impacts to PUB wetlands.

P-2.1.1.3 VEGETATED WETLANDS

P-2.1.1.3.1 SUMMARY OF IMPACTS AND CREDITS REQUIRED

Compensation will be provided for impacts to wetlands resulting from permanent cut/fill, permanent shading, extended temporary shading lasting more than six months (from temporary work trestles), and permanent conversion. Compensation for permanent impacts to vegetated wetlands will be achieved through the purchase of wetland credits from approved mitigation banks using generally-accepted ratios. Impact acreages, compensation ratios, and proposed compensation are summarized in below.

Table P-2- 1: Summary of Credits Required for Permanent Impacts to Nontidal and Tidal Vegetated Wetlands

Impact Type	Compensation Ratio	Impact Area (AC)	Credits Required
Nontidal			
PFO Cut/Fill	2:1	0.12[1]	0.24
PFO Permanent Conversion	1:1	0.01[2]	0.01
PSS Cut/Fill	1.5:1	0.25[1]	0.38
PSS Shading	1:1	0.11[3]	0.11
PEM Cut/Fill/Piles	1:1	0.28[4]	0.28
PEM Shading	1:1	0.01[3]	0.01
Nontidal Total		**0.78**	**1.03**
Tidal			
E2SS Cut/Fill	1.5:1	0.08[5]	0.12
E2SS Cut/Fill Mallory Street Mitigation Site	3:1	0.05[6]	0.15
E2SS Shading Mallory Street Mitigation Site	2:1	0.06[3]	0.12
E2EM Cut/Fill/Piles	1:1	0.13[7]	0.13
E2EM Shading	1:1	1.92[8]	1.92
E2EM Cut/Fill Mallory Street Mitigation Site	2:1	0.04[9]	0.08
E2EM Shading Mallory Street Mitigation Site	2:1	0.09[10]	0.18
Tidal Total		**2.37**	**2.70**

Table P-2-1 Notes

[1] See Appendix G, Table G-2 for impact acreage
[2] See Appendix G, Table G-4 for impact acreage
[3] See Appendix G, Table G-6 for impact acreage
[4] See Appendix G, Table G-2 plus Table G-8 for impact acreage
[5] See Appendix G, Table G-3 impacts P-274, P-267, and P-216 for impact acreage
[6] See Appendix G, Table G-3 impacts P-114, P-120a, and P-120b for impact acreage
[7] See Appendix G, Table G-2 minus Mallory Street (Table G-3 Impact P-119) Plus Table G-8 for impact acreage
[8] See Appendix G, Table G-6 minus Mallory Street (Table G-7 Impact ET-119) for impact acreage
[9] See Appendix G, Table G-3 impact P-119 for impact acreage
[10] See Appendix G, Table G-7 impact ET-119 for impact acreage

P-2.1.1.3.2 PROPOSED COMPENSATION FOR IMPACTS TO VEGETATED WETLANDS

HRCP proposes to compensate for permanent impacts to 0.78 total acres of nontidal vegetated wetlands (PFO, PSS, and PEM) through the application of 1.03 nontidal vegetated wetland credits previously purchased by VDOT from the Great Dismal Swamp Restoration Bank - Lewis Farm Mitigation Bank (Table P-2-1).

HRCP proposes to compensate for permanent impacts (which includes temporary impacts greater than six months) to 2.37 acres of tidal vegetated wetland (ESS and EEM) impacts through the purchase of 2.70 tidal vegetated wetland credits from approved mitigation banks and “advance release credits” from the Living River Restoration Trust (LRRT) in the Hampton Roads sub-basin (HUC 02080208). Impacts to wetlands within the Mallory Street Mitigation Site will be mitigated at double the standard mitigation ratios (*i.e.,* 2:1 for all E2EM impacts; 3:1 for E2SS cut/fill impacts, and 2:1 for E2SS shading impacts). -2 summarizes the tidal vegetated wetland credits that are currently available or that will be available prior to the anticipated construction start date for the Project. Based on the current availability of tidal vegetated wetland credits for purchase in the Hampton Roads sub-basin, it is anticipated that successful mitigation for tidal vegetated wetland impacts will be achieved. A letter of credit availability is provided.

Table P-2- 2: Available Tidal Vegetated Wetland Credits

Bank	Credits Available	Date Available
Chesapeake Land Development Banks (Libertyville, New Mill Creek Mitigation Bank, Steek Street Mitigation Bank)	2 AC	Current
Chesapeake Land Development Banks (Libertyville, New Mill Creek Mitigation Bank, Steek Street Mitigation Bank)	3 AC	Current
Chesapeake Land Development Banks (Libertyville, New Mill Creek Mitigation Bank, Steek Street Mitigation Bank)	5 AC	June 2020
LRRT Advanced Credits	2 AC	Current
Total Credits Available (Updated 06/28/2019)	4 AC	---
Additional Credits Available by June 2020	8 AC	---

The Project will also result in temporary impacts (for jump trestles and construction access) for a total of 3.37 acres of vegetated wetlands, which includes 0.45 acres of nontidal vegetated wetlands (PFO, PSS, and PEM) and 2.92 acres of tidal vegetated wetlands (ESS and EEM) (see Appendix G, Attachment G-2). Compensatory mitigation is not proposed for temporary wetland impacts. Where practicable, the following measures will be implemented to minimize impacts to aquatic resources for temporary impacts:

- E2RS2:
  - Rock/ riprap will be replaced once piles are removed to return structural community for benthic wildlife use.
  - Riprap will be clean and from a VDOT approved quarry.
- E2US2:
  - Pile holes will be filled with clean fill and will return to existing habitat conditions.
  - Wetland access areas will be graded to pre-existing biological, chemical, and hydrological conditions.

- E2US3:
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Pile holes will be filled with clean fill to match adjacent elevations.
    - Wetland matting will be removed and access areas will be returned to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
- E2EM:
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Pile holes will be filled with clean fill to match adjacent elevations.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - Disturbed areas will be sprigged with appropriate native vegetation (for example: low marsh = *Spartina alterniflora*, high marsh = *S. patens*) to match existing reference wetland. Spartina sprigging will consist of nursery stock peat pot plugs planted on one-foot centers.
- E2SS:
    - Shrubs may be cleared with stumps left in place. Planting of shrubs is not expected as stump sprout from cut shrubs is expected.
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Pile holes will be filled with clean fill to match adjacent elevations.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - If temporary access areas are denuded of herbaceous vegetation the appropriate salt tolerant seed mix or plugging of native vegetation will be required. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.
- E2FO:
    - Tree limbs may be removed for accessibility.
    - If tree clearing is required, stumps will be left in place. Planting of trees is not needed as stump sprout from cut trees is expected.
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - If temporary access areas are denuded of herbaceous vegetation the appropriate salt tolerant seed mix or plugging of native vegetation will be required. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.

- PEM:
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Pile holes will be filled with clean fill to match adjacent elevations.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - Disturbed areas will be seeded with an approved wetland seed mixture that compares to existing reference wetland, such as ERNMX-120 OBL-FACW Perennial Food and Cover Wetland Mix. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.
- PSS:
    - Shrubs may be cleared with stumps left in place. Planting of shrubs is not expected as stump sprout from cut shrubs is expected.
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Pile holes will be filled with clean fill to match adjacent elevations.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - If temporary access areas are denuded of herbaceous vegetation the appropriate seed mix or plugging of native vegetation will be required. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.
- PFO:
    - Tree limbs may be removed for access.
    - If tree clearing is required, stumps will be left in place. Planting of trees is not needed as stump sprout from cut trees is expected.
    - Wetland matting and low ground pressure equipment will be used for temporary access.
    - Wetland matting will be removed and access areas will be restored to original elevations as well as to pre-existing biological, chemical, and hydrological conditions.
    - Mats will be cleaned before transport or installed at another wetland location to remove soil and any invasive plant species seed stock or plant material.
    - If temporary access areas are denuded of herbaceous vegetation the appropriate seed mix or plugging of native vegetation will be required. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.
- R2:
    - Will restore grade and banks to existing conditions and to match the upstream and downstream banks.
    - Bare banks will be seeded with an approved riparian seed mixture that compares to existing reference waters, such as ERNMX-892 VA Outer Coastal Plain Riparian Mix. Seeding will follow the VDOT and DEQ recommended densities, fertilizing, and mulching requirements.

- E1OW, SAV, and PUB do not currently have any restoration measures.

If, after the aforementioned measures have been implemented, the temporary wetland impact areas fail to exhibit all three wetland parameters (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) after work has concluded in the area of impact, these would be considered to be permanent wetland losses. HRCP would provide additional compensatory mitigation for these areas at standard compensation ratios based on the pre-disturbance cover-type (e.g., 2:1 ratio for former PFO areas, etc.).

P-2.1.2 NON-VEGETATED AQUATIC HABITAT MITIGATION

The Commonwealth of Virginia does not provide compensatory mitigation guidance for aquatic habitats within jurisdictional waters of U.S. other than vegetated intertidal and nontidal wetlands and other waters. Thus, there is no guidance for non-vegetated intertidal and vegetated and non-vegetated subtidal waters. The vast majority of the impacts from the Project are to non-vegetated subtidal areas through the expansion of the North and South Islands (14.22 acres to uplands, see Attachment P-1 Table P-1-3).

P-2.1.2.1 HABITAT CONDITION ASSESSMENT

To quantify the net loss or gain of aquatic habitat functions and values that may result from the Project, a Habitat Condition Assessment (HCA) was performed (see Attachment 1 of this appendix). The HCA method is a semi-quantitative approach, based on the National Oceanic and Atmospheric Administration (NOAA) Habitat Equivalency Analysis (NOAA 2000). HCAs have been performed for other projects within the Chesapeake Bay watershed to assess habitat value and to aid in determining compensatory mitigation (EA 2017). The HCA expresses habitat functions and values in terms of Habitat Units which are the product of habitat score multiplied by acreage.

The HCA found that impacts (conversion of aquatic habitat or loss of habitat) to tidal subaqueous and non-vegetated wetlands would result in a net loss of 41.39 Habitat Units. The vast majority of this reduction (over 90%) was due to loss of habitat from conversion to uplands necessary for the expansion of the North and South Islands. The remaining impacts are from various fills or conversions from road widening, trestle widening, and other construction activities. When comparing average habitat scores pre- and post-construction, it was found that all other conversions of aquatic resources to another aquatic resource did not result in large changes of functions and values. These results suggest that a loss of functions and values only results if tidal subaqueous and non-vegetated wetlands are converted to uplands and that all other conversion impacts are self-mitigating. These conversions are self-mitigating because there was not a substantive change in function or value so the overall habitat conditions remained largely unchanged from pre-construction conditions.

P-2.1.2.2 PROPOSED COMPENSATION FOR TIDAL AND SUB-TIDAL SUBAQUEOUS HABITATS

HRCP is proposing to compensate for conversion of 14.22 acres of intertidal and subtidal subaqueous habitat to upland (defined as MHHW landward). For the tunnel island expansions, impact acreage was calculated assuming a 2:1 slope from the toe of island fill to MHHW and represents a "permanent loss" of waters of the U.S.

Compensation is not proposed for conversion of intertidal and subtidal subaqueous to other intertidal and subtidal subaqueous (*i.e.,* from toe of island fill to MHHW) as this does not constitute a "permanent loss" of waters of the U.S., but rather represents a conversion of one type of water of the U.S. to another type of water of the U.S.

In addition, compensation is being provided for the loss of 0.37 acres (16,008 sf) of subtidal subaqueous habitat (E1OW) that will result from permanent driven piles (see Appendix G, Table G-8)." Compensation is not proposed for:

- Shallow water dredging for barge access
- Extended temporary trestles >6 months
- Temporary <6 months (including temporary piles)

HRCP is proposing to offset the loss of 14.59 acres of subaqueous habitat by purchasing 14.59 "in-kind" subaqueous advance release credits from the Living River Restoration Trust (LRRT). LRRT's subaqueous credits involve remediating PCB contaminated benthic substrate through carbon seed injection or removal and replacement of the benthic substrate. The presence of PCBs significantly degrades the functions and values of the benthic environment; therefore, remediation serves to replace lost functions and values and would provide "in-kind" compensation for the loss associated with island expansion.

Currently, the LRRT has 16 subaqueous advance release credits available. According to the LRRT's Mitigation Banking Instrument (MBI), the Interagency Review Team (IRT) may approve additional advance release credits to meet current market demand in the watershed. HRCP will request that LRRT initiate coordination with the IRT to secure additional advance release credits if needed. LRRT is currently the only source of subaqueous bottom credits in the watershed and this is the only source of "in-kind" compensation in the watershed.

P-2.1.3 SUBMERGED AQUATIC VEGETATION MITIGATION

Eelgrass (*Zostera marina*) is the predominant submerged aquatic vegetation (SAV) in the Project area. The Project will permanently impact a relatively small area (0.01 acres) of SAV for one 54-inch pile placement (see Attachment G-1, Sheet 5). Additionally, the Project will result in 0.48 acres of extended temporary shading impacts to SAV from pile-supported temporary work trestles that will remain in place for longer than six months (see Appendix G, Impact ET-SAV on Impact Sheet 5). As explained in Appendix G, the DEQ shading formula was used to calculate shading impacts. Impact WT-SAV (0.15

acres) is the area underneath the temporary work trestle and adjacent to Impact ET-SAV that will not experience shading per the DEQ shading formula. During the November 6, 2019 mitigation workshop, agencies concurred that no compensation is required for non-shaded areas, therefore compensation is not being proposed for Impact WT-SAV (0.15 acres). Additionally, there will be no shading impacts to SAV from the permanent trestles.

In coordination with permitting agencies, it was determined that compensating for both permanent and extended temporary impacts greater than six months to SAV beds at a 1:1 ratio would provide suitable replacement of lost functions and values. Temporary impacts (impacts less than six months) and WT impacts (impacts underneath temporary work trestles where shading will not occur) would be avoided and minimized through the implementation of the following measures:

1. Installation of temporary work trestles would occur in a “top down” manner. The use of temporary work trestles was chosen over traditional stone or earthen causeways to avoid filling wetlands and minimize impacts to SAV, even though the cost of construction for trestles is typically higher than stone causeways.
2. Pre-construction contractor education would be conducted.
3. Barge operators would be provided the coordinates of SAV beds and would be instructed to avoid these areas.
4. Environmental monitors would be employed during construction to observe that construction crews avoid SAV beds to the greatest extent practicable.

Should temporary impacts extend beyond six months, additional mitigation would be provided as appropriate.

There are no “in-kind” commercially available mitigation credits available for SAV in the watershed; therefore, HRCP explored three options for SAV compensation: providing funding for SAV restoration through the Virginia Institute of Marine Science (VIMS), the purchase of TNC SAV advance release credits, or the purchase of advance release oyster credits from LRRT. LRRT currently has two advance release oyster credits for restoration of oyster reefs in the watershed. Development of advance release SAV credits through TNC is currently in the very early stages and would not provide credits in time for this Project; therefore, this option was not considered further.

VIMS is actively working to restore SAV through plantings of SAV seed and transplants. Through personal communications, VIMS indicated that SAV restoration in the Hampton Flats area has been successful. Therefore, this SAV mitigation option would involve VIMS reseeding/planting SAV within the Project footprint. HRCP would pay VIMS for reseeding/planting, and VIMS would conduct SAV monitoring. HRCP responsibility would end once VIMS is compensated.

The second option involves purchasing advance release oyster credits from LRRT. Oysters and SAV perform many of the same functions, as depicted in Table P-2-3.

Table P-2- 3: Oyster Functions Compared to SAV Functions

Oysters	SAV
Oyster reefs provide structured habitat for many fish species and crabs (which are shellfish)[11]	SAV provides habitat for juvenile and adult fish and shellfish[12]
Oysters improve water quality by filter feeding (nutrient uptake, sequestration, and filtration)[11]	SAV improves water quality by settling suspended sediment in the water and stabilizing bottom sediments. SAV also uptakes nutrients through roots[12]
Oysters provide food for comb jellies, cownose rays, black drum, oyster drills, crabs, worms, boring sponges, and humans[13]	SAV provides food for waterfowl, fish, and mammals[12]
Oyster reefs serve as natural coastal buffers that provide protection from boat wakes, sea-level rise, and storms[14]	SAV absorbs wave energy[12]

[11] NOAA Chesapeake Bay Office (2019a)
[12] NOAA Chesapeake Bay Office (2019c)
[13] NOAA Chesapeake Bay Office (2019b)
[14]TNC (2019)

Through personal communications, LRRT indicated they would work with HRCP and resource agencies to determine an oyster restoration location close to the HRBT Project so that functions are replaced in the same geographic area. HRCP responsibility would end once credits are purchased.

HRCP is proposing to compensate for impacts to 0.49 acres of SAV beds through the purchase of 0.49 currently available advance release oyster credits from LRRT and seeding impacted areas of SAV by VMRC. In HRCP's opinion, oyster reef credits will offset the lost functions of the SAV impacts; however, HRCP is proposing additional compensation in the form of SAV seeding in the area of impact. Purchasing 0.49 advance release oyster credits would provide immediate compensation for loss of functions. SAV seeding would provide delayed compensation (after impacts have been taken) of SAV acreage and functions. It is expected that because of the robust nature of eelgrass and the existing seed bank in the area of impact, that a significant quantity of SAV bed will not experience mortality from extended temporary shading caused by the temporary work trestles. Therefore, offering compensation for the entire area of shading impact is a conservative approach that will further insure that lost functions and values are replaced.

P-2.1.4 CLAM MITIGATION

Clams will be mitigated for the North Island expansion (including the dredge area for the shape array), South Island expansion, and South Trestle dredging. Compensation for impacts to clams will be accomplished by placing native brood stock chowder clams obtained from either a local aquaculturalist or commercial shell fisherman on public clam grounds (*e.g.,* near the Newport News Middle Ground Lighthouse). HRCP will coordinate with VMRC to select an appropriate supplier and area to place the clams. VMRC will oversee the placement of the clams, at which time, HRCP's obligation will have been satisfied. HRCP will not conduct long-term monitoring of the clam sites and HRCP would assume that

the clam compensation requirement would be satisfied upon purchase and spreading of the chowder sized clams.

In order to determine the number of clams that may be impacted by the Project, HRCP reviewed two baseline benthic surveys that were conducted in 2018, by Versar and VIMS. Per coordination with VMRC, HRCP agreed to use the highest clam density reported for a given area, where discrepancies occur between the two studies. Clam compensation will be provided at a 1.3:1 ratio.

In the Versar survey (Wong et al. 2018), nine samples were conducted within the proposed North Island expansion area, six samples were conducted within the proposed South Island expansion area, and seven samples were conducted within the South Trestle dredging area (South Island to Norfolk). These samples were evaluated for the density of hard clams (*Mercenaria mercenaria*). The results are summarized in 4.

Table P-2- 4: Versar Hard Clam Survey Results

Location	Average of Abundance (# per m^2)	Average of Biomass (AFDW[1])
North Island	0	0
South Island	3.79	0.003
South Trestle Dredging	0	0

[1]Ash-Free Dry Weight (AFDW) is a standardized measurement of biomass

The VIMS survey conducted samples in two regions where island expansion and dredging are proposed: HRBT North (Hampton to South Island) and HRBT South (South Island to Norfolk). These samples were evaluated for the density of hard clams. The results are summarized in Table P-2-5.

Table P-2- 5 VIMS Hard Clam Survey Results

Location	Average of Abundance (# per m^2)
HRBT North	0.30
HRBT South	0.09

Table P-2-6, below, shows the resulting compensation using the Versar survey results.

Table P-2- 6: Versar Clam Compensation

Location	Average of Abundance (# per m^2)	Square Meters of Impact	Abundance of Clams per Impact	Compensation (1.3:1 ratio)
North Island	0	72,497	0	0
South Island	3.79	16,348	61,959	80,547
South Trestle Dredging	0	79,963	0	0

Table P-2-7, below, shows the resulting compensation using the VIMS survey results.

Table P-2- 7: VIMS Clam Compensation

Location	Average of Abundance (# per m^2)	Square Meters of Impact	Abundance of Clams per Impact	Compensation (1.3:1 ratio)
North Island	0.30	72,497	21,749	28,274
South Island	0.09	16,348	1,471	1,912
South Trestle Dredging	0.09	79,963	7,197	9,356

The Versar survey resulted in a higher amount of clam compensation at the South Island (80,547 clams), whereas the VIMS survey resulted in a higher amount of clam compensation at the North Island (28,274 clams) and South Trestle dredging (9,356 clams). Therefore, HRCP will provide compensation for a total of 118,177 clams (80,547 clams at the South Island, 28,274 clams at the North Island, and 9,356 clams at the South Trestle dredging).

P-2.1.5 DREDGING IMPACTS

Limited dredging will occur along the southern extent of the existing bridge between the South Island and Willoughby Spit in areas that are too shallow to allow access for construction vessels. Dredging of 19.76 acres will occur to estuarine open water near the South Trestle and 2.08 acres will occur around the perimeter of the North Island expansion for shape arrays for a total of 21.84 acres. There will also be dredging within the island expansion footprints, which will then be filled. Impacts of dredging to benthic communities in the Chesapeake Bay have been observed to be mostly short-term. A literature

review states there would be no significant impacts to benthic infauna from dredging operations due to the natural resilience of species found in areas subject to strong tidal flushing such as the Chesapeake Bay (Sullivan and Hancock 1977; Dauer 1985; Nichols et al. 1990; USDOT 1994). Stern and Stickle (1978) found the benthic community can recover in as little as 28 days according to the findings of McCauley et al. (1977).Newell et al. (1998) considers recovery to be around 80% of the diversity and abundance as the reference site. Initial colonization after dredging is by opportunistic species like aquatic worms, which transitions to a mixed diversity of both opportunistic and habitat-selective species until finally plateauing with predominately habitat-selective species. Dredging can be expected to reduce species diversity by 30–70% and the number of individuals (abundance) by 40–90%. However, recolonization proceeds rapidly, with only 6 months until re-establishment to a similar condition as the control. In shallow water and estuarine conditions, where the community is likely dominated by opportunistic species, recovery to the original species composition may be very rapid. In the stable environmental conditions of deeper waters, the replacement of the initial colonizers, like opportunistic species, in the transitional community following complex biological interactions between habitat-selective species may take several years (Newell et al. 1998). A comprehensive study by Wilber and Clarke (2007) observed dredging across the United States and found that certain conditions dictate the rate of benthic community recovery time. They studied five (5) sites in the U.S. (one of which being the Delaware Bay) pre and post channel dredge that recorded benthic recovery (equal to that of an un-impacted reference site) anywhere from 1 to 6 months. The Delaware Bay recorded a recovery time just greater than 5 months. No long-term impacts to infaunal community were reported (Wilber and Clarke 2007). Since the proposed dredging for the Project is relatively shallow it is expected that the benthic communities will recover quickly based on the existing scientific data. Since the benthic communities are expected to return to pre-dredged conditions in a fairly short time period, no compensatory mitigation is proposed for dredging impacts other than for clams as discussed in Section P-2.1.3 above.

P-2.1.6 TRESTLE PILES

A total of 1,473 permanent piles (16,754 square feet) will be placed in WOUS outside of permanent shading or fill areas to support the new trestles (see Appendix G, Table G-8). Compensation for permanent pile impacts will be the same as "fill" (see Table P-1 and Section P.1.2).

Demolition of the existing trestles will result in removal of 1,774 piles (12,346 square feet) from WOUS. The existing piles will be cut two to three feet below the mudline and placed onto barges for disposal. The areas where the old piles are removed is expected to return to the surrounding conditions upon removal; therefore, no compensation is proposed for pile removal.

Piles driven in sandy shore (E2US2) or rocky shore (E2RS2) would not result in a significant loss of functions; therefore, no compensation is proposed for pile impacts to sandy shore or rocky shore.

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ATTACHMENT P-3 – BENTHIC REPORT

HAMPTON ROADS BRIDGE-TUNNEL EXPANSION
BASELINE BENTHIC SURVEY

Prepared by

VERSAR

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FOREWORD

This report provides baseline data to characterize the benthic community and sediment composition within and adjacent to the proposed area of disturbance prior to construction activities associated with the expansion of the Hampton Roads Bridge Tunnel. Versar conducted and/or managed all field operations, sample collection, and laboratory analysis. The project and report were managed by David A. Wong, and completed with the assistance of the following staff: Suzanne Arcuri, Amanda Bromilow, Patrick Donovan, Maggie Glaudemans, Roberto Llanso, Kevin McGuckin, Don Strebel, and Danielle Zaveta. Versar was assisted in the field by Crofton Industries who conducted the technical diving portion of the rocky shore surveys. Cove Corporation assisted with taxonomic identification and verifications.

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EXECUTIVE SUMMARY

The Hampton Roads Bridge-Tunnel (HRBT) Expansion Project, known as Alternative A, is an effort to reduce congestion at the tunnel by widening the Interstate 64 corridor through Hampton and Norfolk, Virginia, from four to six lanes. To determine the potential impacts of bridge-tunnel construction on the surrounding marine environment, the natural conditions of the area need to be established. Baseline surveys in the project area were conducted in September and October 2017 to characterize the natural background condition of the benthic macroinvertebrate community within and adjacent to the proposed area of disturbance. The surveys consisted of soft-bottom transects along the existing bridge and disturbance area surrounding the HRBT portal islands, and rocky intertidal and subtidal transects perpendicular to the portal islands.

A total of 48 sites in 12 transects and the cove at Fort Wool was sampled using a Young-modified van Veen grab, and an additional 48 sites in 12 transects were sampled using a coring device in the intertidal habitat and quadrats in the subtidal habitat. Soft-bottom samples were processed for benthic macroinvertebrates, grain size, and organic carbon content, and rocky shore samples were processed for algal biomass and benthic macroinvertebrates. Water quality measurements of temperature, salinity, conductivity, dissolved oxygen, dissolved oxygen saturation, and pH were taken near the surface and near the bottom of the water column.

The surveys yielded a total of 184 taxa in the soft-bottom, 62 taxa in the rocky intertidal, and 117 taxa in the rocky subtidal, a majority of which could be identified to species level. Water quality was homogeneous throughout the project area, with salinity in the polyhaline range and dissolved oxygen near saturation. Sediments were mostly fine and medium sands with various amounts of coarse sand and gravel, and low organic carbon content. In the Fort Wool cove, sediments were fine and very fine sands with various amounts of silt and clay.

The soft-bottom was numerically dominated by the reef-forming polychaete *Sabellaria vulgaris* and amphipods, and oligochaetes were abundant in coarser sediment. High densities of *Sabellaria* were recorded along the south bridge and inner (bridge side) tip of the south portal island. Biomass dominants were the sand lancelet *Branchiostoma caribaeum*, *Sabellaria vulgaris*, and the decapod *Eurypanopeus depressus.* The soft-bottom macrobenthos met the Chesapeake Bay Benthic Community Restoration Goals in 32 sites, and failed the goals in 16 sites. Of the 16 sites that failed, eight were classified as marginal, three as degraded, and five as severely degraded by the Benthic Index of Biotic Integrity.

The rocky intertidal was numerically dominated by barnacles (*Chthamalus fragilis*) and amphipods, and the inner tip of the north portal island exhibited high density and biomass of oysters and mussels. The rocky subtidal was covered by a dense canopy of algae that provided habitat for numerous species of amphipods. Sponges and bryozoans were common in the rocky subtidal, and the amphipod *Caprella penantis* was very abundant. Anemones (*Diadumene leucolena*), oysters, amphipods (*Caprella penantis*), and gastropods (*Mitrella ocellata*) were biomass dominants. Diversity and dominance measures were similar in the soft-bottom and rocky subtidal. In the rocky intertidal, diversity was lower and dominance higher.

Annual secondary production of macrobenthos, estimated by Brey's empirical model, was on average highest in the rocky intertidal (mean = 156.0 g AFDW m^{-2}), including one site with very high oyster and mussel production (578.5 g AFDW m^{-2}), and lowest in the soft-bottom (mean = 15.7 g AFDW m^{-2}). Annual secondary production in the rocky subtidal was high (mean = 86.2 g AFDW m^{-2}) and within the range of production of shoreline stabilization structures reported for other studies.

Total macrobenthic production was 3.7x higher for the soft-bottom than for the rocky shore when scaled to the footprint of the inventory area. Thus, the reef area represented by the portal islands will be unable to compensate for production loss in the surrounding soft-bottom benthic community, if the footprint of the disturbance area is of the same magnitude as the footprint of the inventory area.

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1.0 INTRODUCTION

The Hampton Roads Bridge-Tunnel (HRBT) Expansion Project, known as Alternative A, is an effort to reduce congestion at the tunnel by widening the Interstate 64 corridor through Hampton and Norfolk, Virginia, from four to six lanes. To determine the potential impacts of bridge-tunnel construction on the surrounding marine environment, the natural conditions of the area need to be established. The purpose of this study was to characterize the benthic community and sediment composition within and adjacent to the proposed area of disturbance. In addition, to understand the potential enhancement value of the portal island rock habitat for mitigation purposes, estimates of secondary production are provided. Data from the benthic surveys will be used as a baseline for future ecological impact evaluations of the HRBT Expansion Project.

2.0 METHODS

2.1 Soft-Bottom Survey

Sampling Design

A survey of the soft-bottom benthos in the project area was conducted in September 2017. A total of 48 sites was sampled, with 14 sites located along the existing bridge and 34 sites located within the proposed disturbance area surrounding the HRBT portal islands (Figure 1a). Sample sites surrounding the northern (Figure 1b) and southern (Figure 1c) portal islands were located along transects radiating out from the islands. Four additional sites were selected at random in the cove formed by the southern portal island and Fort Wool (Sites 25-28, Figure 1c). All sampling locations were given final approval by VDOT. Site coordinates are presented in Appendix A.

Field Procedures

Benthic sampling was conducted September 13-14, 2017, from Versar's research vessel R/V *Integrity*. In the field, sampling sites were identified using an onboard Global Positioning System (GPS). Once on station, position coordinates were marked and stored on the GPS and recorded on field datasheets. Sampling of the benthic invertebrates was limited to soft-bottom substrates. If the benthic grab encountered hard substrate (rocks, consolidated sand), samples were taken at alternative locations nearby until a valid soft-sediment sample was obtained. This was done because benthic sampling gears usually cannot penetrate hard substrates.

Water quality parameters were measured at the surface and bottom (~0.5 m from the seafloor) of the water column at each sample site. A Yellow Springs Instrument EXO2 data sonde was used to measure dissolved oxygen concentration (DO), salinity, conductivity, temperature, and pH. Time and water depth were also recorded from the vessel's electronic depth finder.

Benthic samples were collected using a Ted Young-modified van Veen grab sampler with a surface sampling area of 0.044 m^2 and a maximum substrate penetration depth of 10 cm. Separate samples were collected for benthic macroinvertebrates and sediment analysis (one of each per site). Benthic samples were sieved in the field through a 0.5-mm mesh screen. Organisms retained on the screen were transferred to labeled 1-gallon plastic jars and preserved in a 10% solution of buffered formaldehyde stained with Rose Bengal. Sediment samples for grain size and organic carbon content analysis were subsampled by removing the top 2 cm of sediment into labeled 8-oz plastic bags. Bags were kept on ice in the dark while in the field, and subsequently frozen in the laboratory pending analysis.

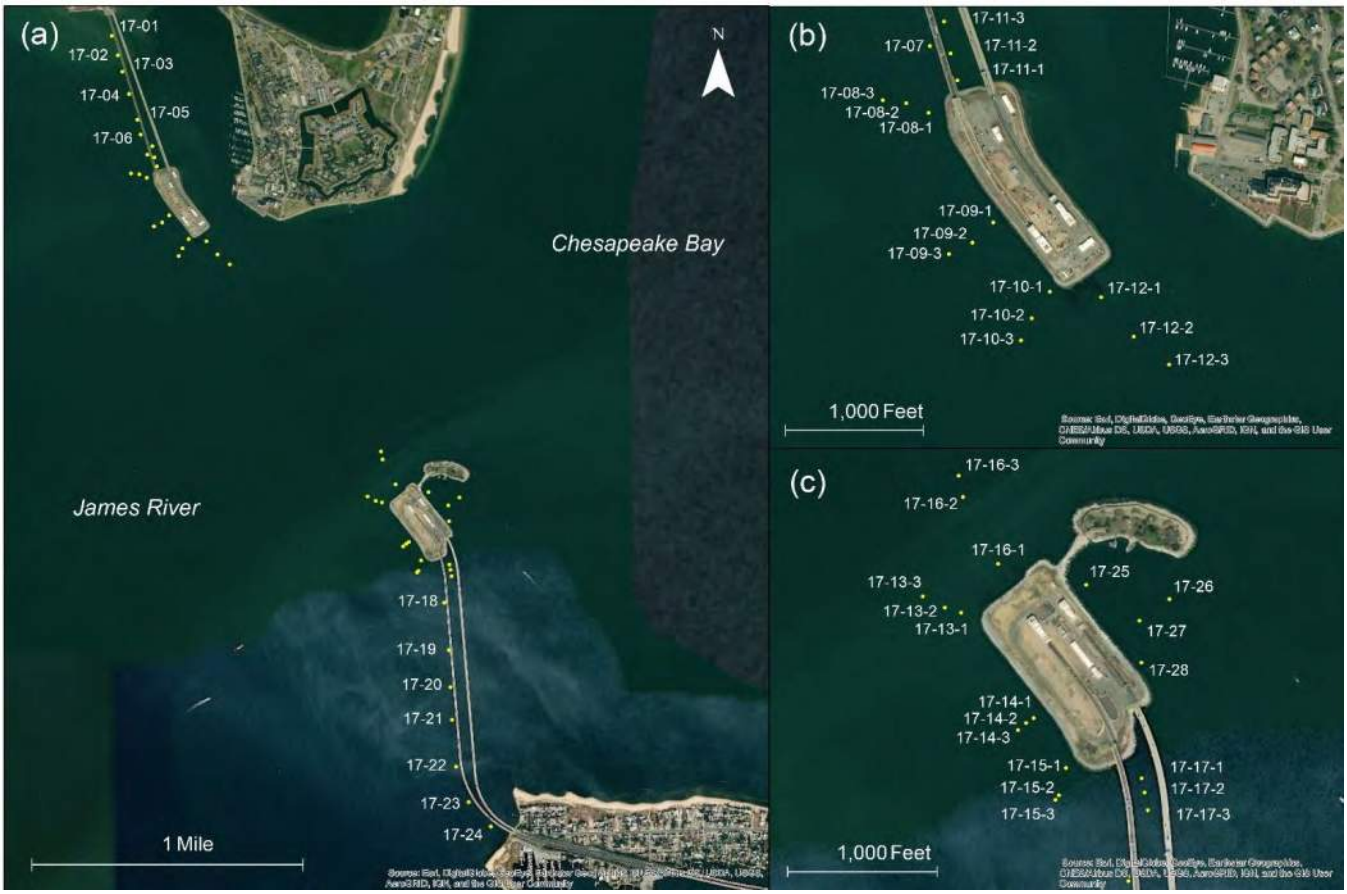

Figure 1. Map of the Soft-Bottom Benthic Survey in the Hampton Roads Bridge-Tunnel Project Area. Sampling sites were positioned along the bridge trestle (a), and transects at the northern (b) and southern (c) portal islands

2.2 Rocky Shore Survey

Sampling Design

The intertidal and subtidal rocks of the portal islands were sampled in October 2017. A reconnaissance dive survey was conducted ahead of sampling on August 16, 2017, to identify representative sites for the benthic survey. Professional divers from Crofton Industries captured video of the substrate at 10 potential survey stations to assess the distribution and abundance of epifaunal growth on the rocky substrate surrounding the portal islands. The video was also used to determine the most efficient strategy for collecting samples.

Versar and VDOT established 12 sampling locations based on the reconnaissance dive survey (Figure 2). At each location, a transect was created from the mean high water (MHW) mark down to the interface where the rocks met the soft bottom. A marker float was anchored at this interface, and the length of the transect was estimated using a laser rangefinder. Three subtidal sites were then marked with weighted floats at equal intervals along the transect. An intertidal site was also marked randomly and sampled at each transect. A total of 48 samples (12 transects x 4 levels) was collected from the rocks. Site coordinates are presented in Appendix A.

Field Procedures

Benthic sampling was conducted October 2-4, 2017, with the help of Crofton Industries divers. In the field, the boats were anchored perpendicular to shore at the sampling locations, and transects and sampling sites were marked. Versar scientists provided guidance to the dive team during the sampling to ensure an understanding of and compliance with the survey design and methods.

Intertidal samples were collected by scraping organisms off the surface of a randomly selected point at the sampling site (Figure 3a). A 15.2-cm (6 in) diameter PVC pipe was used to mark a sampling area (182 cm^2) on the rock surface (Figure 3b). A metal scraper was then used to remove the organisms within the marked area (Figure 3c). All biological material was collected in a labeled cloth bag.

For subtidal samples, the diver located the sampling site following the marker float line to the weight on the seafloor. A 30-cm square PVC quadrat (900 cm^2 surface sampling area) was positioned on the seafloor with the bottom-left corner next to the weight to mark the sampling area. All foliage within the quadrat was removed by hand and placed in a labeled cloth bag (Figure 4). Remaining organisms were then scraped from the rocks

using a metal scraper (Figure 5). A custom-made PVC suction sampler with an attached bag was used to collect material while scraping to minimize the loss of sample (Figure 6). Sample bags were secured and brought to the surface after each dive.

Upon retrieval, sample bags were placed in a 5-gallon bucket filled with ambient seawater. Bags were then transferred to a 0.15% propylene phenoxytol (POP) solution, a common relaxing agent used to aid in taxonomy. After approximately 30 minutes in the POP solution, bags were placed in 1-gallon bottles and preserved in an 8-10% buffered formalin solution.

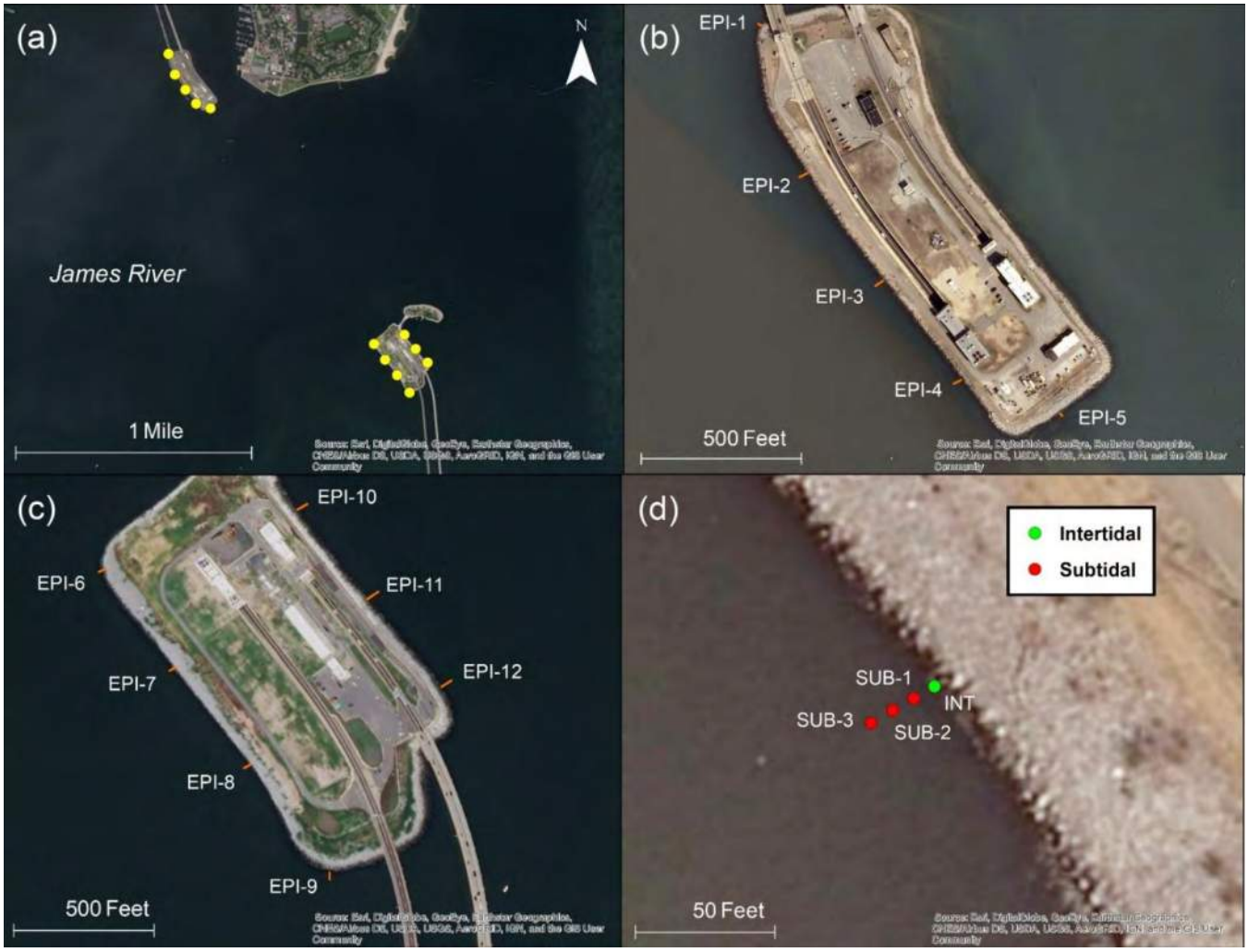

Figure 2. Sites were positioned in transects perpendicular to the portal islands (a), with five transects in the northern portal island (b), seven transects in the southern portal island (c), and four sites per transect (d)

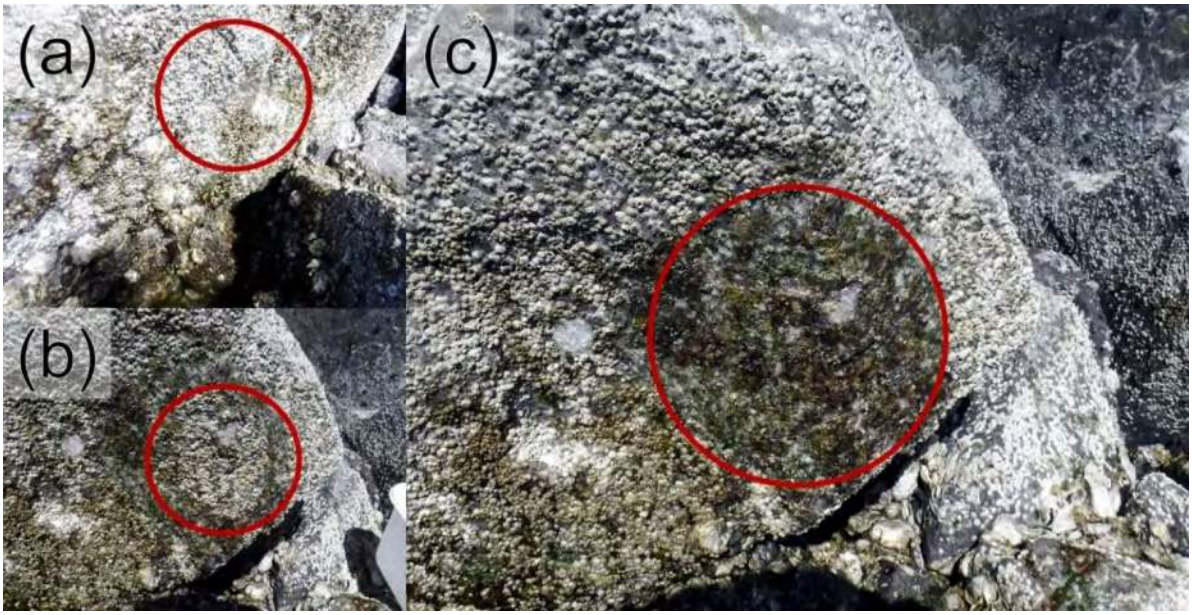

Figure 3. The intertidal was sampled by selecting a point at random (a), marking a circular area with the aid of a 6-inch PVC pipe (b), and removing all the biological material (barnacles in this case) within the sampling area. Red circles indicate the sampling area

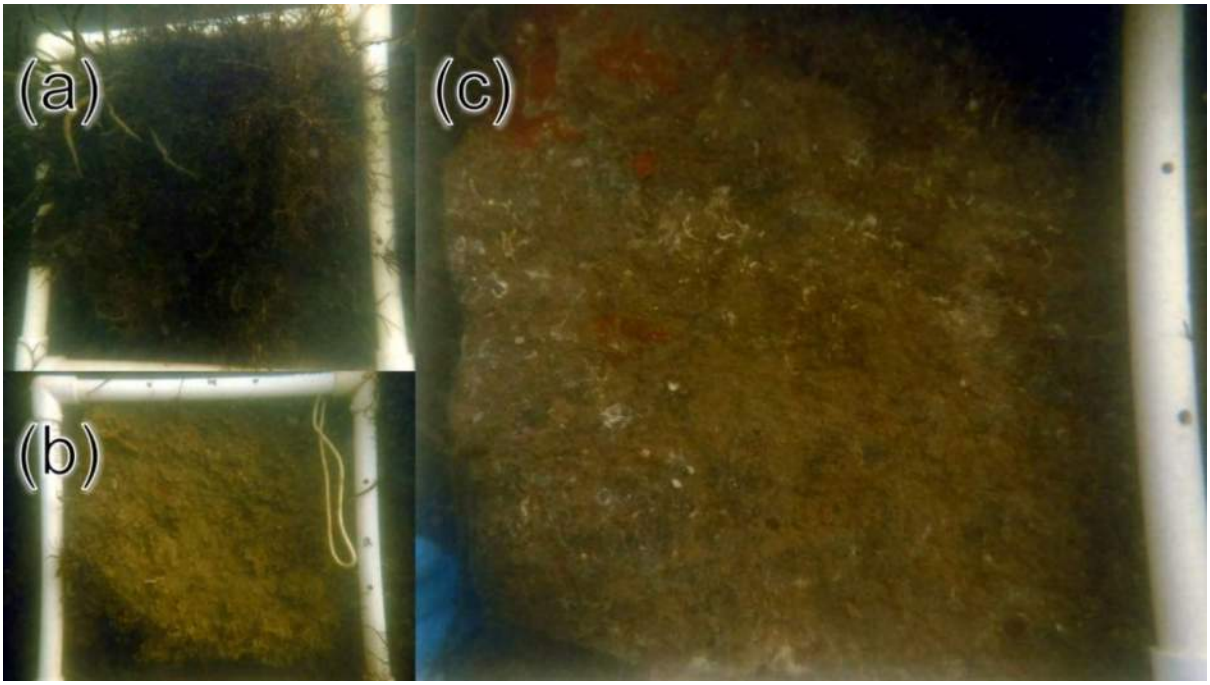

Figure 4. Images of the Sampling Process at a Subtidal Site with Abundant Foliose Growth. Soft growth within a 30 X 30 cm quadrat (a) was first removed by hand to expose the encrusted rock surface (b). The rock was then scraped, and the remaining

biological material collected with the aid of a suction sampler until the rocky surface was exposed (c)

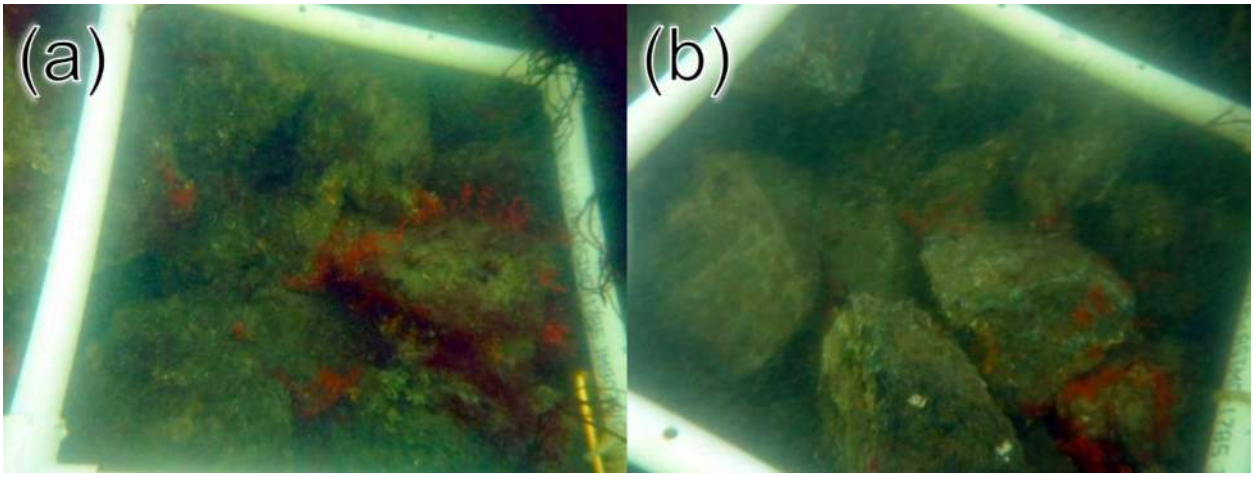

Figure 5. Images of the Sampling Process at a Subtidal Site with Little Foliose Growth. Shown is the epifaunal growth before (a) and after (b) the rocks were scraped

Figure 6. The Custom Suction Sampler Used to Sample the Rocky Shore of the Portal Islands

2.3 Laboratory Procedures

Soft-Bottom Benthos

Benthic macroinvertebrates were sorted from the samples using professional-grade dissecting microscopes. All organisms were identified to the lowest practical taxon, usually species, and counted. Organisms greater than 2 cm in length were recorded separately as an indication of benthic community health. Organisms that could not be identified to species due to early life stage or poor condition were identified to genus or higher-taxonomic level, and excluded from species counts if there was a lower-level taxon reported in the sample for the same group. For example, amphipods in the family *Caprellidae* were identified at the genus (*Caprella* spp.) and species level, with three species reported (*Caprella penantis, Paracaprella tenuis*, and *Caprella equilibra*). Therefore, the generic level designation *Caprella* spp. was excluded from species counts in a sample if any of the species within the group were reported in the same sample.

Ten percent of the samples were re-sorted and identified for quality assurance/quality control (QA/QC), following Versar's standard laboratory operating procedures.

Biomass was determined for each taxon by drying individuals grouped by taxon at 60° C, weighing, ashing at 500° C for 4 hours, and re-weighing. This procedure allows for the calculation of ash-free dry weight (carbon content).

Rocky Shore Benthos

Rocky shore samples were rinsed over a 250-μm sieve using tap water and the foliose material (e.g., algae) was separated and stored in plastic bags for later processing. The remaining sample was transferred from the sieve to petri dishes and sorted from the detritus into major taxa (e.g., barnacles, crustaceans, molluscs) using professional-grade dissecting microscopes. Some large samples were subsampled to reduce processing time. Subsampling was conducted by spreading the sample evenly across a gridded tray and then randomly selecting a pre-determined number of grid cells to process. After sorting, organisms were identified to the lowest practical taxon, usually species, and counted. Colonial organisms that cannot be counted (e.g., sponges, hydroids, bryozoans) were reported as presence/absence.

Biomass (ash-free dry weight) was determined for each taxon following the same procedure used for soft-bottom benthic samples, except that the biomass of colonial encrusting organisms (cheilostomate bryozoans and some hydroids) could not be determined as these organisms cannot be separated from the surfaces on which they live

(e.g., bivalve shells). Foliose organisms were kept in major taxonomic groups (algae, sponges, hydroids, bryozoans) and their wet weight was measured to determine relative biomass of soft growth.

Sediment

Grain size analysis was performed according to methods described in Folk (1974) and Holme & McIntyre (1971). The fine fraction of the sediment (particles < 63 μm) was separated from the sand and gravel fraction (particles > 63 μm) by wet sieving, followed by pipetting and weighing to obtain percent silt-clay. The sand and gravel fraction was oven-dried and sieved over nested mesh metal wire screens (U.S. Standard Sieves No. 5, 10, 18, 35, 60, 120, and 230) to obtain percent sand-size categories in the Wentworth grade scale. Total organic carbon (TOC) was determined for each sample by loss on ignition.

2.4 Data Analysis

Database

All field and laboratory data were entered into a Microsoft Access database and double checked against hard copies of the field and laboratory processing sheets as part of the QA/QC process for data entry.

Benthic Community Structure

Benthic macroinvertebrate data were analyzed to identify patterns in species abundance, composition, and biomass distribution among the soft-bottom sites and portal island rocky shore sites. Sites were examined individually and grouped into North Bridge, South Bridge, South Cove, and by transect.

Species diversity was measured by the Shannon-Wiener H' (Shannon 1948) and Simpson D indices:

$$H' = -\sum_{i=1}^{s} p_i * \log_2(p_i)$$

$$D = \Sigma\ p_i^2$$

where s is the number of species and p_i is the proportion of the i^{th} species abundance in the sample. Species richness was measured according to the formula given by Margalef (1958):

$$SR = s\text{-}1/\log_e N$$

where s is the number of species in a sample and N is the total number of individuals. Evenness, a measure of how evenly the abundance is distributed among the species, was computed according to Pielou (1966):

$$J' = H' / \log_2 s$$

Numerical dominance was calculated by computing the percent abundance contribution of the top two most abundant species to the total abundance of the sample.

Benthic Index of Biotic Integrity

Analysis of the soft-bottom benthos was performed in the context of the Chesapeake Bay Program Benthic Community Restoration Goals which use the Benthic Index of Biotic Integrity (B-IBI) to measure goal attainment. The polyhaline habitat (bottom salinity >18) restoration goals (Weisberg et al. 1997) were applied to each site.

The B-IBI is a multiple-attribute index developed to identify the degree to which a benthic assemblage meets the Chesapeake Bay Program Benthic Community Restoration Goals. The restoration goals are quantitative thresholds based on reference data distributions (Weisberg et al. 1997). The B-IBI provides a means for comparing the relative condition of benthic invertebrate assemblages across different habitats. It also provides a validated mechanism for integrating several benthic community attributes indicative of "health" into a single number that measures overall benthic community condition.

The B-IBI is scaled from 1 to 5, and sites with values of 3 or more are considered to meet the restoration goals. The index is calculated by scoring each of several attributes as either 5, 3, or 1 depending on whether the value of the attribute approximates, deviates slightly from, or deviates strongly from values at the best reference sites in similar

habitats, and then averaging these scores across attributes. The criteria for assigning these scores are numeric and habitat-dependent.

Benthic community condition was classified into four levels based on the B-IBI. Values less than or equal to 2.0 were classified as severely degraded; values from 2.0 to 2.6 were classified as degraded; values between 2.6 and 3.0 were classified as marginal, and values of 3.0 or more were classified as meeting the goals.

Secondary Production

Secondary production (P) was estimated from biomass (B) using Brey's (2001) equation, which relates P/B ratios to mean body mass per individual (w, kJ), sample depth (D, m), and temperature (T, °K):

Log_{10} (P/B) = 7.947 - 2.294 * log_{10} (w) – (2409.856*1/T) + (0.186*1/D) + (0.194**Subtid*) + (0.180**InfEpi*) + (0.277**MoEpi*) + (0.174**Tax1*) – (0.188**Tax2*) + (0.330**Tax3*) + (582.851*log_{10}w*1/T).

Subtid is a dummy variable that increases the P/B ratio if the organism is found in a subtidal habitat (depth >1 m), whereas *InfEpi* and *MoEpi* are set to 1 if the organism is infaunal or motile epifaunal, respectively, also resulting in an increase in the P/B ratio. *Tax1*, *Tax2*, and *Tax3* are dummy variables that identify specific effects on P/B associated with membership in different taxonomic groups, and are set to 1 if the organism is (1) annelid or crustacean, (2) echinoderm, or (3) insect, respectively, and 0 if otherwise (Brey 2001). w was estimated for each species by dividing the AFDW per sample by the total number of individuals of the species to obtain an average mass per individual (g C). This value was then converted to kJ units using taxonomic group specific conversion factors provided in Brey (2001). Species-level mass values in combination with the depth and temperature recorded for the sample were used to calculate log_{10}-transformed P/B ratios. The ratios were then converted back to the arithmetic scale and multiplied to the mean standing crop biomass (per m^2) to obtain an estimate of production per unit area and time for each species. Standing crop values were assumed to be representative of one year of benthic community biomass, so that production could be expressed in terms of g C m^{-2} yr^{-1}. Total community production for a given site was the summation of all the taxa specific production values.

The method used in this study to estimate secondary production employs similar parameters to that described in Steimle et al. (2002) and used in Burton's study of out-of-

kind mitigation success of an artificial reef in Delaware Bay (Burton et al. 2002). Brey's (2001) method, however, offers several advantages, such as that P/B ratios are calculated from the sample biomass data. Brey's method was applied to Chesapeake Bay and found to produce reasonable estimates of secondary production consistent with previous studies (Dauer et al. 2011). An evaluation of production estimation methods also found Brey's method as providing the most satisfactory results among empirical models that were tested and compared to field estimates (Dolbeth et al. 2005).

Colonial organisms (sponges, bryozoans, hydroids) and algae were not included in the production estimates because they cannot be counted as individuals. Also, some colonial organisms, such as encrusting bryozoans, cannot be easily separated from the surfaces on which they grow. Although production will be underestimated by excluding these groups, this was assumed to have little effect on forage value estimates, because few fish feed on these taxa, and, among the megabenthos, only crabs incidentally feed on colonial organisms (Steimle et al. 2002). Typically, colonial organisms are preyed upon by epibionts, such as amphipods and isopods, and these taxa were incorporated in production estimates.

To compare rocky shore secondary production to the surrounding soft-bottom secondary production, average production estimates per unit area were extrapolated to the area covered by the rocky intertidal and subtidal zones, and to the footprint of the inventory area surrounding the portal islands and the bridge expansion areas. The footprint of the inventory area was provided by VDOT.

The boundaries of the project area were defined through a Geographic Information System (GIS) analysis by incorporating field-collected GPS points with a Topobathymetric Lidar Digital Elevation Model (DEM) provided by the National Oceanic and Atmospheric Admin-istration (NOAA) Office of Coastal Management. Topobathymetric digital data for the study area were downloaded from NOAA's Data Access Viewer (https://coast.noaa.gov/ dataviewer/#/lidar/ search/) and overlaid with the inventory corridor shapefile provided by VDOT, and Virginia Base Mapping Program's high-resolution aerial photography (http://garden.gis.vt.edu/arcgis/ rest/ services). The mean high-water line was identified in the GIS from the aerial photography. The mean tidal range (0.74 m) at the Sewells Point, VA, tide station (Station ID: 8638610), located directly southwest of the study area, was then used to determine the intertidal zone in the study area. By finding the elevation of the high-water mark in the DEM, and reclassifying the DEM with the mean tidal range, the rocky intertidal zone of the portal islands was determined. This area was converted to a polygon in the GIS.

The rocky subtidal zone was determined by buffering the intertidal zone in GIS by the average distance measured in the field at each transect, from the mean low-water mark to the boundary between the rocks and the soft-bottom. The resulting polygon was joined to the intertidal polygon and the two areas were used to eliminate area of the inventory corridor using the 'Erase' function in GIS. The final step consisted of removing the areas which represented the portal islands to provide the soft-bottom study area. The soft-bottom layer was split into individual production areas using GPS points collected in the field at sampling transects.

3.0 RESULTS AND DISCUSSION

3.1 Soft-Bottom Benthos

Water Quality

Summary bottom water quality is presented in Table 1. Sites have been grouped by transect, from north to south, so that north island transects are t1-t5, starting with sites 17-11-01 through 17-11-03, and south island transects are t6-t10. North bridge, south bridge, and south cove sites are grouped separately. The individual-site surface and water quality data are presented in Appendix B.

Water depth ranged between 1.2 m and 9.5 m (Appendix B). The average depth of the transects increased from the north bridge to the outer tip of the north island (t5, Table 1). In the south island, it was deepest again at the tips of the island (t6 and t9, Table 1).

Bottom water characteristics were homogeneous throughout the project area (Table 1, Appendix B). Salinity was in the polyhaline range (20.9-22.9), and dissolved oxygen was high (6.8-7.7 mg/L), near saturation, during the two sampling dates in September. Salinity and dissolved oxygen at the surface of the water column were very similar to the bottom readings, indicating absence of water column density stratification in the project area, and no low dissolved oxygen problems. Bottom water temperature varied little (21.9-23.2 °C) and was only slightly higher at the surface (21.8-27.5 °C). pH was homogeneous, in the 7.8-8.0 range, surface to bottom.

Sediment Characteristics

Sediment characteristics for the individual sites are presented in Table 2. Transects are also shown in Table 2, but data have not been averaged because there were significant differences among sites. Sediments were mostly fine sands (mean = 36.2%) and medium sands (mean = 24.2%), with various amounts of coarse material (Table 2). Generally, the coarseness of the material increased from north to south. The south island (t6 – t10) and south bridge had, on average, a higher percentage of medium and coarse sand. There was also a larger spread in particle diameter at these sites, indicating moderately to poorly sorted sediments and a variable water current regime. South cove sediments were fine and very fine sands with various amounts of silt and clay. Some sites had a large percentage of gravel (pebble and granule), especially the outer most site of the

outer tip of the north island (t5, Table 2) and sites near the inner tip of the south island (t10).

Total organic carbon was generally low (mean = 0.65%) and was highest at the south cove (Table 2). As expected for most sedimentary habitats, there was a relationship between grain size (percent silt-clay) and the organic carbon content of the sediment (r^2= 0.78).

Benthic Community Structure

One hundred eighty-four taxa were identified in the soft-bottom benthic samples. Of these, 146 taxa were identified to species level and 38 were identified to a taxonomic level higher than species (genus, family, etc.). Appendix C provides a list of taxa and Appendix D provides the macroinvertebrate abundance and biomass data for each sampling site.

Eight species accounted for 60% of the total abundance. The reef-forming polychaete worm *Sabellaria vulgaris* accounted for 80,542 individuals and 34% of total abundance; the amphipod *Unciola serrata* accounted for 15,859 individuals and 7% of total abundance; and oligochaetes (Oligochaeta spp.) accounted for 10,338 individuals and 4% of total abundance. The next five taxa, the sand lancelet *Branchiostoma caribaeum*, tube-building phoronids (*Phoronis* spp.), the polychaete *Polycirrus eximius*, the amphipod *Batea catharinensis*, and the bivalve *Nucula proxima*, each accounted for 3-4% of total abundance. Thus, the polychaete *Sabellaria vulgaris* was numerically dominant in the soft-bottom of the project area. Although oligochaetes were abundant, they only occurred in large numbers at five sites.

Nine species accounted for 60% of the total biomass. The sand lancelet, *Branchiostoma caribaeum*, accounted for 29.7 g AFDW and 23% of total biomass; the polychaete *Sabellaria vulgaris* accounted for 11.4 g AFDW and 9% of total biomass; and the mud crab *Eurypanopeus depressus* accounted for 9.4 g AFDW and 7% of total biomass. The next six species, the polychaetes *Arabella iricolor* and *Polycirrus eximius*, the bivalves *Nucula proxima* and *Tagelus divisus* (razor clam), and the gastropods *Nassarius vibex* and *Costoanachis avara*, each accounted for 3-5% of total biomass. The sand lancelet, therefore, emerges as the biomass dominant species in the soft-bottom of the project area.

In terms of species composition, the soft-bottom survey identified 76 taxa of polychaete annelids; 45 taxa of crustaceans, of which 23 were amphipods; and 43 taxa of molluscs, of which 19 were gastropods and 24 were bivalves. The remaining taxa were nemerteans (7 taxa), echinoderms (3 taxa), anemones (2 taxa), turbellarians (2 taxa), oligochaete

annelids (unidentified), and one taxon each of Pycnogonida, Phoronida, Hemichordata, Ascidiacea, and Cephalochordata.

Figure 7 summarizes the composition of the soft-bottom macrobenthic community by transect. This figure captures the major groups contributing to total abundance, with polychaetes, amphipods, bivalves, and gastropods accounting for 50-97% of the abundance at any one transect. Polychaetes were abundant in all transects but comprised the largest percentage of the community in t3, t6, and t10. At these transects, amphipods also comprised a large percentage of the community. Transects t6 and t10 were at the outer and inner tips of the south island, where sediments were coarser.

Figure 8 summarizes numerical density of macroinvertebrates by transect. Total abundance (Figure 8a) was higher in the south bridge than in the north bridge, and was highest in t9. The higher abundance in t1, t5, t9, and t10 was due to high densities of the polychaete *Sabellaria vulgaris*, ranging from 2,600 individuals per m^2 in t1 to 22,000 individuals per m^2 in t9, but note the large error bars indicating variability among sites.

Total epifauna (Figure 8b) and total Polychaeta (Figure 8d) predominately reflect the distribution of *Sabellaria*. Oligochaeta (Figure 8e) were abundant in south island transects, and the south bridge. Generally, these sites had coarser sediment and a higher proportion of gravel, which provided habitat for interstitial organisms such as the Oligochaeta.

Among the amphipods (Figure 8f), several species associated with *Sabellaria* reef habitat were abundant. These amphipod species were *Bata cathariniensis*, *Unciola serrata*, and *Elasmopus levis*. Finally, bivalves (Figure 8g) and gastropods (Figure 8h) occurred throughout the project area, but gastropods exhibited higher abundance in transects at the inner tip of the islands (t1, t2, t9, and t10). These sites were dominated by small grastropods in the family Columbellidae (dovesnails).

Figure 9 summarizes biomass density of macroinvertebrates by transect. The dominant species by weight, the sand lancelet *Branchiostoma caribaeum*, occurred throughout the project area except in the south cove. It exhibited highest biomass in the south bridge transect, contributing to the high biomass exhibited in SB (Figure 9a, c). The next dominant species by weight, the polychaete *Sabellaria vulgaris*, contributed to most of the biomass in t9 and t10 (Figure 9a, d). In general, the biomass density of macroinvertebrates followed the same distribution patterns across transects as the abundance density.

Diversity

Diversity and dominance measures of the soft-bottom macrobenthos are shown in Figure 10. Number of species (range =12-45) was highest in t9, t10 and SC, and lowest in t4. Along the bridges, about the same number of species were found in NB and SB (Figure 10a). Shannon diversity (max. possible unbounded, range = 1.6-4.6) was highest in the north island in t1, t2, and t3, and lowest in t6 (Figure 10b). Simpson diversity (max. possible = 1, range = 0.3-0.9) was, on average, high across transects, and exhibited the same pattern as Shannon diversity (Figure 10c). Margalef species richness (max. possible unbounded, range = 1.6-5.0) was highest in t1, t2, t3, t9, t10, and SC, and lowest in t4 and t6. Along the bridges, Margalef species richness was similar in NB and SB (Figure 10d). Percent dominance (max. possible = 100%, range = 21-83%) showed the opposite pattern than Shannon diversity (Figure 10e); it was highest in t9 and t10 where the highest densities of *Sabellaria vulgaris* were found, and showed considerable variability among sites within transects. Lastly, evenness followed the same pattern and direction as Shannon diversity (Figure 10f).

Benthic Index of Biotic Integrity

For each of the soft-bottom survey sites, index metrics, B-IBI values, and the corresponding benthic community condition are presented in Table 3 and Figures 11 and 12.

Of the 48 sites, 32 sites met the Benthic Community Restoration Goals and 16 failed the goals (Table 3). Of the 16 sites that failed, eight were classified as marginal, three were classified as degraded, and five were classified as severely degraded (Table 3).

Sites that failed the goals as degraded or severely degraded were located along the north bridge (three sites), t4 (two sites), and one site each in t5, t9, and south bridge (Figures 11 and 12).

Sites classified as severely degraded failed the B-IBI because of low abundance and biomass below thresholds (scoring 1), insufficient abundance of deep-deposit feeding organisms, insufficient abundance of pollution-sensitive organisms, and/or excess biomass of pollution-indicative organisms (Table 3). Sites classified as degraded also failed the B-IBI because of low abundance and biomass, insufficient abundance of pollution-sensitive organisms, and insufficient abundance of deep-deposit feeding organisms (Table 3).

3.2 Rocky Shore Benthos

Benthic Community Structure

Portal island rocky intertidal and rocky subtidal habitats differed in species composition, abundance, and biomass. Therefore, summaries for these two habitats are presented separately.

Intertidal

Sixty-two taxa were identified in the intertidal benthic samples. Of these, 51 taxa were identified to species level and 11 taxa were identified to a taxonomic level higher than species. The intertidal was numerically dominated by barnacles and amphipods.

Four species accounted for 76% of the total abundance. Barnacles (*Chthamalus fragilis* and unidentifiable juveniles) accounted for 206,727 individuals and 40% of total abundance. The next three species were amphipods. *Monocorophium insidiosum* accounted for 97,032 individuals and 19% of total abundance; *Ampithoe valida* accounted for 59,041 individuals and 11% of total abundance; and *Jassa marmorata* accounted for 34,482 individuals and 7% of total abundance.

Three species accounted for 96% of the total biomass. The Eastern Oyster, *Crassostrea virginica*, accounted for 845.2 g AFDW and 66% of total biomass; barnacles accounted for 305.5 g AFDW and 24% of total biomass; and the Ribbed Mussel, *Geukensia demissa*, accounted for 81.0 g AFDW and 6% of total biomass. Although oysters and mussels were biomass dominants in the intertidal zone, their distribution was limited to a few sites (see below).

In terms of species composition, the intertidal survey identified 28 taxa of crustaceans and 15 taxa of polychaete annelids. The remaining taxa were gastropods (8 taxa), bivalves (4 taxa), turbellarians (2 taxa), insect larvae (2 taxa), and one taxon each of Cnidaria (anemones), nemerteans, and Pycnogonida (sea spiders).

Figure 13 summarizes the composition of the intertidal macrobenthic community by transect. Bivalves (oysters and mussels) were numerically dominant in the inner tip of the north island at t1. Otherwise, amphipods and barnacles (Cirripedia) comprised the largest percentage of the community, but their relative contribution differed among transects (Figure 13).

Figure 14 summarizes numerical density of intertidal macroinvertebrates by transect. Throughout these panels, infaunal and epifaunal organisms are shown separately. Benthic macroinvertebrates were classified as infauna or epifauna based on their predominant living mode. However, many species that live in sediments (infauna) are also found on hard substrata occupying crevices, in sediments deposited within crevices, or on the three-dimensional structure created by other organisms such algae and mussels. Classification of species into infauna and epifauna allows for the comparison of portal island rock surfaces to surrounding soft-sediments for similar types of organisms.

Total abundance (Figure 14a) was variable, but higher in t3 and t11. The higher abundance in these two transects was due to high densities of epifaunal amphipods. This is reflected in Figure 14b (total epifauna) and Figure 14f (Amphipoda). The higher abundance of total infauna in transects t5, t6, and t12 was due to elevated densities of insect larvae (Diptera), predominately in the family Chironomidae (Figure 14c, h). Large densities of bivalves, mostly oysters but also mussels, were found in t1 (Figure 14e), as noted above. Barnacles (Cirripedia) were abundant in most transects, but absent from t1 (Figure 14g).

Figure 15 summarizes the biomass density of intertidal macroinvertebrates by transect. In general, the biomass density of macroinvertebrates followed the same distributional patterns across transects as the abundance density. The most salient point is the high biomass of oysters in t1 (Figure 15a, b, e).

Subtidal

One hundred seventeen taxa were identified in the subtidal benthic samples. Of these, 92 taxa were identified to species level and 25 taxa were identified to a taxonomic level higher than species.

The subtidal rock surfaces of the portal islands were covered by a dense canopy of algae that provided habitat for numerous species of epibionts, predominately amphipods. Sponges (*Microciona prolifera* and *Halichondria bowerbanki*) and bryozoans were also common and hosts of amphipods and polychaetes. Oysters and mussels, although less common, provided three-dimensional habitat for colonial organisms such as hydroids and encrusting bryozoans.

Seven species accounted for 71% of the total abundance. Caprellid amphipods (skeleton shrimps, mostly *Caprella penantis*) were very abundant on algae and accounted for 1,204,332 individuals and 50% of total abundance. The reef-forming polychaete *Sabellaria vulgaris* accounted for 117,000 individuals and 5% of total abundance. The next five taxa, Corophiidae, the amphipods *Elasmopus levis* and *Ericthonious brasiliensis*,

the isopod *Erichsonella filiformis*, and the sabellid polychaete *Fabricinuda trilobata*, each accounted for 3-4% of total abundance.

Seven species accounted for 76% of the total biomass. Dominants by weight were the anemone *Diadumene leucolena*, accounting for 150.2 g AFDW and 26% of total biomass; the Eastern Oyster, *Crassostrea virginica*, accounting for 94.1 g AFDW and 16% of total biomass; and the amphipod *Caprella penantis*, accounting for 68.8 g AFDW and 12% of total biomass. The columbellid gastropod *Mitrela ocellata* accounted for 50 g AFDW and 9% of total biomass. The next three species, the isopod *Erichsonella filiformis*, and the polychaetes *Hydroides dianthus* and *Sabellaria vulgaris*, each accounted for 4-5% of total biomass.

In terms of species composition, the subtidal survey identified 39 taxa of crustaceans, 35 taxa of polychaete annelids, and 20 taxa of gastropods. The remaining taxa were bivalves (9 taxa), nemerteans (4 taxa), Pycnogonidae (3 taxa), turbellarians (2 taxa), ascidians (2 taxa), oligochaete annelids (unidentified), and one taxon each of Cnidaria (anemones) and Diptera (insect larvae). The foliose fraction of samples consisted of green and red algae, hydroids, sponges, and bryozoans.

Figure 16 summarizes composition of the subtidal macrobenthic community by transect. The subtidal community was homogeneous among the samples in terms of species composition, with amphipods and polychaetes accounting for most of the abundance at any one transect. Amphipods were common in all transects but comprised the largest percentage of the community in t2, t6, and t12 (Figure 16).

Figure 17 summarizes numerical density of subtidal macroinvertebrates by transect. Total abundance (Figure 17a) was higher in t2, t6, and t12, but note the large error bars indicating substantial variability among the samples of these transects. The higher abundance in these transects was due to epifaunal amphipods, primarily caprellid amphipods. The distribution of epifauna (Figure 17b) and Amphipoda (Figure 17e) primarily reflected the distribution of caprellids and other epibiont amphipods. Polychaetes (Figure 17d), isopods (Figure 17f), gastropods (Figure 17g) and anemones (Figure 17h) occurred throughout the rocky subtidal habitat, but their numbers varied considerably among transects and among samples.

Figure 18 summarizes biomass density of subtidal macroinvertebrates by transect. Biomass was higher at t1 and t2, and this was primarily due to polychaetes, amphipods, and anemones (Figure 16a, d, e, h). As with abundance, there was considerable variability in biomass density among transects, and among samples within transects, as indicated by the large error bars.

Diversity

Intertidal

Diversity and dominance measures of the intertidal macrobenthos are shown in Figure 19. Number of species (range = 6-29) was highest in t4 and lowest in t7 and t12. Shannon diversity (range = 0.8-3.5) was highest in t8 and lowest in t7 and t12 (Figure 19b). Simpson diversity (range = 0.3-0.9) exhibited a similar pattern to that of Shannon diversity (Figure 19c). Margalef species richness (range =0.5-2.6) was highest int4 and lowest in t6 and t12 (Figure 19d). Percent dominance (range = 50-98%) was generally high, above 50%, indicating that the intertidal community was dominated by 1-2 species (Figure 19e). Evenness (range = 0.3-0.8) was generally low and followed the same pattern and direction as Shannon diversity (Figure 19f).

Subtidal

Diversity and dominance measures of the subtidal macrobenthos are shown in Figure 20. Overall, diversity indices were higher, and dominance values lower, in the subtidal than in the intertidal, indicating a more homogeneous benthic community in the rocky subtidal. Number of species (range = 23-48) was relatively homogeneous across transects, with an average of 34.5 species per transect. Shannon diversity (range = 1.6-4.7) was highest in t7 and lowest in t12. Simpson diversity (range = 0.6-0.9) was similar to Shannon diversity (Figure 20b,c). Margalef species richness (range = 2.0-4.4) was highest in t7 and lowest in t10 (Figure 20d). Lastly, percent dominance (range =22-95%) and evenness (range = 0.3-0.9) were moderate in most transects and followed a similar pattern and direction to that of Shannon diversity (Figure 20e, f).

3.3 Secondary Production

Standing crop and secondary production estimates of macrobenthos for individual sites are provided in Table 4. Wet weight biomass is presented in Table 5.

Secondary production varied among sites, with some sites exhibiting 2-3 times the production of the average site, and a few sites exhibiting more than 3 times the production of the average site. Per unit area, rocky shore production was on average higher than soft-bottom production. The annual mean production of soft-bottom sites was 15.7 g AFDW m^{-2}. The annual mean production of the rocky intertidal was 156.0 g AFDW m^{-2}, but this included one site (t1) with very high production of bivalves (578.5 g AFDW m^{-2} yr^{-1}). Excluding t1, the annual mean production of the rocky intertidal was 117.6 g AFDW m^{-2}. The annual mean production of the rocky subtidal was 86.2 g AFDW m^{-2}. Thus, rocky intertidal production was 1.4x and 7.5x higher than rocky subtidal and

soft-bottom production, respectively, excluding t1. Secondary production values by transect are provided in Figure 21, and ranges for the individual sites are provided in Figures 22 and 23.

The estimates of secondary production calculated in this study are comparable to those estimated for other estuaries (Wong et al. 2011). A North Carolina oyster reef shoreline studied by Wong et al. (2011) had the highest secondary production of any of the habitats sampled, with a mean annual value of 467.3 g AFDW m^{-2} calculated using the same empirical model used in this study. Annual secondary production of the macrobenthos on shoreline stabilization structures, such as bulkheads, was also high, ranging from 36 to 131.4 g AFDW m^{-2} yr^{-1}, depending on estimation method.

Total secondary production for regions (soft-bottom inventory area, portal island intertidal, portal island subtidal) was calculated by splitting each region into individual production areas to account for differing productivity. Individual production areas were made for the north bridge, south bridge, north island, south island, south cove, a soft-bottom south island special area encompassing transects t9 and t10, and the rocky intertidal t1 (Figures 24 and 25). Area measurements, mean production, and total production are presented in Table 6.

South bridge total production was 6x higher than north bridge total production (Table 6), in part because of higher mean productivity in south bridge sites, where *Sabellaria* reefs were present, and in part because of the larger area encompassed by the south bridge inventory area. Total soft-bottom macrobenthic production in the south island was also higher than total soft-bottom macrobenthic production in the north island, due to high production at t9 and t10 (the South Island Special Area, Figure 25). Excluding this area, the north island exhibited higher soft-bottom productivity (Table 6). In the rocky shore, total production was highest in the south island rocky subtidal, due to the larger area assessed around this island.

Even though the per unit mean production of the soft-bottom macrobenthos was lower than the per unit mean production of the rocky shore macrobenthos, when scaled to the inventory area, total macrobenthic production was 3.7x higher for the soft-bottom than for the rocky shore (Table 6). Thus, the reef area represented by the portal islands will be unable to compensate for production loss in the surrounding soft-bottom benthic community if the footprint of the disturbance area is of the same magnitude as the footprint of the inventory area. For a different disturbance area, Table 6 can be used to calculate net loss or net gain in macrobenthic production. In addition to secondary production, other components of ecosystem health should be addressed, such as the

potential degradation of areas with good benthic community condition, as measured by the B-IBI in this study.

Table 1. Bottom Water Characteristics (Mean) for Sites Grouped by Transect. NB = North Bridge, SB = South Bridge, SC = South Cove

Site	Transect	Depth (m)	Salinity (psu)	Conductivity (mS/cm)	DO (mg/L)	DO Sat (%)	Temp (°C)	pH
17-01–17-07	NB	2.4	21.0	33.5	7.0	91.9	22.7	7.9
17-11, 1-3	t1	2.8	21.2	33.8	6.9	90.1	22.6	7.9
17-08, 1-3	t2	3.8	21.4	34.1	6.8	88.9	22.6	7.9
17-09, 1-3	t3	4.4	22.0	34.9	7.1	93.7	22.7	7.9
17-10, 1-3	t4	5.6	21.9	34.8	7.5	97.9	22.7	8.0
17-12, 1-3	t5	6.5	21.9	34.7	7.6	100.1	22.6	8.0
17-16, 1-3	t6	6.7	21.9	34.8	6.8	89.6	22.7	7.9
17-13, 1-3	t7	3.2	21.5	34.2	6.8	89.5	22.8	7.9
17-14, 1-3	t8	4.0	21.5	34.2	6.8	89.4	22.9	7.9
17-15, 1-3	t9	9.5	21.3	33.9	6.8	90.0	22.9	7.9
17-17, 1-3	t10	6.3	21.6	34.4	6.9	90.8	22.9	7.9
17-18–17-24	SB	2.4	21.5	34.2	6.9	89.9	22.5	7.9
17-25–17-28	SC	4.9	22.2	35.2	7.5	99.1	22.7	8.0

Table 2. Grain Size Fractions (Wentworth Grade Scale) and Total Organic Carbon (TOC) Content of Sediments (Percent)

Site	Transect	Pebble	Granule	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt-clay	TOC
17-01	NB	0.0	0.0	0.1	1.3	14.6	75.4	6.5	2.2	0.43
17-02		0.0	0.0	0.0	0.7	35.7	59.4	2.4	1.8	0.44
17-03		0.0	0.0	0.0	1.4	48.8	44.8	3.1	1.8	0.40
17-04		0.0	0.0	0.2	0.3	7.5	37.2	48.3	6.5	0.59
17-05		0.0	0.1	0.1	0.1	0.9	53.5	38.6	6.8	0.68
17-06		0.0	0.1	0.0	0.0	0.6	47.3	47.6	4.3	0.63
17-07		0.0	0.0	0.0	0.1	0.8	56.0	38.9	4.2	0.51
17-11-1	t1	2.9	1.8	3.8	13.9	25.2	40.6	6.8	5.0	0.60
17-11-2		0.3	0.0	0.0	0.3	1.5	69.7	24.1	4.1	0.73
17-11-3		0.0	0.0	0.0	0.2	2.9	76.8	16.2	3.9	0.59
17-08-1	t2	0.0	0.0	0.1	0.2	0.9	48.8	37.5	12.5	0.98
17-08-2		0.0	0.0	0.0	0.0	0.3	20.5	62.0	17.2	1.16
17-08-3		0.0	0.0	0.0	0.1	0.2	34.4	52.7	12.7	1.02
17-09-1	t3	0.0	0.0	0.9	4.5	15.0	69.4	5.3	4.8	0.56
17-09-2		0.0	0.2	0.0	0.2	2.9	82.7	9.1	4.9	0.47
17-09-3		0.0	1.0	5.9	15.9	22.3	38.6	10.7	5.6	0.39
17-10-1	t4	1.7	2.2	5.2	16.7	36.9	28.8	5.3	3.4	0.81
17-10-2		0.0	0.0	0.0	0.1	7.4	86.3	3.8	2.4	0.29
17-10-3		0.0	0.1	0.0	0.1	13.4	81.6	3.1	1.6	0.44
17-12-1	t5	0.0	0.0	0.1	0.1	0.7	83.9	11.4	3.9	0.54
17-12-2		0.3	0.3	0.2	0.6	2.5	79.5	10.4	6.1	0.49
17-12-3		3.5	13.5	21.0	25.7	18.4	11.7	2.6	3.5	0.43
17-16-1	t6	0.4	2.7	10.2	37.5	36.8	5.7	1.7	4.9	0.45
17-16-2		1.2	1.6	9.1	36.2	43.0	5.1	1.0	2.8	0.58
17-16-3		0.2	0.8	4.0	17.2	47.0	17.7	6.1	7.2	0.65
17-13-1	t7	2.1	1.2	6.1	27.0	39.9	11.2	7.2	5.4	0.47
17-13-2		0.4	0.1	0.4	5.9	23.1	39.9	21.4	8.8	0.75
17-13-3		0.0	0.7	3.8	17.2	39.7	29.0	4.4	5.2	0.61

Table 2. Continued

Site	Transect	Pebble	Granule	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt-clay	TOC
17-14-1	t8	0.0	0.6	2.6	16.6	61.9	11.7	3.0	3.7	0.53
17-14-2		2.6	2.4	6.0	19.8	51.1	9.6	4.1	4.4	0.34
17-14-3		3.6	1.0	5.5	22.7	42.0	16.1	5.1	3.9	0.38
17-15-1	t9	0.0	0.4	2.5	18.1	55.4	12.4	2.3	8.9	0.47
17-15-2		0.5	1.4	5.9	31.8	43.8	10.7	1.9	3.9	0.41
17-15-3		2.8	1.6	2.8	13.7	27.2	16.9	8.5	26.6	1.03
17-17-1	t10	0.3	0.8	0.8	9.1	71.8	13.2	1.3	2.7	0.58
17-17-2		12.2	2.4	2.2	4.6	22.4	17.8	14.9	23.4	0.99
17-17-3		1.6	1.8	1.6	2.9	17.2	22.6	7.3	44.9	1.63
17-18	SB	32.0	2.8	1.9	1.8	22.1	32.1	3.6	3.9	0.74
17-19		0.7	0.3	1.3	4.1	61.6	29.0	0.7	2.2	0.21
17-20		0.0	0.1	0.3	1.5	46.9	48.2	0.9	2.2	0.34
17-21		0.0	0.2	2.4	9.7	50.2	35.4	1.1	1.1	0.25
17-22		1.6	9.9	20.2	21.2	32.9	12.6	0.5	1.2	0.15
17-23		0.2	2.2	9.9	15.7	34.9	31.2	4.3	1.5	0.38
17-24		0.0	0.2	0.8	2.0	5.1	24.6	58.5	8.8	1.08
17-25	SC	0.0	0.0	0.1	0.3	0.6	2.2	49.7	47.0	1.84
17-26		0.0	0.1	0.2	0.4	6.8	38.5	39.2	14.8	0.90
17-27		0.0	0.7	0.1	0.1	0.4	10.3	62.7	25.7	1.28
17-28		0.6	1.3	4.0	29.5	17.1	6.8	33.5	7.2	1.03

Table 3. B-IBI Metrics, B-IBI Values, and Benthic Community Condition at Soft-Bottom Survey Sites in the Hampton Roads Bridge-Tunnel Project Area
Abun = abundance (#/m2), Bms = biomass (g AFDW m^{-2}), Poll-ind = pollution-indicative (%), Poll-sen = pollution sensitive (%), Carn-Om = carnivore and omnivores (%)

Site	Transect	Abun	Bms	Shannon-Wiener	Poll-ind Bms	Poll-sen Bms	Poll-sen Abun	Deep-dep Abun	Carn-Omm Abun	Abun Score	Bms Score	Shannon Score	Poll-ind Bms Score	Poll-sen Bms Score	Poll-sen Abun Score	Deep-dep Abun Score	Carn-Om Abun Score	B-IBI Value	Community Condition
17-01	NB	977	0.14	3.42	19.84	58.73	58.14	11.63	32.56	1	1	3	1	.	3	3	.	2	Sev. Degraded
17-02		909	0.32	2.92	1.43	27.96	62.50	5.00	22.50	1	1	3	5	.	3	1	.	2.3	Degraded
17-03		1522	1.14	2.87	1.59	8.75	58.21	7.46	22.39	3	3	3	5	.	5	1	.	3.3	Meets Goal
17-04		1772	1.14	4.30	6.29	36.86	42.31	16.67	19.23	3	3	5	3	.	3	3	.	3.3	Meets Goal
17-05		1931	1.99	3.82	0.80	34.93	48.24	4.71	18.82	3	3	5	5	.	3	1	.	3.3	Meets Goal
17-06		2227	1.94	3.21	1.99	55.85	58.16	7.14	17.35	3	3	3	5	.	5	1	.	3.3	Meets Goal
17-07		909	0.97	3.55	25.53	12.30	35.00	0.00	20.00	1	1	5	1	.	3	1	.	2	Sev. Degraded
17-11-1	t1	2590	2.07	4.42	0.77	8.42	12.28	14.91	26.32	3	3	5	5	.	1	3	.	3.3	Meets Goal
17-11-2		954	1.31	3.35	0.00	34.49	28.57	4.76	11.90	1	3	3	5	.	3	1	.	2.7	Marginal
17-11-3		1113	0.48	3.60	0.00	16.43	51.02	8.16	28.57	1	1	5	5	.	3	1	.	2.7	Marginal
17-08-1	t2	2567	1.65	4.22	3.85	23.44	34.51	13.27	15.93	3	3	5	5	.	3	3	.	3.7	Meets Goal
17-08-2		3499	1.71	4.04	11.16	32.40	38.96	8.44	15.58	5	3	5	3	.	3	1	.	3.3	Meets Goal
17-08-3		3522	1.88	3.76	8.20	22.06	35.48	11.61	11.61	5	3	5	3	.	3	3	.	3.7	Meets Goal
17-09-1	t3	1500	0.73	3.81	1.25	5.31	7.58	21.21	6.06	1	1	5	5	.	1	3	.	2.7	Marginal
17-09-2		1204	0.28	4.20	0.81	24.80	35.85	22.64	15.09	1	1	5	5	.	3	3	.	3	Meets Goal
17-09-3		2227	1.98	4.19	0.46	57.45	41.84	13.27	17.35	3	3	5	5	.	3	3	.	3.7	Meets Goal
17-10-1	t4	2726	2.40	2.76	0.19	8.63	6.67	48.33	12.50	3	3	3	5	.	1	5	.	3.3	Meets Goal
17-10-2		523	1.00	3.26	0.00	89.40	17.39	0.00	0.00	1	1	3	5	.	1	1	.	2	Sev. Degraded
17-10-3		750	0.80	3.33	44.38	0.57	6.06	3.03	3.03	1	1	3	1	.	1	1	.	1.3	Sev. Degraded
17-12-1	t5	1022	0.79	3.80	6.07	16.04	15.56	11.11	15.56	1	1	5	3	.	1	3	.	2.3	Degraded
17-12-2		1477	0.67	3.81	5.57	11.49	12.31	30.77	7.69	1	1	5	3	.	1	5	.	2.7	Marginal
17-12-3		4589	3.88	3.44	0.00	10.02	2.48	18.81	27.72	5	3	3	5	.	1	3	.	3.3	Meets Goal
17-16-1	t6	4680	3.00	3.39	0.00	0.15	0.49	26.21	36.89	5	3	3	5	.	1	5	.	3.7	Meets Goal
17-16-2		1227	0.96	3.06	0.00	13.21	9.26	29.63	5.56	1	1	3	5	.	1	5	.	2.7	Marginal
17-16-3		5362	1.44	1.43	0.00	2.84	1.27	86.86	3.81	3	3	1	5	.	1	5	.	3	Meets Goal
17-13-1	t7	2022	1.82	3.56	6.62	8.74	14.61	20.22	19.10	3	3	5	3	.	1	3	.	3	Meets Goal
17-13-2		1568	0.63	3.26	1.79	53.05	33.33	4.35	11.59	3	1	3	5	.	3	1	.	2.7	Marginal
17-13-3		1454	1.26	3.62	0.00	6.95	10.94	28.13	10.94	1	3	5	5	.	1	5	.	3.3	Meets Goal
17-14-1	t8	2045	0.96	3.21	0.00	3.77	4.44	24.44	13.33	3	1	3	5	.	1	3	.	2.7	Marginal
17-14-2		3931	1.73	3.58	0.00	3.54	6.36	45.09	13.87	5	3	5	5	.	1	5	.	4	Meets Goal
17-14-3		1772	1.43	3.48	0.00	8.74	16.67	24.36	20.51	3	3	3	5	.	1	3	.	3	Meets Goal
17-15-1	t9	15177	5.14	2.60	0.00	12.36	1.65	5.39	13.77	1	5	1	5	.	1	1	.	2.3	Degraded
17-15-2		4317	3.74	3.28	0.00	3.40	1.05	15.79	13.68	5	3	3	5	.	1	3	.	3.3	Meets Goal
17-15-3		3272	1.81	3.96	0.38	16.19	6.94	15.97	27.08	5	3	5	5	.	1	3	.	3.7	Meets Goal
17-17-1	t10	2840	2.43	3.64	0.00	0.19	0.80	12.80	20.80	3	3	5	5	.	1	3	.	3.3	Meets Goal
17-17-2		3953	3.06	3.28	0.00	0.19	1.15	13.79	22.99	5	3	3	5	.	1	3	.	3.3	Meets Goal
17-17-3		4612	7.16	2.98	0.03	33.64	4.93	13.79	20.20	3	5	3	5	3	.	.	1	3.3	Meets Goal
17-18	SB	4612	4.20	2.89	0.27	21.98	4.93	25.62	7.39	5	3	3	5	.	1	5	.	3.7	Meets Goal
17-19		1863	1.78	3.52	1.40	0.13	2.44	13.41	23.17	3	3	5	5	.	1	3	.	3.3	Meets Goal
17-20		750	0.81	2.97	1.69	5.62	24.24	6.06	6.06	1	1	3	5	.	1	1	.	2	Sev. Degraded
17-21		2204	2.34	3.19	1.26	0.19	3.09	18.56	3.09	3	3	3	5	.	1	3	.	3	Meets Goal
17-22		1908	3.33	3.19	0.07	4.44	21.43	19.05	7.14	3	3	3	5	.	1	3	.	3	Meets Goal
17-23		2522	4.95	2.76	0.92	3.08	24.32	8.11	3.60	3	3	3	5	.	1	1	.	2.7	Marginal
17-24		2045	1.54	3.85	0.00	21.37	53.33	16.67	17.78	3	3	5	5	.	5	3	.	4	Meets Goal
17-25	SC	4090	2.38	3.72	5.16	34.46	21.67	29.44	13.33	3	3	5	3	3	.	.	1	3	Meets Goal
17-26		3249	2.50	3.83	5.71	40.82	27.97	16.08	13.29	5	3	5	3	.	3	3	.	3.7	Meets Goal
17-27		3022	4.89	4.10	2.46	23.85	26.32	18.05	15.79	5	3	5	5	.	3	3	.	4	Meets Goal
17-28		3590	0.49	3.07	1.84	44.83	26.58	48.73	19.62	5	1	3	5	.	3	5	.	3.7	Meets Goal

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Table 4. Seasonal Macrobenthic Standing Crop and Brey's Macrobenthic Secondary Production of Soft-Bottom, Rocky Intertidal, and Rocky Subtidal Habitats in the Hampton Roads Bridge-Tunnel Project Area

Site	Component	Transect	Standing Crop (g AFDW $m^{-2)}$	Secondary Production (g AFDW m^{-2} yr^{-1})
17-01	Soft-Bottom	NB	0.14	2.14
17-02	Soft-Bottom		0.32	2.52
17-03	Soft-Bottom		1.17	6.60
17-04	Soft-Bottom		1.31	8.87
17-05	Soft-Bottom		2.25	12.22
17-06	Soft-Bottom		1.95	10.04
17-07	Soft-Bottom		0.99	5.28
17-11-1	Soft-Bottom	t1	2.73	16.90
17-11-2	Soft-Bottom		1.35	6.66
17-11-3	Soft-Bottom		0.57	4.16
17-08-1	Soft-Bottom	t2	1.87	11.18
17-08-2	Soft-Bottom		1.78	11.61
17-08-3	Soft-Bottom		1.89	11.91
17-09-1	Soft-Bottom	t3	0.81	5.72
17-09-2	Soft-Bottom		0.67	4.32
17-09-3	Soft-Bottom		2.12	12.10
17-10-1	Soft-Bottom	t4	2.44	12.53
17-10-2	Soft-Bottom		1.01	2.82
17-10-3	Soft-Bottom		0.82	3.76
17-12-1	Soft-Bottom	t5	0.82	5.45
17-12-2	Soft-Bottom		0.72	4.74
17-12-3	Soft-Bottom		5.90	40.84
17-16-1	Soft-Bottom	t6	3.54	20.76
17-16-2	Soft-Bottom		1.03	5.64
17-16-3	Soft Bottom		1.47	8.92

Table 4. Continued

Site	Component	Transect	Standing Crop (g AFDW $m^{-2)}$	Secondary Production (g AFDW m^{-2} yr^{-1})
17-13-1	Soft-Bottom	t7	1.95	11.14
17-13-2	Soft-Bottom		0.69	4.97
17-13-3	Soft-Bottom		1.90	11.21
17-14-1	Soft-Bottom	t8	1.00	6.28
17-14-2	Soft-Bottom		2.05	14.44
17-14-3	Soft-Bottom		1.52	6.65
17-15-1	Soft-Bottom	t9	14.71	104.45
17-15-2	Soft-Bottom		6.70	35.74
17-15-3	Soft-Bottom		4.19	26.57
17-17-1	Soft-Bottom	t10	6.94	35.60
17-17-2	Soft-Bottom		6.34	34.51
17-17-3	Soft-Bottom		10.97	52.03
17-18	Soft-Bottom	SB	7.41	45.04
17-19	Soft-Bottom		1.79	9.73
17-20	Soft-Bottom		0.82	4.77
17-21	Soft-Bottom		2.37	11.00
17-22	Soft-Bottom		3.33	13.05
17-23	Soft-Bottom		4.95	23.86
17-24	Soft-Bottom		1.66	10.08
17-25	Soft-Bottom	SC	2.46	12.46
17-26	Soft-Bottom		2.54	13.63
17-27	Soft-Bottom		5.01	22.13
17-28	Soft-Bottom		0.54	5.31
EPI1-INT1	Rocky Intertidal	t1	787.03	578.52
EPI2-INT1	Rocky Intertidal	t2	8.45	38.76
EPI3-INT1	Rocky Intertidal	t3	23.68	102.73
EPI4-INT1	Rocky Intertidal	t4	29.22	49.34
EPI5-INT1	Rocky Intertidal	t5	61.82	167.73

Table 4. Continued

Site	Component	Transect	Standing Crop (g AFDW $m^{-2)}$	Secondary Production (g AFDW m^{-2} yr^{-1})
EPI6-INT1	Rocky Intertidal	t6	92.99	253.58
EPI7-INT1	Rocky Intertidal	t7	17.72	66.83
EPI8-INT1	Rocky Intertidal	t8	35.08	68.90
EPI9-INT1	Rocky Intertidal	t9	97.81	128.13
EPI10-INT1	Rocky Intertidal	t10	30.20	114.25
EPI11-INT1	Rocky Intertidal	t11	36.43	145.69
EPI12-INT1	Rocky Intertidal	t12	56.12	157.39
EPI1-SUB1	Rocky Subtidal	t1	24.21	204.09
EPI1-SUB2	Rocky Subtidal		29.67	68.69
EPI1-SUB3	Rocky Subtidal		24.41	30.89
EPI2-SUB1	Rocky Subtidal	t2	189.73	337.73
EPI2-SUB2	Rocky Subtidal		13.99	90.50
EPI2-SUB3	Rocky Subtidal		6.25	36.93
EPI3-SUB1	Rocky Subtidal	t3	3.74	37.68
EPI3-SUB2	Rocky Subtidal		15.85	67.76
EPI3-SUB3	Rocky Subtidal		2.97	29.98
EPI4-SUB1	Rocky Subtidal	t4	8.06	54.43
EPI4-SUB2	Rocky Subtidal		10.35	82.00
EPI4-SUB3	Rocky Subtidal		7.91	72.72
EPI5-SUB1	Rocky Subtidal	t5	13.88	92.31
EPI5-SUB2	Rocky Subtidal		4.43	48.18
EPI5-SUB3	Rocky Subtidal		5.86	59.70
EPI6-SUB1	Rocky Subtidal	t6	16.58	191.01
EPI6-SUB2	Rocky Subtidal		4.13	16.91
EPI6-SUB3	Rocky Subtidal		3.96	30.25
EPI7-SUB1	Rocky Subtidal	t7	11.17	79.76
EPI7-SUB2	Rocky Subtidal		15.71	93.11
EPI7-SUB3	Rocky Subtidal		8.17	64.86

Table 4. Continued

Site	Component	Transect	Standing Crop (g AFDW $m^{-2)}$	Secondary Production (g AFDW m^{-2} yr^{-1})
EPI8-SUB1	Rocky Subtidal	t8	12.10	92.56
EPI8-SUB2	Rocky Subtidal		7.63	48.91
EPI8-SUB3	Rocky Subtidal		13.15	108.54
EPI9-SUB1	Rocky Subtidal	t9	14.77	110.76
EPI9-SUB2	Rocky Subtidal		7.60	58.90
EPI9-SUB3	Rocky Subtidal		36.78	234.73
EPI10-SUB1	Rocky Subtidal	t10	5.05	44.68
EPI10-SUB2	Rocky Subtidal		8.52	85.81
EPI10-SUB3	Rocky Subtidal		7.94	42.38
EPI11-SUB1	Rocky Subtidal	t11	2.46	15.61
EPI11-SUB2	Rocky Subtidal		5.54	49.71
EPI11-SUB3	Rocky Subtidal		6.43	50.58
EPI12-SUB1	Rocky Subtidal	t12	9.77	108.66
EPI12-SUB2	Rocky Subtidal		16.03	163.20
EPI12-SUB3	Rocky Subtidal		11.47	99.10

Table 5. Wet Weight Biomass (g m^{-2}) of Algae and Colonial Species. p = presence, with nill weight.

Site	Component	Transect	Algae	Sponges	Hydroids	Bryozoans
EPI1-INT1	Rocky Intertidal	t1	p	0	0	0
EPI2-INT1	Rocky Intertidal	t2	p	0	0	0
EPI3-INT1	Rocky Intertidal	t3	p	0	0	0
EPI4-INT1	Rocky Intertidal	t4	p	0	0	0
EPI5-INT1	Rocky Intertidal	t5	p	0	0	0
EPI6-INT1	Rocky Intertidal	t6	p	0	0	0
EPI7-INT1	Rocky Intertidal	t7	p	0	0	0
EPI8-INT1	Rocky Intertidal	t8	p	0	0	0
EPI9-INT1	Rocky Intertidal	t9	p	0	0	0
EPI10-INT1	Rocky Intertidal	t10	p	0	0	0
EPI11-INT1	Rocky Intertidal	t11	p	0	0	0
EPI12-INT1	Rocky Intertidal	t12	p	0	0	0
EPI1-SUB1	Rocky Subtidal		717.8	148.9	p	p
EPI1-SUB2	Rocky Subtidal		p	p	p	p
EPI1-SUB3	Rocky Subtidal	t1	288.9	p	p	p
EPI2-SUB1	Rocky Subtidal		3251.1	p	p	p
EPI2-SUB2	Rocky Subtidal		3427.7	p	0	p
EPI2-SUB3	Rocky Subtidal	t2	51.1	307.8	p	p
EPI3-SUB1	Rocky Subtidal		400.0	7.3	0	p
EPI3-SUB2	Rocky Subtidal		608.9	p	p	p
EPI3-SUB3	Rocky Subtidal	t3	700.0	p	0	p
EPI4-SUB1	Rocky Subtidal		2263.3	p	0	p
EPI4-SUB2	Rocky Subtidal		3100.0	133.3	0	p
EPI4-SUB3	Rocky Subtidal	t4	2270.0	355.6	0	p

Table 5. Continued

Site	Component	Transect	Algae	Sponges	Hydroids	Bryozoans
EPI5-SUB1	Rocky Subtidal		1971.1	p	0	p
EPI5-SUB2	Rocky Subtidal		655.6	0	4.2	p
EPI5-SUB3	Rocky Subtidal	t5	1288.9	p	0	p
EPI6-SUB1	Rocky Subtidal		6051.1	p	0	p
EPI6-SUB2	Rocky Subtidal		p	0	0	0
EPI6-SUB3	Rocky Subtidal	t6	110.0	1232.2	p	p
EPI7-SUB1	Rocky Subtidal		1877.8	p	0	p
EPI7-SUB2	Rocky Subtidal		62.6	854.4	p	p
EPI7-SUB3	Rocky Subtidal	t7	171.1	p	p	p
EPI8-SUB1	Rocky Subtidal		2587.3	0	0	p
EPI8-SUB2	Rocky Subtidal		415.6	0	0	p
EPI8-SUB3	Rocky Subtidal	t8	320.0	110.0	p	p
EPI9-SUB1	Rocky Subtidal		p	0	0	0
EPI9-SUB2	Rocky Subtidal		422.2	p	0	p
EPI9-SUB3	Rocky Subtidal	t9	p	922.2	p	p
EPI10-SUB1	Rocky Subtidal		591.7	57.8	0	p
EPI10-SUB2	Rocky Subtidal		706.2	10.9	p	0
EPI10-SUB3	Rocky Subtidal	t10	508.9	264.4	0	p
EPI11-SUB1	Rocky Subtidal		168.9	0	p	0
EPI11-SUB2	Rocky Subtidal		1297.8	p	0	p
EPI11-SUB3	Rocky Subtidal	t11	128.0	p	p	p
EPI12-SUB1	Rocky Subtidal		750.0	0	0	p
EPI12-SUB2	Rocky Subtidal		1201.1	p	0	p
EPI12-SUB3	Rocky Subtidal	t12	143.3	p	0	23.1

Table 6. Mean (per square meter) and Total (for region) Secondary Production of Macrobenthos in the Hampton Roads Bridge-Tunnel Project Area

Region	Component	Area (m^2)	Mean Production (g AFDW m^{-2} yr^{-1})	Total Production (g AFDW yr^{-1})	Total Production (kg AFDW yr^{-1})
North Bridge	Soft Bottom	101,211	6.81	689,244	689
South Bridge	Soft Bottom	249,984	16.79	4,197,231	4,197
North Island	Soft Bottom	146,324	10.31	1,508,600	1,509
South Island	Soft Bottom	85,013	10.00	850,127	850
South Cove	Soft Bottom	42,350	13.38	566,637	567
t9 and t10*	Soft Bottom	29,145	48.15	1,403,310	1,403
North Island	Rocky Intertidal	1,768	89.64	158,455	158
South Island	Rocky Intertidal	5,773	133.54	770,916	771
t1	Rocky Intertidal	191	578.52	110,358	110
North Island	Rocky Subtidal	4,441	87.57	388,883	389
South Island	Rocky Subtidal	12,393	85.24	1,056,409	1,056
Project Area	Soft Bottom				9,215
Project Area	Portal Islands				2,485

*South Island Special Area

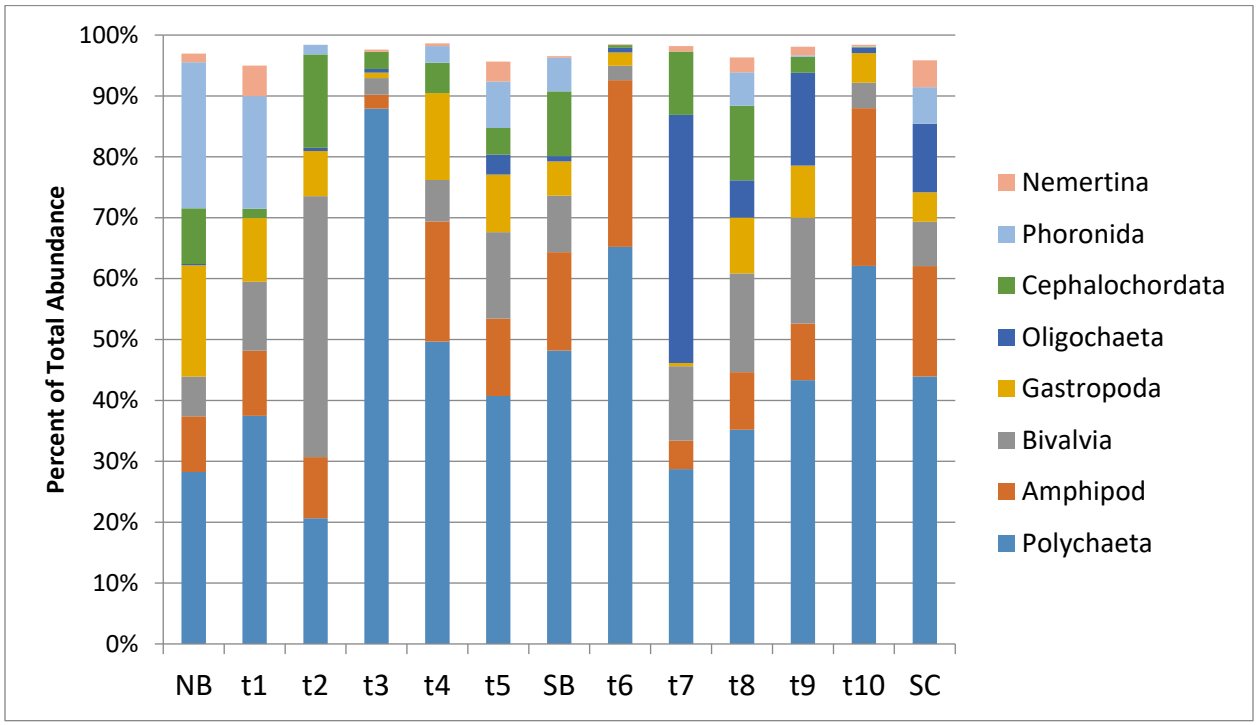

Figure 7. Percent Species Composition of Macrobenthos by Soft-Bottom Transect. NB = North Bridge, SB = South Bridge, SC = South Cove. t1-t5 = North Island, from north to south. t6-t10 = South Island, from north to south

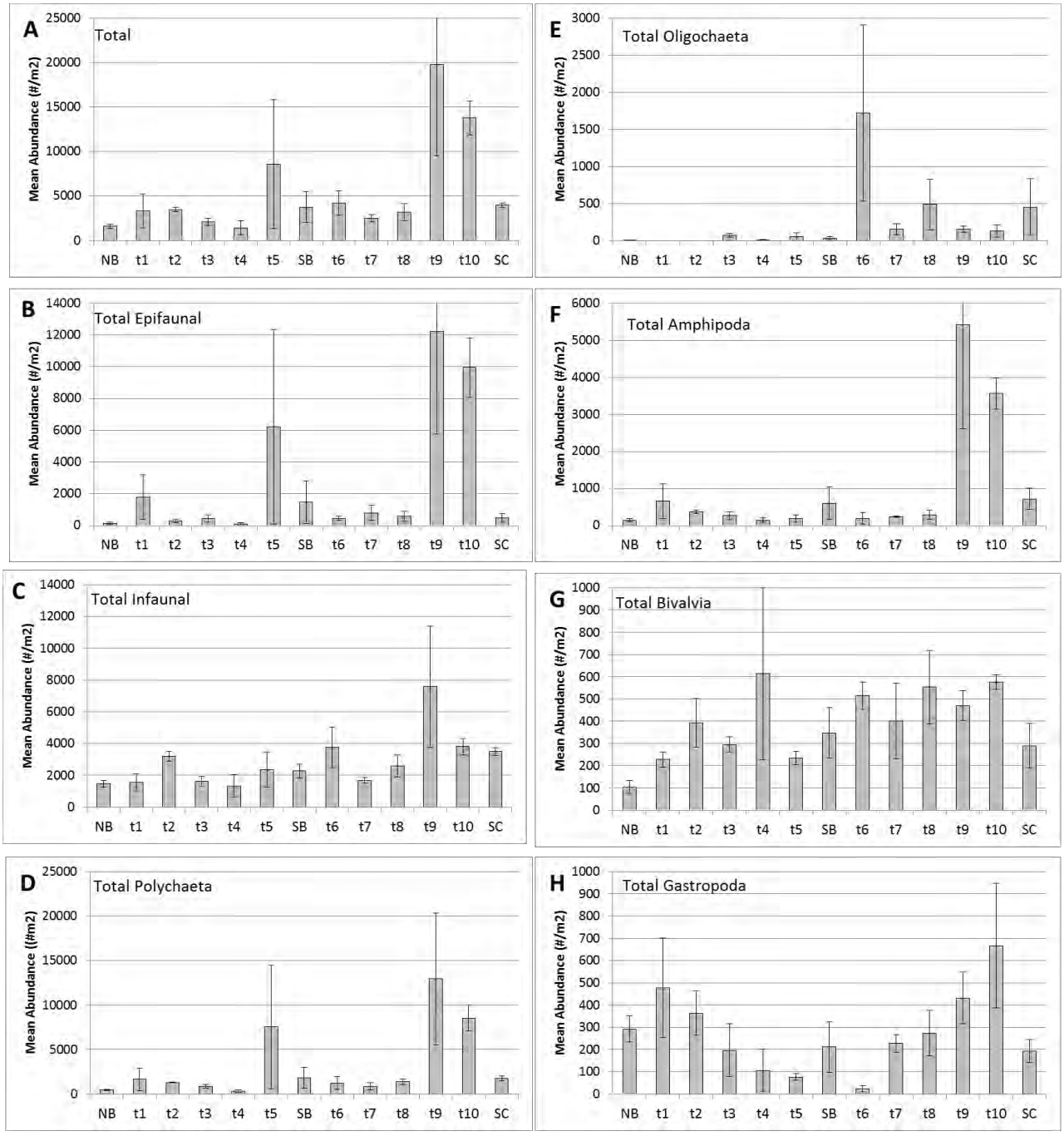

Figure 8. Density of Soft-Bottom Macrobenthos (mean ± 1 s.e.) for Various Taxa by Transect. Transects as in Figure 7

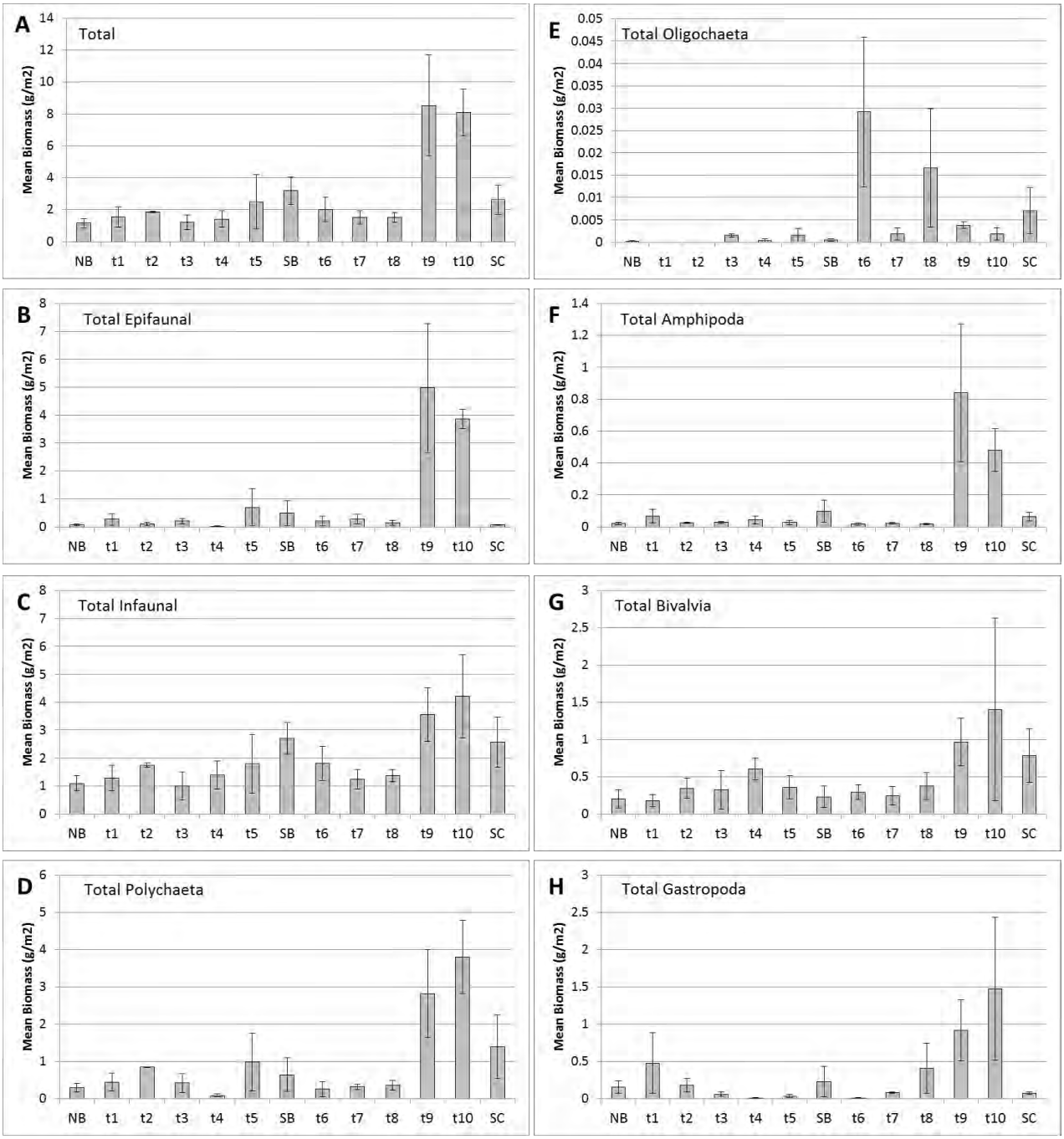

Figure 9. Biomass of Soft-Bottom Macrobenthos (mean g AFDW ± 1 s.e.) for Various Taxa by Transect. Transects as in Figure 7

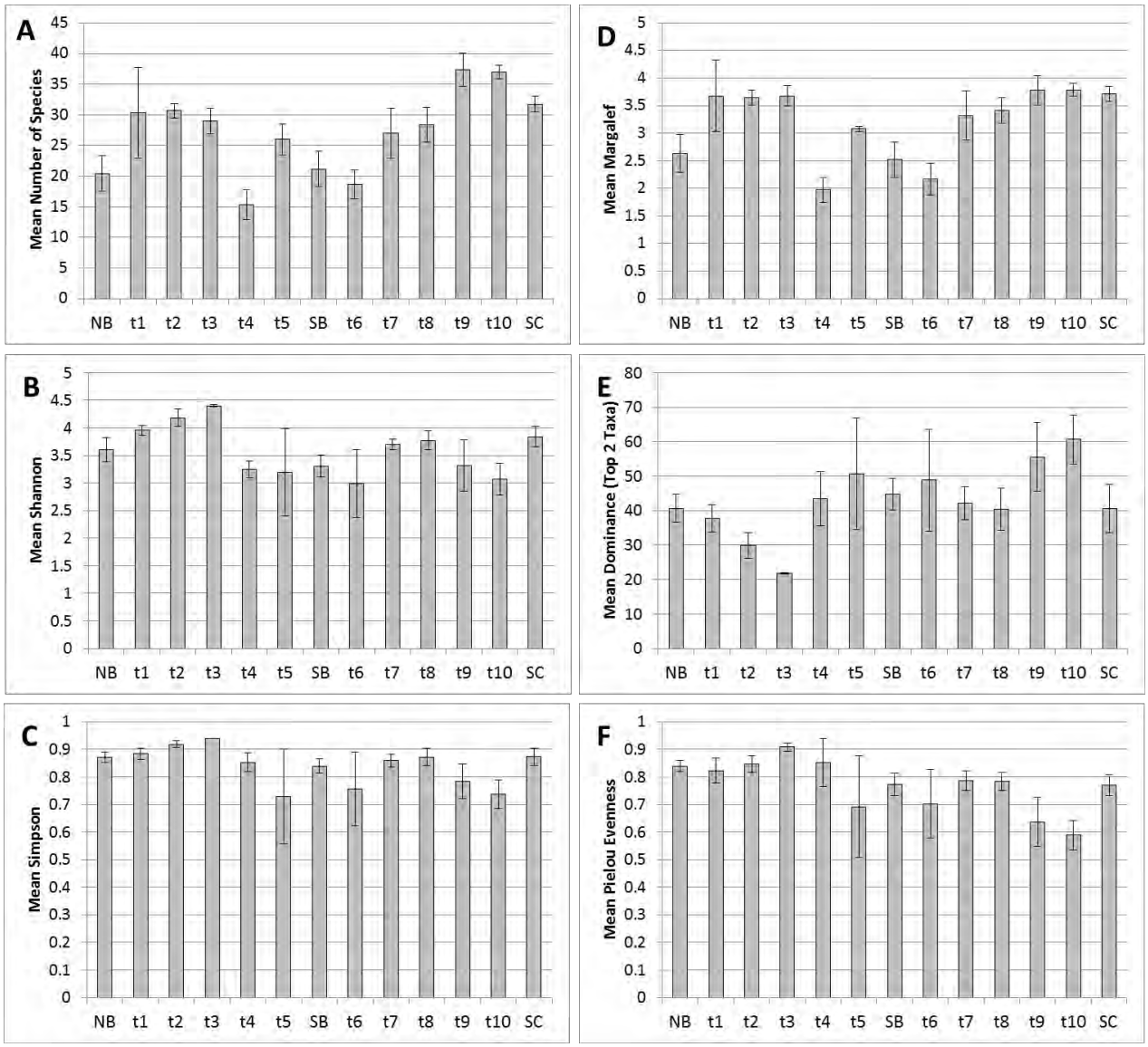

Figure 10. Diversity and Dominance Measures of the Soft-Bottom Benthic Community (mean ± 1 s.e.) by Transect. Transects as in Figure 7.

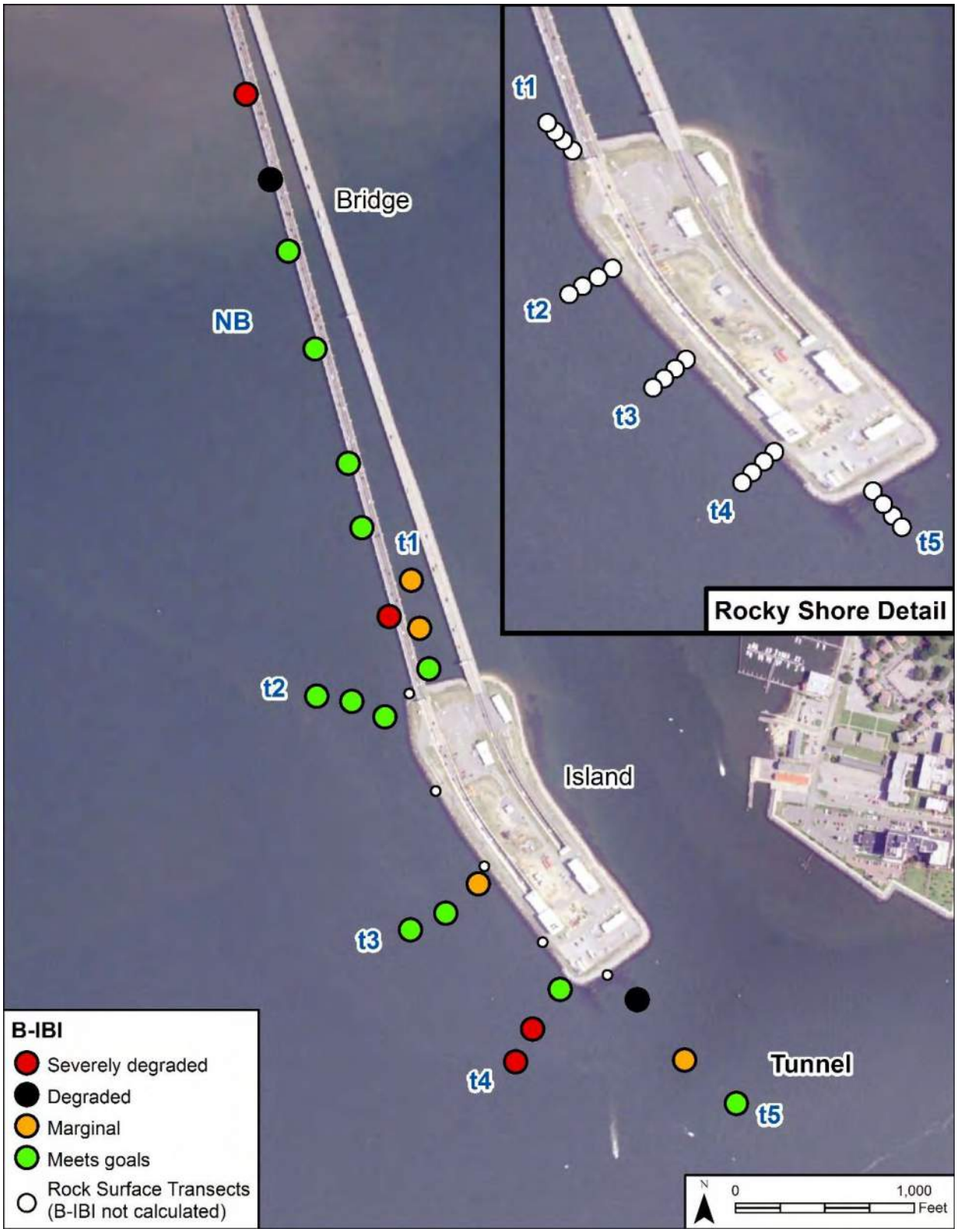

Figure 11. Benthic Communicty Condition of Soft-Bottom Macrobenthos at Sites in the North Bridge and North Portal Island Region

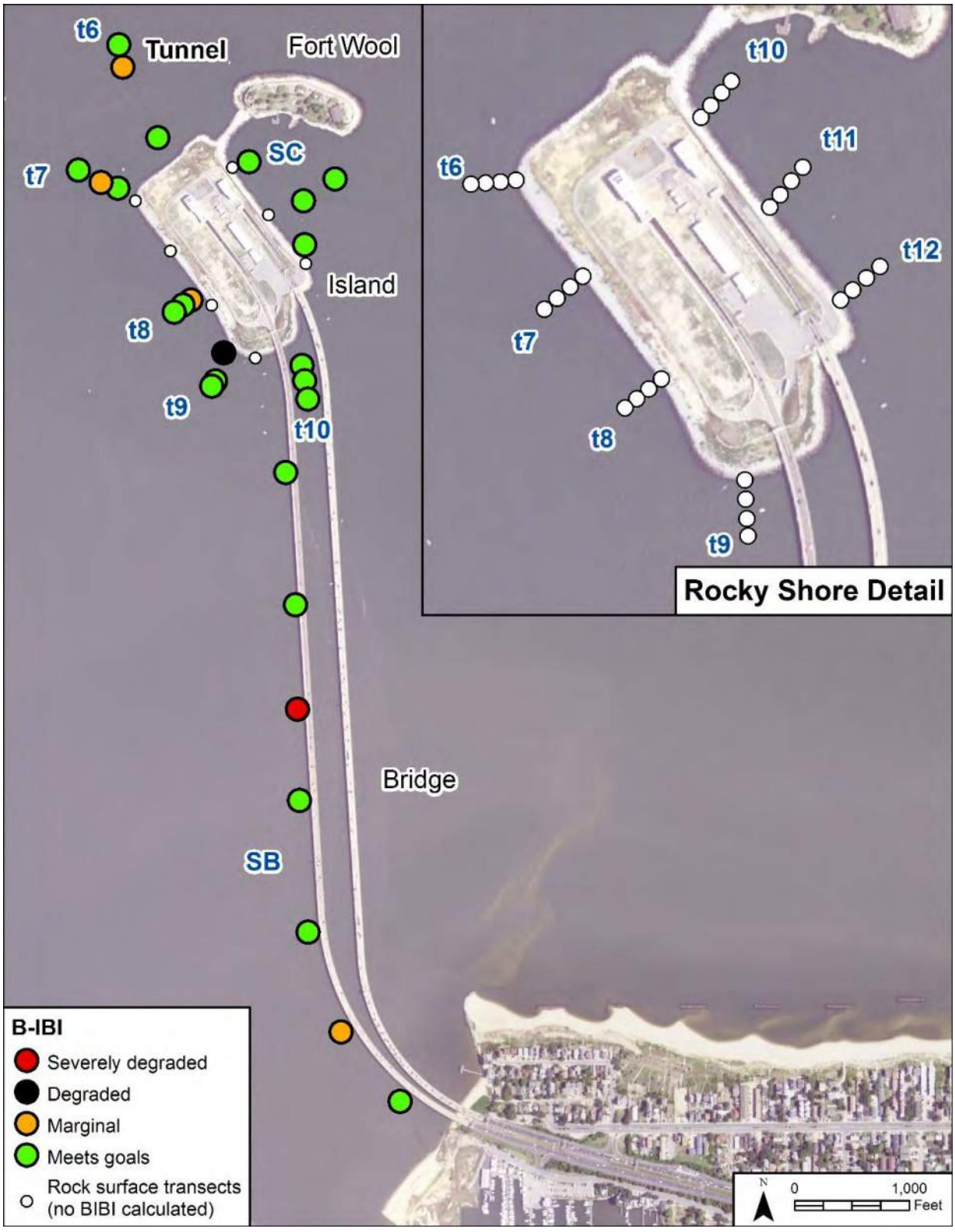

Figure 12. Benthic Community Condition of Soft-Bottom Macrobenthos at Sites in the South Bridge and South Portal Island Region

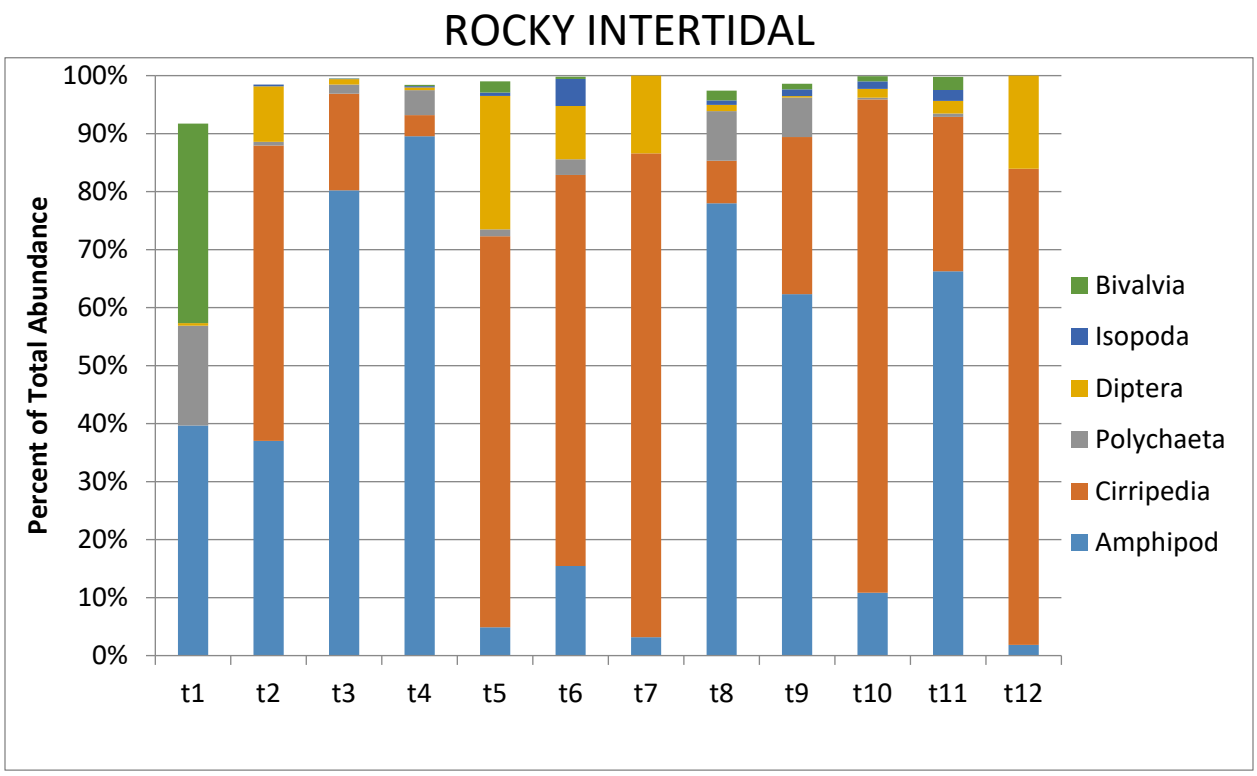

Figure 13. Percent Species Composition of Rocky Intertidal Macrobenthos by Transect. t1-t5 = North Island, t6-t12 = South Island

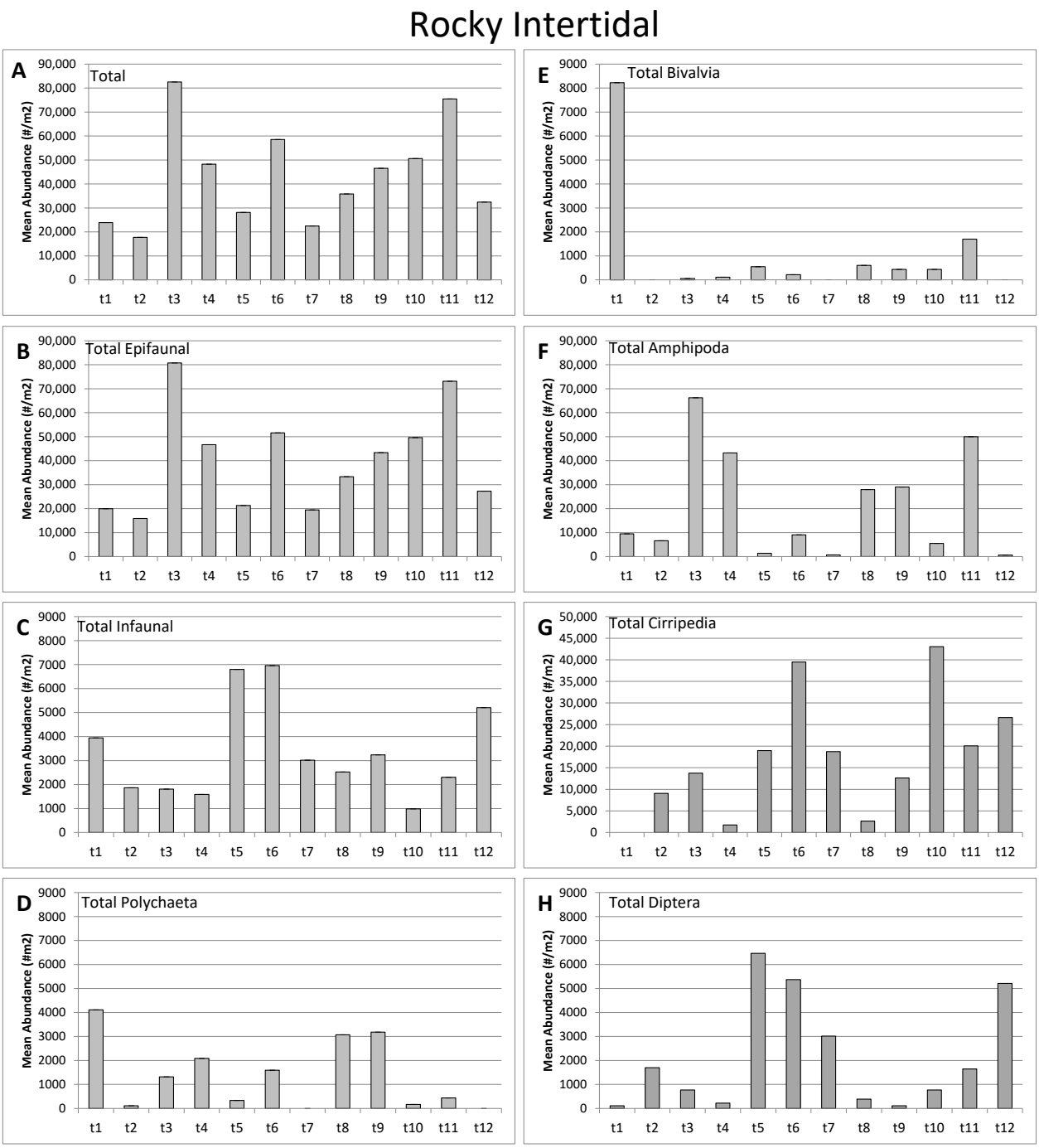

Figure 14. Density of Rocky Intertidal Macrobenthos (indiv m^{-2}) for Various Taxa by Transect. Transects as in Figure 13.

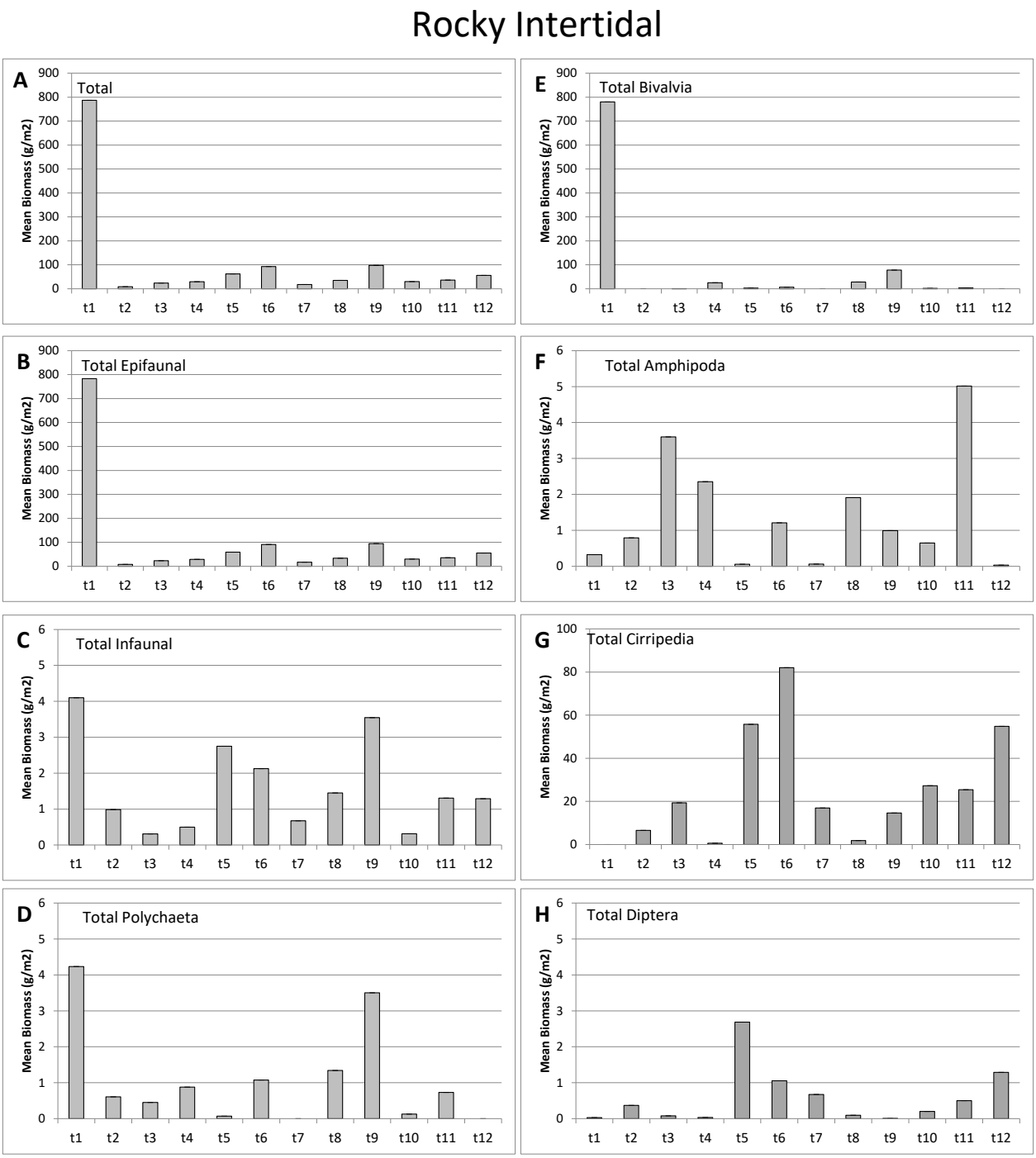

Figure 15. Biomass of Rocky Intertidal Macrobenthos (g AFDW) for Various Taxa by Transect. Transects as in Figure 13.

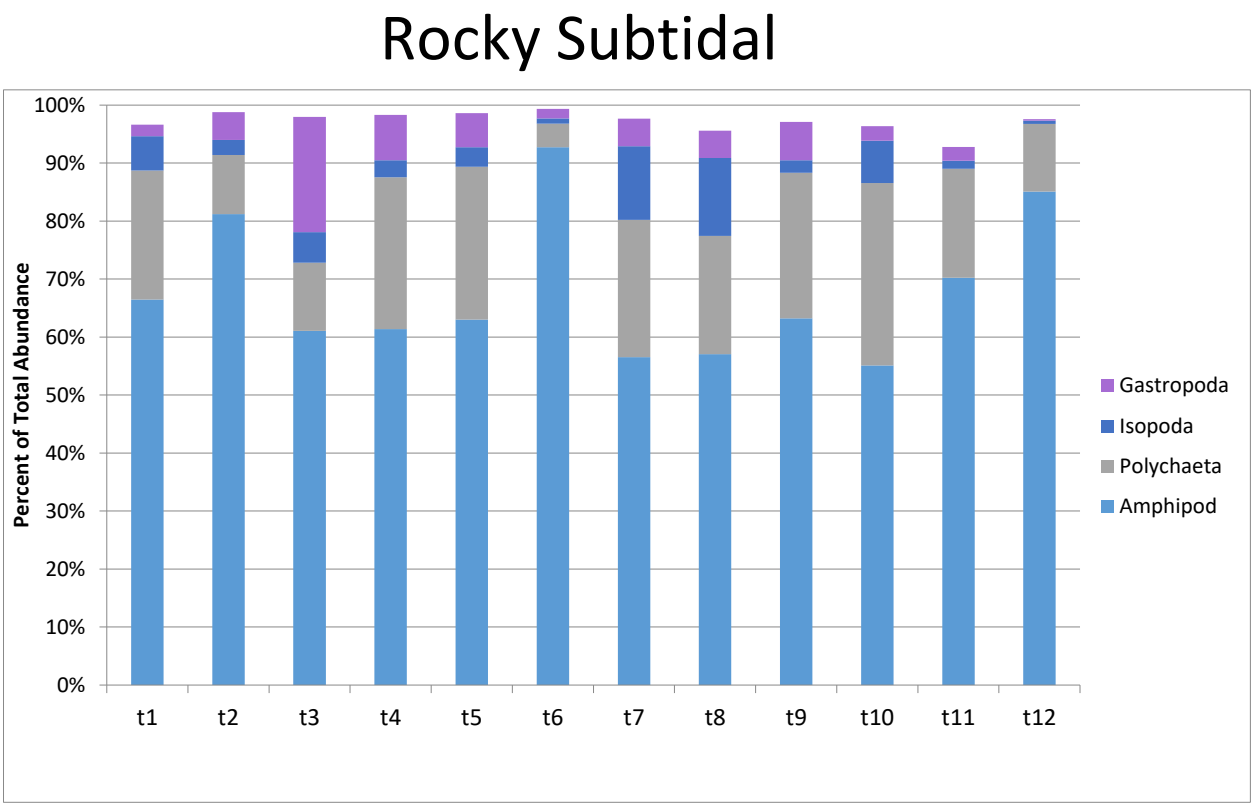

Figure 16. Percent Species Composition of Rocky Subtidal Macrobenthos by Transect. Transects as in Figure 13.

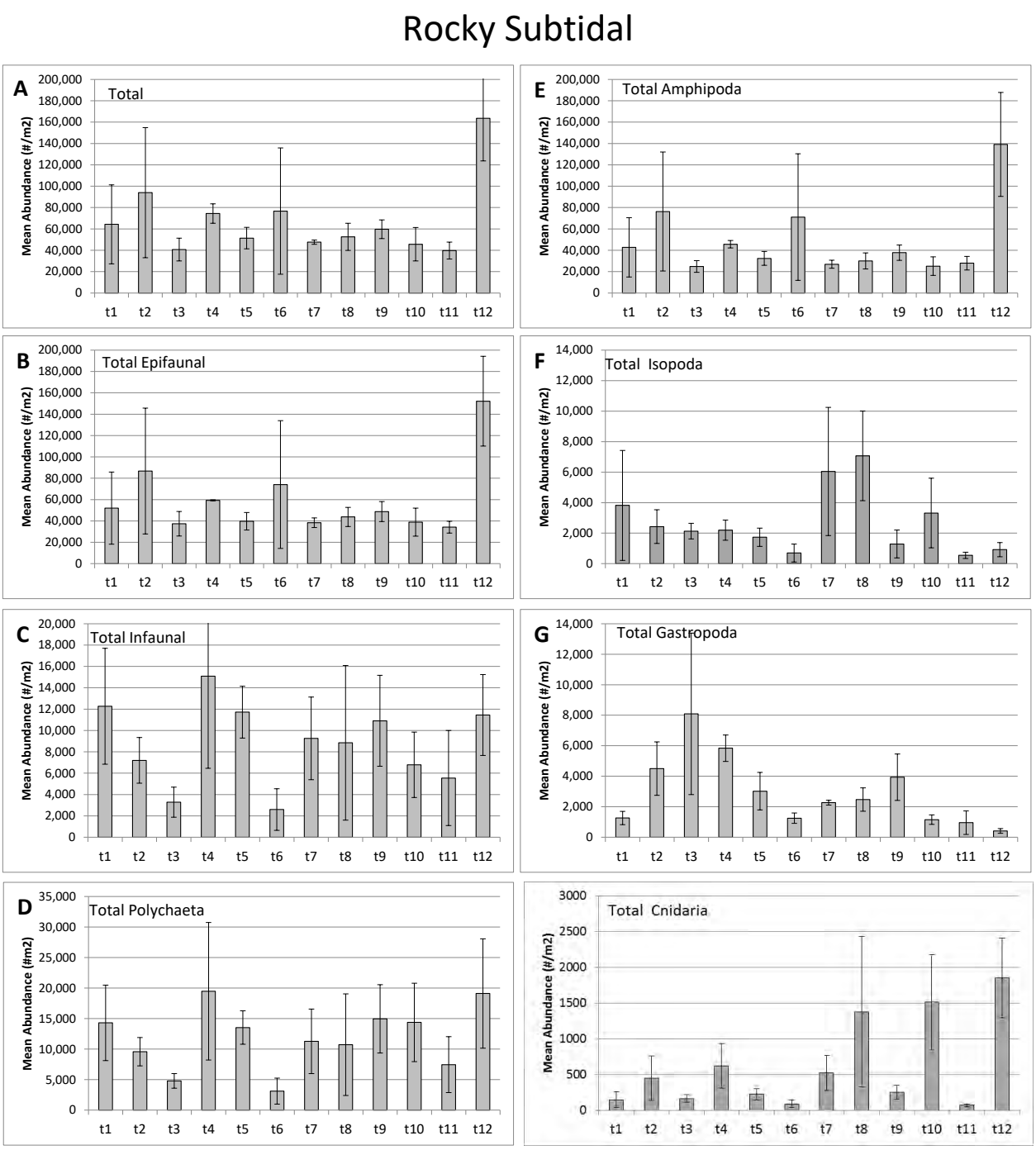

Figure 17. Density of Rocky Subtidal Macrobenthos (mean ± 1 s.e.) for Various Taxa by Transect. Transects as in Figure 13.

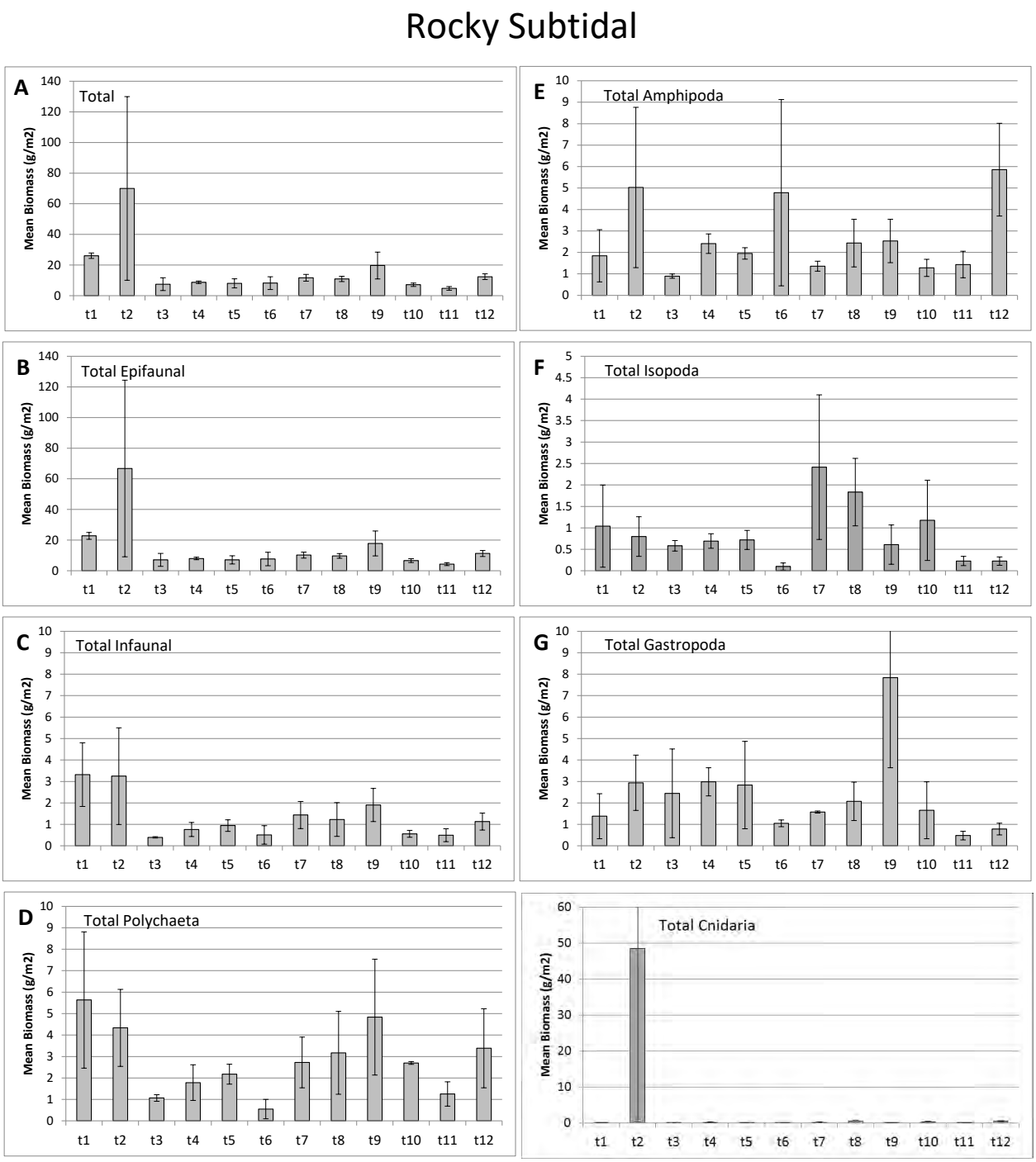

Figure 18. Biomass of Rocky Subtidal Macrobenthos (mean g AFDW ± 1 s.e.) for Various Taxa by Transect. Transects as in Figure 13.

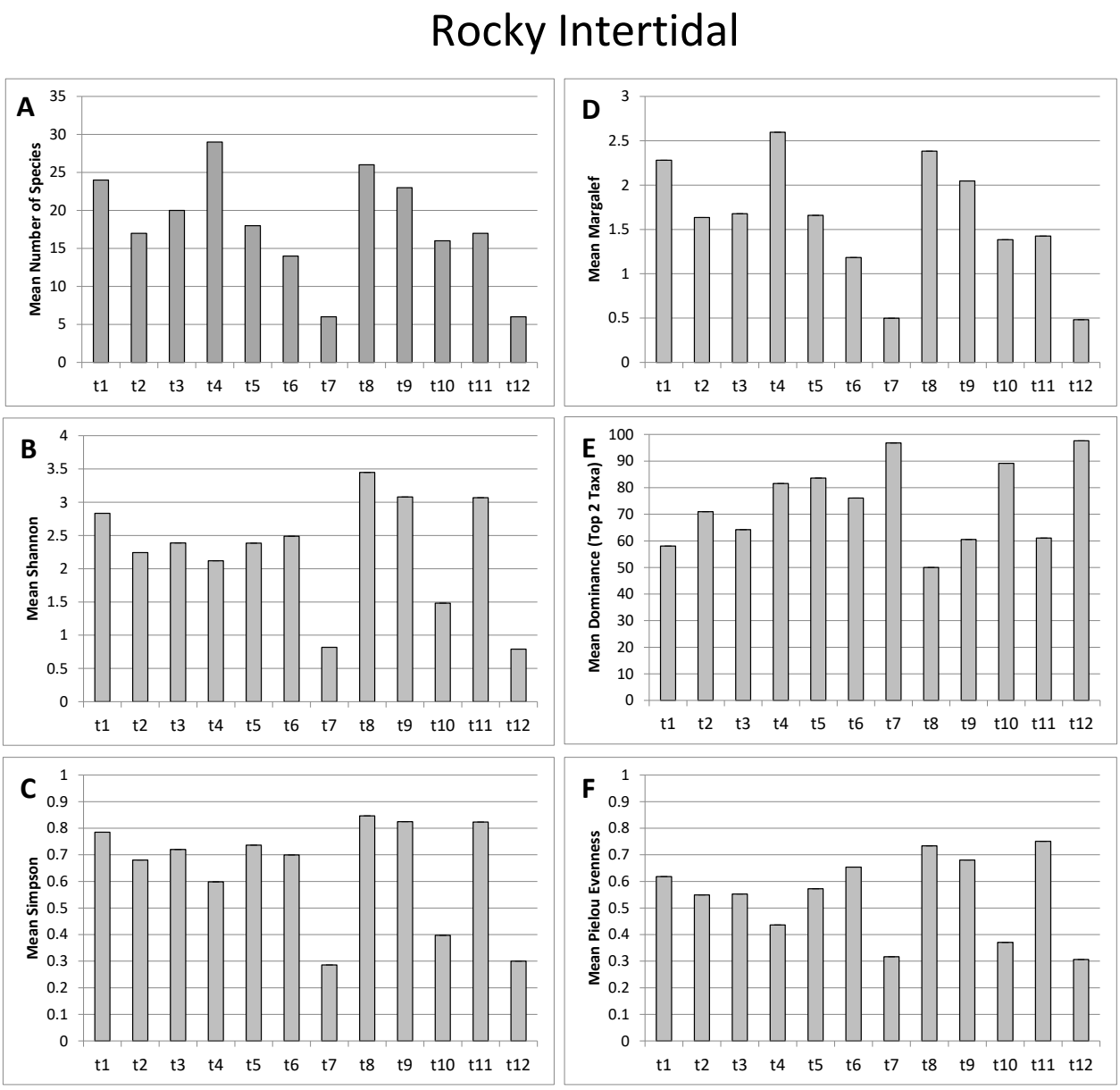

Figure 19. Diversity and Dominance Measures of Rocky Intertidal Macrobenthos by Transect. Transects as in Figure 13.

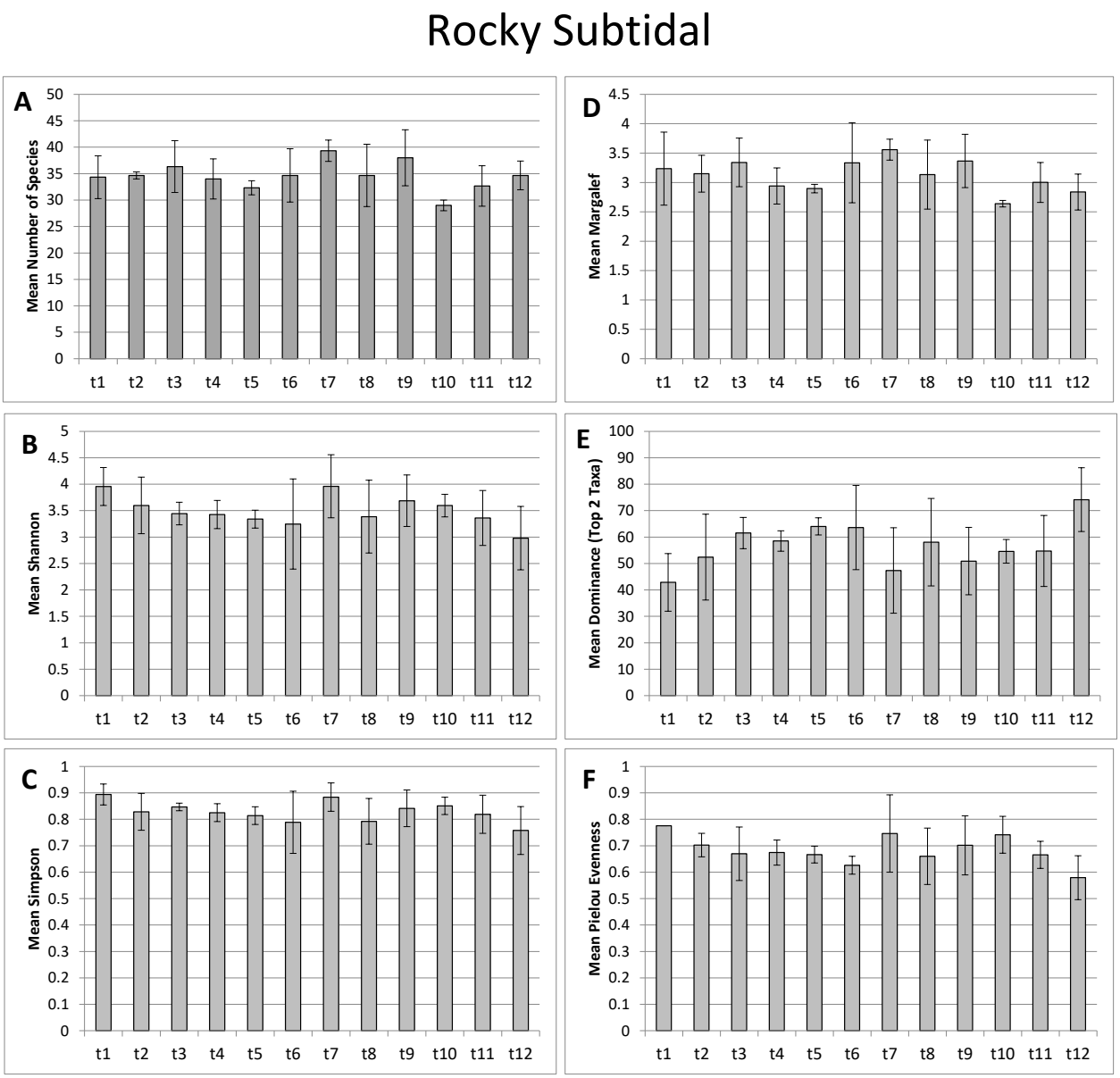

Figure 20. Diversity and Dominance Measures of Rocky Subtidal Macrobenthos (mean ± 1 s.e.) by Transect. Transects as in Figure 13.

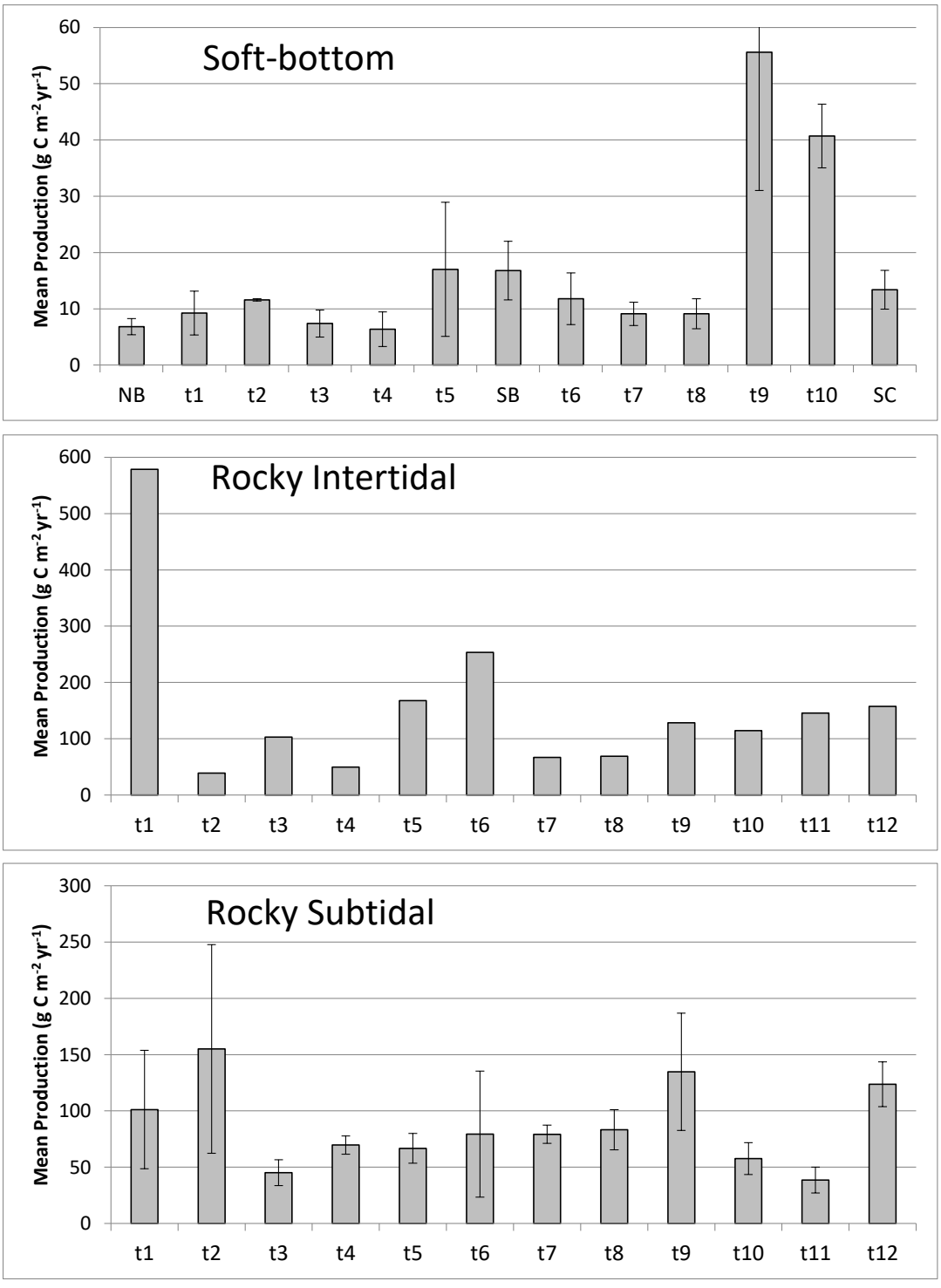

Figure 21. Brey's Macrobenthic Secondary Production (mean ± 1 s.e.) of Soft-Bottom, Rocky Intertidal, and Rocky Subtidal by Transect. NB = North Bridge, SB = South Bridge, SC = South Cove. Soft-bottom: t1-t5 = North Island, from north to south; t6-t10 = South Island, from north to south. Intertidal and subtidal: t1-t5 = North Island; t6-t12 = South Island

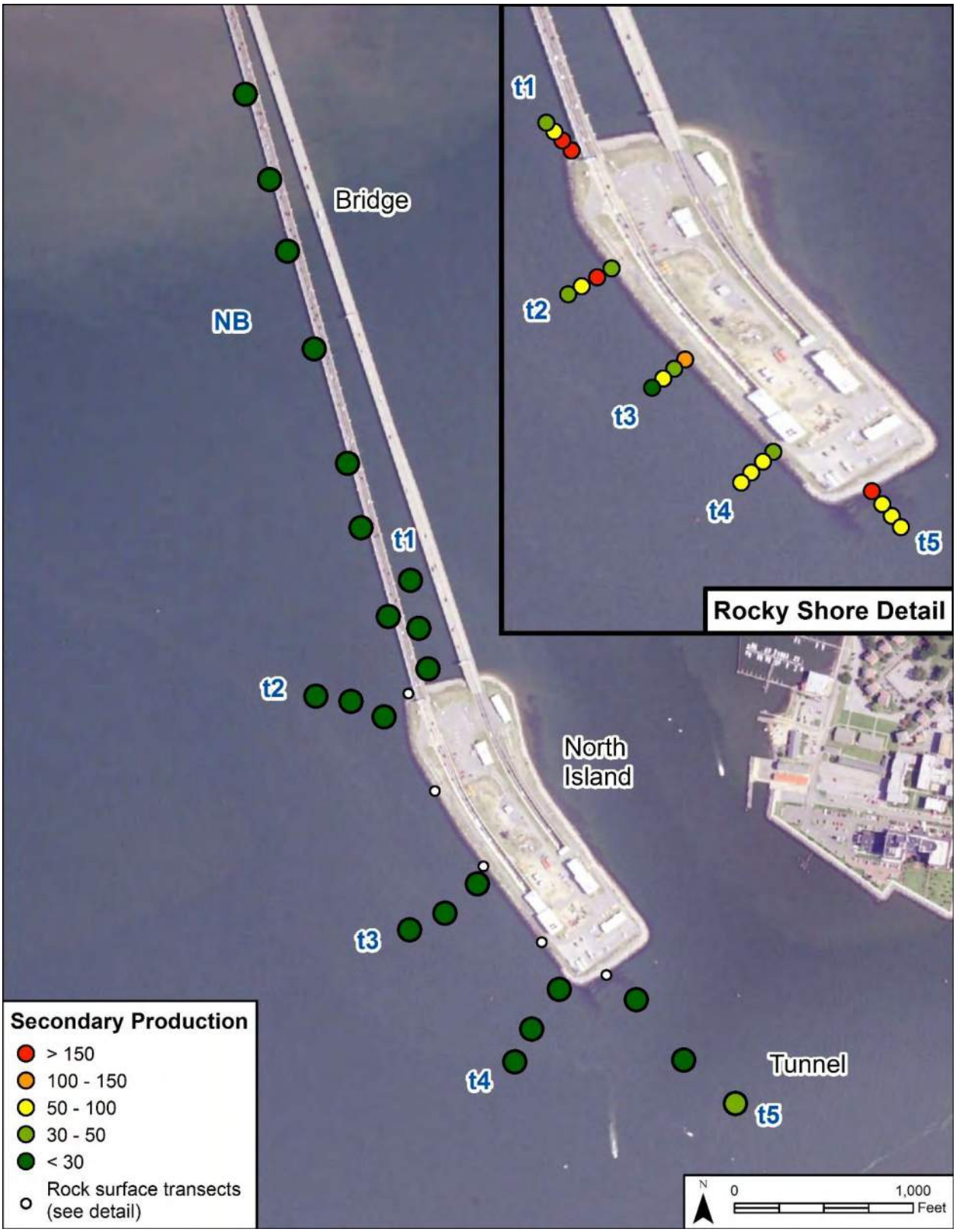

Figure 22. Secondary Production of Macrobenthos at Sites in the North Bridge and North Portal Island Region. Rocky shore transects not to scale.

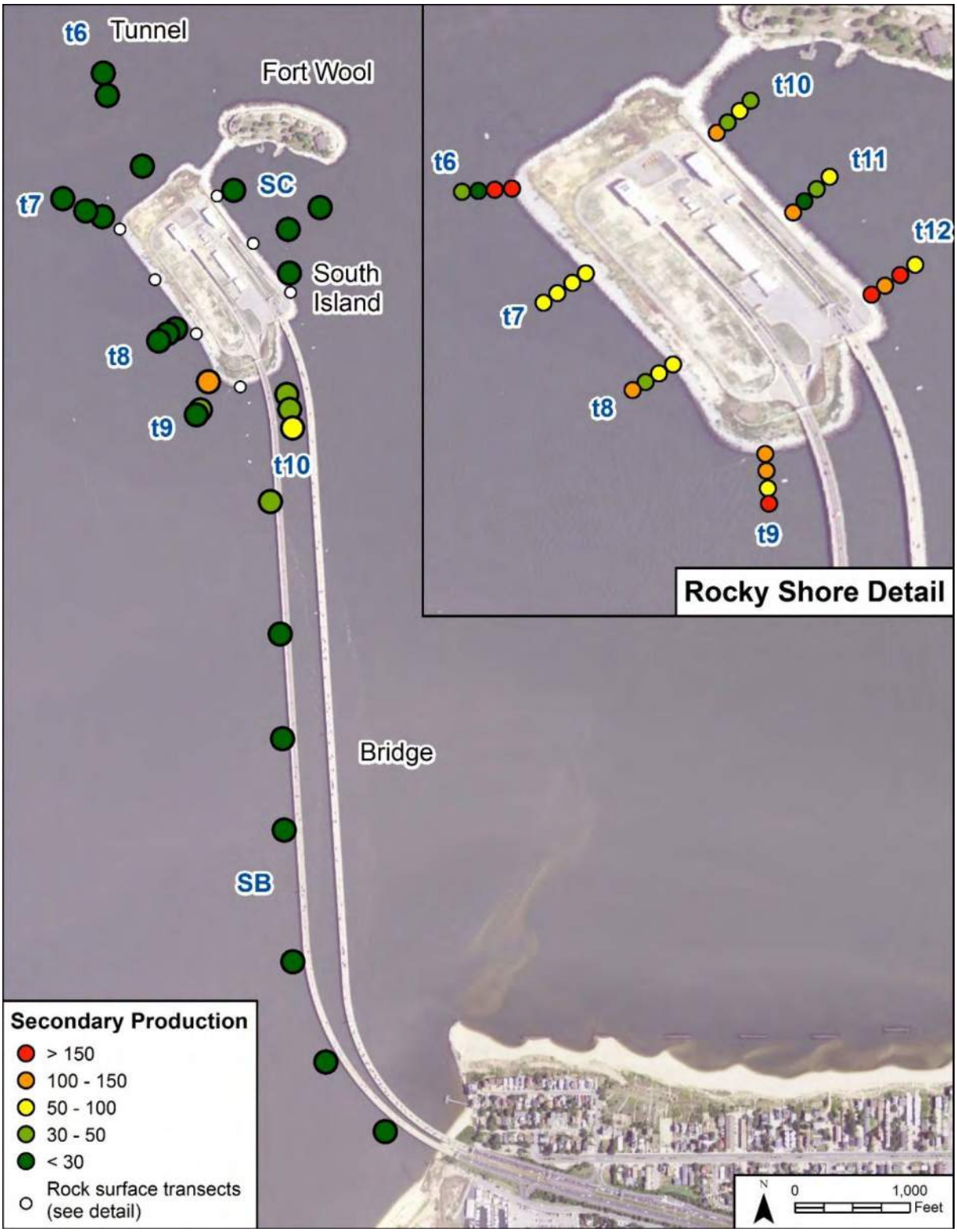

Figure 23. Secondary Production of Macrobenthos at Sites in the South Bridge and South Portal Island Region. Rocky shore transects not to scale.

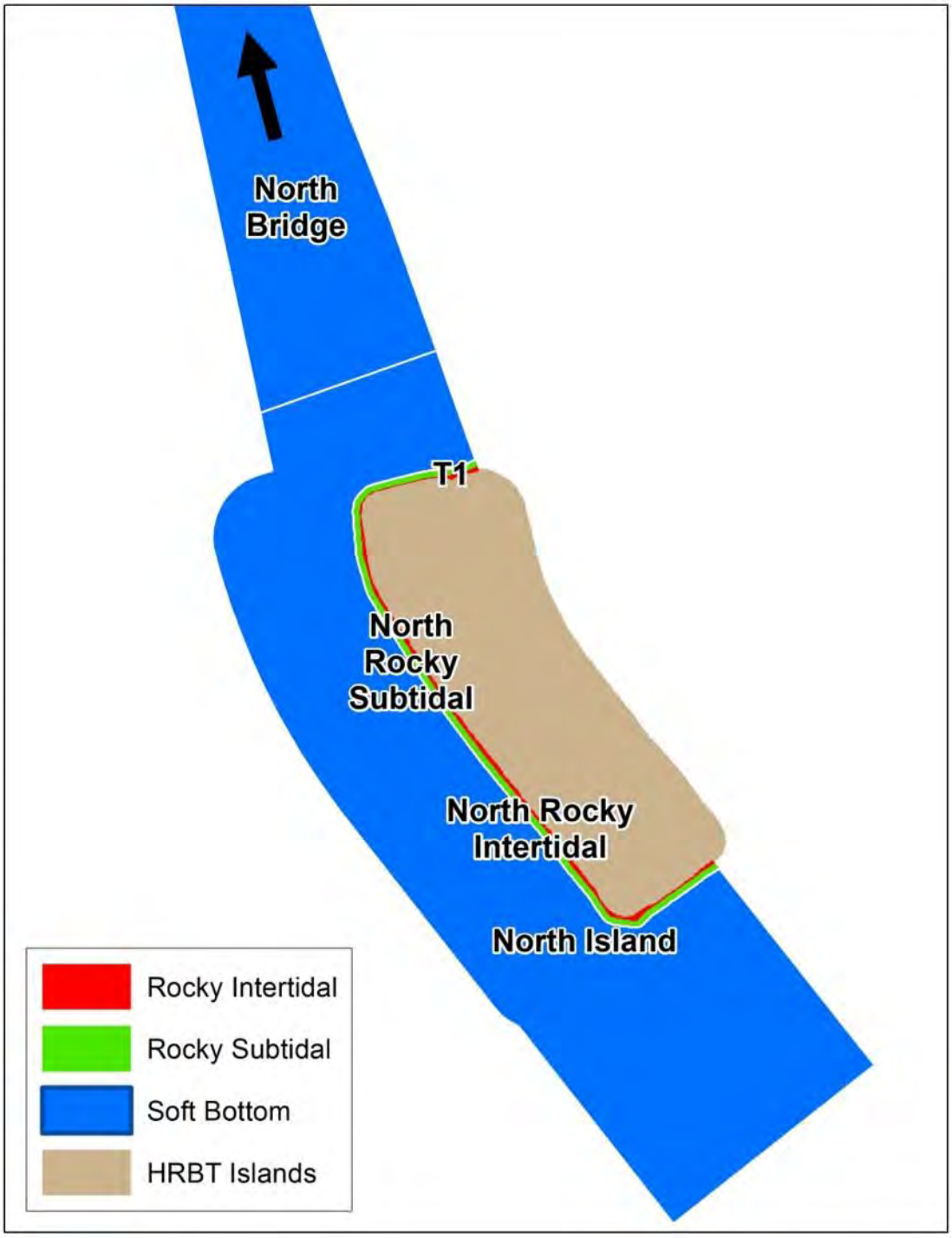

Figure 24. Map of North Island Production Areas

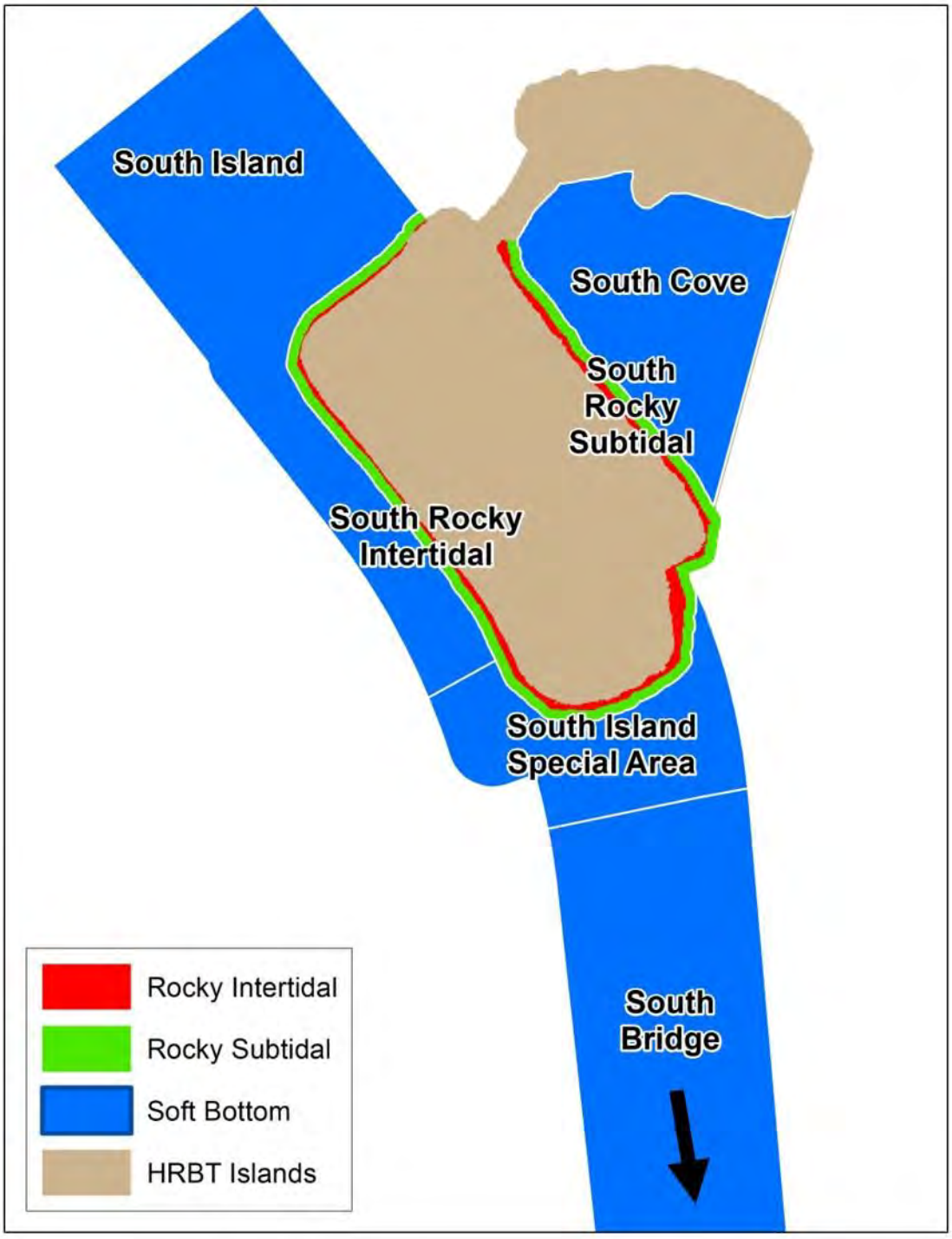

Figure 25. Map of South Island Production Areas

4.0 SUMMARY AND CONCLUSIONS

1. Baseline surveys were conducted in September and October 2017 to characterize the natural background condition of the benthic macroinvertebrate community within and adjacent to the proposed area of disturbance of the Hampton Roads Bridge-Tunnel Expansion Project, known as Alternative A. The surveys consisted of soft-bottom transects along the existing bridge and disturbance area surrounding the portal islands, and rocky intertidal and subtidal transects perpendicular to the portal islands.

2. The surveys yielded a total of 184 taxa in the soft-bottom, 62 taxa in the rocky intertidal, and 117 taxa in the rocky subtidal, a majority of which could be identified to species level.

3. Water depth in the soft-bottom survey area ranged between 1.2 m and 9.5 m, and increased along the bridges toward the tips of the portal islands. Bottom water characteristics were homogeneous throughout the project area, with salinity in the polyhaline range and dissolved oxygen near saturation.

4. The sediments in the survey area were mostly fine and medium sands with various amounts of coarse sand and gravel, and low organic carbon content. The sediments of the cove between the south portal island and Fort Wool were fine and very fine sands with various amounts of silt and clay.

5. Numerically dominant species in the soft-bottom were the reef-forming polychaete *Sabellaria vulgaris*, the amphipod *Unciola serrata*, and oligochaetes. Biomass dominant species were the sand lancelet *Branchiostoma caribaeum*, *Sabellaria vulgaris*, and the decapod *Eurypanopeus depressus*.

6. The rocky intertidal was numerically dominated by barnacles (*Chthamalus fragilis*) and amphipods (*Monocorophium insidiosum*, *Ampithoe valida*, *Jassa marmorata*), whereas oysters (*Croassostera virginica*), mussels (*Geukensia denmissa*), and barnacles were biomass dominants.

7. The rocky subtidal was covered by a dense canopy of algae that provided habitat for numerous species of epibionts, predominately amphipods. Sponges and bryozoans were common. The amphipod *Caprella penantis* was very abundant, followed by *Sabellaria vulgaris*. Anemones (*Diadumene leucolena*), oysters, amphipods (*Caprella penantis*), and gastropods (*Mitrella ocellata*) were biomass dominants.

8. Species abundance, biomass, and composition differed among transects. In the soft-bottom, abundance was higher in the south bridge than in the north bridge, and was highest near the inner (bridge side) tip of the south portal island due to high densities of *Sabellaria vulgaris*. In the rocky intertidal, the inner tip of the north island exhibited high densities of oysters and mussels; elsewhere, the relative densities of barnacles and amphipods differed among transects. In the rocky subtidal, polychaetes, amphipods, isopods, gastropods, and anemones varied considerably among transects, but species composition was homogeneous.

9. Diversity indices and dominance measures were similar in the soft-bottom and the rocky subtidal, but diversity was lower, and dominance higher, in the rocky intertidal. Diversity measures indicated a more homogeneous benthic community in the rocky subtidal.

10. The soft-bottom macrobenthos met the Chesapeake Bay Benthic Community Restoration Goals in 32 sites and failed the goals in 16 sites. Of the 16 sites that failed, eight were classified as marginal, three as degraded, and five as severely degraded by the Benthic Index of Biotic Integrity. Sites that failed the goals as degraded or severely degraded were located along the north bridge (three sites) north island (three sites), south island (one site), and south bridge (one site).

11. Annual secondary production of macrobenthos, estimated by Brey's empirical model, was highest in the rocky intertidal (mean = 156.0 g AFDW m^{-2}), including one site with very high oyster and mussel production (578.5 g AFDW m^{-2}), and lowest in the soft-bottom (mean = 15.7 g AFDW m^{-2}), although production varied among sites. Annual secondary production in the rocky subtidal was high (mean = 86.2 g AFDW m^{-2}) and within the range of shoreline stabilization structures reported for other studies.

12. Total macrobenthic production was 3.7x higher for the soft-bottom than for the rocky shore when scaled to the footprint of the inventory area. Thus, the reef area represented by the portal islands will be unable to compensate for production loss in the surrounding soft-bottom benthic community, if the footprint of the disturbance area is of the same magnitude as the footprint of the inventory area.

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APPENDICES

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Appendix A: Site Coordinates

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Table A-1. Coordinates of the soft-bottom survey sites in the Hampton Roads Bridge-Tunnel project area. Easting and northing coordinates (US ft) are in the NAD83 Virginia South State Plane coordinate system. Latitude and longitude are in decimal degrees in WGS84

Station	Easting	Northing	Latitude	Longitude
17-01	12118586.32	3534621.681	37.01025138	-76.32272900
17-02	12118704.63	3534244.122	37.00920716	-76.32235374
17-03	12118791.79	3533928.303	37.00833444	-76.32208024
17-04	12118920.35	3533496.401	37.00714035	-76.32167422
17-05	12119081.51	3532991.32	37.00574325	-76.32116234
17-06	12119147.851	3532706.312	37.00495645	-76.32095774
17-07	12119279.68	3532314.263	37.00387158	-76.32053739
17-08-1	12119270.48	3531867.857	37.00264639	-76.32060419
17-08-2	12119120.75	3531932.349	37.00283297	-76.32111171
17-08-3	12118963.74	3531952.291	37.00289768	-76.32164765
17-09-1	12119704.21	3531134.885	37.00060624	-76.31917725
17-09-2	12119563.16	3531000.396	37.00024590	-76.31967078
17-09-3	12119407.14	3530923.286	37.00004406	-76.32021099
17-10-1	12120081.37	3530673.204	36.99931459	-76.31792257
17-10-2	12119962.43	3530494.106	36.99883036	-76.31834392
17-10-3	12119889.830	3530347.096	36.99843130	-76.31860410
17-11-1	12119462.41	3532085.726	37.00323246	-76.31992986
17-11-2	12119417.16	3532264.872	37.00372724	-76.32007060
17-11-3	12119373.99	3532477.585	37.00431406	-76.32020161
17-12-1	12120426.79	3530635.126	36.99918810	-76.31674307
17-12-2	12120644.47	3530371.875	36.99845142	-76.31601870
17-12-3	12120880.61	3530183.809	36.99792001	-76.31522519
17-13-1	12123842	3525558.252	36.98503023	-76.30545541
17-13-2	12123724.32	3525594.986	36.98513861	-76.30585531
17-13-3	12123563.01	3525677.195	36.98537464	-76.30640089
17-14-1	12124369.59	3524792.883	36.98289494	-76.30371055
17-14-2	12124314.97	3524758.46	36.98280391	-76.30390023
17-14-3	12124254.74	3524706.572	36.98266528	-76.30411053
17-15-1	12124605.79	3524432.105	36.98188920	-76.30293086
17-15-2	12124553.96	3524235.564	36.98135284	-76.30312390

Table A-1. Continued

Station	Easting	Northing	Latitude	Longitude
17-15-2	12124553.96	3524235.564	36.98135284	-76.30312390
17-15-3	12124528.18	3524200.621	36.98125854	-76.30321492
17-16-1	12124111.65	3525914.041	36.98598996	-76.30450415
17-16-2	12123856.72	3526397.803	36.98733458	-76.30533823
17-16-3	12123824.99	3526552.35	36.98776097	-76.30543454
17-17-1	12125154.6	3524357.368	36.98164889	-76.30105843
17-17-2	12125175.78	3524253.708	36.98136290	-76.30099422
17-17-3	12125199.92	3524125.695	36.98100985	-76.30092180
17-18	12125057.93	3523612.244	36.97960907	-76.30144869
17-19	12125146.61	3522696.523	36.97708896	-76.30121819
17-20	12125178.85	3521971.956	36.97509734	-76.30116563
17-21	12125206.78	3521339.871	36.97335994	-76.30112045
17-22	12125288.11	3520428.806	36.97085308	-76.30091476
17-23	12125533.96	3519741.053	36.96894888	-76.30012829
17-24	12125957.93	3519268.083	36.96762303	-76.29871518
17-25	12124751.43	3525761.467	36.98553013	-76.30232644
17-26	12125354.7	3525656.592	36.98520357	-76.30026994
17-27	12125137.35	3525500.547	36.98478900	-76.30102633
17-28	12125152.9	3525196.753	36.98395383	-76.30099732

Table A-2. Coordinates of the benthic epifauna survey sites surrounding the HRBT portal islands. Easting and northing coordinates (US ft) are in the NAD83 Virginia South State Plane coordinate system. Latitude and longitude are in decimal degrees in WGS84

Station	Easting	Northing	Latitude	Longitude
EPI-01	12119376.989	3531975.787	37.002936	-76.320231
EPI-02	12119520.289	3531512.942	37.001656	-76.319777
EPI-03	12119755.356	3531174.583	37.000712	-76.318999
EPI-04	12119998.257	3530864.085	36.999844	-76.318192
EPI-05	12120313.472	3530761.390	36.999542	-76.317121
EPI-06	12123978.719	3525476.128	36.984796	-76.304994
EPI-07	12124227.293	3525126.829	36.983821	-76.304171
EPI-08	12124494.202	3524780.873	36.982854	-76.303285
EPI-09	12124777.044	3524390.860	36.981765	-76.302348
EPI-10	12124661.851	3525686.862	36.985331	-76.302639
EPI-11	12124911.738	3525369.284	36.984443	-76.301809
EPI-12	12125180.133	3525060.152	36.983577	-76.300915

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Appendix B: Water Quality

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Water Quality Measurements Recorded at Soft-Bottom Survey Sites, September 2017

Station		Depth (m)	Salinity (psu)	Conductivity (mS/cm)	DO (mg/L)	DO Sat. (%)	Temp (°C)	pH
17-01	Surface*	.	.	.	.	.	.	.
	Bottom*	.	.	.	.	.	.	.
17-02	Surface	0.4	21.00	33.49	7.24	95.0	22.84	7.92
	Bottom	1.4	21.04	33.54	7.25	95.0	22.76	7.92
17-03	Surface	0.4	21.02	33.50	7.15	93.7	22.69	7.91
	Bottom	2.0	21.01	33.49	7.08	92.7	22.69	7.91
17-04	Surface	0.4	20.97	33.40	7.14	93.4	22.70	7.91
	Bottom	2.7	20.99	33.45	6.90	90.6	22.69	7.88
17-05	Surface	0.4	20.96	33.42	7.12	92.9	22.66	7.91
	Bottom	2.8	20.93	33.39	6.99	91.6	22.65	7.89
17-06	Surface	0.4	20.95	33.43	7.14	93.5	22.66	7.91
	Bottom	2.7	20.99	33.47	7.09	92.7	22.64	7.91
17-07	Surface	0.4	21.02	33.51	7.03	91.9	22.63	7.90
	Bottom	2.9	21.03	33.53	6.86	88.8	22.61	7.87
17-08-1	Surface	0.4	21.21	33.79	7.18	94.8	23.11	7.92
	Bottom	3.8	21.43	34.10	6.78	88.9	22.61	7.89
17-08-2	Surface	0.4	21.21	33.79	7.18	94.8	23.11	7.92
	Bottom	3.8	21.43	34.10	6.78	88.9	22.61	7.89
17-08-3	Surface	0.4	21.21	33.79	7.18	94.8	23.11	7.92
	Bottom	3.8	21.43	34.10	6.78	88.9	22.61	7.89
17-09-1	Surface	0.4	21.18	33.77	7.24	96.3	23.58	7.92
	Bottom	4.4	21.98	34.90	7.12	93.7	22.65	7.94
17-09-2	Surface	0.4	21.18	33.77	7.24	96.3	23.58	7.92
	Bottom	4.4	21.98	34.90	7.12	93.7	22.65	7.94
17-09-3	Surface	0.4	21.18	33.77	7.24	96.3	23.58	7.92
	Bottom	4.4	21.98	34.90	7.12	93.7	22.65	7.94
17-10-1	Surface	0.4	21.66	34.44	7.47	98.9	22.75	7.99
	Bottom	5.6	21.94	34.83	7.46	97.9	22.68	7.99
17-10-2	Surface	0.4	21.66	34.44	7.47	98.9	22.75	7.99
	Bottom	5.6	21.94	34.83	7.46	97.9	22.68	7.99
17-10-3	Surface	0.4	21.66	34.44	7.47	98.9	22.75	7.99
	Bottom	5.6	21.94	34.83	7.46	97.9	22.68	7.99
17-11-1	Surface	0.4	21.20	33.76	6.97	91.1	22.57	7.89
	Bottom	2.8	21.20	33.76	6.90	90.1	22.55	7.88
17-11-2	Surface	0.4	21.20	33.76	6.97	91.1	22.57	7.89
	Bottom	2.8	21.20	33.76	6.90	90.1	22.55	7.88

Station		Depth (m)	Salinity (psu)	Conductivity (mS/cm)	DO (mg/L)	DO Sat. (%)	Temp (°C)	pH
17-12-1	Surface	0.4	21.75	34.58	7.77	102.5	22.88	8.01
	Bottom	2.3	21.91	34.79	7.70	101.1	22.66	8.01
17-12-2	Surface	0.5	21.46	34.14	7.62	100.8	23.06	7.98
	Bottom	7.8	21.78	34.60	7.70	101.1	22.55	8.04
17-12-3	Surface	0.5	21.48	34.17	7.82	102.4	22.54	8.04
	Bottom	9.5	21.88	34.74	7.47	98.2	22.54	8.02
17-13-1	Surface	0.5	21.53	34.24	6.93	91.2	22.81	7.90
	Bottom	3.5	21.46	34.15	6.80	89.4	22.80	7.84
17-13-2	Surface	0.5	21.53	34.24	6.93	91.2	22.81	7.90
	Bottom	3.1	21.53	34.25	6.80	89.6	22.80	7.90
17-13-3	Surface	0.5	21.53	34.24	6.93	91.2	22.81	7.90
	Bottom	3.1	21.53	34.25	6.80	89.6	22.80	7.90
17-14-1	Surface	0.5	21.41	34.08	6.97	91.8	22.92	7.89
	Bottom	4.0	21.50	34.21	6.78	89.4	22.87	7.89
17-14-2	Surface	0.5	21.41	34.08	6.97	91.8	22.92	7.89
	Bottom	4.0	21.50	34.21	6.78	89.4	22.87	7.89
17-14-3	Surface	0.5	21.41	34.08	6.97	91.8	22.92	7.89
	Bottom	4.0	21.50	34.21	6.78	89.4	22.87	7.89
17-15-1	Surface	0.5	21.26	33.86	7.01	92.4	23.07	7.89
	Bottom	9.5	21.26	33.88	6.84	90.0	22.94	7.89
17-15-2	Surface	0.5	21.26	33.86	7.01	92.4	23.07	7.89
	Bottom	9.5	21.26	33.88	6.84	90.0	22.94	7.89
17-15-3	Surface	0.5	21.26	33.68	7.01	92.4	23.07	7.89
	Bottom	9.5	21.26	33.88	6.84	90.0	22.94	7.89
17-16-1	Surface	0.5	21.55	34.26	6.81	89.5	22.73	7.88
	Bottom	3.0	21.52	34.23	6.77	88.9	22.73	7.87
17-16-2	Surface	0.5	21.33	33.89	6.94	91.0	22.77	7.89
	Bottom	7.5	22.10	35.07	6.80	90.0	22.75	7.92
17-16-3	Surface	0.5	21.54	34.25	6.97	91.7	22.78	7.90
	Bottom	9.5	22.03	35.04	6.82	89.9	22.76	7.92
17-17-1	Surface	0.5	21.24	33.83	6.95	91.6	23.02	7.89
	Bottom	6.3	21.61	34.38	6.89	90.8	22.91	7.91
17-17-2	Surface	0.5	21.24	33.83	6.95	91.6	23.02	7.89
	Bottom	6.3	21.61	34.38	6.89	90.8	22.91	7.91

Station		Depth (m)	Salinity (psu)	Conductivity (mS/cm)	DO (mg/L)	DO Sat. (%)	Temp (°C)	pH
17-17-3	Surface	0.5	21.24	33.83	6.95	91.6	23.02	7.89
	Bottom	6.3	21.61	34.38	6.89	90.8	22.91	7.91
17-18	Surface	0.5	21.29	33.92	7.21	95.3	23.21	7.90
	Bottom	4.7	21.33	33.97	6.91	91.2	23.03	7.89
17-19	Surface	0.5	21.35	34.00	7.18	95.2	23.31	7.90
	Bottom	2.3	21.35	34.00	7.15	94.6	23.21	7.90
17-20	Surface	0.4	21.60	34.34	6.86	89.8	27.52	7.90
	Bottom	2.1	21.60	34.34	6.75	88.3	22.51	7.89
17-21	Surface	0.5	21.69	34.47	6.87	89.8	22.40	7.91
	Bottom	2.0	21.69	34.47	6.85	89.5	22.40	7.91
17-22	Surface	0.5	21.63	34.38	6.88	90.0	22.42	7.93
	Bottom	2.0	21.62	34.37	6.83	89.2	22.42	7.91
17-23	Surface	0.5	22.30	34.22	6.91	90.2	22.30	7.91
	Bottom	1.2	21.48	34.17	6.80	88.9	22.27	7.91
17-24	Surface	0.4	21.41	34.06	7.30	94.1	21.77	7.97
	Bottom	2.3	21.52	34.21	6.82	87.8	21.85	7.91
17-25	Surface	0.4	21.84	34.68	7.67	101.1	22.86	8.00
	Bottom	4.1	22.11	35.07	7.54	99.4	22.69	7.99
17-26	Surface	0.4	21.95	34.85	7.60	100.6	22.99	7.99
	Bottom	5.4	22.19	35.21	7.34	96.9	22.72	7.99
17-27	Surface	0.4	21.85	34.71	7.73	102.5	23.19	8.00
	Bottom	4.9	22.20	35.21	7.61	100.1	22.71	7.99
17-28	Surface	0.4	22.24	35.02	7.67	101.5	22.99	8.00
	Bottom	5.0	22.29	35.34	7.59	100.1	22.72	8.01

*No water quality data collected due to instrument malfunction.

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Appendix C: List of Species

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Group Name	Family	Taxa Name
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena
Platyhelminthes : Turbellaria	Unidentified	Polycladida
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis
Nemertina	Tubulanidae	Carinomella lactea
Nemertina	Cephalothricidae	Cephalothrix spiralis
Nemertina	Lineidae	Lineidae
Nemertina	Lineidae	Micrura sp.
Nemertina	Lineidae	Siphonenteron bicolour
Nemertina	Unidentified	Monostilifera
Nemertina	Amphiporidae	Amphiporus bioculatus
Nemertina	Amphiporidae	Zygonemertes virescens
Nemertina	Tetrastemmatidae	Tetrastemma candidum
Annelida : Polychaeta	Polynoidae	Polynoidae
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis
Annelida : Polychaeta	Polynoidae	Malmgreniella maccraryae
Annelida : Polychaeta	Sigalionidae	Sthenelais boa
Annelida : Polychaeta	Phyllodocidae	Phyllodocidae
Annelida : Polychaeta	Phyllodocidae	Eteone heteropoda
Annelida : Polychaeta	Phyllodocidae	Hypereteone foliosa
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa
Annelida : Polychaeta	Phyllodocidae	Eumida sanguinea
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae
Annelida : Polychaeta	Hesionidae	Podarke obscura
Annelida : Polychaeta	Hesionidae	Podarkeopsis levifuscina
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae
Annelida : Polychaeta	Pilargidae	Sigambra tentaculata
Annelida : Polychaeta	Pilargidae	Hermundura fauveli
Annelida : Polychaeta	Syllidae	Syllidae
Annelida : Polychaeta	Syllidae	Syllis alternata

Group Name	Family	Taxa Name
Annelida : Polychaeta	Syllidae	Exogone sp.
Annelida : Polychaeta	Syllidae	Exogone dispar
Annelida : Polychaeta	Syllidae	Brania sp.
Annelida : Polychaeta	Syllidae	Brania wellfleetensis
Annelida : Polychaeta	Syllidae	Salvatoria clavata
Annelida : Polychaeta	Syllidae	Streptosyllis websteri
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata
Annelida : Polychaeta	Syllidae	Erinaceusyllis erinaceus
Annelida : Polychaeta	Syllidae	Proceraea cornuta
Annelida : Polychaeta	Nereididae	Nereididae
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata
Annelida : Polychaeta	Nereididae	Alitta succinea
Annelida : Polychaeta	Nephtyidae	Nephtys incisa
Annelida : Polychaeta	Nephtyidae	Nephtys picta
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli
Annelida : Polychaeta	Glyceridae	Glyceridae
Annelida : Polychaeta	Glyceridae	Glycera sp.
Annelida : Polychaeta	Glyceridae	Glycera americana
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata
Annelida : Polychaeta	Goniadidae	Glycinde multidens
Annelida : Polychaeta	Onuphidae	Diopatra cuprea
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea
Annelida : Polychaeta	Eunicidae	Marphysa belli
Annelida : Polychaeta	Arabellidae	Drilonereis longa
Annelida : Polychaeta	Arabellidae	Arabella sp.
Annelida : Polychaeta	Arabellidae	Arabella iricolor
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi
Annelida : Polychaeta	Orbiniidae	Scoloplos rubra
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos robustus
Annelida : Polychaeta	Paraonidae	Aricidea wassi
Annelida : Polychaeta	Paraonidae	Paraonis fulgens
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris

Group Name	Family	Taxa Name
Annelida : Polychaeta	Spionidae	Polydora websteri
Annelida : Polychaeta	Spionidae	Polydora colonia
Annelida : Polychaeta	Spionidae	Polydora cornuta
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia
Annelida : Polychaeta	Spionidae	Prionospio perkinsi
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus
Annelida : Polychaeta	Spionidae	Spiophanes bombyx
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata
Annelida : Polychaeta	Spionidae	Streblospio benedicti
Annelida : Polychaeta	Spionidae	Scolelepis texana
Annelida : Polychaeta	Spionidae	Boccardiella hamata
Annelida : Polychaeta	Spionidae	Dipolydora socialis
Annelida : Polychaeta	Spionidae	Dipolydora commensalis
Annelida : Polychaeta	Spionidae	Dipolydora caulleryi
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica
Annelida : Polychaeta	Cirratulidae	Tharyx sp.
Annelida : Polychaeta	Cirratulidae	Tharyx acutus
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris
Annelida : Polychaeta	Opheliidae	Opheliidae
Annelida : Polychaeta	Capitellidae	Capitella teleta
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis
Annelida : Polychaeta	Maldanidae	Maldanidae
Annelida : Polychaeta	Maldanidae	Clymenella torquata
Annelida : Polychaeta	Maldanidae	Clymenella zonalis
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii
Annelida : Polychaeta	Terebellidae	Polycirrus eximius
Annelida : Polychaeta	Terebellidae	Loimia viridis
Annelida : Polychaeta	Sabellidae	Sabellidae

Group Name	Family	Taxa Name
Annelida : Polychaeta	Serpulidae	Hydroides dianthus
Annelida : Polychaeta	Spirorbidae	Spirorbis sp.
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata
Annelida : Polychaeta	Polygordiidae	Polygordius jouinae
Annelida : Oligochaeta	Unidentified	Oligochaeta
Mollusca : Gastropoda	Unidentified	Gastropoda
Mollusca : Gastropoda	Caecidae	Caecum regulare
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum
Mollusca : Gastropoda	Cerithiidae	Seila adamsii
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta
Mollusca : Gastropoda	Epitoniidae	Epitonium humphreysii
Mollusca : Gastropoda	Calyptraeidae	Crepidula fornicata
Mollusca : Gastropoda	Calyptraeidae	Crepidula convexa
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea
Mollusca : Gastropoda	Columbellidae	Columbellidae
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata
Mollusca : Gastropoda	Columbellidae	Astyris lunata
Mollusca : Gastropoda	Columbellidae	Costoanachis avara
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa
Mollusca : Gastropoda	Nassariidae	Nassarius vibex
Mollusca : Gastropoda	Nassariidae	Ilyanassa trivittata
Mollusca : Gastropoda	Mangeliidae	Oenopota
Mollusca : Gastropoda	Turridae	Kurtziella atrostyla
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa
Mollusca : Gastropoda	Pyramidellidae	Odostomia sp.
Mollusca : Gastropoda	Pyramidellidae	Eulimastoma engonium
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta
Mollusca : Gastropoda	Pyramidellidae	Turbonilla nivea
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa
Mollusca : Gastropoda	Pyramidellidae	Boonea seminuda
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana

Group Name	Family	Taxa Name
Mollusca : Gastropoda	Acteonidae	Japonactaeon punctostriatus
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata
Mollusca : Gastropoda	Corambidae	Corambe obscura
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii
Mollusca : Bivalvia	Unidentified	Bivalvia
Mollusca : Bivalvia	Nuculidae	Nucula proxima
Mollusca : Bivalvia	Solemyidae	Solemya velum
Mollusca : Bivalvia	Arcidae	Anadara transversa
Mollusca : Bivalvia	Mytilidae	Mytilidae
Mollusca : Bivalvia	Mytilidae	Geukensia demissa
Mollusca : Bivalvia	Anomiidae	Anomia simplex
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella
Mollusca : Bivalvia	Lasaeidae	Erycina sp.
Mollusca : Bivalvia	Kelliidae	Kelliopsis elevata
Mollusca : Bivalvia	Crassatellidae	Crassinella lunulata
Mollusca : Bivalvia	Mactridae	Spisula solidissima
Mollusca : Bivalvia	Mactridae	Mulinia lateralis
Mollusca : Bivalvia	Solenidae	Ensis directus
Mollusca : Bivalvia	Tellinidae	Tellinidae
Mollusca : Bivalvia	Tellinidae	Limecola balthica
Mollusca : Bivalvia	Tellinidae	Ameritella agilis
Mollusca : Bivalvia	Tellinidae	Macoploma tenta
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus
Mollusca : Bivalvia	Veneridae	Mercenaria mercenaria
Mollusca : Bivalvia	Veneridae	Pitar morrhuanus
Mollusca : Bivalvia	Veneridae	Gemma gemma
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis
Mollusca : Bivalvia	Lasaeidae	Lasaeidae
Mollusca : Bivalvia	Pholadidae	Barnea truncata
Mollusca : Bivalvia	Lyonsiidae	Lyonsia sp.
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare
Arthropoda : Pycnogonida	Phoxichilidiidae	Anoplodactylus petiolatus

Group Name	Family	Taxa Name
Arthropoda : Pycnogonida	Callipallenidae	Callipallene brevirostris
Arthropoda : Cirripedia	Unidentified	Balanomorpha
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis
Arthropoda : Cirripedia	Balanidae	Balanidae
Arthropoda : Mysidacea	Mysidae	Mysidae
Arthropoda : Mysidacea	Mysidae	Chlamydopleon sp.
Arthropoda : Mysidacea	Mysidae	Americamysis bahia
Arthropoda : Cumacea	Leuconidae	Leucon americanus
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi
Arthropoda : Cumacea	Bodotriidae	Cyclaspis varians
Arthropoda : Crustacea	Leptocheliidae	Leptocheliidae
Arthropoda : Tanaidacea	Nototanaididae	Tanaissus psammophilus
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum
Arthropoda : Isopoda	Idoteidae	Synidotea laticauda
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis
Arthropoda : Isopoda	Idoteidae	Idotea balthica
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis
Arthropoda : Isopoda	Idoteidae	Edotia triloba
Arthropoda : Crustacea	Janiridae	Janiridae
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida
Arthropoda : Amphipoda	Aoridae	Microdeutopus gryllotalpa
Arthropoda : Amphipoda	Bateidae	Batea catharinensis
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae
Arthropoda : Amphipoda	Corophiidae	Corophiidae
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis
Arthropoda : Amphipoda	Aoridae	Unciola serrata
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.

Group Name	Family	Taxa Name
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum
Arthropoda : Amphipoda	Corophiidae	Monocorophium
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis
Arthropoda : Amphipoda	Melitidae	Melita nitida
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius sp. D
Arthropoda : Amphipoda	Haustoriidae	Bathyporeia parkeri
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae
Arthropoda : Amphipoda	Oedicerotidae	Americhelidium americanum
Arthropoda : Amphipoda	Oedicerotidae	Ameroculodes species
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni
Arthropoda : Amphipoda	Phoxocephalidae	Eobrolgus spinosus
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta
Arthropoda : Amphipoda	Caprellidae	Caprella sp.
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra
Arthropoda : Amphipoda	Caprellidae	Caprella penantis
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis
Arthropoda : Decapoda	Unidentified	Axiidea sp.
Arthropoda : Decapoda	Unidentified	Caridea
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha
Arthropoda : Decapoda	Callianassidae	Biffarius biformis
Arthropoda : Decapoda	Paguridae	Pagurus sp.
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus
Arthropoda : Decapoda	Porcellanidae	Euceramus praelongus
Arthropoda : Decapoda	Portunidae	Callinectes sapidus
Arthropoda : Decapoda	Xanthidae	Xanthidae
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus

Group Name	Family	Taxa Name
Arthropoda : Decapoda	Panopeidae	Panopeidae
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae
Arthropoda : Decapoda	Pinnotheridae	Pinnixa sp.
Arthropoda : Diptera	Unidentified	Diptera
Phoronida	Phoronidae	Phoronis sp.
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra
Echinodermata :	Phyllophoridae	Pentamera pulcherrima
Echinodermata :	Synaptidae	Leptosynapta tenuis
Hemichordata	Harrimaniidae	Saccoglossus kowalevskii
Chordata : Ascidiacea	Unidentified	Ascidiacea
Chordata : Ascidiacea	Molgulidae	Molgula manhattensis
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum

Appendix D: Site Specific Species Abundance and Biomass

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Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-01 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	90.88	0.0114
Annelida : Polychaeta	Glyceridae	Glycera americana	1	22.72	0.0204
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0045
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	5	113.6	0.025
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	1	22.72	0.0011
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	2	45.44	0.0023
Annelida : Polychaeta	Phyllodocidae	Hypereteone foliosa	1	22.72	0.0114
Annelida : Polychaeta	Pilargidae	Hermundura fauveli	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia	1	22.72	0.0011
Annelida : Polychaeta	Spionidae	Streblospio benedicti	2	45.44	0.0011
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	2	45.44	0.0023
Arthropoda : Amphipoda	Oedicerotidae	Ameroculodes species complex	1	22.72	0.0068
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	1	22.72	0.0011
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	1	22.72	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	6	136.32	0.0159
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0045
Phoronida	Phoronidae	Phoronis sp.	12	272.64	0.0318
		Total	44	999.68	0.1441
		# Taxa	17		

SampleID: 17-02 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0045
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	4	90.88	0.0045
Annelida : Polychaeta	Syllidae	Brania wellfleetensis	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0011
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	2	45.44	0.0045
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	0	68.16	0.209
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0023
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.0159
Mollusca : Bivalvia	Veneridae	Gemma gemma	1	22.72	0.0023
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	1	22.72	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	8	181.76	0.0182
Phoronida	Phoronidae	Phoronis sp.	12	318.08	0.05
		Total	36	931.52	0.318
		# Taxa	13		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-03 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0023
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	5	113.6	0.0114
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	3	68.16	0.0045
Annelida : Polychaeta	Spionidae	Streblospio benedicti	1	22.72	0.0045
Annelida : Polychaeta	Spionidae	Scolelepis texana	1	22.72	0.0011
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	1	22.72	0.0023
Annelida : Polychaeta	Syllidae	Brania wellfleetensis	1	22.72	0.0011
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	6	136.32	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	5	340.8	0.9929
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	22.72	0.025
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	4	90.88	0.0045
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	12	272.64	0.0341
Nemertina	Lineidae	Micrura sp.	1	22.72	0.025
Phoronida	Phoronidae	Phoronis sp.	19	431.68	0.0545
		Total	62	1635.8	1.1722
		# Taxa	15		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-04 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	1	22.72	0.0523
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis	1	22.72	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	7	159.04	0.0114
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	113.6	0.0182
Annelida : Polychaeta	Cirratulidae	Tharyx acutus	1	22.72	0.0068
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	3*	68.16	0.0114
Annelida : Polychaeta	Glyceridae	Glycera americana	1	22.72	0.0204
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Maldanidae	Clymenella torquata	0	22.72	0.1318
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0136
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	1	22.72	0.0011
Annelida : Polychaeta	Phyllodocidae	Eteone heteropoda	1	22.72	0.0011
Annelida : Polychaeta	Pilargidae	Sigambra tentaculata	1	22.72	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0011
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	2	90.88	0.1204
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	5	136.32	0.0568
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0011
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	3	68.16	0.0045
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	1	22.72	0.0011
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.	1	22.72	0.0023
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	3	68.16	0.0114
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	1	22.72	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	2	45.44	0.0068
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	1	22.72	0.0023
Arthropoda : Mysidacea	Mysidae	Mysidae	1	22.72	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	0	113.6	0.384
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.0011
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	6	136.32	0.1363
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	13	295.36	0.1181
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	3	68.16	0.0204
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	2	45.44	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	8	181.76	0.0636
Nemertina	Amphiporidae	Zygonemertes virescens	1	22.72	0.0182
Nemertina	Tubulanidae	Carinomella lactea	2	45.44	0.0045
Phoronida	Phoronidae	Phoronis sp.	9	227.2	0.0523
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0068
		Total	93	2362.9	1.3084
		# Taxa	36		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-05 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	3	68.16	0.2817
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	90.88	0.0227
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	7*	159.04	0.0364
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris	4	90.88	0.0227
Annelida : Polychaeta	Glyceridae	Glycera americana	1	45.44	0.3544
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0682
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	1	22.72	0.0045
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	1	22.72	0.0136
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	3	68.16	0.0159
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	2	45.44	0.0364
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	7	159.04	0.0068
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	4	90.88	0.0545
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	1	22.72	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0045
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	3	68.16	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	2	45.44	0.2567
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	5	113.6	0.1886
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0023
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	4	90.88	0.0841
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0011
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	0.5771
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	11	249.92	0.0613
Phoronida	Phoronidae	Phoronis sp.	14	431.68	0.1454
		Total	82	1999.4	2.2457
		# Taxa	22		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-06 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0011
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	4	90.88	0.0045
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	3	90.88	0.0295
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1*	22.72	0.0011
Annelida : Polychaeta	Cirratulidae	Tharyx acutus	1	22.72	0.0045
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris	1	22.72	0.0045
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	1	22.72	0.0341
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	0	45.44	0.259
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	5	113.6	0.0364
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	5	113.6	0.0273
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	6	159.04	0.2817
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0045
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.6975
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	9	204.48	0.2204
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	1	22.72	0.0068
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	12	272.64	0.0841
Nemertina	Tubulanidae	Carinomella lactea	2	45.44	0.0045
Phoronida	Phoronidae	Phoronis sp.	38	863.36	0.234
		Total	95	2249.3	1.9468
		# Taxa	20		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-07 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Arabellidae	Drilonereis longa	0	22.72	0.0591
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0045
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0011
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	1	22.72	0.0295
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	45.44	0.075
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	2	45.44	0.0023
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0409
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0023
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	2	45.44	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0011
Arthropoda : Amphipoda	Oedicerotidae	Ameroculodes species complex	1	22.72	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	9	227.2	0.4044
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	2	45.44	0.0182
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	4	90.88	0.0091
Mollusca : Bivalvia	Mactridae	Mulinia lateralis	1	22.72	0.2454
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	22.72	0.0114
Mollusca : Gastropoda	Pyramidellidae	Turbonilla nivea	1	22.72	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	4	90.88	0.0318
Phoronida	Phoronidae	Phoronis sp.	6	136.32	0.0386
		Total	41	999.68	0.9861
		# Taxa	20		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-08-1 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	181.76	0.0045
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	4	90.88	0.5157
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	159.04	0.0454
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris	7	159.04	0.0364
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	8*	181.76	0.0295
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0023
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	0	22.72	0.0704
Annelida : Polychaeta	Nereididae	Nereididae	2	45.44	0.0011
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	3	68.16	0.0068
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	0	22.72	0.0636
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	9	204.48	0.0636
Annelida : Polychaeta	Spionidae	Prionospio perkinsi	4	90.88	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	5	113.6	0.0091
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	2	45.44	0.0011
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	3	68.16	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	0	159.04	0.3067
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	2	45.44	0.0818
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.075
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	6	136.32	0.0977
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	14	318.08	0.184
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	0.0772
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	1	22.72	0.0091
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	7	159.04	0.0682
Mollusca : Gastropoda	Turridae	Kurtziella atrostyla	1	22.72	0.0159
Nemertina	Tubulanidae	Carinomella lactea	6	136.32	0.0318
Phoronida	Phoronidae	Phoronis sp.	15	386.24	0.0591
		Total	120	3044.5	1.8697
		# Taxa	30		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-08-2 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	4	90.88	0.0011
Annelida : Polychaeta	Capitellidae	Capitella teleta	4	90.88	0.0011
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	9	204.48	0.0091
Annelida : Polychaeta	Glyceridae	Glycera americana	0	22.72	0.259
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0011
Annelida : Polychaeta	Nephtyidae	Nephtys picta	1	22.72	0.0023
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	0	45.44	0.0545
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	3	68.16	0.0204
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	1	22.72	0.0204
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	16	408.96	0.1908
Annelida : Polychaeta	Spionidae	Prionospio perkinsi	4	90.88	0.0045
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	4	90.88	0.1363
Annelida : Polychaeta	Terebellidae	Loimia viridis	2	45.44	0.1477
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	4	90.88	0.0182
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	10	227.2	0.0068
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	2	45.44	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	4	90.88	0.0011
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans	1	22.72	0.0011
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	8	181.76	0.0886
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	2	45.44	0.0182
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	16	363.52	0.2567
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0011
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	2	45.44	0.2999
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	22.72	0.0227
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	1	22.72	0.0068
Mollusca : Gastropoda	Pyramidellidae	Odostomia sp.	1	22.72	0.0182
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	7	159.04	0.0182
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	5	113.6	0.0295
Nemertina	Amphiporidae	Amphiporus bioculatus	2	45.44	0.0011
Nemertina	Lineidae	Lineidae	1	22.72	0.0011
Nemertina	Tubulanidae	Carinomella lactea	9	204.48	0.0386
Phoronida	Phoronidae	Phoronis sp.	30	749.76	0.0977
		Total	158	3771.5	1.7785
		# Taxa	33		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-08-3 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	15	340.8	0.0182
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	3	113.6	0.0454
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	0	22.72	0.3703
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0045
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	45.44	0.1363
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	2	45.44	0.0045
Annelida : Polychaeta	Spionidae	Prionospio perkinsi	8	181.76	0.0023
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	20	499.84	0.1545
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	4	90.88	0.0932
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	6	136.32	0.0068
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	8	181.76	0.0182
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	1	22.72	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0023
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0023
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans	2	45.44	0.0091
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	3	113.6	0.3522
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.0091
Mollusca : Bivalvia	Lasaeidae	Lasaeidae	1	22.72	0.0091
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	19	431.68	0.3022
Mollusca : Bivalvia	Mytilidae	Mytilidae	1	22.72	0.0023
Mollusca : Bivalvia	Nuculidae	Nucula proxima	1	22.72	0.0011
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	1	22.72	0.0591
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0023
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	2	45.44	0.0011
Mollusca : Gastropoda	Pyramidellidae	Odostomia sp.	1	22.72	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	6	136.32	0.0727
Nemertina	Tubulanidae	Carinomella lactea	5	113.6	0.0182
Phoronida	Phoronidae	Phoronis sp	32	795.2	0.184
		Total	148	3612.5	1.8892
		# Taxa	29		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-09-1 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	90.88	0.0011
Annelida : Polychaeta	Capitellidae	Capitella teleta	1	22.72	0.0023
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	3	68.16	0.0068
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0011
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	11	249.92	0.0409
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	2	45.44	0.0023
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0023
Annelida : Polychaeta	Orbiniidae	Scoloplos rubra	1	22.72	0.0045
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0045
Annelida : Polychaeta	Paraonidae	Aricidea wassi	1	22.72	0.0011
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	11	249.92	0.0182
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	3	68.16	0.0045
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	1	22.72	0.0045
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0341
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	9	204.48	0.0795
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	2	45.44	0.0011
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	1	22.72	0.0023
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	6	136.32	0.0091
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	2	45.44	0.0045
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	3	68.16	0.0045
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	4	90.88	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	2	45.44	0.0011
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis	1	22.72	0.0045
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	2	45.44	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	2	181.76	0.4226
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	10	227.2	0.0182
Mollusca : Bivalvia	Nuculidae	Nucula proxima	3	68.16	0.0886
Mollusca : Bivalvia	Tellinidae	Tellinidae	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0364
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0011
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0011
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0023
		Total	96	2317.4	0.812
		# Taxa	32		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-09-2 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0023
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	4	90.88	0.0045
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	3	68.16	0.0011
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	3*	90.88	0.0114
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris	1	22.72	0.0045
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0091
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	22.72	0.0386
Annelida : Polychaeta	Orbiniidae	Scoloplos rubra	1	22.72	0.0114
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	1	22.72	0.0023
Annelida : Polychaeta	Paraonidae	Aricidea wassi	3	68.16	0.0068
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0227
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	4	90.88	0.0318
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	1	22.72	0.0068
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	1	22.72	0.3772
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	1	45.44	0.0591
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0114
Mollusca : Bivalvia	Lasaeidae	Erycina sp.	1	22.72	0.0045
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0023
Mollusca : Bivalvia	Nuculidae	Nucula proxima	5	113.6	0.0068
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0045
Mollusca : Gastropoda	Mangeliidae	Oenopota	1	22.72	0.0068
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	4	90.88	0.0114
Phoronida	Phoronidae	Phoronis sp.	7	159.04	0.0204
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0011
		Total	54	1272.3	0.6644
		# Taxa	25		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-09-3 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	90.88	0.0011
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	4	90.88	0.0045
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	159.04	0.0704
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	5	113.6	0.0114
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	5*	113.6	0.05
Annelida : Polychaeta	Cirratulidae	Tharyx sp. A Morris	1	22.72	0.0114
Annelida : Polychaeta	Glyceridae	Glycera americana	1	45.44	0.3022
Annelida : Polychaeta	Goniadidae	Glycinde multidens	0	22.72	0.1136
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	2	45.44	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0068
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	2	45.44	0.0091
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	9	272.64	0.3363
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	1	22.72	0.0011
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	7	159.04	0.0136
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	2	45.44	0.0023
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	1	22.72	0.0227
Arthropoda : Decapoda	Pinnotheridae	Pinnixa sp.	1	22.72	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	2	45.44	0.0568
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.0023
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	9	204.48	0.6452
Mollusca : Bivalvia	Nuculidae	Nucula proxima	5	113.6	0.0023
Mollusca : Bivalvia	Tellinidae	Limecola balthica	1	22.72	0.1886
Mollusca : Gastropoda	Acteonidae	Japonactaeon punctostriatus	1	22.72	0.0023
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	13	295.36	0.0636
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	2	45.44	0.0114
Mollusca : Gastropoda	Turridae	Kurtziella atrostyla	3	68.16	0.0386
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0023
Nemertina	Tubulanidae	Carinomella lactea	6	136.32	0.0227
Phoronida	Phoronidae	Phoronis sp.	10	295.36	0.1113
Platyhelminthes : Turbellaria	Unidentified	Polycladida	1	22.72	0.0023
		Total	106	2658.2	2.1153
		# Taxa	30		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-10-1 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0011
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis	3	68.16	0.0091
Annelida : Polychaeta	Hesionidae	Podarkeopsis levifuscina	1	22.72	0.0045
Annelida : Polychaeta	Maldanidae	Clymenella torquata	0	22.72	0.0341
Annelida : Polychaeta	Nephtyidae	Nephtys picta	1	22.72	0.0477
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0045
Annelida : Polychaeta	Paraonidae	Paraonis fulgens	1	22.72	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	11	249.92	0.0386
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0204
Annelida : Polychaeta	Terebellidae	Loimia viridis	1	22.72	0.0045
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	4	90.88	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0045
Arthropoda : Amphipoda	Aoridae	Unciola serrata	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	20	590.72	1.7199
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0159
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	6	136.32	0.0045
Mollusca : Bivalvia	Nuculidae	Nucula proxima	51	1158.72	0.3999
Mollusca : Bivalvia	Tellinidae	Limecola balthica	4	90.88	0.0704
Mollusca : Gastropoda	Caecidae	Caecum regulare	13	295.36	0.0136
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0341
		Total	124	2976.3	2.4352
		# Taxa	20		

SampleID: 17-10-2 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0091
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0432
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	2	45.44	0.0091
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius sp. D (Morris)	1	22.72	0.0068
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	3	68.16	0.0204
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	5	113.6	0.0613
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.8384
Mollusca : Bivalvia	Tellinidae	Tellinidae	2	45.44	0.0011
Mollusca : Bivalvia	Unidentified	Bivalvia	1	22.72	0.0011
Mollusca : Bivalvia	Veneridae	Gemma gemma	3	68.16	0.0011
Phoronida	Phoronidae	Phoronis sp.	2	45.44	0.0091
		Total	24	545.28	1.0052
		# Taxa	12		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-10-3 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	2	45.44	0.0068
Annelida : Polychaeta	Paraonidae	Aricidea wassi	6	136.32	0.0068
Annelida : Polychaeta	Paraonidae	Paraonis fulgens	1	22.72	0.0068
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius intermedius	7	159.04	0.0613
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0023
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	3	68.16	0.025
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0023
Arthropoda : Decapoda	Unidentified	Caridea	1	22.72	0.0159
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	1	68.16	0.2454
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	4	90.88	0.0182
Mollusca : Bivalvia	Mactridae	Mulinia lateralis	1	22.72	0.3544
Mollusca : Bivalvia	Nuculidae	Nucula proxima	1	22.72	0.0011
Mollusca : Bivalvia	Veneridae	Gemma gemma	2	45.44	0.0659
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0023
		Total	32	772.48	0.8145
		# Taxa	14		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-11-1 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	11	249.92	0.0068
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	2	68.16	0.0523
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	13	295.36	0.05
Annelida : Polychaeta	Eunicidae	Marphysa belli	2	45.44	0.0023
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	2	45.44	0.0477
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0011
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	1	22.72	0.0568
Annelida : Polychaeta	Nereididae	Alitta succinea	8	227.2	0.1409
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0045
Annelida : Polychaeta	Pilargidae	Hermundura fauveli	1	22.72	0.0045
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	6	136.32	0.0591
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	115	2612.8	0.3862
Annelida : Polychaeta	Sabellidae	Sabellidae	3*	68.16	0.0023
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	6	136.32	0.0273
Annelida : Polychaeta	Sigalionidae	Sthenelais boa	1	22.72	0.0136
Annelida : Polychaeta	Spionidae	Dipolydora socialis	2	45.44	0.0045
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	1	22.72	0.0159
Annelida : Polychaeta	Spionidae	Boccardiella hamata	2	45.44	0.0011
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia	1	22.72	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	3	68.16	0.0318
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	4	90.88	0.0114
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	15	340.8	0.0454
Arthropoda : Amphipoda	Aoridae	Unciola serrata	4	90.88	0.0159
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	13	295.36	0.0227
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	13	295.36	0.0114
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	10	227.2	0.0227
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	2	45.44	0.0023
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	7	159.04	0.0091
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	1	22.72	0.0045
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	22.72	0.0045
Arthropoda : Decapoda	Unidentified	Axiidea sp.	1	22.72	0.0011
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	1	22.72	0.0023
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	6	136.32	0.3158
Mollusca : Bivalvia	Anomiidae	Anomia simplex	1	22.72	0.0045
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.0091
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0136
Mollusca : Bivalvia	Nuculidae	Nucula proxima	5	113.6	0.0182
Mollusca : Gastropoda	Caecidae	Caecum regulare	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Astyris lunata	1	22.72	0.0091
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	8	181.76	0.0318
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	19	431.68	0.1318
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	1.0565
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	3	68.16	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	6	136.32	0.05
Nemertina	Amphiporidae	Amphiporus bioculatus	2	45.44	0.025
		Total	312	7156.8	2.7342
		# Taxa	45		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-11-2 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	7	159.04	0.0273
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0011
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	1	22.72	0.1136
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	45.44	0.1522
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0023
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	1	22.72	0.0011
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	1	22.72	0.0011
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	2	45.44	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	1	22.72	0.0045
Arthropoda : Cumacea	Bodotriidae	Cyclaspis varians	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	13	295.36	0.6498
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0045
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	4	90.88	0.0182
Mollusca : Bivalvia	Nuculidae	Nucula proxima	1	22.72	0.0011
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0364
Mollusca : Bivalvia	Veneridae	Mercenaria mercenaria	1	22.72	0.2704
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0295
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	2	45.44	0.0068
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0068
Phoronida	Phoronidae	Phoronis sp.	2	45.44	0.0159
Platyhelminthes : Turbellaria	Unidentified	Polycladida	1	22.72	0.0045
		Total	48	1113.3	1.3505
		# Taxa	21		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-11-3 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	1	22.72	0.0045
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0011
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	2	45.44	0.0409
Annelida : Polychaeta	Maldanidae	Maldanidae	1	22.72	0.0273
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	22.72	0.0182
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	13	295.36	0.0295
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	2	45.44	0.0204
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0023
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	3	68.16	0.0023
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	45.44	0.0091
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	22.72	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	2	45.44	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	3	68.16	0.1204
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	7	159.04	0.0364
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0023
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	1	22.72	0.1272
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	3	68.16	0.0023
Mollusca : Gastropoda	Acteonidae	Japonactaeon punctostriatus	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	3	68.16	0.0273
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	5	113.6	0.0182
Mollusca : Gastropoda	Pyramidellidae	Eulimastoma engonium	1	22.72	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	9	204.48	0.05
Phoronida	Phoronidae	Phoronis sp.	10	227.2	0.0204
		Total	77	1749.4	0.5737
		# Taxa	25		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-12-1 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	1	22.72	0.0023
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	1	22.72	0.0011
Annelida : Polychaeta	Glyceridae	Glyceridae	1	22.72	0.0295
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0068
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0068
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	0	22.72	0.0727
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	4	113.6	0.0432
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0023
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	2	45.44	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	2	45.44	0.0204
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	9	249.92	0.3499
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans	1	22.72	0.0068
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	4	90.88	0.0159
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	0	22.72	0.0341
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	3	68.16	0.1113
Mollusca : Bivalvia	Mactridae	Mulinia lateralis	2	45.44	0.0023
Mollusca : Bivalvia	Nuculidae	Nucula proxima	3	68.16	0.0841
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	22.72	0.0091
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	3	68.16	0.0114
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0023
		Total	44	1113.3	0.8225
		# Taxa	23		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-12-2 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis	1	22.72	0.0068
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	19	431.68	0.0114
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	3	68.16	0.0114
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1*	22.72	0.0091
Annelida : Polychaeta	Cirratulidae	Tharyx acutus	1	22.72	0.0182
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	0	22.72	0.075
Annelida : Polychaeta	Pilargidae	Sigambra tentaculata	1	22.72	0.0011
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0011
Annelida : Polychaeta	Spionidae	Streblospio benedicti	4	90.88	0.0011
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	2	45.44	0.0636
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus	1	22.72	0.0045
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	4	90.88	0.0364
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	5	113.6	0.0204
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0011
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	3	68.16	0.0182
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	2	45.44	0.0023
Arthropoda : Cumacea	Leuconidae	Leucon americanus	1	22.72	0.0023
Arthropoda : Decapoda	Callianassidae	Biffarius biformis	1	22.72	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	2	68.16	0.1522
Mollusca : Bivalvia	Kelliidae	Kelliopsis elevata	1	22.72	0.0204
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	6	136.32	0.1795
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	3	68.16	0.0432
Mollusca : Gastropoda	Nassariidae	Ilyanassa trivittata	1	22.72	0.0295
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0023
		Total	67	1567.7	0.7167
		# Taxa	24		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-12-3 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	7	159.04	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	20	454.4	0.0182
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis	2	45.44	0.0045
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	2	45.44	0.0295
Annelida : Polychaeta	Glyceridae	Glyceridae	1	22.72	0.0011
Annelida : Polychaeta	Hesionidae	Podarke obscura	22	499.84	0.0909
Annelida : Polychaeta	Nereididae	Alitta succinea	26	590.72	0.1431
Annelida : Polychaeta	Orbiniidae	Scoloplos rubra	1	22.72	0.0045
Annelida : Polychaeta	Phyllodocidae	Eumida sanguinea	1	22.72	0.0136
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	792	17994.24	1.3587
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	3	68.16	0.0364
Annelida : Polychaeta	Spionidae	Dipolydora socialis	23	522.56	0.0318
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	1	22.72	0.0068
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	49	1113.28	0.777
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	2	45.44	0.0011
Arthropoda : Amphipoda	Aoridae	Unciola serrata	10	227.2	0.0318
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	2	45.44	0.0011
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	1	22.72	0.0045
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	22.72	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus sp.	1	22.72	0.0182
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	5	113.6	0.4726
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	10	408.96	2.0334
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	3	68.16	0.0727
Mollusca : Bivalvia	Arcidae	Anadara transversa	3	68.16	0.3385
Mollusca : Bivalvia	Nuculidae	Nucula proxima	8	181.76	0.2795
Mollusca : Bivalvia	Veneridae	Mercenaria mercenaria	2	45.44	0.05
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	1	22.72	0.0023
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	1	22.72	0.0011
Nemertina	Amphiporidae	Amphiporus bioculatus	2	45.44	0.0114
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	4	90.88	0.0545
		Total	1007	23061	5.9001
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-13-1 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	10	227.2	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	2	45.44	0.0011
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0136
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0023
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	1	22.72	0.0159
Annelida : Polychaeta	Nephtyidae	Nephtys picta	2	45.44	0.075
Annelida : Polychaeta	Nereididae	Alitta succinea	5	113.6	0.0341
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos robustus	0	22.72	0.1204
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	7	159.04	0.0409
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	1	22.72	0.0011
Annelida : Polychaeta	Syllidae	Brania wellfleetensis	1	22.72	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	5	113.6	0.1068
Arthropoda : Amphipoda	Aoridae	Unciola serrata	11	249.92	0.0318
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis	1	22.72	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	21	545.28	1.3291
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	3	68.16	0.0011
Mollusca : Bivalvia	Nuculidae	Nucula proxima	4	90.88	0.0045
Mollusca : Gastropoda	Caecidae	Caecum regulare	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	1	22.72	0.0114
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	8	181.76	0.0772
Nemertina	Amphiporidae	Amphiporus bioculatus	4	90.88	0.0068
Nemertina	Tubulanidae	Carinomella lactea	2	45.44	0.0045
Phoronida	Phoronidae	Phoronis sp.	9	204.48	0.0545
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0011
		Total	102	2408.3	1.9491
		# Taxa	24		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-13-2 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Arabellidae	Drilonereis longa	0	22.72	0.0204
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	1	22.72	0.0636
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	6	136.32	0.0318
Annelida : Polychaeta	Maldanidae	Clymenella torquata	1	22.72	0.0409
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	2	45.44	0.0068
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	2	45.44	0.0011
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	3	68.16	0.0114
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vernilli	4	90.88	0.0091
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	4	90.88	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	1	22.72	0.0011
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.0795
Hemichordata	Harrimaniidae	Saccoglossus kowalevskii	1	22.72	0.0091
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	27	613.44	0.1613
Mollusca : Bivalvia	Nuculidae	Nucula proxima	1	22.72	0.0023
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0011
Mollusca : Bivalvia	Tellinidae	Limecola balthica	1	22.72	0.1113
Mollusca : Bivalvia	Veneridae	Pitar morrhuanus	1	22.72	0.0068
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	8	181.76	0.0477
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	1	22.72	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	4	90.88	0.0159
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0045
Phoronida	Phoronidae	Phoronis sp.	7	159.04	0.0545
		Total	79	1817.6	0.6848
		# Taxa	22		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-13-3 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	10	227.2	0.0011
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	5	113.6	0.0045
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0011
Annelida : Polychaeta	Onuphidae	Diopatra cuprea	1	22.72	0.0409
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0045
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	1	22.72	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	54	1226.88	0.1795
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	2	45.44	0.0182
Annelida : Polychaeta	Syllidae	Erinaceusyllis erinaceus	1	22.72	0.0011
Annelida : Polychaeta	Terebellidae	Loimia viridis	1	22.72	0.0454
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	5	113.6	0.0613
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	2	45.44	0.0091
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	1	22.72	0.0045
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	1	22.72	0.0011
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	1	22.72	0.0023
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	3	68.16	0.0023
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	3	68.16	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	3	68.16	0.2136
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	1	22.72	0.0011
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	22.72	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	10	363.52	0.7634
Echinodermata : Holothuroidea	Phyllophoridae	Pentamera pulcherrima	1	22.72	0.0045
Mollusca : Bivalvia	Anomiidae	Anomia simplex	1	22.72	0.15
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0136
Mollusca : Bivalvia	Lyonsiidae	Lyonsia sp.	1	22.72	0.0023
Mollusca : Bivalvia	Nuculidae	Nucula proxima	8	181.76	0.0136
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0227
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	1	22.72	0.2363
Mollusca : Gastropoda	Caecidae	Caecum regulare	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	3	68.16	0.0386
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	1	22.72	0.0068
Mollusca : Gastropoda	Columbellidae	Astyris lunata	2	45.44	0.025
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0045
Phoronida	Phoronidae	Phoronis sp.	2	45.44	0.0045
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	2	45.44	0.0011
		Total	135	3203.5	1.8954
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-14-1 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	11	249.92	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	3	68.16	0.0011
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	38	863.36	0.0568
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0114
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	0	22.72	0.0863
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0011
Annelida : Polychaeta	Nereididae	Nereididae	2	45.44	0.0011
Annelida : Polychaeta	Paraonidae	Aricidea wassi	1	22.72	0.0023
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	2	45.44	0.0114
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	2	45.44	0.0204
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	2	45.44	0.0409
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0068
Arthropoda : Amphipoda	Aoridae	Unciola serrata	3	68.16	0.0011
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	1	90.88	0.3294
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0011
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0136
Mollusca : Bivalvia	Nuculidae	Nucula proxima	8	181.76	0.2613
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	1	22.72	0.0204
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	2	45.44	0.0159
Nemertina	Amphiporidae	Amphiporus bioculatus	3	68.16	0.0045
Nemertina	Lineidae	Lineidae	1	22.72	0.0954
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0068
		Total	91	2158.4	0.9993
		# Taxa	25		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-14-2 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	51	1158.72	0.0432
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	5	113.6	0.0182
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	6	136.32	0.0182
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	1	22.72	0.0023
Annelida : Polychaeta	Nereididae	Alitta succinea	3	68.16	0.0114
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	3	68.16	0.0136
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	3	68.16	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	36	817.92	0.234
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	5	113.6	0.0273
Annelida : Polychaeta	Spionidae	Dipolydora socialis	2	45.44	0.0011
Annelida : Polychaeta	Syllidae	Streptosyllis websteri	2	45.44	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	20	454.4	0.2613
Annelida : Polychaeta	Terebellidae	Loimia viridis	1	22.72	0.0045
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0011
Arthropoda : Amphipoda	Aoridae	Unciola serrata	19	431.68	0.0182
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	45.44	0.0045
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	1	22.72	0.0023
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	4	113.6	0.3703
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans	1	22.72	0.1659
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0114
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.0045
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	8	181.76	0.1204
Mollusca : Bivalvia	Nuculidae	Nucula proxima	22	499.84	0.593
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0023
Mollusca : Bivalvia	Veneridae	Pitar morrhuanus	1	22.72	0.0011
Mollusca : Bivalvia	Veneridae	Gemma gemma	1	22.72	0.0011
Mollusca : Gastropoda	Caecidae	Caecum regulare	4	90.88	0.0045
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	2	45.44	0.0273
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0182
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	8	181.76	0.05
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0023
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	2	45.44	0.0023
		Total	222	5066.6	2.047
		# Taxa	34		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-14-3 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	2	45.44	0.0023
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	0	22.72	0.0068
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	9	204.48	0.0091
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0011
Annelida : Polychaeta	Nephtyidae	Nephtys picta	1	45.44	0.0704
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	2	45.44	0.0011
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	3	68.16	0.0068
Annelida : Polychaeta	Spionidae	Dipolydora commensalis	1	22.72	0.0011
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	3	68.16	0.0011
Annelida : Polychaeta	Syllidae	Exogone dispar	1	22.72	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	14	318.08	0.1204
Annelida : Polychaeta	Terebellidae	Loimia viridis	1	22.72	0.0045
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0011
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	8	181.76	0.0114
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	2	45.44	0.0068
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	1	22.72	0.0114
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	1	22.72	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	2	45.44	0.0568
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	10	227.2	0.0091
Mollusca : Bivalvia	Nuculidae	Nucula proxima	17	386.24	0.1068
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0023
Mollusca : Gastropoda	Caecidae	Caecum regulare	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	8	181.76	0.0523
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	0.9883
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	7	159.04	0.0386
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0068
		Total	100	2317.4	1.5209
		# Taxa	26		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-15-1 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	6	136.32	0.0045
Annelida : Polychaeta	Capitellidae	Heteromastus filiformis	1	22.72	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	16	363.52	0.0182
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0011
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	6	136.32	0.0114
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	1	22.72	0.0023
Annelida : Polychaeta	Glyceridae	Glycera americana	0	22.72	0.2045
Annelida : Polychaeta	Hesionidae	Podarke obscura	34	772.48	0.0841
Annelida : Polychaeta	Nereididae	Alitta succinea	47	1067.84	0.4112
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	15	340.8	0.3363
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	953	21652.16	2.6151
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	13	295.36	0.0318
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	31	704.32	0.3181
Annelida : Polychaeta	Spionidae	Dipolydora socialis	4	90.88	0.0068
Annelida : Polychaeta	Syllidae	Erinaceusyllis erinaceus	1	22.72	0.0023
Annelida : Polychaeta	Syllidae	Exogone dispar	4	90.88	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	87	1976.64	1.1201
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	43	976.96	0.2113
Arthropoda : Amphipoda	Aoridae	Unciola serrata	354	8042.88	1.2541
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	42	954.24	0.1704
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	2	45.44	0.0011
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	18	408.96	0.0273
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	10	227.2	0.0182
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	15	340.8	0.0182
Arthropoda : Cirripedia	Balanidae	Balanidae	1	22.72	0.0068
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	1	22.72	0.2658
Arthropoda : Decapoda	Porcellanidae	Euceramus praelongus	1	22.72	0.1318
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	14	340.8	5.5891
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	3	113.6	0.3862
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	7	159.04	0.184
Mollusca : Bivalvia	Arcidae	Anadara transversa	7	159.04	0.2499
Mollusca : Bivalvia	Nuculidae	Nucula proxima	13	295.36	0.1477
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.1681
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0114
Mollusca : Bivalvia	Veneridae	Gemma gemma	3	68.16	0.0136
Mollusca : Gastropoda	Caecidae	Caecum regulare	2	45.44	0.0045
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	1	22.72	0.0114
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	0.6339
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	1	22.72	0.0045
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	4	90.88	0.0091
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	2	45.44	0.0136
		Total	1767	40237	14.7066
		# Taxa	41		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-15-2 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	10	227.2	0.0045
Annelida : Polychaeta	Arabellidae	Drilonereis longa	1	22.72	0.0045
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	6	136.32	0.0159
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	3	68.16	0.0114
Annelida : Polychaeta	Eunicidae	Marphysa belli	1	22.72	0.1113
Annelida : Polychaeta	Hesionidae	Podarke obscura	3	68.16	0.0114
Annelida : Polychaeta	Nephtyidae	Nephtys picta	1	22.72	0.1068
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	7	159.04	0.0636
Annelida : Polychaeta	Nereididae	Alitta succinea	9	204.48	0.1113
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0136
Annelida : Polychaeta	Polynoidae	Polynoidae	4	90.88	0.0295
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	197	4475.84	0.468
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	1	22.72	0.0091
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	4	90.88	0.1204
Annelida : Polychaeta	Spionidae	Dipolydora socialis	4	90.88	0.0091
Annelida : Polychaeta	Syllidae	Exogone dispar	3	68.16	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	65	1476.8	0.7861
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	8	181.76	0.0227
Arthropoda : Amphipoda	Aoridae	Unciola serrata	32	727.04	0.0841
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	72	1635.84	0.2636
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	2	45.44	0.0045
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	2	45.44	0.0011
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	9	204.48	0.025
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	3	68.16	0.0068
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	13	295.36	0.0273
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	1	22.72	0.3204
Arthropoda : Mysidacea	Mysidae	Mysidae	1	22.72	0.0045
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	5	159.04	0.7475
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.0204
Mollusca : Bivalvia	Nuculidae	Nucula proxima	14	318.08	1.5813
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	1	22.72	0.0114
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	21	477.12	1.704
		Total	505	11519	6.7022
		# Taxa	32		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-15-3 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	90.88	0.0023
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	9	204.48	0.0341
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0182
Annelida : Polychaeta	Eunicidae	Marphysa belli	5	136.32	0.5407
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0045
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0045
Annelida : Polychaeta	Maldanidae	Clymenella zonalis	1	22.72	0.0227
Annelida : Polychaeta	Nereididae	Alitta succinea	16	363.52	0.0886
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	11	249.92	0.0386
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	105	2385.6	0.5021
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	3	68.16	0.0295
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	2	45.44	0.0068
Annelida : Polychaeta	Spionidae	Dipolydora socialis	7	159.04	0.0182
Annelida : Polychaeta	Syllidae	Exogone dispar	9	204.48	0.0045
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	181.76	0.0818
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	30	681.6	0.1999
Arthropoda : Amphipoda	Aoridae	Unciola serrata	5	113.6	0.0114
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	9	204.48	0.0318
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	9	204.48	0.025
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	15	340.8	0.0182
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	15	340.8	0.075
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	3	68.16	0.0091
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	3	68.16	0.0091
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	2	45.44	0.0011
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	6	136.32	1.3109
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	3	68.16	0.0182
Mollusca : Bivalvia	Arcidae	Anadara transversa	2	45.44	0.0114
Mollusca : Bivalvia	Nuculidae	Nucula proxima	9	204.48	0.4203
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis	9	204.48	0.0318
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.2272
Mollusca : Bivalvia	Veneridae	Mercenaria mercenaria	1	22.72	0.0159
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	12	272.64	0.2227
Mollusca : Gastropoda	Columbellidae	Astyris lunata	5	113.6	0.0523
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	5	113.6	0.0795
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	2	45.44	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	2	45.44	0.0068
Nemertina	Tubulanidae	Carinomella lactea	3	68.16	0.0068
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0045
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0045
		Total	338	7702.1	4.1928
		# Taxa	39		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-16-1 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	45	1022.4	0.0273
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	2	45.44	0.0023
Annelida : Polychaeta	Eunicidae	Marphysa belli	1	22.72	0.0318
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	4*	90.88	0.0114
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Hesionidae	Podarke obscura	26	590.72	0.0454
Annelida : Polychaeta	Nereididae	Alitta succinea	30	681.6	0.1022
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	10	227.2	0.0454
Annelida : Polychaeta	Polygordiidae	Polygordius jouinae	1	22.72	0.0011
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	2	45.44	0.0011
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	19	431.68	0.2817
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	8	181.76	0.0204
Annelida : Polychaeta	Syllidae	Erinaceusyllis erinaceus	2	45.44	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	10	227.2	0.1091
Arthropoda : Amphipoda	Aoridae	Unciola serrata	22	499.84	0.0341
Arthropoda : Decapoda	Paguridae	Pagurus longicarpus	2	45.44	0.2227
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	16	658.88	2.4651
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	3	68.16	0.0068
Mollusca : Bivalvia	Crassatellidae	Crassinella lunulata	6	136.32	0.0432
Mollusca : Bivalvia	Lyonsiidae	Lyonsia sp.	1	22.72	0.0023
Mollusca : Bivalvia	Nuculidae	Nucula proxima	7	159.04	0.0659
Mollusca : Bivalvia	Veneridae	Gemma gemma	5	113.6	0.0011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	1	22.72	0.0091
Nemertina	Amphiporidae	Amphiporus bioculatus	2	45.44	0.0068
		Total	226	5430.1	3.5419
		# Taxa	23		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-16-2 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	90.88	0.0011
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	1	22.72	0.0023
Annelida : Polychaeta	Paraonidae	Paraonis fulgens	1	22.72	0.0011
Annelida : Polychaeta	Paraonidae	Aricidea wassi	1	22.72	0.0023
Annelida : Polychaeta	Polygordiidae	Polygordius jouinae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	6	136.32	0.0341
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0023
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	1	22.72	0.0045
Arthropoda : Amphipoda	Aoridae	Unciola serrata	1	22.72	0.0045
Arthropoda : Decapoda	Paguridae	Pagurus sp.	3	68.16	0.0227
Chordata : Ascidiacea	Unidentified	Ascidiacea	1	22.72	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	9	272.64	0.6316
Mollusca : Bivalvia	Nuculidae	Nucula proxima	12	272.64	0.1659
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	5	113.6	0.1272
Mollusca : Bivalvia	Veneridae	Gemma gemma	11	249.92	0.0136
Mollusca : Gastropoda	Caecidae	Caecum regulare	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	22.72	0.0068
Nemertina	Cephalothricidae	Cephalothrix spiralis	2	45.44	0.0023
		Total	62	1476.8	1.0292
		# Taxa	18		

SampleID: 17-16-3 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	178	4044.16	0.0591
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	7	159.04	0.0045
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	4	90.88	0.0068
Annelida : Polychaeta	Goniadidae	Glycinde multidens	2	45.44	0.0045
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0045
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	3	68.16	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	13	295.36	0.0159
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	1	22.72	0.0011
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	2	45.44	0.0045
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	2	45.44	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	14	386.24	0.8952
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	1	22.72	0.0011
Mollusca : Bivalvia	Nuculidae	Nucula proxima	20	454.4	0.4158
Mollusca : Bivalvia	Veneridae	Mercenaria mercenaria	1	22.72	0.0364
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0045
		Total	250	5748.2	1.4652
		# Taxa	15		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-17-1 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	5	113.6	0.0011
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	9	204.48	0.0068
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0023
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	1	22.72	0.0182
Annelida : Polychaeta	Glyceridae	Glycera sp.	1	22.72	0.0182
Annelida : Polychaeta	Hesionidae	Podarke obscura	3	68.16	0.0011
Annelida : Polychaeta	Nereididae	Alitta succinea	12	272.64	0.0386
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	1	22.72	0.0068
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	341	7747.52	1.7494
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	5	113.6	0.0023
Annelida : Polychaeta	Syllidae	Exogone dispar	4	90.88	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	6	136.32	0.0477
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	3	68.16	0.025
Arthropoda : Amphipoda	Aoridae	Unciola serrata	28	636.16	0.0795
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	113	2567.36	0.4203
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1	22.72	0.0011
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	22.72	0.0011
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	4	90.88	0.0045
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	13	295.36	0.0545
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	3	68.16	0.0011
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	17	386.24	0.0273
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	2	45.44	0.0023
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	4	90.88	0.4658
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	1	45.44	0.209
Echinodermata : Holothuroidea	Phyllophoridae	Pentamera pulcherrima	1	22.72	0.0863
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.0045
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	2	45.44	0.0011
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0011
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis	19	431.68	0.2636
Mollusca : Bivalvia	Veneridae	Gemma gemma	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	5	113.6	0.0613
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	10	227.2	1.7426
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	2	45.44	1.5813
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	1	22.72	0.0023
Nemertina	Amphiporidae	Amphiporus bioculatus	3	68.16	0.0068
		Total	627	14268	6.9371
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-17-2 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	12	272.64	0.0045
Annelida : Polychaeta	Arabellidae	Arabella iricolor	0	45.44	2.0175
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	11	249.92	0.0159
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	2	45.44	0.0182
Annelida : Polychaeta	Eunicidae	Marphysa belli	2	45.44	0.1068
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0011
Annelida : Polychaeta	Hesionidae	Podarke obscura	4	90.88	0.025
Annelida : Polychaeta	Maldanidae	Maldanidae	1	22.72	0.0011
Annelida : Polychaeta	Nereididae	Alitta succinea	26	590.72	0.209
Annelida : Polychaeta	Polynoidae	Polynoidae	1	22.72	0.0204
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	161	3657.92	0.568
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	41	931.52	1.2905
Annelida : Polychaeta	Spionidae	Dipolydora socialis	2	45.44	0.0011
Annelida : Polychaeta	Spionidae	Dipolydora commensalis	4	90.88	0.0045
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0136
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	12	272.64	0.0273
Arthropoda : Amphipoda	Aoridae	Unciola serrata	54	1226.88	0.1113
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	13	295.36	0.0159
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	17	386.24	0.0182
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	8	181.76	0.0136
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	17	386.24	0.0227
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	22.72	0.0023
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0045
Arthropoda : Decapoda	Unidentified	Caridea	3	68.16	0.6316
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	10	227.2	0.5748
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	2	45.44	0.0159
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	22.72	0.0045
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis	17	386.24	0.0795
Mollusca : Bivalvia	Pholadidae	Barnea truncata	5	113.6	0.0045
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	3	68.16	0.05
Mollusca : Gastropoda	Columbellidae	Astyris lunata	7	159.04	0.0636
Mollusca : Gastropoda	Corambidae	Corambe obscura	1	22.72	0.0011
Mollusca : Gastropoda	Nassariidae	Ilyanassa trivittata	1	22.72	0.3476
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	2	45.44	0.0068
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	2	45.44	0.0045
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0364
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0068
		Total	448	10224	6.3406
		# Taxa	37		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-17-3 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Arabellidae	Arabella iricolor	0	22.72	1.6563
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	7	159.04	0.0091
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0091
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	2	45.44	0.0045
Annelida : Polychaeta	Eunicidae	Marphysa belli	2	113.6	1.5586
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0011
Annelida : Polychaeta	Hesionidae	Podarke obscura	4	90.88	0.0204
Annelida : Polychaeta	Nereididae	Alitta succinea	22	499.84	0.1295
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	1	22.72	0.0011
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	3	68.16	0.0114
Annelida : Polychaeta	Phyllodocidae	Eteone heteropoda	1	22.72	0.0023
Annelida : Polychaeta	Polynoidae	Polynoidae	5	113.6	0.1022
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	2	45.44	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	385	8747.2	1.4086
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	36	817.92	0.1749
Annelida : Polychaeta	Syllidae	Exogone dispar	1	22.72	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	7	159.04	0.1
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	43	976.96	0.2726
Arthropoda : Amphipoda	Aoridae	Unciola serrata	73	1658.56	0.1886
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	36	817.92	0.1272
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	45.44	0.0091
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	5	113.6	0.0114
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	4	90.88	0.0045
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	22.72	0.0011
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	4	90.88	0.6952
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	3	68.16	0.0409
Mollusca : Bivalvia	Anomiidae	Anomia simplex	0	22.72	0.6771
Mollusca : Bivalvia	Arcidae	Anadara transversa	4	90.88	0.8111
Mollusca : Bivalvia	Nuculidae	Nucula proxima	20	454.4	0.7838
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	2	68.16	1.5768
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	1	22.72	0.0011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	15	340.8	0.1636
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	13	295.36	0.2545
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	8	181.76	0.0932
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	10	227.2	0.0227
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	6	136.32	0.0114
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0045
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0159
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0114
		Total	733	16790	10.9724
		# Taxa	39		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-18 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	5	113.6	0.0011
Annelida : Polychaeta	Arabellidae	Arabella iricolor	0	22.72	0.7202
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	12	272.64	0.0114
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0091
Annelida : Polychaeta	Nereididae	Alitta succinea	9	204.48	0.0613
Annelida : Polychaeta	Onuphidae	Diopatra cuprea	0	22.72	0.4771
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	1	22.72	0.0114
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	1	22.72	0.0182
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	2	45.44	0.025
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	307	6975.04	1.4268
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	9	204.48	0.0954
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	38	863.36	0.4476
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	7	159.04	0.0636
Arthropoda : Amphipoda	Aoridae	Unciola serrata	74	1681.28	0.1908
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	57	1295.04	0.2476
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	4	90.88	0.0091
Arthropoda : Decapoda	Unidentified	Caridea	2	45.44	0.2931
Arthropoda : Decapoda	Xanthidae	Xanthidae	3	68.16	0.359
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	8	181.76	0.5612
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	4	90.88	0.0386
Mollusca : Bivalvia	Arcidae	Anadara transversa	6	136.32	0.2726
Mollusca : Bivalvia	Nuculidae	Nucula proxima	33	749.76	0.443
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.159
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0091
Mollusca : Gastropoda	Columbellidae	Costoanachis avara	14	318.08	0.5498
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	9	204.48	0.1045
Mollusca : Gastropoda	Columbellidae	Astyris lunata	7	159.04	0.0863
Mollusca : Gastropoda	Nassariidae	Nassarius vibex	1	22.72	0.7111
Phoronida	Phoronidae	Phoronis sp.	1	22.72	0.0045
		Total	617	14064	7.4075
		# Taxa	29		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-19 **Collection Date: 9/14/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	1	22.72	0.0011
Annelida : Polychaeta	Nereididae	Alitta succinea	1	22.72	0.0204
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	10	227.2	0.025
Annelida : Polychaeta	Paraonidae	Paraonis fulgens	1	22.72	0.0023
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	3	68.16	0.0045
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Prionospio perkinsi	1	22.72	0.0023
Annelida : Polychaeta	Syllidae	Streptosyllis websteri	11	249.92	0.0045
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	1	22.72	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0068
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	1	22.72	0.0068
Arthropoda : Amphipoda	Haustoriidae	Bathyporeia parkeri	1	22.72	0.0023
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	1	22.72	0.0091
Arthropoda : Amphipoda	Phoxocephalidae	Eobrolgus spinosus	1	22.72	0.0011
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	3	68.16	0.0159
Arthropoda : Tanaidacea	Nototanaididae	Tanaissus psammophilus	1	22.72	0.0011
Chordata : Ascidiacea	Unidentified	Ascidiacea	10	227.2	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	3	522.56	1.6517
Mollusca : Bivalvia	Nuculidae	Nucula proxima	1	22.72	0.0045
Mollusca : Bivalvia	Tellinidae	Tellinidae	3	68.16	0.0045
Mollusca : Bivalvia	Veneridae	Gemma gemma	11	249.92	0.0068
Mollusca : Gastropoda	Caecidae	Caecum regulare	3	68.16	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0011
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0068
Nemertina	Unidentified	Monostilifera	1	22.72	0.0011
		Total	73	2113	1.7922
		# Taxa	25		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-20 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	0	22.72	0.2022
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0136
Annelida : Polychaeta	Paraonidae	Aricidea wassi	1	22.72	0.0023
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	2	45.44	0.0011
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius intermedius	3	68.16	0.0227
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	3	68.16	0.0364
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0068
Arthropoda : Mysidacea	Mysidae	Mysidae	1	22.72	0.0068
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	2	227.2	0.4771
Mollusca : Bivalvia	Veneridae	Gemma gemma	2	45.44	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0045
Phoronida	Phoronidae	Phoronis sp.	7	159.04	0.0409
		Total	25	772.48	0.8155
		# Taxa	12		

SampleID: 17-21 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	90.88	0.0011
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0068
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	14	318.08	0.0295
Annelida : Polychaeta	Paraonidae	Paraonis fulgens	9	204.48	0.0091
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	21	477.12	0.0136
Annelida : Polychaeta	Spionidae	Scolelepis texana	3	68.16	0.0045
Annelida : Polychaeta	Syllidae	Exogone dispar	1	22.72	0.0011
Annelida : Polychaeta	Syllidae	Syllidae	1	22.72	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0045
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius intermedius	9	204.48	0.0477
Arthropoda : Tanaidacea	Nototanaididae	Tanaissus psammophilus	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	5	477.12	2.2107
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	3	68.16	0.0318
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.0023
Mollusca : Bivalvia	Veneridae	Gemma gemma	7	159.04	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0023
		Total	84	2272	2.3695
		# Taxa	16		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-22 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	2	45.44	0.0114
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	3	68.16	0.0159
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0045
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	3	68.16	0.0068
Annelida : Polychaeta	Opheliidae	Ophelildae	2	45.44	0.0045
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	2	45.44	0.0023
Annelida : Polychaeta	Syllidae	Streptosyllis websteri	1	22.72	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	13	295.36	0.0523
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	10	386.24	3.0558
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	1	22.72	0.0045
Mollusca : Bivalvia	Nuculidae	Nucula proxima	12	272.64	0.0159
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0011
Mollusca : Bivalvia	Veneridae	Gemma gemma	9	204.48	0.0045
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0011
Phoronida	Phoronidae	Phoronis sp.	12	363.52	0.1454
		Total	73	1908.5	3.3283
		# Taxa	15		

SampleID: 17-23 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0011
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	1	22.72	0.0068
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Orbiniidae	Leitoscoloplos sp.	8	181.76	0.0454
Annelida : Polychaeta	Paraonidae	Cirrophorus sp. B Morris	20	454.4	0.0364
Annelida : Polychaeta	Syllidae	Erinaceusyllis erinaceus	1	22.72	0.0023
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	22.72	0.0011
Arthropoda : Amphipoda	Haustoriidae	Acanthohaustorius intermedius	1	22.72	0.0011
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	3	68.16	0.0023
Arthropoda : Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	1	22.72	0.0114
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0011
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	28	976.96	4.619
Cnidaria : Anthozoa	Edwardsiidae	Edwardsia elegans	1	22.72	0.0613
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	3	68.16	0.0045
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	1	22.72	0.0068
Mollusca : Bivalvia	Veneridae	Gemma gemma	2	45.44	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.0023
Phoronida	Phoronidae	Phoronis sp.	16	477.12	0.1363
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	22.72	0.0068
		Total	92	2544.6	4.9528
		# Taxa	19		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-24 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	2	45.44	0.0011
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	4	90.88	0.075
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0023
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	1	22.72	0.0011
Annelida : Polychaeta	Glyceridae	Glycera dibranchiata	1	22.72	0.0273
Annelida : Polychaeta	Goniadidae	Glycinde multidens	4	90.88	0.0091
Annelida : Polychaeta	Maldanidae	Maldanidae	11	249.92	0.409
Annelida : Polychaeta	Phyllodocidae	Phyllodoce arenae	1	22.72	0.0011
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	45.44	0.0613
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	4	90.88	0.0068
Arthropoda : Amphipoda	Aoridae	Unciola serrata	4	90.88	0.0011
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	22.72	0.0011
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	1	22.72	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	10	227.2	0.0182
Arthropoda : Amphipoda	Oedicerotidae	Americhelidium americanum	1	22.72	0.0045
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0011
Arthropoda : Decapoda	Portunidae	Callinectes sapidus	1	22.72	0.0204
Arthropoda : Isopoda	Idoteidae	Edotia triloba	1	22.72	0.0045
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	2	45.44	0.0023
Arthropoda : Mysidacea	Mysidae	Americamysis bahia	1	22.72	0.0023
Chordata : Cephalochordata	Branchiostomidae	Branchiostoma caribaeum	0	22.72	0.075
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	2	45.44	0.0068
Mollusca : Bivalvia	Kelliidae	Kelliopsis elevata	1	22.72	0.0011
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	8	181.76	0.6634
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0023
Mollusca : Gastropoda	Acteonidae	Japonactaeon punctostriatus	2	45.44	0.0011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	1	22.72	0.0091
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	4	90.88	0.0545
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	12	272.64	0.0204
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	7	159.04	0.0568
Nemertina	Tubulanidae	Carinomella lactea	1	22.72	0.0136
Phoronida	Phoronidae	Phoronis sp.	16	431.68	0.1022
		Total	109	2590.1	1.6582
		# Taxa	32		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-25 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	7	159.04	0.0011
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	35	795.2	0.0204
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	1	22.72	0.1908
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	18	568	0.0023
Annelida : Polychaeta	Maldanidae	Maldanidae	3	68.16	0.0886
Annelida : Polychaeta	Nephtyidae	Nephtys picta	2	68.16	0.125
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	6	136.32	0.0636
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	22	499.84	0.1227
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus	1	22.72	0.0011
Annelida : Polychaeta	Syllidae	Exogone dispar	1	22.72	0.0011
Annelida : Polychaeta	Terebellidae	Loimia viridis	2	45.44	0.0159
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vernilli	3	68.16	0.0045
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	29	658.88	0.0409
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	2	45.44	0.0023
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0011
Arthropoda : Decapoda	Pinnotheridae	Pinnixa sp.	1	22.72	0.0011
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis	1	22.72	0.1431
Cnidaria : Anthozoa	Sagartiidae	Actinothoe sp.	1	22.72	0.0045
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	1	22.72	0.0977
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	8	181.76	0.0114
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	1	22.72	0.3976
Mollusca : Bivalvia	Solemyidae	Solemya velum	1	22.72	0.3294
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	5	113.6	0.4908
Mollusca : Bivalvia	Tellinidae	Limecola balthica	1	22.72	0.1522
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	4	90.88	0.0477
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	7	159.04	0.025
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	4	90.88	0.0364
Nemertina	Amphiporidae	Amphiporus bioculatus	2	45.44	0.0045
Nemertina	Tubulanidae	Carinomella lactea	12	272.64	0.0273
Phoronida	Phoronidae	Phoronis sp.	2	45.44	0.0068
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	3	68.16	0.0068
		Total	187	4430.4	2.4637
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-26 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0023
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	20	454.4	0.0091
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	11	363.52	0.0659
Annelida : Polychaeta	Goniadidae	Glycinde multidens	4	90.88	0.0091
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	3	136.32	0.443
Annelida : Polychaeta	Nephtyidae	Nephtys incisa	1	22.72	0.0613
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	2	45.44	0.0068
Annelida : Polychaeta	Polynoidae	Malmgreniella maccraryae	1	22.72	0.0091
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	24	545.28	0.1431
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0091
Annelida : Polychaeta	Spionidae	Prionospio perkinsi	5	113.6	0.0011
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vernilli	6	136.32	0.0295
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	11	249.92	0.0227
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	22.72	0.0023
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	2	45.44	0.0011
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	1	22.72	0.0045
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	1	22.72	0.0023
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0204
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	3	136.32	0.1772
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	16	363.52	0.6112
Mollusca : Bivalvia	Solecurtidae	Tagelus divisus	2	45.44	0.5794
Mollusca : Bivalvia	Tellinidae	Ameritella agilis	2	45.44	0.1318
Mollusca : Bivalvia	Tellinidae	Macoploma tenta	2	45.44	0.1
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0114
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	2	45.44	0.0114
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	1	22.72	0.025
Nemertina	Amphiporidae	Amphiporus bioculatus	1	22.72	0.0091
Nemertina	Tubulanidae	Carinomella lactea	5	113.6	0.0114
Phoronida	Phoronidae	Phoronis sp	8	181.76	0.025
		Total	140	3430.7	2.5356
		# Taxa	29		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-27 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	1	22.72	0.0023
Annelida : Polychaeta	Arabellidae	Arabella iricolor	0	45.44	1.7585
Annelida : Polychaeta	Capitellidae	Notomastus sp. A Ewing	3	90.88	0.8156
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	10	227.2	0.0091
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	9	295.36	0.125
Annelida : Polychaeta	Goniadidae	Glycinde multidens	1	22.72	0.0045
Annelida : Polychaeta	Hesionidae	Podarke obscura	1	22.72	0.0045
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	2	113.6	0.5657
Annelida : Polychaeta	Onuphidae	Diopatra cuprea	0	22.72	0.1613
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	7	159.04	0.1886
Annelida : Polychaeta	Pilargidae	Sigambra tentaculata	1	22.72	0.0011
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	22.72	0.0068
Annelida : Polychaeta	Spionidae	Prionospio pygmaeus	5	113.6	0.0068
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	28	636.16	0.1204
Annelida : Polychaeta	Spionidae	Polydora cornuta	1	22.72	0.0023
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	4	113.6	0.0454
Annelida : Polychaeta	Terebellidae	Loimia viridis	1	45.44	0.0932
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	12	272.64	0.0364
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0091
Arthropoda : Amphipoda	Ischyroceridae	Cerapus sp C LeCroy 2007	48	1090.56	0.0841
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	4	90.88	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella barnardi	1	22.72	0.0023
Arthropoda : Isopoda	Anthuridae	Ptilanthura tenuis	1	22.72	0.0114
Echinodermata : Holothuroidea	Synaptidae	Leptosynapta tenuis	1	22.72	0.0023
Echinodermata : Ophiuroidea	Amphiuridae	Microphiopholis atra	2	159.04	0.543
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	8	181.76	0.0114
Mollusca : Bivalvia	Nuculidae	Nucula proxima	2	45.44	0.0727
Mollusca : Bivalvia	Solenidae	Ensis directus	0	22.72	0.1954
Mollusca : Bivalvia	Tellinidae	Limecola balthica	1	22.72	0.0636
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0204
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	1	22.72	0.0011
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	3	68.16	0.025
Nemertina	Tubulanidae	Carinomella lactea	6	136.32	0.0136
Phoronida	Phoronidae	Phoronis sp.	2	45.44	0.0011
Platyhelminthes : Turbellaria	Unidentified	Polycladida	1	22.72	0.0011
		Total	171	4316.8	5.0074
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: 17-28 **Collection Date: 9/13/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	70	1590.4	0.0227
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	4	90.88	0.0068
Annelida : Polychaeta	Chaetopteridae	Spiochaetopterus oculatus	6	136.32	0.0295
Annelida : Polychaeta	Cirratulidae	Caulleriella venefica	1	22.72	0.0023
Annelida : Polychaeta	Cirratulidae	Tharyx sp.	1	22.72	0.0045
Annelida : Polychaeta	Hesionidae	Podarkeopsis levifuscina	1	22.72	0.0023
Annelida : Polychaeta	Nephtyidae	Aglaophamus verrilli	1	22.72	0.0068
Annelida : Polychaeta	Nereididae	Alitta succinea	2	45.44	0.0068
Annelida : Polychaeta	Nereididae	Neanthes arenaceodentata	1	22.72	0.0023
Annelida : Polychaeta	Pectinariidae	Pectinaria gouldii	3	68.16	0.0318
Annelida : Polychaeta	Pilargidae	Sigambra tentaculata	1	22.72	0.0011
Annelida : Polychaeta	Pilargidae	Ancistrosyllis hartmanae	1	22.72	0.0023
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	2	45.44	0.0023
Annelida : Polychaeta	Spionidae	Paraprionospio pinnata	2	45.44	0.0091
Annelida : Polychaeta	Spionidae	Spiophanes bombyx	1	22.72	0.0068
Annelida : Polychaeta	Syllidae	Exogone dispar	5	113.6	0.0023
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	8	181.76	0.0011
Annelida : Polychaeta	Terebellidae	Loimia viridis	2	45.44	0.1386
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca verrilli	1	22.72	0.0023
Arthropoda : Amphipoda	Aoridae	Unciola serrata	3	68.16	0.0023
Arthropoda : Amphipoda	Liljeborgiidae	Idunella clymenellae	2	45.44	0.0011
Arthropoda : Decapoda	Pinnotheridae	Pinnixa sp.	1	22.72	0.0045
Arthropoda : Isopoda	Idoteidae	Synidotea laevidorsalis	1	22.72	0.0023
Arthropoda : Mysidacea	Mysidae	Chlamydopleon sp.	1	22.72	0.0023
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	1	22.72	0.0045
Mollusca : Gastropoda	Acteonidae	Japonactaeon punctostriatus	1	22.72	0.0023
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	2	45.44	0.0318
Mollusca : Gastropoda	Corambidae	Corambe obscura	1	22.72	0.0045
Mollusca : Gastropoda	Pyramidellidae	Turbonilla interrupta	1	22.72	0.0023
Mollusca : Gastropoda	Scaphandridae	Acteocina canaliculata	3	68.16	0.0295
Nemertina	Tubulanidae	Carinomella lactea	5	113.6	0.0136
Phoronida	Phoronidae	Phoronis sp.	30	681.6	0.1545
		Total	165	3748.8	0.5372
		# Taxa	32		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI10-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	1	54.8201	0.0329
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	54.8201	0.0713
Annelida : Polychaeta	Spionidae	Polydora cornuta	1	54.8201	0.0219
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	21	1151.2221	0.1699
Arthropoda : Amphipoda	Aoridae	Unciola serrata	1	54.8201	0.0219
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	14	767.4814	0.1535
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	3*	164.4603	0.0219
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	38	2083.1638	0.0384
Arthropoda : Amphipoda	Corophiidae	Corophiidae	8*	438.5608	0.0439
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	5	274.1005	0.1261
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	9	493.3809	0.0493
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	1	54.8201	0.0219
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	711	38977.091	24.7219
Arthropoda : Cirripedia	Unidentified	Balanomorpha	74*	4056.6874	2.573
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0329
Arthropoda : Diptera	Unidentified	Diptera	14	767.4814	0.2028
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	54.8201	0.0164
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	11	603.0211	0.1974
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	8	438.5608	1.6775
		Total	923	50599	30.1948
		# Taxa	16		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI10-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	0.3289
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0178
Annelida : Polychaeta	Nereididae	Alitta succinea	80	888.888	0.4267
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	16	177.7776	0.3289
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	8	88.8888	0.0178
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	136	1511.1096	0.4533
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	72	799.9992	0.9511
Annelida : Polychaeta	Spionidae	Boccardiella hamata	16	177.7776	0.0089
Annelida : Polychaeta	Spionidae	Polydora websteri	8	88.8888	0.0006
Annelida : Polychaeta	Spionidae	Polydora colonia	32	355.5552	0.0089
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	24	266.6664	0.0356
Arthropoda : Amphipoda	Aoridae	Unciola serrata	40	444.444	0.0267
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	32	355.5552	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1440	15999.984	0.9156
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	528*	5866.6608	0.0444
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	56	622.2216	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	32*	355.5552	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	32	355.5552	0.0178
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	128	1422.2208	0.0444
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	216	2399.9976	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	8	88.8888	0.0089
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	104	1155.5544	0.0889
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	16	177.7776	0.0006
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	152	1688.8872	0.3733
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	136	1511.1096	0.5511
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	24	266.6664	0.0178
Mollusca : Gastropoda	Columbellidae	Astyris lunata	32	355.5552	0.2311
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	8	88.8888	0.0089
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	8	88.8888	0.0006
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	8	88.8888	0.0356
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	8	88.8888	0.0089
		Total	3432	38133	5.0521
		# Taxa	30		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI10-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0006
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	56	622.2216	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0444
Annelida : Polychaeta	Nereididae	Alitta succinea	80	888.888	0.0444
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	16	177.7776	0.2933
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1328	14755.541	0.9956
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	8	88.8888	0.0006
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	136	1511.1096	1.1556
Annelida : Polychaeta	Spionidae	Polydora cornuta	48	533.3328	0.0178
Annelida : Polychaeta	Spionidae	Polydora websteri	24	266.6664	0.0089
Annelida : Polychaeta	Spionidae	Polydora colonia	80	888.888	0.0089
Annelida : Polychaeta	Spionidae	Boccardiella hamata	272	3022.2192	0.0711
Annelida : Polychaeta	Syllidae	Syllis alternata	32	355.5552	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	152*	1688.8872	0.0089
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	112	1244.4432	0.0622
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	8	88.8888	0.0178
Arthropoda : Amphipoda	Aoridae	Unciola serrata	232	2577.7752	0.1333
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.	8	88.8888	0.0089
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1656	18399.982	1.4578
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	680*	7555.548	0.0622
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	24	266.6664	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	16	177.7776	0.0089
Arthropoda : Amphipoda	Corophiidae	Corophiidae	24*	266.6664	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	144	1599.9984	0.08
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	576	6399.9936	0.1956
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	16	177.7776	0.0178
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.1867
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	696	7733.3256	3.0311
Arthropoda : Isopoda	Idoteidae	Idotea balthica	8	88.8888	0.0089
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	240	2666.664	0.1778
Mollusca : Bivalvia	Unidentified	Bivalvia	8*	88.8888	0.0178
Mollusca : Gastropoda	Columbellidae	Astyris lunata	48	533.3328	0.3111
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	16	177.7776	0.0178
Mollusca : Gastropoda	Unidentified	Gastropoda	8*	88.8888	0.0444
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0178
		Total	6816	75733	8.5187
		# Taxa	30		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI10-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	16	177.7776	0.1067
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	56	622.2216	0.0178
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0267
Annelida : Polychaeta	Nereididae	Alitta succinea	112	1244.4432	0.0978
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	24	266.6664	0.5956
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	24	266.6664	0.0267
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	472	5244.4392	1.0667
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	144	1599.9984	0.7911
Annelida : Polychaeta	Spionidae	Polydora colonia	40	444.444	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	32	355.5552	0.0006
Annelida : Polychaeta	Spionidae	Boccardiella hamata	56	622.2216	0.0267
Annelida : Polychaeta	Syllidae	Syllidae	8*	88.8888	0.0089
Annelida : Polychaeta	Syllidae	Syllis alternata	32	355.5552	0.0089
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	24	266.6664	0.0267
Arthropoda : Amphipoda	Aoridae	Unciola serrata	24	266.6664	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	360	3999.996	0.3822
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	152*	1688.8872	0.0267
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	80	888.888	0.0178
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	8*	88.8888	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	80	888.888	0.1422
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	56	622.2216	0.0267
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	40	444.444	0.1156
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	32	355.5552	0.1067
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	16	177.7776	0.0178
Mollusca : Gastropoda	Columbellidae	Astyris lunata	40	444.444	0.24
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	40	444.444	3.92
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	56	622.2216	0.0533
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	8	88.8888	0.08
		Total	2080	23111	7.9412
		# Taxa	27		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI11-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	4	219.2804	0.4605
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	3	164.4603	0.2631
Annelida : Polychaeta	Spionidae	Polydora cornuta	1	54.8201	0.0055
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	1	54.8201	0.0439
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	118	6468.7718	1.0909
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	6	328.9206	0.0219
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	17	931.9417	0.0493
Arthropoda : Amphipoda	Corophiidae	Corophiidae	39*	2137.9839	0.0329
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	56	3069.9256	0.1096
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	180	9867.618	2.7136
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	474	25984.727	0.9374
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	21	1151.2221	0.0164
Arthropoda : Cirripedia	Balanidae	Balanidae	39*	2137.9839	2.7134
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	140	7674.814	9.7403
Arthropoda : Cirripedia	Unidentified	Balanomorpha	187*	10251.359	13.0103
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	3	164.4603	0.0329
Arthropoda : Diptera	Unidentified	Diptera	30	1644.603	0.4989
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	26	1425.3226	1.0964
Mollusca : Bivalvia	Mytilidae	Geukensia demissa	3	164.4603	0.148
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	28	1534.9628	3.4482
		Total	1376	75432	36.4334
		# Taxa	17		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI11-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	20	222.222	0.0578
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	100	1111.11	0.0644
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	2	22.2222	0.0022
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	6	66.6666	0.0133
Annelida : Polychaeta	Spionidae	Polydora cornuta	2	22.2222	0.0044
Annelida : Polychaeta	Spionidae	Polydora colonia	2	22.2222	0.0006
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	2	22.2222	0.0022
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	36	399.9996	0.0422
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	24	266.6664	0.02
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	326	3622.2186	0.1644
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	134*	1488.8874	0.0133
Arthropoda : Amphipoda	Corophiidae	Corophiidae	162*	1799.9982	0.0111
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	182	2022.2202	0.0467
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	34	377.7774	0.0156
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	30	333.333	0.0244
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	2	22.2222	0.0022
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	392	4355.5512	0.1467
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	262	2911.1082	0.0644
Arthropoda : Cirripedia	Unidentified	Balanomorpha	4	44.4444	0.0022
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	6	66.6666	0.0067
Arthropoda : Isopoda	Idoteidae	Idotea balthica	10	111.111	0.0067
Arthropoda : Pycnogonida	Callipallenidae	Callipallene brevirostris	2	22.2222	0.0006
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	2	22.2222	0.0006
Chordata : Ascidiacea	Molgulidae	Molgula manhattensis	2	22.2222	0.0111
Chordata : Ascidiacea	Unidentified	Ascidiacea	402	4466.6622	0.0844
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	2	22.2222	0.0022
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	11	122.2221	1.2456
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	4	44.4444	0.0022
Mollusca : Gastropoda	Columbellidae	Astyris lunata	10	111.111	0.0222
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	2	22.2222	0.0222
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	2	22.2222	0.3422
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	2	22.2222	0.0022
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	2	22.2222	0.0133
		Total	2181	24233	2.4603
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI11-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	52	577.7772	0.0044
Annelida : Polychaeta	Nereididae	Alitta succinea	16	177.7776	0.0667
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	16	177.7776	0.1689
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	176	1955.5536	0.4222
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	84	933.3324	0.8756
Annelida : Polychaeta	Spionidae	Polydora colonia	20	222.222	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	8	88.8888	0.0089
Annelida : Polychaeta	Spionidae	Boccardiella hamata	16	177.7776	0.0178
Annelida : Polychaeta	Syllidae	Syllidae	4	44.4444	0.0044
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0222
Arthropoda : Amphipoda	Aoridae	Unciola serrata	32	355.5552	0.0356
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	956*	10622.212	0.0844
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	12	133.3332	0.0133
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2056	22844.422	2.2711
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	48	533.3328	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	40	444.444	0.0356
Arthropoda : Amphipoda	Corophiidae	Corophiidae	8*	88.8888	0.0044
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	4	44.4444	0.0044
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	56	622.2216	0.04
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	8	88.8888	0.0006
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	264	2933.3304	0.1022
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	8	88.8888	0.0044
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	56	622.2216	0.0267
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	52	577.7772	0.3244
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	4	44.4444	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0089
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	3	33.3333	0.7911
Mollusca : Bivalvia	Unidentified	Bivalvia	4*	44.4444	0.0178
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	4	44.4444	0.0711
Mollusca : Gastropoda	Columbellidae	Astyris lunata	4	44.4444	0.0356
Mollusca : Gastropoda	Unidentified	Gastropoda	4*	44.4444	0.0667
		Total	4031	44789	5.5395
		# Taxa	27		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI11-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	64	711.1104	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	40	444.444	0.3111
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	264	2933.3304	0.0267
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	8	88.8888	0.0267
Annelida : Polychaeta	Nereididae	Alitta succinea	104	1155.5544	0.2311
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.24
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	296	3288.8856	0.5956
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	64	711.1104	0.0711
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	32	355.5552	0.3378
Annelida : Polychaeta	Spionidae	Boccardiella hamata	32	355.5552	0.0267
Annelida : Polychaeta	Spionidae	Polydora colonia	184	2044.4424	0.0444
Annelida : Polychaeta	Spionidae	Polydora cornuta	104	1155.5544	0.0444
Annelida : Polychaeta	Spionidae	Dipolydora socialis	24	266.6664	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	240	2666.664	0.0356
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	16	177.7776	0.0178
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	16	177.7776	0.0089
Arthropoda : Amphipoda	Aoridae	Unciola serrata	112	1244.4432	0.0711
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	24	266.6664	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	408*	4533.3288	0.0356
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	32	355.5552	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1160	12888.876	0.7467
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	96	1066.6656	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	144	1599.9984	0.08
Arthropoda : Amphipoda	Corophiidae	Corophiidae	120*	1333.332	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	80	888.888	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	144	1599.9984	0.0444
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	24	266.6664	0.0089
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	40	444.444	0.0178
Arthropoda : Cirripedia	Unidentified	Balanomorpha	8	88.8888	0.0089
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.0444
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	80	888.888	0.3467
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	8	88.8888	0.0178
Chordata : Ascidiacea	Unidentified	Ascidiacea	240	2666.664	0.0267
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0267
Mollusca : Bivalvia	Arcidae	Anadara transversa	16	177.7776	0.1244
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	2	22.2222	1.8011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	112	1244.4432	0.6044
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	16	177.7776	0.1156
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	88	977.7768	0.0622
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	8	88.8888	0.08
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0267
Platyhelminthes : Turbellaria	Prosthiostomidae	Eupiana gracilis	24	266.6664	0.0006
		Total	4514	50156	6.4254
		# Taxa	40		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI12-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	109.6402	0.0055
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	1	54.8201	0.0055
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	7	383.7407	0.011
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	1	54.8201	0.011
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	486	26642.569	54.7982
Arthropoda : Diptera	Unidentified	Diptera	95	5207.9095	1.2883
		Total	592	32453	56.1195
		# Taxa	6		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI12-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0044
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	16	177.7776	0.0133
Annelida : Polychaeta	Maldanidae	Maldanidae	20	222.222	0.0133
Annelida : Polychaeta	Nereididae	Alitta succinea	36	399.9996	0.0889
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	8	88.8888	0.0133
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	8	88.8888	0.0844
Annelida : Polychaeta	Spionidae	Polydora cornuta	172	1911.1092	0.0267
Annelida : Polychaeta	Spionidae	Polydora websteri	12	133.3332	0.0089
Annelida : Polychaeta	Spionidae	Boccardiella hamata	24	266.6664	0.0178
Annelida : Polychaeta	Syllidae	Syllidae	8	88.8888	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	48	533.3328	0.0933
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1900	21111.09	3.0889
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1848*	20533.313	0.1556
Arthropoda : Amphipoda	Corophiidae	Corophiidae	6752*	75022.147	0.5689
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	4044	44933.288	1.7333
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	852	9466.6572	0.3822
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	32	355.5552	0.0222
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	4	44.4444	0.0178
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	692	7688.8812	0.5422
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	720	7999.992	0.2356
Arthropoda : Decapoda	Panopeidae	Panopeidae	4	44.4444	0.2311
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	4	44.4444	0.0044
Arthropoda : Diptera	Unidentified	Diptera	4	44.4444	0.0222
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	16	177.7776	0.1333
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	140	1555.554	0.1822
Mollusca : Bivalvia	Arcidae	Anadara transversa	12	133.3332	0.4622
Mollusca : Bivalvia	Mytilidae	Geukensia demissa	56	622.2216	0.0311
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	3	33.3333	0.3333
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis	28	311.1108	0.0006
Mollusca : Bivalvia	Unidentified	Bivalvia	12*	133.3332	0.0178
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	20	222.222	1.1289
Mollusca : Gastropoda	Columbellidae	Astyris lunata	8	88.8888	0.0622
Mollusca : Gastropoda	Epitoniidae	Epitonium humphreysii	4	44.4444	0.0089
Nemertina	Amphiporidae	Amphiporus bioculatus	4	44.4444	0.0133
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0133
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	64	711.1104	0.0178
		Total	17591	195455	9.7742
		# Taxa	33		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI12-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	64	711.1104	0.0178
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	80	888.888	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0356
Annelida : Polychaeta	Nereididae	Alitta succinea	272	3022.2192	0.2844
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	16	177.7776	0.0889
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	448	4977.7728	0.9422
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	64	711.1104	0.1067
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	144	1599.9984	1.6178
Annelida : Polychaeta	Spionidae	Polydora colonia	304	3377.7744	0.0533
Annelida : Polychaeta	Spionidae	Polydora cornuta	144	1599.9984	0.0356
Annelida : Polychaeta	Spionidae	Boccardiella hamata	32	355.5552	0.0178
Annelida : Polychaeta	Syllidae	Syllidae	96	1066.6656	0.0006
Annelida : Polychaeta	Syllidae	Proceraea cornuta	16	177.7776	0.0178
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	32	355.5552	0.0178
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	16	177.7776	0.0533
Arthropoda : Amphipoda	Aoridae	Unciola serrata	128	1422.2208	0.1244
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	16	177.7776	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	11232	124799.88	8
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	4400*	48888.84	0.32
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	240	2666.664	0.1422
Arthropoda : Amphipoda	Corophiidae	Corophiidae	112*	1244.4432	0.0178
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	272	3022.2192	0.1067
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	32	355.5552	0.0178
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	64	711.1104	0.0178
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	320	3555.552	0.16
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	80	888.888	0.0356
Arthropoda : Cirripedia	Balanidae	Balanidae	16	177.7776	0.0178
Arthropoda : Crustacea	Leptocheliidae	Leptocheliidae	16	177.7776	0.0178
Arthropoda : Decapoda	Panopeidae	Panopeidae	32	355.5552	0.32
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	160	1777.776	0.1244
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	96	1066.6656	0.1956
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	2.8367
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	16	177.7776	0.2667
		Total	18993	211033	16.0293
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI12-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	32	355.5552	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	16	177.7776	0.8356
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	80	888.888	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0178
Annelida : Polychaeta	Nereididae	Alitta succinea	288	3199.9968	0.3378
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	32	355.5552	0.6756
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	192	2133.3312	0.3289
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1560	17333.316	2.1778
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	200	2222.22	2.0978
Annelida : Polychaeta	Spionidae	Polydora cornuta	184	2044.4424	0.0267
Annelida : Polychaeta	Spionidae	Polydora colonia	264	2933.3304	0.0356
Annelida : Polychaeta	Spionidae	Boccardiella hamata	104	1155.5544	0.0711
Annelida : Polychaeta	Spionidae	Polydora websteri	16	177.7776	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	72*	799.9992	0.0006
Annelida : Polychaeta	Syllidae	Proceraea cornuta	16	177.7776	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	32	355.5552	0.0356
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	32	355.5552	0.0533
Arthropoda : Amphipoda	Aoridae	Unciola serrata	128	1422.2208	0.1333
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	8	88.8888	0.0089
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1080*	11999.988	0.1156
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	160	1777.776	0.0533
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	16	177.7776	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	984	10933.322	0.88
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	160	1777.776	0.0006
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	224	2488.8864	0.1156
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0089
Arthropoda : Amphipoda	Corophiidae	Corophiidae	248*	2755.5528	0.0444
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	128	1422.2208	0.0889
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	392	4355.5512	0.1422
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	72	799.9992	0.0356
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	120	1333.332	0.0178
Arthropoda : Decapoda	Panopeidae	Panopeidae	24	266.6664	1.0667
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	56	622.2216	0.1778
Arthropoda : Isopoda	Idoteidae	Synidotea laticauda	16	177.7776	0.24
Arthropoda : Pycnogonida	Phoxichilidiidae	Anoplodactylus petiolatus	8	88.8888	0.0006
Chordata : Ascidiacea	Unidentified	Ascidiacea	256	2844.4416	0.0267
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	264	2933.3304	0.6667
Mollusca : Bivalvia	Arcidae	Anadara transversa	8	88.8888	0.0356
Mollusca : Gastropoda	Columbellidae	Astyris lunata	8	88.8888	0.0267
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	0.8533
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0089
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0089
		Total	7584	84267	11.472
		# Taxa	40		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI1-INT1 **Collection Date: 10/2/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Capitella teleta	11	603.0211	0.011
Annelida : Polychaeta	Nereididae	Alitta succinea	46	2521.7246	3.9306
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	1	54.8201	0.0877
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	1	54.8201	0.1425
Annelida : Polychaeta	Spionidae	Polydora websteri	5	274.1005	0.0384
Annelida : Polychaeta	Spionidae	Polydora cornuta	4	219.2804	0.0027
Annelida : Polychaeta	Spionidae	Streblospio benedicti	6	328.9206	0.0164
Annelida : Polychaeta	Syllidae	Salvatoria clavata	1	54.8201	0.0055
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1*	54.8201	0.0027
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	109.6402	0.0055
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	1	54.8201	0.0027
Arthropoda : Amphipoda	Corophiidae	Corophiidae	1*	54.8201	0.0027
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	3	164.4603	0.0027
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	1	54.8201	0.0055
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	1	54.8201	0.0027
Arthropoda : Amphipoda	Melitidae	Melita nitida	162	8880.8562	0.2905
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	54.8201	0.0055
Arthropoda : Decapoda	Panopeidae	Panopeidae	9	493.3809	0.1042
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0164
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	4	219.2804	2.2093
Arthropoda : Diptera	Unidentified	Diptera	2	109.6402	0.0274
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	20	1096.402	0.2577
Mollusca : Bivalvia	Mytilidae	Geukensia demissa	59	3234.3859	80.8377
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	91	4988.6291	698.9782
Mollusca : Gastropoda	Pyramidellidae	Boonea impressa	1	54.8201	0.0329
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	54.8201	0.0055
		Total	436	23902	787.025
		# Taxa	24		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI1-SUB1 **Collection Date: 10/2/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	96	1066.6656	0.0711
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0356
Annelida : Polychaeta	Nereididae	Alitta succinea	256	2844.4416	1.0311
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	512	5688.8832	3.9111
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	256	2844.4416	1.4578
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	96	1066.6656	4.5156
Annelida : Polychaeta	Spionidae	Polydora cornuta	128	1422.2208	0.0356
Annelida : Polychaeta	Spionidae	Polydora colonia	224	2488.8864	0.0711
Annelida : Polychaeta	Spionidae	Streblospio benedicti	32	355.5552	0.0356
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	192	2133.3312	0.4978
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	32	355.5552	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	4224	46933.286	3.0578
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	2624*	29155.526	0.1778
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	224	2488.8864	0.0711
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	128	1422.2208	0.0356
Arthropoda : Amphipoda	Corophiidae	Corophiidae	64*	711.1104	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	832	9244.4352	0.5689
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	320	3555.552	0.1778
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	192	2133.3312	0.1067
Arthropoda : Amphipoda	Melitidae	Melita nitida	32	355.5552	0.0356
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	96	1066.6656	0.0356
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	32	355.5552	0.32
Arthropoda : Decapoda	Panopeidae	Panopeidae	96	1066.6656	0.4267
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	992	11022.211	2.9511
Chordata : Ascidiacea	Unidentified	Ascidiacea	192	2133.3312	0.0711
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	32	355.5552	0.0711
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	4	44.4444	0.9556
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	96	1066.6656	0.0711
Mollusca : Gastropoda	Columbellidae	Astyris lunata	96	1066.6656	3.4133
		Total	12132	134800	24.2105
		# Taxa	27		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI1-SUB2 **Collection Date: 10/2/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0089
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	16	177.7776	0.24
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	8	88.8888	0.0267
Annelida : Polychaeta	Nereididae	Alitta succinea	216	2399.9976	0.5689
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	16	177.7776	0.1244
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	352	3911.1072	2.4622
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	160	1777.776	0.5156
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	8	88.8888	0.2044
Annelida : Polychaeta	Spionidae	Boccardiella hamata	8	88.8888	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	616	6844.4376	0.0711
Annelida : Polychaeta	Spionidae	Dipolydora socialis	16	177.7776	0.0006
Annelida : Polychaeta	Spionidae	Polydora colonia	376	4177.7736	0.0356
Annelida : Polychaeta	Syllidae	Syllidae	56	622.2216	0.0089
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0889
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	8	88.8888	0.0089
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	8	88.8888	0.0006
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	8	88.8888	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	336*	3733.3296	0.0267
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	464	5155.5504	0.0006
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	168	1866.6648	0.0089
Arthropoda : Amphipoda	Corophiidae	Corophiidae	240*	2666.664	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	160	1777.776	0.0711
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	208	2311.1088	0.1244
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	64	711.1104	0.0178
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	64	711.1104	0.0444
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	432	4799.9952	0.0711
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	16	177.7776	0.0533
Arthropoda : Decapoda	Panopeidae	Panopeidae	8	88.8888	0.1156
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	32	355.5552	0.1511
Chordata : Ascidiacea	Unidentified	Ascidiacea	168	1866.6648	0.0267
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.1689
Mollusca : Bivalvia	Arcidae	Anadara transversa	8	88.8888	0.0444
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	24.05
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	24	266.6664	0.0356
Mollusca : Gastropoda	Columbellidae	Astyris lunata	32	355.5552	0.2578
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	16	177.7776	0.0089
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0006
		Total	4345	48278	29.6709
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI1-SUB3 **Collection Date: 10/2/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	2	22.2222	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	7	77.7777	0.0144
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	3	33.3333	0.0089
Annelida : Polychaeta	Nereididae	Alitta succinea	53	588.8883	0.1678
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	32	355.5552	0.3144
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	24	266.6664	0.1367
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	14	155.5554	0.2278
Annelida : Polychaeta	Spionidae	Polydora cornuta	17	188.8887	0.0011
Annelida : Polychaeta	Spionidae	Polydora websteri	5	55.5555	0.0011
Annelida : Polychaeta	Spionidae	Polydora colonia	13	144.4443	0.0022
Annelida : Polychaeta	Syllidae	Opisthodonta longocirrata	1	11.1111	0.0011
Annelida : Polychaeta	Syllidae	Proceraea cornuta	2	22.2222	0.0011
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	11.1111	0.0033
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	4	44.4444	0.0111
Arthropoda : Amphipoda	Aoridae	Microdeutopus gryllotalpa	23	255.5553	0.0078
Arthropoda : Amphipoda	Aoridae	Unciola serrata	1	11.1111	0.0011
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.	1	11.1111	0.0011
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	1	11.1111	0.0011
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	53*	588.8883	0.0033
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	13	144.4443	0.0044
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	13	144.4443	0.0033
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	98	1088.8878	0.0656
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	27	299.9997	0.0033
Arthropoda : Amphipoda	Corophiidae	Corophiidae	49*	544.4439	0.6278
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	63	699.9993	0.0311
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	52	577.7772	0.0311
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	2	22.2222	0.0022
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	67	744.4437	0.0256
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	62	688.8882	0.0333
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	78	866.6658	0.0133
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	3	33.3333	0.0078
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	5	55.5555	0.0844
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	7	77.7777	0.0178
Chordata : Ascidiacea	Unidentified	Ascidiacea	1	11.1111	0.0011
Mollusca : Bivalvia	Mytilidae	Geukensia demissa	1	11.1111	0.0011
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	5	55.5555	22.1422
Mollusca : Bivalvia	Unidentified	Bivalvia	1*	11.1111	0.0544
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	7	77.7777	0.0022
Mollusca : Gastropoda	Columbellidae	Astyris lunata	34	377.7774	0.1633
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	1	11.1111	0.0033
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	17	188.8887	0.1556
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	2	22.2222	0.0144
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	2	22.2222	0.0006
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	14	155.5554	0.0144
		Total	881	9788.9	24.4096
		# Taxa	41		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI2-INT1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	1	54.8201	0.5975
Annelida : Polychaeta	Nereididae	Alitta succinea	1	54.8201	0.011
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	65	3563.3065	0.5811
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	1	54.8201	0.0055
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	1	54.8201	0.0027
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	9	493.3809	0.0658
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	31	1699.4231	0.1096
Arthropoda : Amphipoda	Corophiidae	Corophiidae	9*	493.3809	0.011
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	2	109.6402	0.0055
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	1	54.8201	0.0055
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	1	54.8201	0.0027
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	165	9045.3165	6.5949
Arthropoda : Diptera	Unidentified	Diptera	31	1699.4231	0.3673
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	54.8201	0.011
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	2	109.6402	0.0055
Mollusca : Gastropoda	Columbellidae	Astyris lunata	1	54.8201	0.0329
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	1	54.8201	0.0274
Nemertina	Amphiporidae	Zygonemertes virescens	1	54.8201	0.011
		Total	324	17762	8.4479
		# Taxa	17		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI2-SUB1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	32	355.5552	0.0356
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	16	177.7776	0.2655
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	4.0109
Annelida : Polychaeta	Nereididae	Alitta succinea	192	2133.3312	0.7738
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	304	3377.7744	0.0433
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	32	355.5552	1.0773
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	160	1777.776	0.0469
Annelida : Polychaeta	Spionidae	Polydora cornuta	176	1955.5536	0.0082
Annelida : Polychaeta	Spionidae	Dipolydora socialis	32	355.5552	0.4699
Annelida : Polychaeta	Spionidae	Polydora websteri	80	888.888	0.0827
Annelida : Polychaeta	Spionidae	Polydora colonia	64	711.1104	0.176
Annelida : Polychaeta	Syllidae	Salvatoria clavata	16	177.7776	0.8329
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	48	533.3328	0.0958
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	224	2488.8864	0.2822
Arthropoda : Amphipoda	Aoridae	Unciola serrata	320	3555.552	0.0068
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	32	355.5552	0.0326
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	9232	102577.68	8.4009
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	4752*	52799.947	0.5351
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	640	7111.104	0.0904
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	32	355.5552	0.0192
Arthropoda : Amphipoda	Corophiidae	Corophiidae	48*	533.3328	0.0268
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	800	8888.88	0.0382
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	128	1422.2208	1.7248
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	448	4977.7728	1.1959
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	48	533.3328	0.0213
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	16	177.7776	0.0036
Arthropoda : Decapoda	Panopeidae	Panopeidae	80	888.888	0.0536
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	352	3911.1072	0.6247
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	96	1066.6656	144.8767
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	5	55.5555	22.1422
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	272	3022.2192	0.2581
Mollusca : Gastropoda	Columbellidae	Astyris lunata	192	2133.3312	1.29
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	160	1777.776	0.0192
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	16	177.7776	0.0574
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	48	533.3328	0.0222
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	16	177.7776	0.0933
		Total	19141	212678	189.734
		# Taxa	34		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI2-SUB2 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	16	177.7776	0.0267
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	64	711.1104	0.0178
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0444
Annelida : Polychaeta	Nereididae	Alitta succinea	104	1155.5544	0.5778
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	248	2755.5528	1.2089
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	40	444.444	0.0089
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	48	533.3328	0.7556
Annelida : Polychaeta	Spionidae	Polydora colonia	152	1688.8872	0.0267
Annelida : Polychaeta	Spionidae	Boccardiella hamata	48	533.3328	0.0444
Annelida : Polychaeta	Spionidae	Polydora cornuta	136	1511.1096	0.0006
Annelida : Polychaeta	Syllidae	Salvatoria clavata	32	355.5552	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0089
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	8	88.8888	0.0089
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	32	355.5552	0.0267
Arthropoda : Amphipoda	Aoridae	Unciola serrata	48	533.3328	0.0089
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	24	266.6664	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1096*	12177.766	0.0622
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1648	18311.093	2.0533
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	120	1333.332	0.0178
Arthropoda : Amphipoda	Corophiidae	Corophiidae	56*	622.2216	0.0006
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	96	1066.6656	0.0444
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	72	799.9992	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	168	1866.6648	0.08
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	216	2399.9976	0.16
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	8	88.8888	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.1244
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	8	88.8888	0.9511
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	280	3111.108	1.6711
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	16	177.7776	0.1333
Mollusca : Bivalvia	Arcidae	Anadara transversa	8	88.8888	0.32
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	64	711.1104	0.0978
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	104	1155.5544	4.4
Mollusca : Gastropoda	Columbellidae	Astyris lunata	152	1688.8872	0.9778
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	16	177.7776	0.0267
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	8	88.8888	0.0178
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0089
		Total	5200	57778	13.9853
		# Taxa	34		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI2-SUB3 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	0.0711
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	8	88.8888	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0356
Annelida : Polychaeta	Nereididae	Alitta succinea	112	1244.4432	0.4
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.16
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	72	799.9992	0.3556
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	96	1066.6656	0.4
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	80	888.888	0.8978
Annelida : Polychaeta	Spionidae	Boccardiella hamata	48	533.3328	0.0267
Annelida : Polychaeta	Spionidae	Polydora cornuta	8	88.8888	0.0089
Annelida : Polychaeta	Spionidae	Streblospio benedicti	8	88.8888	0.0089
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	8	88.8888	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	8	88.8888	0.0006
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	64	711.1104	0.0267
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	96	1066.6656	0.0711
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	8*	88.8888	0.0006
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	8	88.8888	0.0178
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	32	355.5552	0.0178
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	8	88.8888	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	16	177.7776	0.0006
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	16	177.7776	0.0178
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	24	266.6664	0.0089
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	8	88.8888	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	32	355.5552	0.1156
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	8	88.8888	0.9156
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	24	266.6664	0.0978
Chordata : Ascidiacea	Unidentified	Ascidiacea	16	177.7776	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.32
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	0.7089
Mollusca : Gastropoda	Calyptraeidae	Crepidula convexa	8	88.8888	0.16
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	24	266.6664	0.0267
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	0.8711
Mollusca : Gastropoda	Columbellidae	Astyris lunata	56	622.2216	0.3022
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	8	88.8888	0.0267
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	8	88.8888	0.0978
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	8	88.8888	0.0711
		Total	1025	11389	6.2519
		# Taxa	36		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI3-INT1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	1	54.8201	0.1645
Annelida : Polychaeta	Nereididae	Alitta succinea	6	328.9206	0.0439
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	3	164.4603	0.2083
Annelida : Polychaeta	Spionidae	Polydora websteri	2	109.6402	0.011
Annelida : Polychaeta	Spionidae	Polydora cornuta	12	657.8412	0.0219
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	273	14965.887	1.4692
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	4	219.2804	0.0164
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	694	38045.149	1.6446
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	54.8201	0.011
Arthropoda : Amphipoda	Corophiidae	Corophiidae	121*	6633.2321	0.1699
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	1	54.8201	0.0055
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	76	4166.3276	0.2028
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	3	164.4603	0.0055
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	35	1918.7035	0.0767
Arthropoda : Cirripedia	Balanidae	Balanidae	7*	383.7407	0.5398
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	237	12992.364	18.2773
Arthropoda : Cirripedia	Unidentified	Balanomorpha	7*	383.7407	0.5398
Arthropoda : Decapoda	Panopeidae	Panopeidae	1	54.8201	0.0548
Arthropoda : Diptera	Unidentified	Diptera	14	767.4814	0.0767
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	54.8201	0.0055
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	2	109.6402	0.0439
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	54.8201	0.0658
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	4	219.2804	0.0274
		Total	1506	82559	23.6822
		# Taxa	20		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI3-SUB1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	28	311.1108	0.0844
Annelida : Polychaeta	Nereididae	Alitta succinea	60	666.666	0.2
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	152	1688.8872	0.4133
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	4	44.4444	0.0311
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	20	222.222	0.1644
Annelida : Polychaeta	Spionidae	Polydora websteri	16	177.7776	0.0311
Annelida : Polychaeta	Spionidae	Polydora cornuta	16	177.7776	0.0178
Annelida : Polychaeta	Syllidae	Syllidae	8	88.8888	0.0133
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	36	399.9996	0.04
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	8	88.8888	0.0044
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	684*	7599.9924	0.0578
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	956	10622.212	0.6178
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	16	177.7776	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	36	399.9996	0.0311
Arthropoda : Amphipoda	Corophiidae	Corophiidae	28*	311.1108	0.0044
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	236	2622.2196	0.1067
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	12	133.3332	0.0006
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	92	1022.2212	0.0267
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	52	577.7772	0.0356
Arthropoda : Decapoda	Panopeidae	Panopeidae	20	222.222	0.1511
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	4	44.4444	0.2933
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	184	2044.4424	0.5644
Arthropoda : Isopoda	Idoteidae	Idotea balthica	8	88.8888	0.0044
Arthropoda : Pycnogonida	Callipallenidae	Callipallene brevirostris	4	44.4444	0.0044
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	4	44.4444	0.0178
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	24	266.6664	0.0667
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	492	5466.6612	0.4667
Mollusca : Gastropoda	Columbellidae	Astyris lunata	36	399.9996	0.2489
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	8	88.8888	0.0311
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	12	133.3332	0.0133
		Total	3256	36178	3.7432
		# Taxa	28		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI3-SUB2 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	12	133.3332	0.0006
Annelida : Polychaeta	Capitellidae	Capitella teleta	32	355.5552	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	4	44.4444	0.0006
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	4	44.4444	0.0006
Annelida : Polychaeta	Nereididae	Alitta succinea	28	311.1108	0.0889
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	160	1777.776	0.5111
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	16	177.7776	0.08
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	8	88.8888	0.08
Annelida : Polychaeta	Spionidae	Boccardiella hamata	12	133.3332	0.0089
Annelida : Polychaeta	Spionidae	Streblospio benedicti	4	44.4444	0.0089
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia	8	88.8888	0.0133
Annelida : Polychaeta	Spionidae	Polydora cornuta	36	399.9996	0.0044
Annelida : Polychaeta	Syllidae	Syllidae	12	133.3332	0.0044
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0711
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	4	44.4444	0.0044
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	20	222.222	0.0222
Arthropoda : Amphipoda	Aoridae	Unciola serrata	44	488.8884	0.0133
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	4	44.4444	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1264*	14044.430	0.08
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1192	13244.431	0.6356
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	28	311.1108	0.0044
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	4	44.4444	0.0044
Arthropoda : Amphipoda	Corophiidae	Corophiidae	4*	44.4444	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	364	4044.4404	0.2222
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	180	1999.998	0.0533
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	4	44.4444	0.0044
Arthropoda : Amphipoda	Phoxocephalidae	Eobrolgus spinosus	4	44.4444	0.0006
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	16	177.7776	0.0044
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	36	399.9996	0.08
Arthropoda : Decapoda	Panopeidae	Panopeidae	20	222.222	0.1022
Arthropoda : Decapoda	Portunidae	Callinectes sapidus	4	44.4444	0.2933
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	272	3022.2192	0.8
Arthropoda : Pycnogonida	Callipallenidae	Callipallene brevirostris	4	44.4444	0.0006
Chordata : Ascidiacea	Unidentified	Ascidiacea	4	44.4444	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	12	133.3332	0.0222
Mollusca : Bivalvia	Arcidae	Anadara transversa	8	88.8888	0.0889
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	16	177.7776	5.9722
Mollusca : Gastropoda	Calyptraeidae	Crepidula fornicata	4	44.4444	0.0222
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	1324	14711.096	1.0756
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	64	711.1104	1.1644
Mollusca : Gastropoda	Columbellidae	Astyris lunata	188	2088.8868	1.2533
Mollusca : Gastropoda	Columbellidae	Columbellidae	4*	44.4444	0.0267
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	8	88.8888	2.9556
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	4	44.4444	0.0089
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	20	222.222	0.04
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	4	44.4444	0.0006
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	4	44.4444	#Numl
Mollusca : Gastropoda	Unidentified	Gastropoda	4*	44.4444	0.0089
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	4	44.4444	0.0044

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

Total	5484	60933	15.8444
# Taxa	45		

SampleID: EPI3-SUB3 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	4	44.4444	0.0044
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	24	266.6664	0.0044
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	16	177.7776	0.1556
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	4	44.4444	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	8	88.8888	0.0006
Annelida : Polychaeta	Nereididae	Alitta succinea	60	666.666	0.1067
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	24	266.6664	0.0489
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	108	1199.9988	0.4844
Annelida : Polychaeta	Sabellidae	Sabellidae	4*	44.4444	0.0006
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	36	399.9996	0.4667
Annelida : Polychaeta	Spionidae	Polydora colonia	176	1955.5536	0.0089
Annelida : Polychaeta	Spionidae	Polydora cornuta	48	533.3328	0.0006
Annelida : Polychaeta	Spionidae	Polydora websteri	4	44.4444	0.0006
Annelida : Polychaeta	Spionidae	Boccardiella hamata	72	799.9992	0.0444
Annelida : Polychaeta	Spionidae	Dipolydora caulleryi	4	44.4444	0.0044
Annelida : Polychaeta	Syllidae	Salvatoria clavata	16	177.7776	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	24*	266.6664	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	16	177.7776	0.0444
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	4	44.4444	0.0044
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	16	177.7776	0.0044
Arthropoda : Amphipoda	Aoridae	Unciola serrata	24	266.6664	0.0133
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	12	133.3332	0.0133
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	284*	3155.5524	0.0222
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	660	7333.326	0.5289
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	72	799.9992	0.0006
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	20	222.222	0.0044
Arthropoda : Amphipoda	Corophiidae	Corophiidae	12*	133.3332	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	56	622.2216	0.0267
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	140	1555.554	0.0356
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	120	1333.332	0.0578
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	4	44.4444	0.1067
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.32
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	112	1244.4432	0.3778
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0444
Mollusca : Bivalvia	Arcidae	Anadara transversa	4	44.4444	0.0044
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	0.0022
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	4	44.4444	0.0044
Mollusca : Gastropoda	Columbellidae	Astyris lunata	4	44.4444	0.0178
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0006
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	16	177.7776	0.0006
		Total	2245	24944	2.9685
		# Taxa	36		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI4-INT1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Capitella teleta	1	54.8201	0.0027
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	1	54.8201	0.0384
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	2	109.6402	0.2412
Annelida : Polychaeta	Nereididae	Alitta succinea	8	438.5608	0.0932
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	2	109.6402	0.1316
Annelida : Polychaeta	Sabellidae	Sabellidae	1*	54.8201	0.0027
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	1	54.8201	0.2357
Annelida : Polychaeta	Spionidae	Polydora websteri	12	657.8412	0.1042
Annelida : Polychaeta	Spionidae	Polydora cornuta	8	438.5608	0.0164
Annelida : Polychaeta	Spionidae	Dipolydora socialis	1	54.8201	0.0055
Annelida : Polychaeta	Spionidae	Boccardiella hamata	1	54.8201	0.0055
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	200	10964.02	1.1128
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	4*	219.2804	0.0055
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	4	219.2804	0.0329
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	518	28396.812	1.0087
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	4	219.2804	0.0274
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	1	54.8201	0.0027
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	40	2192.804	0.1206
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	2	109.6402	0.011
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	15	822.3015	0.0329
Arthropoda : Cirripedia	Balanidae	Balanidae	20*	1096.402	0.3454
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	5	274.1005	0.2631
Arthropoda : Cirripedia	Unidentified	Balanomorpha	7*	383.7407	0.0219
Arthropoda : Decapoda	Panopeidae	Panopeidae	3	164.4603	0.0822
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0439
Arthropoda : Diptera	Unidentified	Diptera	4	219.2804	0.0329
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	54.8201	0.0055
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	1	54.8201	0.0877
Arthropoda : Pycnogonida	Phoxichilidiidae	Anoplodactylus petiolatus	1	54.8201	0.0055
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	6	328.9206	0.0767
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	54.8201	0.0164
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	54.8201	24.998
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	3	164.4603	0.0055
		Total	880	48242	29.2163
		# Taxa	29		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI4-SUB1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	48	533.3328	0.1244
Annelida : Polychaeta	Sabellaridae	Sabellaria vulgaris	40	444.444	0.1333
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	16	177.7776	0.0356
Annelida : Polychaeta	Spionidae	Dipolydora socialis	8	88.8888	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	16	177.7776	0.0006
Annelida : Polychaeta	Spirorbidae	Spirorbis sp.	8	88.8888	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	16	177.7776	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	232	2577.7752	0.2578
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1176*	13066.654	0.0889
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1912	21244.423	1.7689
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	64*	711.1104	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	304	3377.7744	0.2311
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	560	6222.216	0.1867
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	8	88.8888	0.0006
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	80	888.888	0.0178
Arthropoda : Cirripedia	Balanidae	Balanidae	8	88.8888	0.0006
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	272	3022.2192	0.7644
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	24	266.6664	0.0444
Mollusca : Bivalvia	Arcidae	Anadara transversa	8	88.8888	0.0006
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	0.3989
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	360	3999.996	0.3644
Mollusca : Gastropoda	Columbellidae	Astyris lunata	136	1511.1096	1.0489
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	32	355.5552	0.2933
Mollusca : Gastropoda	Corambidae	Corambe obscura	8	88.8888	0.0533
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	8	88.8888	2.2133
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	16	177.7776	0.0178
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0006
		Total	5385	59833	8.0581
		# Taxa	27		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI4-SUB2 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	8	88.8888	0.0006
Annelida : Polychaeta	Capitellidae	Capitella teleta	8	88.8888	0.0006
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	64	711.1104	0.0089
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	0.1333
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	1664	18488.870	0.0889
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	48	533.3328	0.0533
Annelida : Polychaeta	Nereididae	Alitta succinea	96	1066.6656	0.0978
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	8	88.8888	0.0533
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	824	9155.5464	1.8489
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	88	977.7768	0.1422
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	104	1155.5544	0.5333
Annelida : Polychaeta	Spionidae	Polydora websteri	8	88.8888	0.0006
Annelida : Polychaeta	Spionidae	Boccardiella hamata	128	1422.2208	0.1067
Annelida : Polychaeta	Spionidae	Polydora cornuta	96	1066.6656	0.0178
Annelida : Polychaeta	Spionidae	Streblospio benedicti	8	88.8888	0.0089
Annelida : Polychaeta	Spionidae	Polydora colonia	272	3022.2192	0.0356
Annelida : Polychaeta	Syllidae	Syllidae	144	1599.9984	0.0089
Annelida : Polychaeta	Syllidae	Salvatoria clavata	32	355.5552	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	32	355.5552	0.0267
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	24	266.6664	0.0089
Arthropoda : Amphipoda	Aoridae	Unciola serrata	72	799.9992	0.0267
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	16	177.7776	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1432	15911.095	1.1644
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1096*	12177.766	0.0711
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	96	1066.6656	0.0089
Arthropoda : Amphipoda	Corophiidae	Corophiidae	72*	799.9992	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	48	533.3328	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	168	1866.6648	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	400	4444.44	0.1244
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	64	711.1104	0.0533
Arthropoda : Cirripedia	Unidentified	Balanomorpha	8*	88.8888	0.0006
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	32	355.5552	0.0711
Arthropoda : Decapoda	Panopeidae	Panopeidae	24	266.6664	0.2222
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	240	2666.664	0.9422
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	112	1244.4432	0.2844
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	2	22.2222	0.8878
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	384	4266.6624	0.3022
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	96	1066.6656	2.4267
Mollusca : Gastropoda	Columbellidae	Astyris lunata	88	977.7768	0.3378
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	56	622.2216	0.08
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	16	177.7776	0.0533
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0178
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	16	177.7776	0.0006
		Total	8210	91222	10.3497
		# Taxa	40		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI4-SUB3 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	56	622.2216	0.0089
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	40	444.444	0.9956
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	440	4888.884	0.0178
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	8	88.8888	0.0178
Annelida : Polychaeta	Nereididae	Alitta succinea	56	622.2216	0.0356
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	352	3911.1072	0.3911
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	48	533.3328	0.0267
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	32	355.5552	0.2489
Annelida : Polychaeta	Spionidae	Boccardiella hamata	120	1333.332	0.0533
Annelida : Polychaeta	Spionidae	Polydora cornuta	40	444.444	0.0178
Annelida : Polychaeta	Spionidae	Polydora colonia	96	1066.6656	0.0178
Annelida : Polychaeta	Spionidae	Dipolydora socialis	16	177.7776	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	136	1511.1096	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	32	355.5552	0.0444
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	8	88.8888	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	88	977.7768	0.0533
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	8	88.8888	0.0089
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	624*	6933.3264	0.0444
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2864	31822.190	2.64
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	96	1066.6656	0.0178
Arthropoda : Amphipoda	Corophiidae	Corophiidae	32*	355.5552	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	40	444.444	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	160	1777.776	0.0978
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	296	3288.8856	0.08
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	272	3022.2192	0.1511
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.3022
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	8	88.8888	0.4622
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	80	888.888	0.3733
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	8	88.8888	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	32	355.5552	0.0267
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	128	1422.2208	0.0978
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	0.8622
Mollusca : Gastropoda	Columbellidae	Astyris lunata	112	1244.4432	0.56
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	56	622.2216	0.0711
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	8	88.8888	0.0356
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	16	177.7776	0.1244
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	16	177.7776	0.0006
		Total	6496	72178	7.9136
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI5-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	5	274.1005	0.0603
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	54.8201	0.011
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	1	54.8201	0.011
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	4	219.2804	0.0274
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	2	109.6402	0.0027
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	1	54.8201	0.0055
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	14	767.4814	0.0055
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	2	109.6402	0.0027
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	1	54.8201	0.0027
Arthropoda : Cirripedia	Balanidae	Balanidae	38*	2083.1638	6.1279
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	210	11512.221	33.8646
Arthropoda : Cirripedia	Unidentified	Balanomorpha	98*	5372.3698	15.8035
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0027
Arthropoda : Diptera	Unidentified	Diptera	118	6468.7718	2.6862
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	3	164.4603	0.0822
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	10	548.201	2.9164
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	1	54.8201	0.0027
Mollusca : Gastropoda	Columbellidae	Astyris lunata	1	54.8201	0.0329
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	1	54.8201	0.0548
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	1	54.8201	0.1206
		Total	513	28123	61.8233
		# Taxa	18		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI5-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Arabellidae	Arabella sp.	8	88.8888	0.0444
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	16	177.7776	0.0089
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	48	533.3328	0.8533
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	1008	11199.989	0.0356
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0444
Annelida : Polychaeta	Maldanidae	Maldanidae	8	88.8888	0.0089
Annelida : Polychaeta	Nereididae	Alitta succinea	152	1688.8872	0.3911
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.3467
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	216	2399.9976	0.7733
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	24	266.6664	0.0444
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	32	355.5552	0.5067
Annelida : Polychaeta	Spionidae	Boccardiella hamata	24	266.6664	0.0267
Annelida : Polychaeta	Spionidae	Polydora cornuta	48	533.3328	0.0006
Annelida : Polychaeta	Spionidae	Polydora websteri	8	88.8888	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	16	177.7776	0.0089
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	16	177.7776	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	32	355.5552	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1832	20355.535	1.8044
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1208*	13422.209	0.0711
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	88	977.7768	0.0089
Arthropoda : Amphipoda	Corophiidae	Corophiidae	40*	444.444	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	24	266.6664	0.0356
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	488	5422.2168	0.3022
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	200	2222.22	0.0444
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	16	177.7776	0.0178
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	72	799.9992	0.0444
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	16	177.7776	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	16	177.7776	0.4267
Arthropoda : Diptera	Unidentified	Diptera	8	88.8888	0.0006
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	240	2666.664	1.0489
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0356
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	336	3733.3296	0.3556
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	72	799.9992	1.7867
Mollusca : Gastropoda	Columbellidae	Astyris lunata	64	711.1104	0.48
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	8	88.8888	4.2756
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	8	88.8888	0.0089
		Total	6432	71467	13.8787
		# Taxa	35		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI5-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	32	355.5552	0.0356
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	88	977.7768	0.3289
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	624	6933.3264	0.0178
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0356
Annelida : Polychaeta	Nereididae	Alitta succinea	48	533.3328	0.0533
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.3289
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	32	355.5552	0.0444
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	184	2044.4424	0.7644
Annelida : Polychaeta	Spionidae	Polydora websteri	16	177.7776	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	32	355.5552	0.0178
Annelida : Polychaeta	Spionidae	Polydora colonia	48	533.3328	0.0089
Annelida : Polychaeta	Spionidae	Boccardiella hamata	8	88.8888	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	32	355.5552	0.0178
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	40	444.444	0.0533
Arthropoda : Amphipoda	Aoridae	Unciola serrata	64	711.1104	0.0711
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1144	12711.098	1.12
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	8	88.8888	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	376*	4177.7736	0.0267
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	72	799.9992	0.0178
Arthropoda : Amphipoda	Corophiidae	Corophiidae	24*	266.6664	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	72	799.9992	0.0267
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	216	2399.9976	0.1511
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	64	711.1104	0.0267
Arthropoda : Crustacea	Janiridae	Janiridae	8	88.8888	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	8	88.8888	0.1689
Arthropoda : Diptera	Unidentified	Diptera	8	88.8888	0.0006
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	56	622.2216	0.2933
Chordata : Ascidiacea	Unidentified	Ascidiacea	64	711.1104	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	32	355.5552	0.16
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	120	1333.332	0.08
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	16	177.7776	0.1511
Mollusca : Gastropoda	Columbellidae	Astyris lunata	64	711.1104	0.4
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	8	88.8888	0.0089
		Total	3632	40356	4.4298
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI5-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	20	222.222	0.0178
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	4	44.4444	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	36	399.9996	0.3156
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	364	4044.4404	0.0267
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	16	177.7776	0.0222
Annelida : Polychaeta	Nereididae	Alitta succinea	76	844.4436	0.1511
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	40	444.444	0.08
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	112	1244.4432	0.4711
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	44	488.8884	0.6
Annelida : Polychaeta	Spionidae	Dipolydora socialis	8	88.8888	0.0133
Annelida : Polychaeta	Spionidae	Polydora websteri	4	44.4444	0.0044
Annelida : Polychaeta	Spionidae	Polydora cornuta	12	133.3332	0.0006
Annelida : Polychaeta	Spionidae	Polydora colonia	40	444.444	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	20	222.222	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	32	355.5552	0.0222
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	528*	5866.6608	0.0356
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1784	19822.202	1.8044
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	96	1066.6656	0.0044
Arthropoda : Amphipoda	Corophiidae	Corophiidae	12*	133.3332	0.0044
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	28	311.1108	0.0222
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	124	1377.7764	0.1022
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	8	88.8888	0.0006
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	56	622.2216	0.04
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	4	44.4444	0.0178
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	12	133.3332	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	24	266.6664	0.2756
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	172	1911.1092	0.8133
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	20	222.222	0.0578
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	12	133.3332	0.04
Mollusca : Gastropoda	Columbellidae	Astyris lunata	36	399.9996	0.2489
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	0.6311
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	8	88.8888	0.0044
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	8	88.8888	0.0267
		Total	3816	42400	5.8568
		# Taxa	31		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI6-INT1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	1	54.8201	0.0055
Annelida : Polychaeta	Nereididae	Alitta succinea	28	1534.9628	1.069
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	93	5098.2693	1.0471
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	7	383.7407	0.0493
Arthropoda : Amphipoda	Corophiidae	Corophiidae	11*	603.0211	0.0027
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	2	109.6402	0.0055
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	31	1699.4231	0.0493
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	2	109.6402	0.011
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	18	986.7618	0.0384
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	1	54.8201	0.0055
Arthropoda : Cirripedia	Balanidae	Balanidae	113*	6194.6713	12.8763
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	56	3069.9256	6.3812
Arthropoda : Cirripedia	Unidentified	Balanomorpha	551*	30205.875	62.7863
Arthropoda : Diptera	Unidentified	Diptera	98	5372.3698	1.0525
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	50	2741.005	0.8442
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	4	219.2804	6.7484
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	2	109.6402	0.0219
		Total	1068	58548	92.9941
		# Taxa	14		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI6-SUB1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	32	355.5552	0.0356
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	8	88.8888	0.0089
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	40	444.444	0.0006
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	16	177.7776	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	24	266.6664	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	16	177.7776	0.0178
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	48	533.3328	0.08
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	9824	109155.45	12.7378
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	6304*	70044.374	0.2756
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	24	266.6664	0.0178
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	8	88.8888	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	64*	711.1104	0.0267
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	72	799.9992	0.0444
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	16	177.7776	0.0089
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	144	1599.9984	0.0356
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	528	5866.6608	0.24
Arthropoda : Decapoda	Panopeidae	Panopeidae	8	88.8888	0.0889
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	88	977.7768	0.1511
Arthropoda : Isopoda	Idoteidae	Idotea balthica	80	888.888	0.1156
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	16	177.7776	0.0178
Mollusca : Bivalvia	Anomiidae	Anomia simplex	8	88.8888	1.0756
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	4	44.4444	0.8444
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	24	266.6664	0.0178
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	8	88.8888	0.1956
Mollusca : Gastropoda	Columbellidae	Astyris lunata	72	799.9992	0.5333
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0006
		Total	17492	194355	16.5811
		# Taxa	25		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI6-SUB2 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	1	11.1111	0.0006
Annelida : Polychaeta	Nereididae	Alitta succinea	14	155.5554	0.0156
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	2	22.2222	0.0189
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	1	11.1111	0.04
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	6	66.6666	0.02
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	4	44.4444	0.0267
Annelida : Polychaeta	Spionidae	Polydora cornuta	14	155.5554	0.0022
Annelida : Polychaeta	Syllidae	Proceraea cornuta	1	11.1111	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	1	11.1111	0.0044
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	9	99.9999	0.0044
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	2	22.2222	0.0022
Arthropoda : Amphipoda	Aoridae	Unciola serrata	4	44.4444	0.0044
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	1	11.1111	0.0011
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	38*	422.2218	0.0044
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	137	1522.2207	0.0911
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	22	244.4442	0.0122
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	25	277.7775	0.0067
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	5	55.5555	0.0011
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	10	111.111	0.0033
Arthropoda : Amphipoda	Corophiidae	Corophiidae	2*	22.2222	0.0011
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	91	1011.1101	0.0878
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	16	177.7776	0.0111
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	3	33.3333	0.0006
Arthropoda : Amphipoda	Melitidae	Melita nitida	8	88.8888	0.0078
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	27	299.9997	0.0222
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	36	399.9996	0.0111
Arthropoda : Decapoda	Panopeidae	Panopeidae	25	277.7775	0.2122
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	11.1111	0.0006
Mollusca : Bivalvia	Arcidae	Anadara transversa	1	11.1111	0.0333
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	4	44.4444	2.1933
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	2	22.2222	0.0011
Mollusca : Gastropoda	Columbellidae	Astyris lunata	127	1411.1097	1.0578
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	7	77.7777	0.0722
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	10	111.111	0.1111
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	1	11.1111	0.0011
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	6	66.6666	0.0222
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	12	133.3332	0.0056
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	4	44.4444	0.0044
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	1	11.1111	0.01
		Total	681	7566.7	4.1265
		# Taxa	37		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI6-SUB3 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	8	88.8888	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	1.2089
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	8	88.8888	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	32	355.5552	0.0311
Annelida : Polychaeta	Nereididae	Alitta succinea	76	844.4436	0.0222
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	32	355.5552	0.0089
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	140	1555.554	0.0844
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	28	311.1108	0.0311
Annelida : Polychaeta	Spionidae	Dipolydora socialis	4	44.4444	0.0044
Annelida : Polychaeta	Spionidae	Polydora cornuta	12	133.3332	0.0044
Annelida : Polychaeta	Spionidae	Polydora colonia	48	533.3328	0.0133
Annelida : Polychaeta	Syllidae	Proceraea cornuta	16	177.7776	0.0044
Annelida : Polychaeta	Syllidae	Syllidae	248*	2755.5528	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0356
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	4	44.4444	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	4	44.4444	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	76	844.4436	0.0267
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	16	177.7776	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	344*	3822.2184	0.0222
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	436	4844.4396	0.28
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	60	666.666	0.0133
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	16	177.7776	0.0089
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	36	399.9996	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	128*	1422.2208	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	20	222.222	0.0044
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	56	622.2216	0.0444
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0133
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	184	2044.4424	0.0622
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	64	711.1104	0.0311
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	204	2266.6644	0.0756
Arthropoda : Amphipoda	Phoxocephalidae	Eobrolgus spinosus	12	133.3332	0.0044
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	48	533.3328	0.0044
Arthropoda : Crustacea	Janiridae	Janiridae	4	44.4444	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	24	266.6664	0.4844
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	20	222.222	0.0311
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0044
Mollusca : Bivalvia	Anomiidae	Anomia simplex	4	44.4444	0.2533
Mollusca : Gastropoda	Calyptraeidae	Crepidula plana	4	44.4444	0.0044
Mollusca : Gastropoda	Columbellidae	Astyris lunata	24	266.6664	0.1289
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	20	222.222	0.9333
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	4	44.4444	0.0044
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	4	44.4444	0.0044
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	8	88.8888	0.04
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0044
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0006
		Total	2524	28044	3.9641
		# Taxa	42		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI7-INT1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	1	54.8201	0.0027
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	1*	54.8201	0.0027
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2	109.6402	0.0219
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	438.5608	0.0274
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	1	54.8201	0.0055
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	342	18748.474	16.9833
Arthropoda : Diptera	Unidentified	Diptera	55	3015.1055	0.6743
		Total	410	22476	17.7178
		# Taxa	6		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI7-SUB1 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0089
Annelida : Polychaeta	Nereididae	Alitta succinea	44	488.8884	0.1911
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	4	44.4444	0.0133
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	24	266.6664	0.0844
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	4	44.4444	0.0489
Annelida : Polychaeta	Spionidae	Polydora cornuta	96	1066.6656	0.0089
Annelida : Polychaeta	Spionidae	Polydora websteri	4	44.4444	0.0044
Annelida : Polychaeta	Syllidae	Syllidae	16	177.7776	0.0133
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	4	44.4444	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	100	1111.11	0.0756
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.	4	44.4444	0.0044
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1244	13822.208	1.3911
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	808*	8977.7688	0.0711
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	12	133.3332	0.0006
Arthropoda : Amphipoda	Corophiidae	Corophiidae	16*	177.7776	0.0133
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	152	1688.8872	0.1244
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	84	933.3324	0.0311
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	4	44.4444	0.0044
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	12	133.3332	0.0133
Arthropoda : Cirripedia	Balanidae	Balanidae	4	44.4444	0.0006
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	4	44.4444	0.0622
Arthropoda : Diptera	Unidentified	Diptera	4	44.4444	0.0311
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1272	14133.319	5.68
Arthropoda : Isopoda	Idoteidae	Idotea balthica	12	133.3332	0.0178
Arthropoda : Isopoda	Idoteidae	Synidotea laticauda	4	44.4444	0.0267
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	12	133.3332	0.0311
Mollusca : Bivalvia	Anomiidae	Anomia simplex	12	133.3332	1.4711
Mollusca : Bivalvia	Arcidae	Anadara transversa	4	44.4444	0.0089
Mollusca : Bivalvia	Mactridae	Spisula solidissima	4	44.4444	0.0089
Mollusca : Bivalvia	Mytilidae	Geukensia demissa	4	44.4444	0.0006
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	0.1133
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	88	977.7768	0.0844
Mollusca : Gastropoda	Columbellidae	Astyris lunata	64	711.1104	0.44
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	24	266.6664	1.0622
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	4	44.4444	0.0044
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	8	88.8888	0.0133
Nemertina	Amphiporidae	Zygonemertes virescens	4	44.4444	0.0044
		Total	4177	46411	11.173
		# Taxa	36		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI7-SUB2 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	64	711.1104	1.7156
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	32	355.5552	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	64	711.1104	0.1244
Annelida : Polychaeta	Nereididae	Alitta succinea	328	3644.4408	0.3644
Annelida : Polychaeta	Phyllodocidae	Phyllodocidae	8	88.8888	0.0006
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.0622
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	160	1777.776	0.6044
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	48	533.3328	0.0622
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	72	799.9992	0.64
Annelida : Polychaeta	Spionidae	Boccardiella hamata	40	444.444	0.0178
Annelida : Polychaeta	Spionidae	Polydora cornuta	72	799.9992	0.0267
Annelida : Polychaeta	Spionidae	Polydora colonia	56	622.2216	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	32	355.5552	0.0089
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	8	88.8888	0.0089
Arthropoda : Amphipoda	Aoridae	Unciola serrata	152	1688.8872	0.1067
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	48	533.3328	0.0711
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	232*	2577.7752	0.0267
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	304	3377.7744	0.2222
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	40	444.444	0.0267
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	208	2311.1088	0.0178
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	208	2311.1088	0.0178
Arthropoda : Amphipoda	Corophiidae	Corophiidae	16*	177.7776	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	136	1511.1096	0.0533
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	104	1155.5544	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	784	8711.1024	0.2311
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	696	7733.3256	0.5067
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	48	533.3328	0.0267
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	16	177.7776	0.0711
Arthropoda : Decapoda	Panopeidae	Panopeidae	8	88.8888	0.0267
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	40	444.444	2.7467
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	288	3199.9968	1.3244
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	40	444.444	0.08
Mollusca : Bivalvia	Anomiidae	Anomia simplex	8	88.8888	1.2178
Mollusca : Bivalvia	Lucinidae	Parvilucina crenella	8	88.8888	0.0006
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	3	33.3333	3.7011
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	24	266.6664	0.0267
Mollusca : Gastropoda	Columbellidae	Astyris lunata	80	888.888	0.4444
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	0.8889
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	16	177.7776	0.0356
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	40	444.444	0.0533
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	8	88.8888	0.0006
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	8	88.8888	0.0356
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0267
		Total	4635	51500	15.7138
		# Taxa	43		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI7-SUB3 **Collection Date: 10/3/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Arabellidae	Arabella sp.	8	88.8888	0.0267
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	48	533.3328	0.0178
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	24	266.6664	0.9333
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	176	1955.5536	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	104	1155.5544	0.0978
Annelida : Polychaeta	Nereididae	Alitta succinea	152	1688.8872	0.1422
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	104	1155.5544	0.1956
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	416	4622.2176	0.8533
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	272	3022.2192	1.8489
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia	8	88.8888	0.0006
Annelida : Polychaeta	Spionidae	Polydora colonia	72	799.9992	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	160	1777.776	0.0006
Annelida : Polychaeta	Spionidae	Boccardiella hamata	48	533.3328	0.0178
Annelida : Polychaeta	Spionidae	Dipolydora socialis	56	622.2216	0.0089
Annelida : Polychaeta	Syllidae	Salvatoria clavata	144	1599.9984	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	40*	444.444	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	16	177.7776	0.0089
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	8	88.8888	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	216	2399.9976	0.0889
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	168	1866.6648	0.0622
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	440	4888.884	0.4444
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	216*	2399.9976	0.0178
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	88	977.7768	0.0267
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	80	888.888	0.0178
Arthropoda : Amphipoda	Corophiidae	Corophiidae	80*	888.888	0.0178
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	160	1777.776	0.0622
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	80	888.888	0.0711
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	192	2133.3312	0.0889
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	48	533.3328	0.0267
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	56	622.2216	0.0089
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	16	177.7776	0.8978
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	56	622.2216	0.1956
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	8	88.8888	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	88	977.7768	0.3378
Mollusca : Gastropoda	Cerithiidae	Seila adamsii	8	88.8888	0.2311
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	16	177.7776	0.0178
Mollusca : Gastropoda	Columbellidae	Astyris lunata	40	444.444	0.2489
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	48	533.3328	1.0133
Mollusca : Gastropoda	Pyramidellidae	Boonea bisuturalis	8	88.8888	0.0089
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	56	622.2216	0.0444
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	16	177.7776	0.08
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	8	88.8888	0.0006
		Total	4048	44978	8.1656
		# Taxa	39		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI8-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	1	54.8201	0.0027
Annelida : Polychaeta	Nereididae	Alitta succinea	22	1206.0422	1.1293
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	2	109.6402	0.1809
Annelida : Polychaeta	Spionidae	Polydora cornuta	11	603.0211	0.0219
Annelida : Polychaeta	Spionidae	Polydora websteri	19	1041.5819	0.0055
Annelida : Polychaeta	Spionidae	Streblospio benedicti	1	54.8201	0.0027
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	202	11073.660	1.3212
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	5	274.1005	0.0164
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	12*	657.8412	0.0055
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	51	2795.8251	0.1645
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	125	6852.5125	0.2522
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	2	109.6402	0.0055
Arthropoda : Amphipoda	Corophiidae	Corophiidae	53*	2905.4653	0.0439
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	1	54.8201	0.0027
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	25	1370.5025	0.0658
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	34	1863.8834	0.0329
Arthropoda : Cirripedia	Balanidae	Balanidae	18*	986.7618	0.296
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	14	767.4814	1.5514
Arthropoda : Cirripedia	Unidentified	Balanomorpha	16*	877.1216	0.0055
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0164
Arthropoda : Decapoda	Xanthidae	Eurypanopeus depressus	1	54.8201	0.5975
Arthropoda : Diptera	Unidentified	Diptera	7	383.7407	0.0932
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1	54.8201	0.0164
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	4	219.2804	0.2138
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	3	164.4603	0.3947
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	11	603.0211	28.183
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	2	109.6402	0.0548
Nemertina	Amphiporidae	Zygonemertes virescens	1	54.8201	0.0027
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	2	109.6402	0.0055
Platyhelminthes : Turbellaria	Stylochidae	Stylochus ellipticus	7	383.7407	0.3947
		Total	654	35852	35.0792
		# Taxa	26		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI8-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	28	311.1108	0.0667
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	16	177.7776	0.0356
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	8	88.8888	0.0622
Annelida : Polychaeta	Spionidae	Polydora cornuta	36	399.9996	0.0044
Annelida : Polychaeta	Syllidae	Syllidae	4	44.4444	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	168	1866.6648	0.2711
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	440*	4888.884	0.0267
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2792	31022.191	4.2489
Arthropoda : Amphipoda	Corophiidae	Corophiidae	96*	1066.6656	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	64	711.1104	0.0133
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	52	577.7772	0.0044
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	16	177.7776	0.0044
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	4	44.4444	0.0089
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	12	133.3332	0.0006
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	8	88.8888	0.0044
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	100	1111.11	0.0444
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	8	88.8888	0.0844
Arthropoda : Isopoda	Idoteidae	Idotea balthica	44	488.8884	0.0178
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	1120	12444.432	3.3778
Arthropoda : Pycnogonida	Tanystylidae	Tanystylum orbiculare	4	44.4444	0.0044
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	8	88.8888	0.0006
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	8	88.8888	0.0089
Mollusca : Gastropoda	Columbellidae	Astyris lunata	32	355.5552	0.3022
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	56	622.2216	3.4978
Nemertina	Amphiporidae	Zygonemertes virescens	4	44.4444	0.0006
		Total	5128	56978	12.1
		# Taxa	23		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI8-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0006
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	4	44.4444	0.2444
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	8	88.8888	0.0006
Annelida : Polychaeta	Nereididae	Alitta succinea	72	799.9992	0.2711
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.1511
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	80	888.888	0.0356
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	48	533.3328	0.1822
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	96	1066.6656	1.6489
Annelida : Polychaeta	Spionidae	Prionospio heterobranchia	4	44.4444	0.0006
Annelida : Polychaeta	Spionidae	Polydora cornuta	4	44.4444	0.0006
Annelida : Polychaeta	Syllidae	Brania sp.	4	44.4444	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	8	88.8888	0.0222
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca abdita	4	44.4444	0.0044
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	8	88.8888	0.0133
Arthropoda : Amphipoda	Aoridae	Unciola serrata	32	355.5552	0.0006
Arthropoda : Amphipoda	Aoridae	Grandidierella sp.	4	44.4444	0.0089
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	4	44.4444	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	1100	12222.21	0.9067
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	4	44.4444	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	100*	1111.11	0.0089
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	12	133.3332	0.0006
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	12	133.3332	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	4	44.4444	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	8	88.8888	0.0133
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	64	711.1104	0.0356
Arthropoda : Amphipoda	Ischyroceridae	Ericthonius brasiliensis	60	666.666	0.0356
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	24	266.6664	0.0089
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	4	44.4444	0.0311
Arthropoda : Decapoda	Panopeidae	Panopeidae	8	88.8888	0.0889
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	4	44.4444	0.0133
Arthropoda : Isopoda	Idoteidae	Idotea balthica	4	44.4444	0.0044
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	388	4311.1068	0.8844
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	52	577.7772	0.1111
Mollusca : Bivalvia	Arcidae	Anadara transversa	4	44.4444	0.0178
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	8	88.8888	2.0022
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	180	1999.998	0.1733
Mollusca : Gastropoda	Columbellidae	Astyris lunata	56	622.2216	0.2933
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	28	311.1108	0.2533
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	8	88.8888	0.0311
Mollusca : Gastropoda	Pyramidellidae	Boonea seminuda	4	44.4444	0.0006
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	48	533.3328	0.0267
Mollusca : Gastropoda	Turridae	Kurtziella atrostyla	8	88.8888	0.0622
Nemertina	Amphiporidae	Zygonemertes virescens	4	44.4444	0.0222
		Total	2592	28800	7.6302
		# Taxa	42		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI8-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	40	444.444	0.0089
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	32	355.5552	0.7111
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	120	1333.332	0.0006
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	72	799.9992	0.1511
Annelida : Polychaeta	Nereididae	Alitta succinea	392	4355.5512	0.9778
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	8	88.8888	0.0356
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	8	88.8888	0.16
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	136	1511.1096	0.4178
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	336	3733.3296	0.9156
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	184	2044.4424	3.1111
Annelida : Polychaeta	Spionidae	Boccardiella hamata	64	711.1104	0.0533
Annelida : Polychaeta	Spionidae	Polydora colonia	640	7111.104	0.0533
Annelida : Polychaeta	Spionidae	Polydora cornuta	128	1422.2208	0.0089
Annelida : Polychaeta	Syllidae	Proceraea cornuta	8	88.8888	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	240*	2666.664	0.0178
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	48	533.3328	0.16
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	16	177.7776	0.0089
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	16	177.7776	0.0089
Arthropoda : Amphipoda	Aoridae	Unciola serrata	128	1422.2208	0.1422
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	144	1599.9984	0.0622
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	384*	4266.6624	0.0444
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	88	977.7768	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	696	7733.3256	0.5689
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	184	2044.4424	0.0178
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	232	2577.7752	0.16
Arthropoda : Amphipoda	Corophiidae	Corophiidae	192*	2133.3312	0.0178
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	96	1066.6656	0.0889
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	128	1422.2208	0.0533
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	608	6755.5488	0.4267
Arthropoda : Decapoda	Hippolytidae	Hippolyte pleuracantha	48	533.3328	0.2133
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	352	3911.1072	1.2178
Chordata : Ascidiacea	Unidentified	Ascidiacea	120	1333.332	0.0356
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	312	3466.6632	1.0578
Mollusca : Bivalvia	Anomiidae	Anomia simplex	8	88.8888	0.64
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	72	799.9992	0.0622
Mollusca : Gastropoda	Columbellidae	Parvanachis obesa	8	88.8888	0.0889
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	64	711.1104	1.04
Mollusca : Gastropoda	Columbellidae	Astyris lunata	64	711.1104	0.2756
Mollusca : Gastropoda	Turridae	Pyrgocythara plicosa	32	355.5552	0.1067
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0006
Nemertina	Lineidae	Siphonenteron bicolour	16	177.7776	0.0089
Nemertina	Tetrastemmatidae	Tetrastemma candidum	8	88.8888	0.0006
		Total	6480	72000	13.1493
		# Taxa	39		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI9-INT1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Nereididae	Alitta succinea	49	2686.1849	3.2837
Annelida : Polychaeta	Phyllodocidae	Paranaitis speciosa	2	109.6402	0.1974
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1	54.8201	0.0055
Annelida : Polychaeta	Spionidae	Polydora websteri	2	109.6402	0.011
Annelida : Polychaeta	Spionidae	Polydora cornuta	4	219.2804	0.0055
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	103	5646.4703	0.2741
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	3*	164.4603	0.0027
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	3	164.4603	0.0219
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	6	328.9206	0.0055
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	284	15568.908	0.4989
Arthropoda : Amphipoda	Corophiidae	Corophiidae	97*	5317.5497	0.148
Arthropoda : Amphipoda	Hyalidae	Ptilohyale littoralis	21	1151.2221	0.0219
Arthropoda : Amphipoda	Ischyroceridae	Jassa marmorata	10	548.201	0.011
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	2	109.6402	0.0055
Arthropoda : Cirripedia	Balanidae	Balanidae	20*	1096.402	1.2737
Arthropoda : Cirripedia	Chthamalidae	Chthamalus fragilis	110	6030.211	7.0055
Arthropoda : Cirripedia	Unidentified	Balanomorpha	100*	5482.01	6.3687
Arthropoda : Decapoda	Panopeidae	Panopeidae	4	219.2804	0.1699
Arthropoda : Decapoda	Pinnotheridae	Pinnotheridae	1	54.8201	0.0219
Arthropoda : Diptera	Unidentified	Diptera	2	109.6402	0.0055
Arthropoda : Isopoda	Sphaeromatidae	Sphaeroma quadridentatum	10	548.201	0.0493
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	2	109.6402	0.0027
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	7	383.7407	78.2228
Mollusca : Bivalvia	Unidentified	Bivalvia	1*	54.8201	0.0329
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	2	109.6402	0.0027
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	1	54.8201	0.1535
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	1	54.8201	0.0055
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	1	54.8201	0.0027
		Total	849	46542	97.8099
		# Taxa	23		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI9-SUB1 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	8	88.8888	0.0356
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	0.0089
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	48	533.3328	0.0089
Annelida : Polychaeta	Maldanidae	Maldanidae	8	88.8888	0.0178
Annelida : Polychaeta	Nereididae	Alitta succinea	32	355.5552	0.6311
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	240	2666.664	0.6578
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	8	88.8888	0.0356
Annelida : Polychaeta	Spionidae	Boccardiella hamata	16	177.7776	0.0178
Annelida : Polychaeta	Spionidae	Polydora cornuta	32	355.5552	0.0089
Annelida : Polychaeta	Syllidae	Syllidae	48	533.3328	0.0006
Arthropoda : Amphipoda	Ampithoidae	Ampithoe valida	32	355.5552	0.0356
Arthropoda : Amphipoda	Aoridae	Unciola serrata	8	88.8888	0.0089
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	8	88.8888	0.0178
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	2832	31466.635	4.16
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	816*	9066.6576	0.0533
Arthropoda : Amphipoda	Corophiidae	Corophiidae	344*	3822.2184	0.0267
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	104	1155.5544	0.0267
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	32	355.5552	0.0178
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	104	1155.5544	0.08
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	96	1066.6656	0.0267
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	96	1066.6656	0.0444
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	16	177.7776	1.1467
Arthropoda : Isopoda	Idoteidae	Idotea balthica	16	177.7776	0.0178
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	264	2933.3304	1.5022
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	16	177.7776	0.0889
Mollusca : Bivalvia	Arcidae	Anadara transversa	16	177.7776	0.0089
Mollusca : Bivalvia	Ostreidae	Crassostrea virginica	1	11.1111	0.9733
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	40	444.444	0.0356
Mollusca : Gastropoda	Columbellidae	Astyris lunata	32	355.5552	0.3022
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	160	1777.776	4.7289
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	32	355.5552	0.0267
Nemertina	Amphiporidae	Zygonemertes virescens	8	88.8888	0.0178
		Total	5521	61344	14.7699
		# Taxa	30		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI9-SUB2 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Oligochaeta	Unidentified	Oligochaeta	8	88.8888	0.0006
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	12	133.3332	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	8	88.8888	1.1644
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	744	8266.6584	0.0356
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	20	222.222	0.0178
Annelida : Polychaeta	Nereididae	Alitta succinea	88	977.7768	0.2
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	12	133.3332	0.0311
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	248	2755.5528	0.9911
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	20	222.222	0.44
Annelida : Polychaeta	Spionidae	Boccardiella hamata	12	133.3332	0.0089
Annelida : Polychaeta	Spionidae	Polydora colonia	156	1733.3316	0.0089
Annelida : Polychaeta	Spionidae	Polydora cornuta	28	311.1108	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	48*	533.3328	0.0133
Annelida : Polychaeta	Syllidae	Proceraea cornuta	4	44.4444	0.0089
Arthropoda : Amphipoda	Aoridae	Unciola serrata	80	888.888	0.08
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	32	355.5552	0.0222
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	844	9377.7684	0.6133
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	240*	2666.664	0.0133
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	8	88.8888	0.0006
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	8	88.8888	0.0089
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	44	488.8884	0.0044
Arthropoda : Amphipoda	Corophiidae	Corophiidae	308*	3422.2188	0.0222
Arthropoda : Amphipoda	Corophiidae	Monocorophium insidiosum	4	44.4444	0.0006
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	376	4177.7736	0.2356
Arthropoda : Amphipoda	Corophiidae	Monocorophium acherusicum	8	88.8888	0.0006
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	92	1022.2212	0.0489
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	128	1422.2208	0.0489
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	24	266.6664	0.0089
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	52	577.7772	0.0089
Arthropoda : Crustacea	Janiridae	Janiridae	28	311.1108	0.0006
Arthropoda : Decapoda	Panopeidae	Panopeidae	20	222.222	0.1378
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	4	44.4444	0.9511
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	28	311.1108	0.0533
Chordata : Ascidiacea	Unidentified	Ascidiacea	4	44.4444	0.0006
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	12	133.3332	0.08
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	116	1288.8876	2.0311
Mollusca : Gastropoda	Columbellidae	Astyris lunata	56	622.2216	0.3067
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	4	44.4444	0.0006
Platyhelminthes : Turbellaria	Prosthiostomidae	Euplana gracilis	4	44.4444	0.0006
		Total	3932	43689	7.6015
		# Taxa	36		

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

SampleID: EPI9-SUB3 **Collection Date: 10/4/2017**

Group Name	Family	Taxon	Count	Abundance (# per sq m)	Biomass (AFDW)
Annelida : Polychaeta	Capitellidae	Mediomastus californiensis	64	711.1104	0.0267
Annelida : Polychaeta	Dorvilleidae	Schistomeringos rudolphi	8	88.8888	0.0006
Annelida : Polychaeta	Eunicidae	Marphysa sanguinea	32	355.5552	0.9867
Annelida : Polychaeta	Fabriciidae	Fabricinuda trilobata	8	88.8888	0.0089
Annelida : Polychaeta	Hesionidae	Oxydromus obscurus	88	977.7768	0.0889
Annelida : Polychaeta	Nereididae	Alitta succinea	320	3555.552	0.8267
Annelida : Polychaeta	Polynoidae	Lepidonotus sublevis	48	533.3328	1.0756
Annelida : Polychaeta	Sabellariidae	Sabellaria vulgaris	1064	11822.210	4.9067
Annelida : Polychaeta	Sabellariidae	Parasabella microphthalma	152	1688.8872	0.2756
Annelida : Polychaeta	Serpulidae	Hydroides dianthus	256	2844.4416	1.9289
Annelida : Polychaeta	Spionidae	Polydora cornuta	8	88.8888	0.0089
Annelida : Polychaeta	Spionidae	Boccardiella hamata	24	266.6664	0.0089
Annelida : Polychaeta	Syllidae	Exogone sp.	24	266.6664	0.0006
Annelida : Polychaeta	Syllidae	Proceraea cornuta	8	88.8888	0.0006
Annelida : Polychaeta	Syllidae	Syllidae	56*	622.2216	0.0006
Annelida : Polychaeta	Terebellidae	Polycirrus eximius	32	355.5552	0.0267
Arthropoda : Amphipoda	Ampeliscidae	Ampelisca vadorum	8	88.8888	0.0006
Arthropoda : Amphipoda	Amphilochiadae	Apolochus cresti	8	88.8888	0.0006
Arthropoda : Amphipoda	Aoridae	Unciola serrata	544	6044.4384	0.5333
Arthropoda : Amphipoda	Bateidae	Batea catharinensis	120	1333.332	0.0711
Arthropoda : Amphipoda	Caprellidae	Caprella equilibra	8	88.8888	0.0006
Arthropoda : Amphipoda	Caprellidae	Paracaprella tenuis	136	1511.1096	0.0356
Arthropoda : Amphipoda	Caprellidae	Caprella penantis	640	7111.104	0.4
Arthropoda : Amphipoda	Caprellidae	Caprella sp.	232*	2577.7752	0.0178
Arthropoda : Amphipoda	Colomastigidae	Colomastix halichondriae	56	622.2216	0.0089
Arthropoda : Amphipoda	Corophiidae	Monocorophium tuberculatum	8	88.8888	0.0089
Arthropoda : Amphipoda	Corophiidae	Apocorophium simile	416	4622.2176	0.1778
Arthropoda : Amphipoda	Corophiidae	Corophiidae	8*	88.8888	0.0089
Arthropoda : Amphipoda	Gammaridae	Elasmopus levis	360	3999.996	0.24
Arthropoda : Amphipoda	Ischyroceridae	Erichthonius brasiliensis	616	6844.4376	0.3111
Arthropoda : Amphipoda	Melitidae	Dulichiella appendiculata	248	2755.5528	0.1422
Arthropoda : Amphipoda	Phoxocephalidae	Eobrolgus spinosus	24	266.6664	0.0178
Arthropoda : Amphipoda	Stenothoidae	Stenothoe minuta	40	444.444	0.0089
Arthropoda : Crustacea	Janiridae	Janiridae	16	177.7776	0.0006
Arthropoda : Cumacea	Diastylidae	Oxyurostylis smithi	8	88.8888	0.0089
Arthropoda : Decapoda	Panopeidae	Panopeidae	104	1155.5544	1.1733
Arthropoda : Decapoda	Xanthidae	Dyspanopeus sayi	72	799.9992	6.4267
Arthropoda : Isopoda	Idoteidae	Erichsonella filiformis	40	444.444	0.2578
Cnidaria : Anthozoa	Diadumenidae	Diadumene leucolena	40	444.444	0.1156
Mollusca : Bivalvia	Arcidae	Anadara transversa	32	355.5552	0.4356
Mollusca : Bivalvia	Nuculidae	Nucula proxima	24	266.6664	0.0356
Mollusca : Bivalvia	Petricolidae	Petricolaria pholadiformis	8	88.8888	0.0089
Mollusca : Gastropoda	Cerithiidae	Bittiolum alternatum	48	533.3328	0.0356
Mollusca : Gastropoda	Columbellidae	Astyris lunata	72	799.9992	0.4444
Mollusca : Gastropoda	Columbellidae	Mitrella ocellata	376	4177.7736	15.1911
Mollusca : Gastropoda	Muricidae	Urosalpinx cinerea	16	177.7776	0.2933
Mollusca : Gastropoda	Newtoniellidae	Retilaskeya emersonii	16	177.7776	0.0178
Mollusca : Gastropoda	Pyramidellidae	Fargoa bushiana	64	711.1104	0.0622
Mollusca : Gastropoda	Triphoridae	Marshallora nigrocincta	32	355.5552	0.0356

* denotes not included in total number of taxa

Hampton Roads Bridge Tunnel Benthic Study
Sample Taxonomy

Nemertina	Amphiporidae	Zygonemertes virescens		24	266.6664	0.0267
Nemertina	Lineidae	Siphonenteron bicolour		8	88.8888	0.0533
			Total	6664	74044	36.7787
			# Taxa	48		

* denotes not included in total number of taxa

Appendix E: Additional Field Photos

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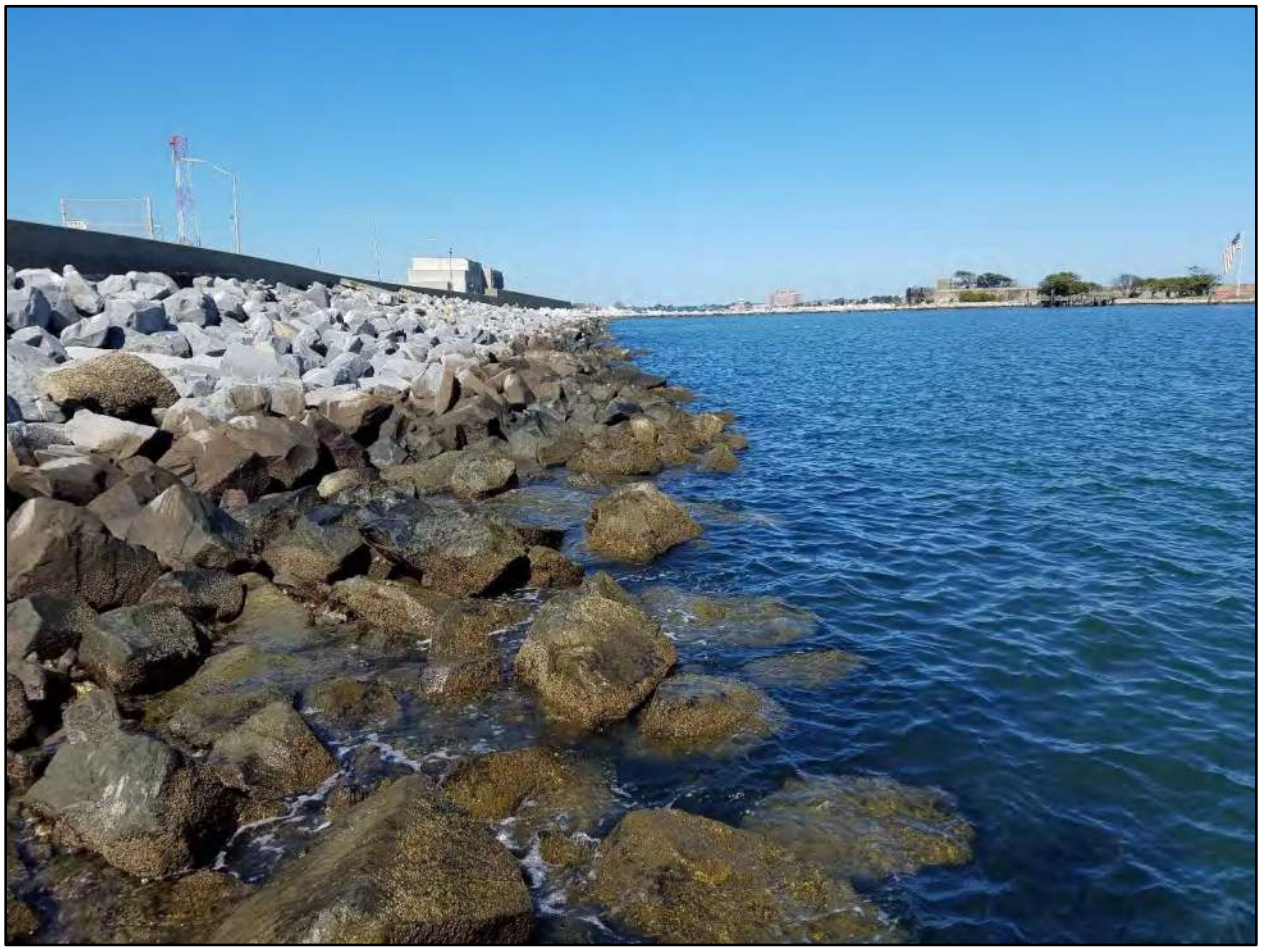

Figure E-1. Rocky shoreline of the southern portal island of the HRBT. Intertidal samples were collected among the rocks during the portal island benthic survey

Figure E-2. Diver taking photographs of an intertidal site prior to sampling. The piece of PVC in this image was used to mark the sample areas to be scraped

Figure E-3. Diver scraping the rock and suctioning the sample into a collection bag at a subtidal site during the portal island benthic survey