APPENDIX C

ECOLOGICAL APPENDIX

GENERAL REEVALUATION REPORT (GRR) AND
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (SEIS)
FOR THE
POPLAR ISLAND ENVIRONMENTAL RESTORATION PROJECT

CHESAPEAKE BAY, TALBOT COUNTY, MARYLAND

LIST OF TABLES

BIRD CENSUS MONITORING MONTHLY SUMMARIES

Table C-1. Algae Taxa Observed in Cells at Poplar Island

BACILLARIOPHYTA (Diatoms)	**CRYPTOPHYTA**	**CHLOROPHYTA (Greens)**
Amphiprora	*Gymnodinium*	*Ankistrodesmus*
Amphora	*Gymnodinium* sp.	*Apedinella radians*
Asterionellopsis	*Gyrodinium dominans*	*Chlamydomonas* sp.
Asterionellopsis gracillis	*Gyrodinium uncatenum*	*Chorella* sp. (2.0u)
Centrales <10u	*Pfisteria-like*	*Euglena* sp.
Centrales 10-20u		*Eutreptria*
Centrales 21-40u	**PRASINOPHYCEAE**	*Gloeocystis* sp.
Cerataulina pelagica	*Nephroselmis*	*Gonyaulax verior*
Chaetoceros sp.	*Prachysphaera*	*Gymnodinium* sp.
Cyclotella 25u	*Tetraselmis*	*Oocystis* sp.
Cylindrotheca closterium		*Paulinella ovalis*
Dactyosolens fragillissima	**PYRRHOPHYTA**	*Procentrum minimum*
Diadesmis contenta	*Oxyrrhis marina*	*Prorocentrum micans*
Guinardia	*Peridinium*	*Puedopedinella pyriformae*
Gyrosigma		*Skeletonema costatum*
Leptocylindrus danicus	**DINOPHYCEAE**	*Synura*
Leptocylindrus minimus	*Diplopsalis lenticula*	*Tetraselmis*
Navicula	*Gymnodinium stellatum*	Unidentified *Flagellates*
Nitzchia longissima	*Gyrodinium dominans*	Unidentified *Phytoflagellates* 3-4u
Nitzschia americana	*Gyrodinium pellucidum*	
Pennales 10-20u	*Gyrodinium spirale*	**CYANOPHYTA (Blue-greens)**
Pennales 21-40u	*Heterocapsa rotundata*	*Anabaena circularis*
Pennales 41-50u	*Heterocapsa triquetra*	*Anabaena spiroides*
Pennales 61-100u	*Karlodinium micrum*	*Anabaenopsis circularis*
Pennales 100-120u	*Kryptoperidinium foleacium*	*Arthospira*
Psuedo-nitzschia	*Oxxyrrhis marina*	*Chroococcus*
Scenedesmus quadricaudata	*Procentrum minimum*	*Dactylococcopsis* sp.
Skeletonema costatum	*Protoperidinium*	*Microcystis aeruginosus*
Skeletonema potamos	*Scrippsiella trachoidea*	*Oscillatoria* sp.
Thalassionema		*Oscillatoriaceae*
Thalassiosira sp.	**CILIOPHORA**	*Spirulina*
	ROTIFERA	
	CILIOPHORA	**CHRYSOPHYCEAE**
		Chroomonas amphioxea
		Chrysochromulina
		Psuedopedinella

Table C-2. Summary of Seasonal Nutrient Parameters Measured in Surface Water Samples from PIERP Exterior Monitoring Locations

ANALYTE	UNITS	WINTER	SPRING	SUMMER	FALL
Ammonium	MG N/L	0.07	0.03	0.04	0.03
Chlorophyll *a*	UG/L	12.63	15.60	13.94	10.34
Dissolved Organic Carbon	MG C/L	3.60	3.52	3.75	3.65
Nitrate	MG N/L	0.30	0.37	0.07	0.13
Nitrite	MG N/L	0.01	0.01	0.01	0.03
Particulate Carbon	MG C/L	1.17	1.47	1.45	0.85
Particulate Nitrogen	MG N/L	0.18	0.22	0.27	0.17
Particulate Phosphorus	MG P/L	0.02	0.02	0.03	0.02
Phaeophytin	UG/L	2.87	2.72	4.45	3.74
Phosphate	MG P/L	0.00	0.00	0.00	0.01
Total Dissolved Nitrogen	MG N/L	0.64	0.65	0.42	0.45
Total Dissolved Phosphorus	MG P/L	0.01	0.01	0.02	0.02
Total Suspended Solids	MG/L	12.18	11.67	24.36	15.27

Source: EA 2004a.

**Based on results from monthly nutrient sampling conducted between January 2001 and December 2003.*

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information

Name/ Coordination	Restrictions	Life History Information
Bald Eagle *Haliaeetus leucocephalus* MDNR & USFWS Glenn Therres DNR Wildlife and Heritage 410-260-8572 Jason Miller USFWS 410-573-4522 Craig Koppie USFWS 410-573-4534	Three zones of activity limitation. **Zone 1:** Extends 330 feet from nest. Year-round restrictions include any habitat changes such as timber cutting, land clearing, building and road construction. Dec 15-June15-no human activities. June 16 – Dec. 14 - limited activity, restricted hunting & off road vehicles. **Zone 2:** Extends 660 feet from nest. Restrictions include major habitat changes such as clear cutting, land clearing, building and road construction. Dec. 15-June 15 - no human activities, although some activities are allowed if researchers find that the nesting eagles are tolerant of it. June 16 – Dec. 14, activities such as hunting, fishing, hiking, farming are possible. Aug 16-Nov 16 - timber thinning & maint., buildings and road maintenance is possible. **Zone 3:** ¼ mile radius around nest. Most activities are possible, but management should include protection of roosts & feeding sites in this area. Dec. 15-June 15– restrictions on timber cutting, land clearing, building, road & trail construction	The Bald Eagle is the only eagle unique to North America. Male Bald Eagles average 0.91 m from head to tail, have a mass of 3.18- 4.5 kg, and a wing span of about 2 m. Females are typically larger, reaching a mass of up to 6.35 kg with wing spans of 2.44 m. Eagles are thought to live more than 30 years in the wild. **Status at PIERP:** During data collection for the EIS, a Bald Eagle pair was observed nesting at Jefferson Island, although they fledged no young in 1995. By the time construction had begun in 1999, the pair had moved to Coaches Island after their original nest was lost in a storm. The nest at Coaches Island has fledged two young per year since 1999. **Breeding:** Shoreline of coasts, rivers and large lakes. One brood averaging 2 eggs. Monogamous, Male and Female both tend the nest. Nest is typically a platform nest used perennially. **Diet:** Largely made up of fish, also small mammals, waterfowl, seabirds, and carrion. **Conservation Status:** Federally Threatened species in Maryland. Recently delisted to threatened – will still require 5 years of monitoring and then protections will be continued under the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. **Comments:** The eagle was adopted as the United States national emblem in 1782. Bald Eagle numbers in the lower 48 states are thought to have declined from between 25,000 - 75,000 nesting birds to fewer than 450 nesting pairs by the early 1960's. U.S. breeding population declined due to habitat destruction and degradation, illegal shooting, contamination of its food source and reproductive impairment from pesticides (notably DDT) and heavy metals. Currently- there are more than 6,000 adult Bald Eagle nesting pairs in the lower 48 states, of which an estimated 260 pair are in Maryland. Numerous studies have documented that most bald eagles will flush from the nest if disturbed by human presence. If the disturbance occurs frequently, nesting can fail and the adults may or may not nest again.

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
American Oyster *Crassostrea virginica* MDNR, Chris Judy MDE Rick Ayella	Natural Oyster Bars 8-10, 8-11 and 11-3 Oysters have stages of spawning and stasis (minimal respiration and filtering activity) during their life cycle. From June 1 – September 30, hydraulic excavation is prohibited within 1500 feet of the oyster bars.	The American oyster is a commercially and ecologically important species to the Chesapeake Bay. **Status at PIERP:** There are three oyster bars in proximity to PIERP, NOB 8-10, NOB 8-11 and NOB 11-3. These bars have oyster populations, but at very low levels. These bars are, at best, minimally and sporadically commercially productive, due to some past plantings by DNR, as seen on NOB 8-10 in the last 5 years. **Breeding:** Oysters spawn when water temperatures reach 18-20 degrees C, typically in May-June and again in October around PIERP. Spawning may occur more than once per year. **General Information:** Disease, combined with over harvest has reduced the population significantly from the 1700's. The ability of American oysters to filter large volumes of Bay water is thought to have significantly affected water clarity in historic times. If that function is realized in the future, the hypothesis is that significant improvement of Chesapeake Bay water quality would be possible. **Conservation Status:** Natural Oyster Bars are designated by the Maryland Department of Natural Resources as a resource of special significance. Oyster recovery is a goal of the CB 2000 Agreement.
Least Tern, *Sterna antillarum* Glenn Therres DNR Wildlife and Heritage 410-260-8572 Dave Brinker 1-410-744-8939 Jason Miller USFWS 410-573-4522	Activity disturbs nesting terns, causing them to abandon their nests. The nests should be avoided and activity limited during nesting and fledging. DNR-designated SSPRA nesting zones limit activity between Apr 15-Jul 31. Created habitat areas at PIERP are not designated. No formal restrictions. Least Tern typically nest in more isolated areas, from May-June. Activities that could result in a 'take' are required to be coordinated with USFWS, DNR.	Least Terns are a shorebird whose habitat has become threatened due to development and human disturbance. **Status at PIERP–** Least Terns nested at PIERP from May-July 2001, in several areas around Phase I and Phase II. **Appearance** - This 8 to 9 inch birds have a black "crown" on their head, a snowy whiter underside and forehead, grayish back and wings, orange legs, and a yellow bill with a black tip. **Habitat** - From late April to August, terns use barren to sparsely vegetated sandbars along shorelines. **Reproduction** - The terns nest in a shallow hole scraped in an open sandy area, gravelly patch, or exposed flat. They nest in small colonies. Chicks leave the nest only a few days after hatching, but the adults continue to care for them, leading them to shelter in nearby grasses and bringing them food. **General Information:** Terns hover over and dive into standing or flowing water to catch small fish. Regionally, they breed in isolated areas along the Chesapeake Bay. Winter home is unknown, but probably includes coastal areas of Central and South America. **Conservation Status:** State Listed – Threatened. Protected under the Federal Migratory Bird Treaty Act.

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
Osprey *Pandion haliaetus* Jason Miller USFWS 410-573-4522	No formal restrictions. Moving nests from inappropriate areas requires a federal permit from USFWS. Assistance from a federal agency is required to move the nest. Permits must be renewed annually. Prior to 'weaving' or sitting activities, sticks can be removed from inappropriate areas to inhibit nesting.	Osprey are large raptors that feed almost exclusively on fish. Osprey populations declined dramatically in the 20th century due primarily to effects of DDT. Populations in the Chesapeake Bay are now rising. **Status at PIERP:** Osprey are reported to have nested on the Poplar Island remnants until the loss of much of the trees as the islands eroded. With construction of Phase I and enclosure of several remnant islands, Osprey again built nests, beginning in the spring of 2001. Up to 5 pairs are now known to have nested in the newly created habitat. **Appearance**: Wingspan 4.5-6 ft. length 22-25 in. They are dark brown above, white below, have a white head with a prominent black eye stripe. Females usually have a dark spotted "necklace". **Habitat:** Found near water, they usually nest near the top of large trees but will nest on artificial structures such as power poles, channel markers or special "Osprey platforms". Almost exclusively a fish eater, Ospreys are noted for their feet first plunge into the water when catching fish. Special adaptations for fishing include a reversible front toe and "spicules" on the bottom of their feet for grasping slippery fish. After catching a fish the bird carries it in a head first orientation as it flies back to the nest. **Reproduction:** Ospreys build a bulky nest of sticks similar to eagle nests. In some places they nest in colonies, Ospreys lay 3-4 eggs which hatch in about 30 days. **Range:** Ospreys have a worldwide distribution being found at some time in their life cycle on every continent except Antarctica. **Conservation Status:** Protected under the Federal Migratory Bird Treaty Act.
Common Tern *Sterna hirundo* Glenn Therres DNR Wildlife and Heritage 410-260-8572 Dave Brinker 1-410-744-8939 Jason Miller USFWS 410-573-4522	Avoid activity near nesting sites during the mid-May to late July nesting season. DNR-designated SSPRA nesting zones limit activity between Apr 15-Aug 15. Created habitat areas at PIERP are not designated. No formal restrictions. Activities that could result in a 'take' are required to be coordinated with USFWS, DNR.	**Status at PIERP–** Common Terns have historically nested at PIERP. Nesting has continued through restoration. **Appearance –** Common Terns are similar in appearance to Least Terns, but slightly larger. A black cap, a pale gray back and wings, and a red-tipped black bill offset their white body. The tail is deeply forked **Habitat** - From late April to August, terns use barren to sparsely vegetated sandbars along shorelines. Common Terns feed in a variety of ways, including capture of prey while in-flight or by diving to the water's surface. Prey items include small fish, shrimp, and insects. Pairs generally occupy and defend a feeding territory which may be more than 20 km away from the breeding colony **Reproduction** - The Common Tern is a colonial breeder that often associates with other gulls or terns. Nests are simple depressions in the sand or shallow cups of dead grass formed on beaches or open rocky areas. Typical clutch size is 2-3 eggs. One study found that 90% of terns observed had returned to the territory occupied the previous year. **Range**. Wide distribution in the Americas. Wintering occurs from Florida to southern South America **Conservation Status:** Protected under the Federal Migratory Bird Treaty Act.

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
Submerged Aquatic Vegetation **Sago Pondweed** **Widgeon Grass** **Horned Pondweed** Jason Miller USFWS 410-573-4522	No excavation or dredging within 500 yards of SAV beds between April 1 and October 1 each year.	Creation of SAV habitat is a goal of the PIERP. In particular, Poplar Harbor is targeted for SAV restoration due to creation of more quiescent conditions. **Status at PIERP–** SAV were found in small patches around PIERP in 1995 during data collection. Small patches of SAV were found again in 2001 after construction of Phase I was complete. Small patches were found in the western 'wave shadow' of Jefferson Island, and just north of Coaches Island in Poplar Harbor. Annual monitoring will take place to document SAV. **Appearance –** Patches of darker vegetative growth in shallow waters. **Habitat –** Shallow, clear Bay waters of <1-3 m. **Conservation Status:** Chesapeake Bay 2000 Agreement has set SAV restoration goals for all Tier I waters, which includes Poplar Harbor.
Double Crested Cormorant ***Phalacrocorax auritus*** Glenn Therres DNR Wildlife and Heritage 410-260-8572 Dave Brinker 1-410-744-8939 Jason Miller USFWS 410-573-4522	No formal restrictions at PIERP. Limited activity from April 1-Aug 15 applied to Jefferson Island area. Activities that could result in a 'take' are required to be coordinated with USFWS, DNR. Double Crested Cormorant, while native, are considered a nuisance species by some. Records should be kept of activities by the cormorants that may result in habitat destruction for other species.	**Status at PIERP–** Double-Crested Cormorants are reported to have nested on remnant islands at PIERP until around 1995. With continued erosion and loss of tree snags to the water, the colony moved to Jefferson Island, where they have apparently contributed to significant tree mortality on the northern side of Jefferson Island. **Appearance –** Large, dark waterbird with a long, hooked bill and long tail. Length: 27 inches Wingspan: 50 inches. The sexes are similar in appearance. Long, thin neck, gular area squared off and orange, extending straight down across throat, orange lores often perches with wings spread to dry them. **Habitat –** Wetlands and open water. Feeds on fish and some benthic invertebrates. A colonial breeder that may nest with other species, this species can be found either in coastal areas or freshwater areas located further inland. **Reproduction –** Nests are found on the ground, on cliffs, or in trees. Clutch of 3-4 eggs, incubates 25-29 days, fledges in 35-42 days. Adults nest once per season. **Range –** Breeds in Great Lakes region and along Atlantic coast of the U.S. **Conservation Status:** Protected under the Federal Migratory Bird Treaty Act. Double-Crested Cormorants are considered by some to be a nuisance bird. Cormorants can affect other waterbird species either through direct competition for nests and nest-sites or by degradation of habitat (Wires et al. 2001). The presence of cormorants and their nests can defoliate trees from acidic guano within a few years, making them less attractive as nest sites for other species, especially those that prefer concealed, leafy areas in the sub-canopy for nesting. Eventually sub-canopy nesters such as Black-Crowned Night-Herons abandon these trees in favor of other sites with suitable vegetation. For this reason, some states have been granted depredation permits for control of cormorants in habitat areas where state- and federally-listed bird species may not be achieving their target population levels due to competition from the cormorants. Controls can include nest destruction, egg-oiling and adult control.

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
Great Blue Heron, *Ardea herodeus* Glenn Therres DNR Wildlife and Heritage 410-260-8572 Dave Brinker 1-410-744-8939 Jason Miller USFWS 410-573-4522	Restricted areas set by DNR, USFWS limiting activity during nesting, fledging periods. Feb 15 – Jul 31 – Limited activities are allowed, with specific stipulations. Normal operational activities (light vehicle traffic, personnel access to spillways) are allowed within restricted areas on PIERP at all times of year. Construction, heavy equipment, earth-moving activities are not allowed during nesting season. Activity within restricted area such as wetland planting, volunteer activities are limited to 6 people at a time, no vehicles. Tours can be conducted, but no people should exit the buses in the restricted areas during the restricted time of year. Activity should be limited to days when air temperatures are less than 85^{o}F and greater than 65 ^{o}F, and not during periods of precipitation.	Great Blue Herons are large colonial nesters. Coaches Island has a large breeding population of Great Blue Herons. **Status at PIERP–** Great Blue Herons have nested on Coaches Island for decades. At least 450 pair are known to nest, mostly on the southern side of Coaches Island. **Appearance –** Huge long-legged, long-necked wader. Long thick yellow bill, usually holds neck in an S-shape. Male and female have similar appearance. Height 38 inches, wingspan 70 inches. White crown and face, black plume extending from above and behind eye to beyond back of head. Brownish-buff neck with black-bordered white stripe down center of foreneck. Blue-gray back, wings and belly, black shoulder, shaggy neck and back plumes in alternate plumage. **Habitat –** Coastal wetlands, brackish marshes, inland lakes and rivers. **Reproduction –** Nesting occurs either in single-species or mixed colonies. Nests are usually formed in trees, but ground, rock, cliff edges, reeds or rushes may also be used. Typical clutch size is 3-7 eggs. Great Blue Herons are inclined to renest in the same area year after year. Old nests may be enlarged and reused Eggs can hatch as early as March at PIERP colony. **Feeding Habits –** Generalist. The Great Blue Heron forages by walking slowly or standing motionless in water and striking at prey. This species rarely forages more than 15 to 20 km from its nesting grounds. Fishing requires shallow waters (up to 0.5 m) with a firm substrate. Main prey items are fish and amphibians, but will also take small mammals, reptiles, crustaceans, insects, and birds **Range -** The Great Blue Heron breeds throughout the U.S. and winters as far north as New England and southern Alaska. **Conservation Status:** Protected under the Federal Migratory Bird Treaty Act.

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
Mixed Heronry **Snowy Egret** *Egretta thula* **Cattle Egret** *Bubulcus ibis* **Little Blue Heron**, *Ardea caerulea* Glenn Therres DNR Wildlife and Heritage 410-260-8572 Dave Brinker 1-410-744-8939	No formal restrictions. Similar to Great Blue Heron. Feb 15 – Aug 15 – Limited activities are allowed, with specific stipulations	A mixed heronry indicates the presence of mixed species of colonial nesters. **Status at PIERP–** Little Blue Heron were found on PIERP during the data collection for the EIS in 1995/1996. Coaches Island may provide breeding habitat for Little Blue Heron. Cattle Egret and Snowy Egret have also been observed nesting on the habitat islands at PIERP. **Appearance:** Little Blue Heron are similar to Great Blue Heron, without white crown, and smaller in size. Snowy Egret are a smaller white heron, distinguished from the Great Egret by smaller size, black bill and yellow feet. Cattle Egret are also a white heron (length 50 cm) with a stout yellow bill and in the breeding season with buff yellow-orange plumes on head, neck and back. **Habitat:** Heron nest in trees or shrubs. They are all primarily fish eaters, but will also eat invertebrates, benthic organisms, reptiles, and amphibians. **Conservation Status:** Protected under the Federal Migratory Bird Treaty Act.
Diamondback terrapin, *Malaclemys terrapin* Howard King or Jim Uphoff DNR Fisheries 410-260-8304 Corps Researcher William Roosenburg 301-884-7467	No formal restrictions. Report sightings to MDDNR or Dr. Roosenburg. PIERP has elected to become a State Terrapin Station to assist in the conservation of terrapin breeding habitat.	The diamondback terrapin is the Maryland State Symbol. **Status at PIERP–** Diamondback terrapin tracks were found at Coaches Island in 1996 2001. Nesting has been observed inside Wetland Cell 5 in Summer 2002, and along the sandy beach remnant outside of Cells 1 and 3d. **Appearance:** The terrapin has a strong beak rather than teeth and is a predator. The carapace or top shell of the Maryland terrapin may be light brown, bluish gray or black. The plastron is yellow to olive in color. The outside of the top shell is covered with thin, shiny scales called scutes. The scutes on some *Malaclemys* have black concentric rings which earned this group the nickname "diamondback." The skin of terrapins is its "fingerprint" in that no two animals are alike. Black spots and dashed or curly lines create a unique design. Diamondbacks are strong climbers and have webbed feet enabling them to swim fast. How far they move throughout the Bay is unknown. Studies have shown that adult terrapins may remain in a rather small area for most of their life. Unlike the aggressive snapping turtle, the terrapin can be quite docile. **Habitat:** Lives and breeds in salt marshes and tidal tributaries. The only North American turtle that lives exclusively in brackish water. Prefers unpolluted tidal areas and therefore are good indicators of healthy wetland systems. May live as long as 50 years. Males mature at seven years at about a pound, when the plastron reaches about four inches. The plastron is the underside ridge running front to back. The female terrapin matures by twelve years old, weighs up to seven pounds and reach lengths of nine inches long. Water temperatures and food supply play a role in growth rates, in warmer waters terrapins stay active, feed longer, and hibernate less. **Breeding:** Mating occurs in May. Female terrapins store sperm and thus can produce fertilized eggs up to four years after mating. Light pink and leathery textured eggs, on average 13, are laid in nests during June and July on shore in sand or loam, then covered. Hatching occurs from August through October depending on temperatures. When the hatchlings emerge, they are an inch long and on their own. 1-3% of the eggs laid produce a hatchling, the survivorship of hatchlings in the wild is currently unknown but is believed to be low. Hatchlings are a favorite with herons. A late hatch may stay buried in the nest and hibernate, most of the adult terrapins also hibernate during winter **Conservation Status:** Not listed, although data is scarce on habitat and populations. There is a terrapin fisheries season in

Table C-3. PIERP Environmental Time of Year Restrictions/Resource Management Information (continued)

Name/ Coordination	Restrictions	Life History Information
		Maryland for commercial fishing. Studies are underway to determine whether this species should be listed as rare, threatened or endangered in the region or state.
Sea Turtles **Loggerhead sea turtle** (*Caretta caretta*) **Green sea turtle** (*Chelonia mydas*) **Leatherback sea turtle** (*Dermochelys coriacea*) **Atlantic (Kemp's) Ridley sea turtle** (*Lepidochelys kempii*) John Nichols NMFS 410-226-5606	No formal restrictions. Report sightings to NMFS. Activities that could result in a 'take' are required to be coordinated with NMFS, DNR.	**Status at PIERP:** Juvenile forage area may be present in the waters around PIERP, in particular in shallow water and areas with SAV. NMFS is very interested in any sightings of sea turtles, as the lower and mid bay are thought to be habitat for juveniles, but not much data is available to evaluate this resource. **Breeding:** Sea turtles nest on sandy ocean beaches. They are not expected to breed at PIERP. **Conservation Status:** Endangered Species Act- Listed Endangered or Threatened, depending on species.

Table C-4. Fish Species Commonly Found in Mesohaline Areas of the Chesapeake Bay

Species Common Name	General Distribution					
	Resident	Seasonal				Occasional
		Fall	Winter	Spring	Summer	
Bull shark						J, A
Sandbar shark						J
Cownose ray					J, A	
Shortnose sturgeon						J, A
Atlantic sturgeon						J,A
American eel				L, J		A
Blueback herring		J	J	J, A	J, A	
Hickory shad						J, A
Alewife		J	A	J, A	J, A	
American shad			A	J, A	J, A	
Atlantic menhaden		A, L	J	E, L, A	J, A	
Atlantic herring			A	A	J, A	
Gizzard shad						J, A
Threadfin shad						J, A
Striped anchovy						J, A
Bay anchovy		E,L J,A	J,A	E,L J,A	E,L,J,A	
Chain pickerel						J, A
Inshore lizardfish						J, A
Oyster toadfish	X					
Skilletfish	X					
Halfbeak						J, A
Atlantic needlefish		J,A		E,A	E,L J, A	
Sheepshead minnow	X					
Banded killifish						J, A
Mummichog	X					
Striped killifish	X					
Rainwater killifish	X					
Rough silverside						J,A

Table C-4. (continued)

Species Common Name	General Distribution					
	Resident	Seasonal				Occasional
		Fall	Winter	Spring	Summer	
Inland silverside	X					
Atlantic silverside	X					
Fourspine stickleback	X					
Threespine stickleback	X					
Lined seahorse	X					
Dusky pipefish						J, A
Northern pipefish	A					
Northern searobin						J, A
White perch						J, A
Striped bass	X (J)					
Black sea bass						J, A
Yellow perch						A
Silver perch						J, A
Spotted seatrout		J		J	J, A	
Weakfish		J		L,J	L, J A	
Spot		J		J	J, A	
Atlantic croaker		J		J	J, A	
Black drum		J			J, A	
Red drum		J				
Striped mullet						J, A
White mullet						J, A
Northern stargazer						A
Striped blenny	X					
Feather blenny	X					
Darter goby						J, A
Naked goby	X					
Seaboard goby						J, A
Green goby	X					
Spanish mackerel						J, A
Harvestfish						J, A
Butterfish						J, A

Table C-4. (continued)

Species Common Name	General Distribution					
	Resident	Seasonal				Occasional
		Fall	Winter	Spring	Summer	
Summer flounder		J, A		J, A	J, A	
Windowpane						J, A
Winter flounder		A	A, L	L, J	J	
Hogchoker	X					
Blackcheek tonguefish						J, A
Northern puffer						J, A

Resident= non-mobile, habitat specific; Seasonal= pelagic migratory;
Occasional= limited by salinity or habitat, occurrence unlikely.
Lifestages: E=Egg; L=Larvae; J=Juvenile; A=Adult, X= All Lifestages Resident

Sources: Hildebrand and Shroeder, 1928; Lippson and Lippson, 1984; Lippson, 1973; Setzler-Hamilton, 1987; White, 1989; Dovel, 1971; Funderburk et al., 1991; Lippson and Moran, 1975; Heck and Thoman, 1984; Murdy et al., 1997.

Table C-5. Finfish Species and Crab Species Collected During Fisheries Studies at the PIERP, 2004

Common Name		Scientific Name		Spring (May)	Summer (August)	Fall (October)
Family	**Species**	**Family**	**Species**			
Anchovies	Bay anchovy	Engraulidae	*Anchoa mitchilli*	**X**	**X**	**X**
	Striped anchovy		*Anchoa hepsetus*		**X**	
Herring	Blueback herring	Clupeidae	*Alosa aestivalis*	**X**	**X**	**X**
	Atlantic menhaden		*Brevoortia tyrannus*	**X**	**X**	**X**
	Gizzard shad		*Dorosoma cepedianum*	**X**	**X**	**X**
	Alewife		*Alosa psuedoharengus*	**X**		
	American shad		*Alosa sapidissima*	**X**		
	Hickory shad		*Alosa mediocris*	**X**	**X**	
Clingfishes	Skilletfish	Gobiesocidae	*Gobiesox strumosus*		**X**	
Needlefishes	Atlantic needlefish	Belonidae	*Strongylura marina*		**X**	
Killifishes	Striped killifish	Cyprinodontidae	*Fundulus majalis*	**X**	**X**	**X**
	Mummichog		*Fundulus heteroclitus*	**X**	**X**	**X**
	Sheepshead minnow		*Cyprinodon variegatus*			**X**
Silversides	Atlantic silverside	Atherinidae	*Menidia menidia*	**X**	**X**	**X**
	Rough silverside		*Membras martinica*			**X**
Pipefishes	Northern pipefish	Sygnathidae	*Syngnathus fuscus*	**X**	**X**	
Drums	Atlantic croaker	Sciaenidae	*Micropogonias undulatus*	**X**	**X**	
	Weakfish		*Cynoscion regalis*			**X**
	Red drum		*Sciaenops ocellatus*			**X**
	Spot		*Leiostomus xanthurus*		**X**	**X**
Bluefishes	Bluefish	Pomatomidae	*Pomatomus saltatrix*		**X**	**X**
Gobies	Green goby	Gobiidae	*Microgobius thalassinus*			**X**
	Naked goby		*Gobiosoma bosc*	**X**		**X**
Temperate basses	Striped bass	Moronidae	*Morone saxatilus*	**X**	**X**	**X**
	White perch		*Morone americana*	**X**	**X**	**X**
Soles	Hogchoker	Achiridae	*Trinectes maculatus*	**X**	**X**	
Lefteye flounders	Summer flounder	Paralichthyidae	*Paralichthys dentatus*	**X**	**X**	**X**
Swimming crabs	Blue crab	Portunidae	*Callinectes sapidus*	**X**	**X**	**X**

Table C-6. Summary of Benthic Macroinvertebrate Taxa Collected From the PIERP, 2000 through 2004

Taxa	Pre-Placement (2000)	Reconnaissance Study (2001)	Post-Placement (2002)	Expansion Study (2004)
Cnidaria (sea anemones)				
Anthozoa[(a)]			X	
Diadumene leucolena[(a)]	X			
Edwardsia elegans	X	X	X	
Turbellaria (flatworms)				
Planariidae		X		
Stylochus ellipticus[(a)]		X	X	
Turbellaria		X		
Turbellaria sp. A[(a)]		X	X	
Nemertinea (unsegmented worms)				
Amphiporidae[(a)]			X	
Amphiporus bioculatus		X	X	
Carinoma tremaphorus	X	X	X	
Micrura leidyi	X	X	X	X
Polychaeta (bristle worms)				
Eteone foliosa	X	X	X	
Eteone heteropoda	X	X	X	X
Glycinde solitaria	X	X	X	X
Heteromastus filiformis	X	X	X	X
Laeonereis culveri			X	
Leitoscoloplos fragilia				X
Leitoscoloplos spp.	X	X		
Leitoscoloplos robustus			X	
Marenzellaria viridis	X	X		X
Mediomastus ambiseta	X	X	X	
Neanthes succinea	X	X	X	X
Nereididae[(a)]			X	
Parahesione luteola			X	
Paraonis fulgens		X	X	
Paraprionospio pinnata		X	X	
Pectinaria gouldii	X	X	X	
Podarkeopsis levifuscina			X	
Polydora cornuta	X		X	
Polydora websteri[(a)]			X	
Sigambra tentaculata		X		
Spiochaetopterus costarum	X		X	
Spionidae		X		

Table C-6. (continued)

Taxa	Pre-Placement (2000)	Reconnaissance Study (2001)	Post-Placement (2002)	Expansion Study (2004)
Streblospio benedicti	X	X	X	X
Tharyx sp. A		X		
Oligochaeta (aquatic earthworms)				
Naididae	X			
Tubificoides spp.	X	X	X	
Gastropoda (snails)				
Acteocina canaliculata	X	X	X	
Epitonium rupicola		X		
Cratena pilata			X	
Gastropoda (snails)				
Gastropoda[(a)]			X	
Haminoea solitaria	X	X	X	
Odostomia engonia[(a)]	X			
Rictaxis punctostriatus	X	X	X	
Sayella chesapeakea[(a)]	X	X	X	
Bivalvia (clams and mussels)				
Gemma gemma	X	X	X	X
Geukensia demissa[(a)]	X			
Lyonsia hyalina		X		
Macoma balthica		X	X	
Macoma mitchelli	X	X	X	X
Mulinia lateralis	X	X	X	X
Mya arenaria	X	X		
Rangia cuneata	X			
Tagelus plebeius	X		X	
Phoronida (phoronids)				
Phoronis sp.			X	
Ascidiacea (sea squirts;tunicates;ascidians)				
Ascidiacea		X		
Molgula manhattensis[(a)]			X	
Amphipoda (beach fleas;scuds)				
Ameroculodes spp. complex	X	X	X	
Apocorophium lacustre[(a)]	X			
Complex				X
Lepidactylus dytiscus		X		
Leptocheirus plumulosus	X			X
Microprotopus raneyi		X	X	
Isopoda (isopods)				
Cyathura polita	X	X	X	X
Edotea triloba	X	X	X	X

Table C-6. (continued)

Taxa	Pre-Placement (2000)	Reconnaissance Study (2001)	Post-Placement (2002)	Expansion Study (2004)
Cumacea (cumacean shrimp)				
Cyclaspis varians	X	X	X	
Branchiuran (barnacles)				
Balanus improvisus[(a)]	X	X	X	
Mysidacea (mysid shrimp)				
Americamysis almyra[(a)]	X	X	X	X
Americamysis bahia[(a)]			X	
Americamysis bigelowi[(a)]	X	X		
Neomysis americana[(a)]		X	X	
Diptera (insects)				
Chironomidae larvae	X			
Total Number of Taxa	**31**	**46**	**35**	**16**

[(a)]Excluded from total number of taxa, based on guidance in Versar, 2002

Table C-7. Summary of Epibenthic Macroinvertebrates Collected From the PIERP, 2000 and 2002

Taxon	Pre-Placement (2000)	Post-Placement (2002)
CNIDARIA (sea anemones)		
Anthrozoa		X
PLATYHELMINTHES (flatworms)		
Stylochus ellipticus (carnivorous flatworm; oyster flatworm)	X	X
Euplana gracilis (slender flatworm)	X	X
ANNELIDA (segmented worms)		
POLYCHAETA (bristle worms)		
Polydora cornuta (mud worm)	X	X
Polydora websteri		X
Neanthes succinea	X	X
Eteone heteropoda (freckled paddle worm)	X	X
Streblospio benedicti (barred-gilled mud worm)	X	
OLIGOCHAETA (aquatic earthworms)		
Naididae	X	X
GASTROPODA (snails)		
Cratena pilata		X
BIVALVIA (clams and mussels)		
Gemma gemma (gem clam)	X	
Geukensia demissa (Atlantic ribbed mussel)	X	
CRUSTACEA (barnacles and amphipods)		
Apocorophium lacustre (amphipod)	X	X
Balanus improvisus (bay barnacle)	X	X
Ampithoe valida (amphipod)	X	X
Cymadusa compta (amphipod)		X
Melita nitida (amphipoda)	X	
Hargeria rapax (Tanaidacea)		X
BRYOZOA (colonial)		
Membranipora tenuis (coffin box bryozoan)	X	

Table C-8. List of Bird Species Observed at the PIERP and Surrounding Waters, May 2001 through May 2005

Group	Family	Scientific Name	Common Name
Waterfowl	Anatidae	*Branta canadensis*	Canada Goose
		Cygnus olor	Mute Swan
		Cygnus columbianus	Tundra Swan
		Anas rubripes	American Black Duck
		Anas platyryhnchos	Mallard
		Anas americana	American Wigeon
		Anas strepera	Gadwall
		Anas discors	Blue-Winged Teal
		Anas crecca	Green-Winged Teal
		Anas clypeata	Northern Shoveler
		Anas acuta	Northern Pintail
		Aix sponsa	Wood Duck
		Aythya valisineria	Canvasback
		Aythya collaris	Ring-Necked Duck
		Aythya marila	Greater Scaup
		Aythya affinis	Lesser Scaup
		Melanitta perspicillata	Surf Scoter
		Melanitta fusca	White-Winged Scoter
		Melanitta nigra	Black Scoter
		Clangula hyemalis	Long-Tailed Duck
		Bucephala albeola	Bufflehead
		Bucephala clangula	Common Goldeneye
		Mergus serrator	Red-Breasted Merganser
		Oxyura jamaicensis	Ruddy Duck
	Gaviidae	*Gavia immer*	Common Loon
	Podicipedidae	*Podiceps auritus*	Horned Grebe
		Podiceps grisegena	Red-Necked Grebe
Pelicans, Cormorants, & Gannets	Pelecanidae	*Pelecanus occidentalis*	Brown Pelican
		Pelecanus erythrorhynchos	White Pelican
	Phalacrocoracidae	*Phalacrocorax auritus*	Double-Crested Cormorant
	Sulidae	*Morus bassanus*	Northern Gannet
Gulls & Terns	Laridae	*Larus atricilla*	Laughing Gull
		Larus delawarensis	Ring-Billed Gull
		Larus argentatus	Herring Gull
		Larus philadelphia	Bonaparte's Gull
		Larus marinus	Great Black-Backed Gull
		Larus hyperboreus	Glaucous Gull
		Larus glaucoides	Iceland Gull
		Larus fuscus	Lesser Black-backed Gull
		Sterna maxima	Royal Tern

Table C-8. (continued)

Group	Family	Scientific Name	Common Name
Gulls & Terns	Laridae	*Sterna caspia*	Caspian Tern
		Sterna hirundo	Common Tern
		Sterna sandvicensis	Sandwich Tern
		Sterna antillarum	Least Tern
		Sterna forsteri	Forster's Tern
		Sterna nilotica	Gull-Billed Tern
		Chlidonias niger	Black Tern
		Rynchops niger	Black Skimmer
Shorebirds	Scolopacidae	*Tringa melanoleuca*	Greater Yellowlegs
		Tringa flavipes	Lesser Yellowlegs
		Catoptrophorus	Willet
		Actitis macularia	Spotted Sandpiper
		Numenius phaeoopus	Whimbrel
		Limosa haemastica	Hudsonia Godwit
		Arenaria interpres	Ruddy Turnstone
		Calidris alba	Sanderling
		Calidris pusilla	Semi-Palmated Sandpiper
		Calidris mauri	Western Sandpiper
		Calidris minutilla	Least Sandpiper
		Calidris fuscicollis	White-Rumped Sandpiper
		Calidris bairdii	Baird’s Sandpiper
		Calidris melanotos	Pectoral Sandpiper
		Calidris maritima	Purple Sandpiper
		Calidris alpina	Dunlin
		Calidris himantopus	Stilt Sandpiper
		Tryngites subruficollis	Buff-Breasted Sandpiper
		Phalaropus tricolor	Wilson's Phalarope
		Phalaropus lobatus	Red-Necked Phalarope
		Limosa fedoa	Marbled Godwit
		Limnodromus scolopaceus	Long-Billed Dowitcher
		Limnodromus griseus	Short-Billed Dowitcher
	Ardeidae	*Ardea herodia*	Great Blue Heron
		Ardea alba	Great Egret
		Egretta thula	Snowy Egret
		Egretta tricolor	Tri-Colored Heron
		Nycticorax nycticorax	Black-Crowned Night-Heron
		Bubulcus	Cattle Egret
	Charadriidae	*Charadrius vociferus*	Killdeer
		Charadrius semipalmatus	Semi-Palmated Plover
		Pluvialis squatarola	Black-Bellied Plover
		Pluvialis dominica	American Golden-Plover
	Haematopdidae	*Haematopus palliatus*	American Oystercatcher
	Recurvirostidae	*Recurvirostra americana*	American Avocet

Table C-8. (continued)

Group	Family	Scientific Name	Common Name
Marsh Birds	Icteridae	*Agelaius phoeniceus*	Red-Winged Blackbird
		Quiscalus quiscula	Common Grackle
		Molothrus ater	Brown-headed Cowbird
	Fringillidae	*Carduelis tristis*	American Goldfinch
	Rallidae	*Rallus limicola*	Virginia Rail
Predatory and Scavenging Birds	Cathartidae	*Cathartes aura*	Turkey Vulture
	Accipitridae	*Pandion haliaetus*	Osprey
		Haliaeetus leucocephalus	Bald Eagle
		Circus cyaneus	Northern Harrier
		Accipiter striatus	Sharp-Shinned Hawk
		Accipiter cooperii	Cooper's Hawk
		Buteo jamaicensis	Red-Tailed Hawk
	Falconidae	*Falco columbarius*	Merlin
		Falco sparverius	American Kestrel
		Falco peregrinus	Peregrine Falcon
	Strigidae	*Nyctea scandiaca*	Snowy Owl
		Asio flammeus	Short-Eared Owl
	Hirundinidae	*Progne subis*	Purple Martin
		Tachycineta bicolor	Tree Swallow
		Riparia riparia	Bank Swallow
		Hirundo rustica	Barn Swallow
		Stelgidopteryx serripennis	Northern Rough-Winged
	Corvidae	*Cyanocitta cristata*	Blue Jay
		Corvus brachyrhynchos	American Crow
		Corvus ossifragus	Fish Crow
Miscellaneous Land Birds	Alcedinidae	*Ceryle alcyon*	Belted Kingfisher
	Picidae	*Colaptes auratus*	Northern Flicker
	Parulidae	*Dendroica palmarum*	Palm Warbler
		Dendroica coronata	Yellow-Rumped Warbler
		Geothlypis trichas	Common Yellowthroat
	Emberizidae	*Melospiza melodia*	Song Sparrow
		Plectrophenax nivalis	Snow Bunting
		Melospiza georgiana	Swamp Sparrow
		Zonotrichia albicollis	White-Throated Sparrow
		Junco hyemalis	Dark-Eyed Junco
	Troglodytidae	*Thryothorus ludovicianus*	Carolina Wren
	Bombycillidae	*Bombycilla cedrorum*	Cedar Waxwing
	Sturnidae	*Sturnus vulgaris*	European Starling
	Motacillidae	*Anthus rubescens*	American Pipit
	Columbidae	*Zenaida macroura*	Mourning Dove
	Apodidae	*Chaetura pelagica*	Chimney Swift
	Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal

Source: MES, 2005b (Appendix B)

Table C-9. Terrestrial Invertebrate Species Observed at the PIERP from May 2001 through January 2005

Family	Common Name	Scientific Name
Butterflies, Moths, and Skippers		
Papilionidae	Pipevine Swallowtail	*Battus philenor*
	Black Swallowtail	*Papilio polyxenes*
	Eastern Tiger Swallowtail	*Pterourus glaucus*
	Spicebush Swallowtail	*Pterourus troilus*
Pieridae	Checkered White	*Pontia protodice*
	Cabbage White	*Pieris rapae*
	Clouded Sulphur	*Colias philodice*
	Alfalfa Butterfly	*Colias eurytheme*
	Cloudless Sulphur	*Phoebis sennae*
Nymphalidae	Variegated Fritillary	*Euptoieta claudia*
	Pearl Crescent	*Phyciodes tharos*
	Question Mark	*Polygonia interrogationis*
	Mourning Cloak	*Nymphalis antiopa*
	American Painted Lady	*Vanessa virginiensis*
	Red Admiral	*Vanessa atalanta*
	Buckeye	*Junonia coenia*
	Red-spotted Purple	*Basilarchia arthemis*
Danaidae	Monarch	*Danaus plexippus*
Hesperiidae	Skipper species	*Hesperiidae sp.*
Libytheidae	American Snout Butterfly	*Libytheana carinenta*
Apaturidae	Hackberry Butterfly	*Asterocampa celtis*
Satyridae	Satyrs and Wood Nymph species	*Satyridae sp.*
Lycaenidae	Copper, Hairstreak, and Blue species	*Lycaenidae sp.*
Saturniidae	Luna Moth	*Actias luna*
Insects and Spiders		
Acrididae	Band-winged Grasshopper	*Pardalophora phoenicoptera*
Gryllidae	Field Cricket	*Gryllus pennsylvanicus*
Libellulidae	Skimmer Dragonfly	unknown
Theridiidae	Black widow Spider	*Lactrodectus mactans*

Source: MES, 2005b

Table C-10. Tree, Shrub, and Dike Seed Mix Plantings Included in the Cell 4D Upland Design at the PIERP

Scientific Name	Common Name
Trees	
Acer rubrum	Red Maple
Celtis occidentalis	Hackberry
Cercis canadensis	Redbud
Cornus florida	Flowering Dogwood
Diospyros virginiana	Common Persimmon
Fagus grandifolia	American Beech
Fraxinus pennsylvanica	Green Ash
Liquidambar styraciflua	Sweet Gum
Liriodendron tulipera	Tulip Poplar
Nyssa sylvatica	Black Gum
Pinus strobes	White Pine
Pinus taeda	Loblolly Pine
Quercus alba	White Oak
Quercus bicolor	Swamp White Oak
Quercus coccinea	Scarlet Oak
Quercus marylandica	Blackjack Oak
Quercus palustris	Pin Oak
Quercus phellos	Willow Oak
Quercus rubra	Northern Red Oak
Shrubs	
Amelanchier canadensis	Serviceberry
Clenthra alnifolia	Sweet Pepperbush
Cornus racemosa	Gray Dogwood
Cornus sericea	Red-osier Dogwood
Ilex glabra	Inkberry
Ilex vericillata	Winterberry
Magnolia virginiana	Sweetbay Magnolia
Prunus maritime	Beach Plum
Sambucus canadensis	Elderberry
Vaccinum angustifolium	Lowbush Blueberry
Viburnum dentatum	Arrowwood
Viburnum lentago	Nannyberry
Baccharis halimifolia	Groundsel Tree
Iva frutescens	Marsh elder
Myrica pensylvanica	Bayberry
Vaccinium corymbosum	Highbush Blueberry
Vines	
Toxicodendron radicans	Poison Ivy
Parthenocissus quinquefolia	Virginia Creeper
Campsis radicans	Trumpetvine
Rubus spp.	Blackberries
Smilax rotundifolia	Greenbrier
Dike Seed Mix – warm season species	
Andropogon glomeratus	Bushy bluestem

Table C-10. (continued)

Scientific Name	Common Name
Boutelouacurtipendula	Sideoats gramagrass
Eragrostis curvula	Weeping lovegrass
Panicum amarum	Coastal panicgrass
Sorghastrum nutans	indiangrass
Schizachyrium scoparium	Little bluestem
Panicum virgatum	switchgrass
Dike Seed Mix – cool season species	
Agrostis alba	Redtop
Festuca ovina varduriuscula	Hard fescue
Festuca arundinacea	Tall fescue
Elymus canadensis	Canada wildrye
Elymus virginicus	Virginia wildrye
Dike Seed Mix – forb species	
Chamaecristafasciculata	Partridge pea
Rudbeckia triloba	Brown eyed susan
Monarda fistulosa	Monarda

Source: MES, 2004b

Table C-11. Woody Species Survival in the Cell 4D Upland at the PIERP, Fall 2002[1]

Scientific Name	Common Name	Indicator Status*	Percent Survivorship
Trees			
Acer rubrum	Red Maple	FAC	22%
Celtis occicentalis	Hackberry	FACU	140%**
Cercis canadensis	Redbud	FACU-	50%
Cornus florida	White dogwood	FACU-	40%
Disopyros virginiana	Persimmon	FACU-	100%
Fagus grandifolia	American Beech	FACU	30%
Fraxinus pennsylvanica	Green Ash	FACW	89%
Liquidambar styraciflua	Sweet Gum	FAC	76%
Lirodendren tulipifera	Tulip Poplar	FACU	83%
Nyssa sylvatica	Black Gum	FACW+	25%
Pinus strobus	White Pine	FACU	0%
Pinus taeda	Loblolly Pine	FAC-	76%
Quercus alba	White Oak	FACU-	60%
Quercus bicolor	Swamp White Oak	FACW	70%
Quercus caccinea	Scarlet Oak	UPL	7%
Quercus palustris	Pin Oak	FACW	0%
Quercus phellos	Willow Oak	FAC+	91%
Quercus rubra	N. Red oak	FACU-	10%
Chamaecyparis thyoides	Atlantic White cedar	OBL	67%
Tree total			**54%**
Shrubs			
Amelanchier Canadensis	Serviceberry	FAC	135%**
Baccharis holimifolia	Groundsel Tree	FACW	45%
Clethra alnifolia	Sweet Pepperbush	FAC+	80%
Cornus racemosa	Gray Dogwood	FAC	60%
Cornus sericea	Red-osier Dogwood	FACW+	55%
IIex Globra	Inkberry	FACW-	60%

Table C-11. (continued)

Scientific Name	Common Name	Indicator Status*	Percent Survivorship
Iiex Verticillata	Winterberry	FAC-	13%
Iva Frusescents	High Tide Bush	FACW+	0%
Magnolia Virginiana	Sweetboy Magnolia	FAC+	95%
Myrica Pensylvanica	Bayberry	FAC	40%
Prunus moritima	Beach Plum	UPL	10%
Sambucus canadensis	Elderberry	FACW-	15%
Vaccinum angustifolium	Lowbush Blue berry	FACU-	10%
Vaccinium Corymbosum	Highbush Blueberry	FACW-	50%
Viburnum dentatum	Arrowwood	FAC	63%
Viburnum Lentago	Nannyberry	FAC	70%
Shrub totals			**46%**

[1] Spring 2002 Cell 4D Total woody species planted = 1061; October 2004 Cell 4D Total woody species survival = 528; Survival rate = 0.4976 or 50%

***Key to Table:**

FAC	Facultative Plants
FAC-	Facultative Plants (with less of an association with wetlands)
FACW+	Facultative Wetland Plants (with a strong tendency towards wetland conditions)
FACW-	Facultative Wetland Plants (with less of an association with wetlands)
UPL	Obligate Upland Plants
FACU	Facultative Upland Plants
FACU-	Facultative Upland Plants (with less of an association with wetlands)
OBL	Obligate Wetland Plants

**Number of individuals planted may not be correct. A second survey in the spring will be conducted to verify these results.

Table C-12. Tree, Shrub, and Herbaceous Species Observed at Coaches Island

Scientific Name	Common Name
Tidal Marsh	
Baccharis halimifolia	Groundsel Tree
Juniperus virginianus	Eastern red cedar
Myrica cerifera	Southern bayberry
Phragmites australis	Common Reed
Schoenoplectus americanus	Olney Three-square
Scirpus robustus	Saltmarsh bulrush
Typha angustifolia	Narrow-leaf Cattail
Upland Areas	
Acer rubrum	Red Maple
Allium vineale	Field Garlic
Campsis radicans	Trumpet Creeper
Cornus florida	Flowering Dogwood
Dicanthelium sabulorum	Panic Grass
Ilex opaca	American Holly
Juniperus virginianus *Lonicera japonica*	Eastern Red Cedar Japanese Honeysuckle
Nyssa sylvatica *Parthenocissus quinquefolia*	Tupli Poplar Virginia Creeper
Peinus serotinus	Black Cherry
Phytolacca americana	Pokeweed
Polygonum pensylvanicum	Pennsylvania smartweed
Prunus serotina	Black Gum
Smilax rotundifolia	Greenbrier
Thelypters palustris var. *pubescens*	Marsh Fern
Toxicodendron radicans	Poison Ivy
Vaccinium corymbosum	Highbush blueberry
Viburnum prunifolium	Black haw
Impoundment Areas	
Carex annectens	Yellow-fruited Sedge
Eichomia crassipes	Water Hyacinth
Juncus acuminatus	Taper-tip Rush
Juncus dichotomous	Forked Rush
Juncus effusus	Soft Rush
Lemna minor	Lesser Duckweed
Polygonum pensylvanicum	Pennsylvania Smartweed
Scirpus cyperinus	Wool grass

BIRD CENSUS MONITORING MONTHLY SUMMARIES

Frequent bird census monitoring on PIERP is conducted throughout the year to determine the seasonal and long-term bird utilization of each interim habitat type and cell at PIERP (MES, 2003a). Monitoring is conducted from dike roads on a biweekly basis to document both bird species occurrence and abundance (numbers of birds) using the existing PIERP habitats (MES, 2003a). The surveys are generally conducted monthly depending on bird activity; however, more frequent surveys generally occur during the waterbird nesting period (May-June) and shorebird migration period (July to September). During heavy bird usage periods, the survey frequency occurs approximately every 12 days. Currently, biweekly surveys are scheduled, conducted, and the results are submitted to the USACE on a monthly basis and annual basis (to summarize yearly results). The summaries of monthly and bimonthly bird monitoring reports completed by MES from September 2002 through March 2005 are presented below.

14 and 25 September and 7 October 2002 (10-02)

Bird predators are attracted to gregarious concentrations of any species. Shorebirds focused at PIERP are most likely to attract Merlin and Peregrine Falcons, while Bald Eagle take waterfowl. Singles of all of these predators were observed feeding on prey at the project site or nearby Coaches Island. Additional hawks and other species sighted at the project site include Osprey, Northern Harrier, Double-crested Cormorant, and Mourning Dove. Osprey and cormorants nest within the project site and observed birds may have been late lingering local nesters, while the harrier and dove are surely passing migrants.

In summary, the census period coincides with southward migrations of mid-season for gulls, terns, and songbirds, late-season for wading and shorebirds, and early-season for waterfowl. The wettest portions of Cells 1 and 3 are generally most utilized by migrant waterfowl and large numbers of shorebirds for feeding, while migrant wading birds, gulls and terns stage and rest on the security of vast, unoccupied, terrestrial portions of Cells 2, 3, 4, and 6. Numerous species of vagrant and migrating butterflies also utilize the restoration site as a rest stop, while several other invertebrate species and White-tailed Deer are present.

22 October and 15 November 2002 (11-02)

The census period coincides with southward migrations of late-season for gulls, terns, shorebirds, and songbirds, mid-season for waterfowl, and early-season for loons, grebes, bay ducks, sea ducks, field birds, and finches. Precipitation during October greatly increased the flooded area within cells and may have influenced the distribution of some species within the restoration site. The wettest portions of Cells 1 and 3 are generally most utilized by migrant waterfowl for resting and large numbers of shorebirds for feeding, while migrant gulls and terns stage and rest on the security of vast, unoccupied, terrestrial portions of Cells 2, 4, and 6. The first seasonal deposition of marine dredge spoils into south Cell 2 commenced during the November census, but its influence on bird distribution within PIERP will have to be deferred to subsequent census. Construction and/or substrate excavation may have influenced bird occurrence in Cells 3 and 4 during the period censuses. River Otter was observed within the restoration site during the October census, while southward migration of vagrant and migrating

butterflies was lacking on the November census. A Band-winged Grasshopper was observed during each census of the period.

13 December 2002 (12-02)

The census period coincides with the end of southward migration for the season and prominence of wintering species such as loons, grebes, sea ducks, bay ducks, Purple Sandpiper, and Snow Bunting. Precipitation during November and early December greatly increased the flooded area of all the cells where increased water depth and/or prolonged freezing appear to have forced shorebirds to open water of rip-rap around the periphery of PIERP and new shallow-water habitat created by recent precipitation in Cell 5, while waterfowl moved to open tidewater offshore. Bird activity was anticipated to be focused in Cell 2 at the out-fall pipe of the spoils deposition initiated in November. Instead, no birds were found in that area. Concentrated construction and/or substrate excavation may have precluded birds from using Cell 4 during the period, while shorebirds appeared to quickly utilize new shallow-water habitats created in Cell 5 by recent precipitation. Conversely, the shorebirds were not utilizing new shallow storm water habitats created in Cell 4D. Gull utilization of the site continues in a seasonal decline. Loons, sea ducks, and bay ducks were found feeding in Cell 6 where nearly all the gulls, some shorebirds, geese, and Snow Buntings were also located. Two Common Loons were observed in Cell 5 where one surfaced with a fish.

12 March 2003 (03-03)

Precipitation since the last census greatly increased the flooded area of most cells, while prolonged freezing may have prevented waterfowl and shorebirds from utilizing cell water during most of that period. The census period largely reflects wintering offshore species like loons, grebes, swan, geese, sea ducks, bay ducks, Purple Sandpiper, and terrestrial Snow Bunting, but some species may represent early spring transients such as Great Blue Heron, large gull species, Least Sandpiper, and Red-winged Blackbird. Most notable is the concentration of Herring Gulls in Cell 1 where nearly all the gulls had adult plumage, with brightly colored soft-part colors, were very vocal, and many appeared to be paired and/or defending specific locations. Spring transient Herring Gulls typically reach a peak at this latitude in mid-March while their nesting has occurred at PIERP in recent years. Consequently, presence of these gulls may represent spring transients and/or birds early to arrive at the nesting location. Cell 6 continued to attract an interesting array of wintering species, while offshore Horned Grebe, Red-necked Grebe, Black Scoter and Purple Sandpiper, and the Least Sandpipers in Cell 5 are the most interesting occurrence. Most notable are seven Red-necked Grebes, a Canadian coastal wintering bird seldom coming this far south.

15 and 26 April 2003 (04-03)

Precipitation in the last half of March through April was near normal for the region keeping the portion of cells covered with stormwater at or near the maximum area covered since completion of the project site in 2002. Construction during the survey period was centered in Cell 4 where draining, excavation, and construction subdivided the cell while topography grading in newly made Cell 4DX is creating a tidal wetland designed for that cell. Bird survey results with few species and individuals of waterfowl indicate termination of the wintering waterfowl season, while arrival and/or concentrations of migrants and potential nesting species indicate spring transient and the nesting season are in progress. Dunlin and Sanderling comprise nearly all the

individual transient shorebirds present during the surveys and those species are anticipated to remain dominant through the spring transient period. Nests of Mute Swan, Canada Goose, Osprey, Herring Gull and Great Black-backed Gull in habitats of Cell 1 signal the nesting season is in progress. Existing stormwater removal with exposure and drying of the bed of Cells 1 and 3 may discourage transient shorebirds and/or nesting birds from those cells.

14 and 29 May 2003 (05-03)

Continuing weather characterized by overcast sky, frequent precipitation, and well below normal ambient temperatures strongly influenced habitats with the cells of PIERP where stormwater cover increased over the period despite a stepped-up pumping effort to remove water cover throughout the project site. Excavation and grading construction of tidal wetland topography in Cell 4DX was completed during the period, while a preliminary dissecting dike across Cell 1 was also completed. The weather and/or construction activity may have influenced procession or initiation of nesting by some bird species particularly in Cell 1. The May censuses were timed to coincide with the peak period of spring shorebird migration, and to further document nesting bird activities at the site. The census results suggest peak shorebird migration is delayed about two weeks or more, while nesting initiated in April has intensified. On 14 May Double-crested Cormorant, Mallard, Osprey, Herring Gull, Common Tern and probably Great Black-backed Gull, Killdeer, Willet, and Red-winged Blackbird had nests with eggs. On 29 May the colonies of Double-crested Cormorant, and Common Tern were comprised of substantially more individuals than the previous census while Mallard, Osprey and Killdeer were noted with young.

4, 5, 10, 20, 25 June and 7, 9, 21, 31 July 2003 (06/07-03)

Terns are the highlight of bird sightings at PIERP during the period. A Gull-billed Tern was among the terns flying around the nesting islands in Cell 4C on 25 June. Historically, this tern species nested in coastal Maryland, but was extirpated decades ago by development filling of marshes along the coast. Their occurrence anywhere in Maryland is rare today. The coastal Sandwich Tern has the same history in Maryland and it is most interesting that one of those seen on 14 May was also at Cell 4C. PIERP provides suitable nesting habitat for both these species. The Caspian Tern and Black Tern are species that nest primarily at interior lake and marsh locations in North America. Both species are casual coastal vagrants in summer, thus it is a delight to see one of the former attracted to the nesting tern activity in Cell 1 on 9 July while a Black Tern was noted resting among a flock of gulls and terns in Cell 3 on 31 July. These occurrences bring to date an unprecedented sighting of eight species of terns at PIERP.

A total of 15 species of birds were confirmed as nesting at PIERP in 2003 while presence of large numbers of cormorants, gulls and terns suggest hundreds of these colonial nesting species may have utilized the site for nesting. Additionally, five potential nesting species were frequently seen, but not confirmed as nesting. Ospreys nesting at the project site produced 1.8 fledglings per active nest. Construction activity during the period focused on mining substrates in Cell 4 & 5, creation of dissecting dikes in Cells 1 & 3, excavation of stormwater drainage ditches in all containment cells, and temporary pump stations set-up at most cells to remove accumulated stormwater. Frequent precipitation during preceding months had left large areas of most cells covered with trapped stormwater, however increased pumping efforts had vastly reduced the area of cells covered by stormwater by the end of the period. Censuses are timed to detect spring departing and fall arriving migrant shorebirds, and cell utilization by these species and local

nesting bird species. Peak of the spring shorebird migration is about 15 days late, took place within just a few days, and anticipated numbers utilizing PIERP are less than anticipated. The fall shorebird migration began on time the first week of July with weekly numbers of individuals increasing for remainder of the period. Red-necked Phalarope, White-rumped Sandpiper, Avocet, Chimney Swift, and an unprecedented eight species of terns are the most out-standing bird species seen during the period.

13, 21, 23, and 29 August 2003 (08-03)

Censuses are timed to detect the end and departure of nesting species, most shorebird migration, and utilization of the cells by all migrants. Nesting Double-crested Cormorant, Mallard and Herring Gull still had flightless young during the period, Osprey, Killdeer, Willet, Great Black-backed Gull, Common Tern, Least Tern, Barn Swallow and Red-winged Blackbird had ceased nesting, and Willet, Least Tern and most Barn Swallow and Red-winged Blackbird had totally departed the site by the end of the period. The fall shorebird migration followed a historical pattern beginning the first week of July with subsequent census numbers of individuals increasing and peaking in the second half of the period. Construction activity during the period focused on mining substrates in Cells 4, 4C & 5, creation of dissecting dikes in Cells 1 & 3, excavation of stormwater drainage ditches in all containment cells, and temporary pump stations set-up at most cells to remove accumulated stormwater for drying and preparation to receive dredge materials. Increased pumping efforts vastly reduced the area of cells covered by stormwater throughout the period. Outstanding occurrences include vast numbers of Great Black-backed Gulls at the site during the period, appearance of Chimney Swifts on several censuses, unusual vagrants like Caspian Tern, Black Tern and Black-Crowned Night Heron. Additionally, most observed Royal Terns were wearing leg bands, and a European Mute Swan wearing a transmitter spent a few days at the site. An American Golden Plover spotted on 23 August by a tour participant was the most exciting species seen during the period.

8, 15, and 24 September 2003 (09-03)

Censuses are timed to detect the end of fall shorebird migration, arrival of fall migrating surface-feeding ducks, and utilization of the cells by all migrant species. Late nesting activity was noted on 8 September in Cell 3 where an adult Osprey was still present tending a fledgling, and six Double-crested Cormorants on the nesting island included at least one pre-fledging young. Young gulls have not been seen in the nesting areas of Cell 3 for weeks yet hundreds of Herring Gulls were present throughout the period and similar numbers of Great Black-backed Gulls were present on 8 September. Fall shorebird migration followed a historical pattern beginning the first week of July and was anticipated to end during this period. Indeed, individual numbers dropped 30 percent from August to the 8 September census. Arrival of fall migrating surface-feeding ducks was anticipated during the period with the presence of 59 ducks of four species on 8 September. Construction activity during the first half of the period included mining substrates in Cells 4, 4C & 5, creation of dissecting dikes in Cells 1 & 3, excavation of stormwater drainage ditches in all containment cells, and removing accumulated stormwater for drying and preparation to receive dredge materials. Additionally, arrival of the off-loading pump barge and installation of a pipeline along the central dike for deposition of dredge materials was underway. Pumping efforts during past periods had reduced the area of cells covered by stormwater in the first half of the period to their lowest proportions than any time during the past 12 months. All of these bird and construction activities came to a halt when the island was breached and flooded by

Chesapeake tidewater during tropical storm Isabel on 18-19 September. Migrant birds went elsewhere while construction efforts were furiously centered on reconstructing breaches in the island dikes to prevent further damage to the project site. These conditions prevailed through the second half of the period. Caspian Tern, American Golden Plover, and Norway Rat are the most unusual occurrences during the period.

8 and 31 October and 18 November 2003 (10/11-03)

Censuses are timed to detect late migrant shorebird, tern or gull species, peak of fall migrant surface-feeding ducks, and first arrival of wintering species. Census results show several species of shorebirds were present into November with late migrating Dunlin and Sanderling comprising most individuals. Great Black-Backed Gull numbers dropped sharply in early November, while other gull species and numbers declined through the period. Migrant surface-feeding duck species and numbers appear to have peaked in early November. Tidewater flooding from tropical storm Isabel and/or marine dredge material slurry covered all of Cells 1, 3, 3D, 5 and 6 throughout the period limiting bird activity to the south portion of Cell 3 and Cells 5-6. Construction disturbance throughout the project site was most intense since bird monitoring began. Great Black-Backed Gulls continue to be the most frequent fatalities found dead at the site. Transient American Black Duck, a bird of concern, had a presence at the site throughout the period, while late migrating Royal Tern and Lesser Yellowlegs were found late in the period. Transient Short-eared Owls were flushed from grass by construction activity at Cell 2 in early November, while transient butterflies were found into 31 October.

13 January 2004 (01-04)

Censuses are timed to detect wintering loon, grebe, waterfowl, shorebird, and songbird species choosing to winter at the project site. Pumping to remove cell water was complete in all but Cells 5 and 1 south by mid-January 2004 eliminating shallow water habitat for bird use. Furthermore, surface water throughout the project site including tidewater in Cell 4X was frozen with exception of the deepwater portion of Cell 5 and tidewater in Cell 6. These conditions forced wintering birds to open water habitats in Cells 5 and 6, the riprap island perimeter, or offsite to suitable non-frozen habitats. Indeed, 85 percent of the birds within the project site were in Cells 5 and 6, while 67 percent of all birds observed during the census were in unfrozen tidewater outside the project site. A total of 18 species of waterfowl including a rare American Merganser and five species of shorebirds including Black-bellied Plover and Purple Sandpiper were found in unfrozen habitats adjacent to the project site. Construction activity during the period attempted to remove water from Cells 3 south and 5, mining materials for repairs and construction, repairing the breach in Cell 5, and construction to increase Cell 2 dike height. Construction activity during the period appeared to have no effect on habitat utilization by birds since the birds were not present. An immature Herring Gull was the only fatality found at the site. There were over 100 American Black Duck, a bird of concern, wintering at the site through 13 January. A total of three wintering Brown Pelican and 54 Purple Sandpipers were noted on island riprap during the census.

20 February 2004 (02-04)

Censuses are timed to detect wintering loon, grebe, waterfowl, shorebird, and songbird species choosing to winter at the project site, and the first spring migrants. Cell water and/or surrounding Chesapeake Bay tidewater was frozen throughout much of the period. Tidewater of Cell 4X and

surface water was frozen in all cells during the census with exception of the deepwater portion of Cell 5, tidewater in Cell 6, and a few acres in the southeast corner of Cell 3 south. These conditions forced wintering birds to open water habitats in Cells 3 south, 5 and 6, the riprap island perimeter, or offsite to suitable non-frozen habitats. Construction activities in Cell 5 late in the period may have disturbed birds focused around open water there. An unusual number of 167 Horned Grebes offshore, and over 200 Herring Gulls and 50 Red-winged Blackbirds at island nesting areas suggest early spring migrants, while over 1200 shorebird individuals may be attracted to recently exposed substrates in Cell 5. A Herring Gull and Lesser Scaup comprise fatalities found during the census.

1 March 2004 (03-04)

Censuses are timed to detect wintering and/or departing spring migrant loon, grebe, waterfowl, shorebird, and songbird species utilizing the project site. Storm water removal and recent completion of the winter thaw leaves Cell 1A flooded, but all other cells have modest to sparse puddles of water available for bird use. Construction activities during the period include removal of cell storm water, mining materials for repair and construction, repairing the breach in Cell 5, and construction to increase Cell 2 dike height. An unusual number of bird fatalities found on dike roads may be diseased wintering waterfowl fatalities that scavengers found washed-up around the island perimeter after thaw of tidewater. Killdeer and Herring Gull have arrived at the project site in anticipation of nesting while incubating Bald Eagle and Great Blue Heron are well into the nesting cycle. Numbers and species of surface-feeding ducks indicate passing spring migrants while some missing Sanderling and Dunlin suggest those species are migrating north.

9 and 29 April, and 11and 21 May 2004 (04/05-04)

Construction activity during the period was intense with on-going storm water removal from cells; mining materials for repair and construction; repairing the breach in south Cell 5, tropical storm damaged subdivision dikes, and roadways; and construction to increase Cell 2 dike height, and create an elevated pad for construction of permanent headquarters buildings. Additionally, dike repair and construction grading areas were being covered with stabilizing seed mats. All or any of these activities may have precluded and/or limited habitat utilization by birds in some cells or portion of cells. The portion of cells covered by storm water remained near constant throughout the period and appeared to have provided satisfactory shallow-water habitat during the time of peak transient shorebirds whose numbers exceeded all previous documented seasons at the site. Censuses are timed to detect late departing wintering species, arrival and peak of spring migrating species, and nesting activity of species utilizing the island. Herring Gull continues to be the most common bird fatality detected at the site. An American White Pelican, Red-necked Phalarope, Caspian Tern, and Black Tern were the most unusual species found at the site latitude during the period.

1, 15, and 30 June 2004 (06-04)

Construction activity during the period was minimal with on-going storm water removal from cells; mining materials for repair and construction; repair tropical storm damaged internal dikes and worn roadways; install weirs in some internal dikes; and excavation/grading for creation of a tidal wetland in Cell 3D. A subcontractor was completing grading of the recent Cell 2 dike elevation, installing seed-mats on those barren area, and removing men and machinery from the site. Construction activity centered in the Cell 3D-Cell B-C area may have disturbed nesting

birds focused in that area. The portion of cells covered by storm water remained near constant throughout the period and appeared to have provided satisfactory shallow-water habitat for late transient shorebirds. Censuses are timed to detect late departing migrant shorebird species and nesting activity of local species utilizing the island. Herring Gull continues to be the most common bird fatality detected at the site. Whimbrel, Bonaparte's Gull, six species of terns, Rough-winged Swallow, hundreds of Laughing Gulls throughout the period, and nesting by Snowy Egrets highlighted bird occurrence during the period.

13 and 29 July 2004 (07-04)

Construction activity during the period was minimal with on-going storm water removal from cells; mining materials for repair and construction; repair tropical storm damaged internal dikes; install weirs in some internal dikes; and excavation/grading for creation of a tidal wetland in Cell 3D. Construction activity centered in the Cell 3D-Cell 1B-C area may have disturbed nesting birds focused in Cell 1A, but not those nesting in Cell 4DX. The portion of cells covered by storm water increased slightly during the period and provided good shallow-water habitat for arrival of south migrating transient shorebirds. Censuses are timed to detect species and portions of the site utilized by local nesting birds, and early arrival of south migrating transient shorebirds. Herring Gull continues to be the most common bird fatality detected at the site. Laughing Gulls throughout the period, a vagrant Tri-colored Heron, and unusual American Avocet and Bonaparte's Gull highlighted bird occurrence during the period.

9, 18, and 26 August and 3, 10-12, and 25-27 September 2004 (08/09-04)

Construction activity during the period was minimal with limited storm water removal from some cells and more continuous removal from Cells 4, 5, and 3D; mining materials for road repair and dissecting dike construction in Cell 3AB; and excavation/grading for creation of a tidal wetland in Cell 3D. Construction activity centered in the Cell 3AB and Cells 1A-3D areas may have disturbed late nesting and/or transient birds focused in those areas. The portion of cells covered by storm water increased in most cells during the period to provide good shallow-water habitat for south migrating transient shorebirds. Censuses are timed to detect late nesting activity of species utilizing the site, early arrival of south migrating transient surface-feeding waterfowl, and peak of south migrating transient shorebirds. Census found increased gull, waterfowl, and shorebird fatalities during the period with losses widespread by 25 September. A toxin developed in damp to wet substrates where birds feed may be responsible for the fatalities. Abundant shallow-water habitat throughout much of the project site enabled transient shorebirds to utilize nearly all the enclosed cells. An unprecedented 24 species of shorebirds during the 10-12 September period contained coastal migrating Red Knot, Whimbrel, Marbled and Hudsonian Godwits, Red-necked and Wilson's Phalaropes, and six species of Erolia sandpipers including a first Baird's Sandpiper. Additional unusual birds include an American White Pelican, Turkey Vulture, Tricolored and Green Herons, Black Tern, and first Lesser Black-backed Gull.

2 and 26 October and 11 and 26 November 2004 (10/11-04)

Construction activity during the period was minimal with limited storm water removal from Cells 3A, 4, and 5, mining materials for road repair and dissecting dike construction in Cell 3AB; and excavation/grading for creation of a tidal wetland in Cell 3D. Repair and construction activity appears to not have prevented birds from utilizing most areas of the project site. An exception may be the activity centered in the Cell 3D and Cells 1A area that is synonymous with

much bird activity. Storm water quality below regulatory standards in most cells precluded discharging into Chesapeake Bay during the period with the portion covered by storm water increasing in affected cells through the period. Censuses are timed to detect south transient surface-feeding waterfowl, late migrant shorebirds, and early arrival of south transient loons, grebes, swans, bay ducks, and sea ducks. South transient surface-feeding waterfowl reached a peak with 642 individuals of seven species in Cell 2 on 26 November. A flock of 1403 Dunlin on 26 October comes during their historical peak migratory period, but the high number suggests a mass southward movement related to prevailing climatic conditions. South migrating Common Loon, Horned Grebe, Tundra Swan and most species of bay ducks and sea ducks arrived in the area of the project site at appropriate historical dates. The north end of Cell 2 hosted a flock of over 4500 Lesser Scaup and Ruddy Duck on 26 November. Numerous bird fatalities noted during the previous period continued into this period with 13 sick or dead birds of seven species noted during the 26 October census. A toxin developed in damp to wet substrates where birds feed may be responsible for the fatalities. Shallow-water habitat suitable for transient shorebird utilization was abundant into the period. Constantly rising water depth could have discouraged shorebird use late in the period while attracting the abundant ducks noted there at this time. Outstanding bird occurrences include Tri-colored Heron into early October, Royal Tern on the late date of 26 October, Brown Pelican and Belted Kingfisher in Cell 4 on 11 November, a Black-crowned Night Heron at Cell 4DX on each November census, and 77 Snow Buntings on 26 November.

08 and 30 December 2004 (12-04)

Construction activity was diverse centering on storm water removal from some cells; operating the dredge material out-fall pipe along the north-central dike; mining stored material from Cells 5 & 6 for construction of the tidewater inlet beneath the east dike at Cell 3D; repairing eroded areas; and construction grading of substrates in Cell 3D for creation of a tidal wetland. Repair and construction activity appears to not have prevented birds from utilizing most areas of the project site. An exception may be the activity centered in the Cell 3D and Cells 1A area that is synonymous with much bird activity. Deposition of channel dredge material slurry was realized over the entirety of Cells 1A-D, 2, and 3A-C by the end of the period and may be beginning to discourage many birds from using most portions of those cells. Censuses are timed to detect late south transient surface-feeding waterfowl, and arrival of wintering shorebirds, loons, grebes, swans, bay ducks, and sea ducks. The number of surface-feeding waterfowl at the site remained high through the period while arrival of several hundred shorebirds suggests some species in these groups may winter at the sight as long as open cell water is available and/or water is not too muddled with depositional slurry. Bird fatalities are not of note this period. A large flock of resting, surface and diving waterfowl in Cell 2 from mid-November to late in this period may indicate the significance of protected bodies of shallow fresh-water habitat provided by containment cells within the project site. Constantly rising storm water and/or depositional slurry depth in most cells through the period may have discouraged late period use of some cells by surface-feeding waterfowl and shorebirds and this situation is anticipated to continue until the trend reverses. Late Western and Least Sandpipers on 30 December, continued presence of over 100 European Starling, and increasing numbers of Song Sparrow and Snow Bunting through the period are notable bird occurrences.

12 January 2005 (01-05)

Construction activity centered on storm water removal from Cells 4 & 5; operating the dredge material out-fall pipe along the north-central dike; mining stored material from Cells 5 & 6 for construction of the tidewater inlet beneath the east dike at Cell 3D; repairing eroded areas; and construction grading of substrates in Cell 3D for creation of a tidal wetland. Repair and construction activity appears to not have prevented birds from utilizing most areas of the project site. An exception may be the activity centered in the Cell 3D and Cells 1A area that is synonymous with much bird activity. Deposition of channel dredge material slurry was realized over the entirety of Cells 1A-D, 2, and 3A-C by the end of the period and may be beginning to discourage many birds from using most portions of those cells. Censuses are timed to detect wintering waterfowl, shorebirds, and songbirds utilizing the project site, and wintering offshore loons, grebes, swans, geese, bay ducks, and sea ducks. Continued presence of over 1000 waterfowl within the project site denote its significance as a refuge and resting area for wintering waterfowl while increasing cell water depth has forced over 500 wintering shorebirds to island periphery habitats. Herbaceous plantings in Cell 4DX and Cells 1 & 2 dike slopes appear to be supporting good numbers of seed-eating Song Sparrow, Snow Bunting and Red-winged Blackbird for the winter. Bird fatalities are not of note this period. Western and Least Sandpipers are very late migrants and/or unusual wintering species, while Red-breasted Merganser in Cells 4 & 4DX suggest fish prey in those cells. Daily high temperatures below freezing and/or snow cover from 17 January through the end of the period excluded bird activity from the project site.

8 and 22 February 2005 (02-05)

Construction activity centered on storm water removal from Cell 5; storm water and dredge slurry water removal from Cells 1A-D, 2 and 3A-C; adjusting the dredge material out-fall pipe along the north-central dike; mining and stockpiling materials in Cells 5 & 6 for construction use; repairing eroded areas; and final construction grading of substrates in Cell 3D for creation of a tidal wetland. Fresh dredge slurry deposits increased water depth in Cells 1A-D, 2, and 3A-C discouraging utilization by wintering surface-feeding waterfowl and eliminating shallow-water habitat for shorebirds. Furthermore, extended periods of frozen cell water excluded utilization of cells by all species of birds. Wintering waterfowl appear to return to depositional cells at thaw and/or clearing of slurry water while shorebirds are forced to open, shallow water of the island periphery or unfrozen shallow-water habitat of Cell 5 unaffected by dredge material deposition. The active mining and storing of materials operations in the latter cell may have disturbed and/or further discouraged some species from utilizing that cell. Censuses are timed to detect wintering waterfowl, shorebirds, and songbirds utilizing the project site, and wintering offshore loons, grebes, swans, geese, bay ducks, and sea ducks. The two census found respective presence of 768 and 1026 waterfowl within the project site denoting its significance as a refuge and resting area for wintering waterfowl while increasing cell water depth in Cells 1A-D, 2, and 3A-C has forced over 500 wintering shorebirds to island periphery habitats and/or the only remaining shallow-water habitat that is located in Cell 5. Herbaceous plantings in Cell 4DX and Cells 1 & 2 dike slopes appear to be supporting good numbers of seed-eating Song Sparrow and Red-winged Blackbird for the winter. Extended periods of snow cover during the period may be responsible for disappearance of wintering Snow Buntings on the 22 February census. Sea duck hunting pressure appeared to discourage offshore wintering bay and sea ducks from the site vicinity during the last period, but 1860 on the 22 February census may indicate remaining ducks returning to waters around the island. Bird fatalities noted on the census include two Ruddy

Ducks washed-up on the Cell 6 beach and remains of two Lesser Scaup found on Cells 5 and 6 dike roads. Outstanding bird occurrences on 22 February include the first Snow Goose sighting, and the first transient arrival of Killdeer and territorial singing of Red-winged Blackbird both potential nesting species. Over 100 American Black Duck and 500 Herring Gull wintered within the project site during the period, while fish-eating Red-breasted Merganser continue to frequent Cell 4.

7 and 30 March 2005 (03-05)

Construction activity centered on storm water removal from Cell 5; storm water and dredge slurry water removal from Cells 1A-D, 2 and 3A-C; adjusting the dredge material out-fall pipe along the north-central dike; mining and stockpiling materials from Cells 5 for construction of a dissecting dike; repairing eroded areas; resurfacing some dike roads; and covering with plastic the bird nesting islands in Cell 1B. It appears all dredge materials were deposited in Cell 2 this period keeping that cell covered with water and/or slurry while the accumulated storm and slurry water was pumped within and/or from the other depositional cells making Cells 1B, 1D and 3C most wet, and Cells 1C and 3C least wet. Considerable storm water remained in portions of non-depositional Cells 4, 4C and 5 despite constant removal of water from Cell 5. Dredge slurry deposits increased water depth in Cells 1A-D, 2, and 3A-C eliminating shallow-water habitat for shorebirds and temporarily discouraging utilization by wintering surface-feeding waterfowl that appeared to return with settling of major suspended particles. The active mining and storing of materials operations in Cell 5 may have disturbed and/or further discouraged some species from utilizing that cell. Censuses are timed to detect wintering and/or departing spring migrant loon, grebe, waterfowl, shorebirds, and songbirds utilizing the project site or surrounding Chesapeake Bay tidewater. The two census found respective presence of 776 and 524 waterfowl within the project site denoting its significance as a refuge and resting area for wintering waterfowl while increasing cell water depth in Cells 1A-D, 2, and 3A-C forced over 1000 wintering shorebirds to island periphery habitats and/or the only remaining shallow-water habitat that is located in Cell 5. Herbaceous plantings in Cell 4DX and Cells 1 & 2 dike slopes appear to be supporting a small wintering population of seed-eating Song Sparrow and Red-winged Blackbird. Increasing offshore numbers of loon, Horned Grebe, Tundra Swan, bay duck and sea duck during the period suggest staging of wintering birds prior migrating north. Bird fatalities noted on the census include remnants of three diving-ducks found on dike roads at the south portion of the island. Outstanding bird occurrences on 30 March include offshore Red-throated Loon, flying Glossy Ibis, Turkey Vulture, Blue-winged Teal and Wood Duck, Eastern Phoebe at Cell 4DX, American Pipit flushed from the dike road at Cell 1A, and fish-eating Red-breasted Merganser still frequenting Cell 4.

12, 16, and 27 of April 2005 (04-05)

Construction activity centered on storm water removal from Cell 5, accumulated water consolidation in Cells 1A-D and 3A-C, and mining materials at Cells 5 and 6 for construction of a Cell 5 dissecting dike. Construction may not have seriously disturbed bird activity except where it is focused in Cell 5 a favorite haunt for several species. Water covered the entirety of Cells 1B and D, 2, 3C, and 4 during the period while Cells 1A, 3A, 4C, and 5 had partial inundation. Cells 1C and 3B are void of surface water, while Cells 3D, 4DX, and 6 are open to diurnal tides of varying water cover. Bird census is timed to detect late spring transient loon,

grebe and waterfowl, early arriving spring shorebirds and songbirds, and early nesting at the project site. Census found most loon, grebe and waterfowl had migrated from or through the area by the end of the period, while spring migrating shorebirds are beginning to arrive. The census found Great Blue Heron, Mute Swan, Canada Goose, Mallard, Osprey, Killdeer, and Tree Swallow with nests and/or eggs by the end of the period. Bird fatalities were dead Herring Gull, including both adult and immature individuals in Cell 1A and an immature in Cell 1B on 27 April. Period census found transient waterfowl utilize flooded Cells 1D and 3C, shorebirds prefer partially flooded Cells 1A and 5, and few bird utilize dry Cells 1C and 3B, and flooded Cells 2 and 4. Congregating gulls and/or cormorants sometimes utilize Cells 1B and 4C while few birds appeared to utilize shallow and deepwater habitats of Cell 3A. Outstanding bird occurrences include Cattle Egret, Turkey Vulture, Caspian Tern, Black Tern and Northern Rough-winged Swallow. The most outstanding occurrence of the period is an Iceland Gull spotted on the dike road between Cells 1A and 3D on 12 April which is the first for this bird census monitoring.

9 and 26 of May 2005 (05-05)

Construction activity centered on storm water removal from Cells 2 & 5, accumulated water consolidation in Cells 1A-D and 3A-C, hydro-seeding and planting in Cell 3D; and mining materials at Cells 5 and 6 for construction of a Cell 5 dissecting dike. Construction may not have seriously disturbed bird activity except where it is focused in Cells 3D & 5 where the latter is a favorite haunt for several species. Water covered the entirety of Cells 1B & D, 2, 4, most of Cell 3C, and west portions of Cells 4C & 5 during the period while Cells 1A, 2, 3A & C, and the east portion of 5 had partial inundation. Cells 1C and 3B are void of surface water, while closing the weir and pumping the water from Cell 3D has left some shallow-water habitat. Predominance for several months of high tide flooding lower topography in Cells 4DX & 6 has eliminated shallow-water habitats. Bird census is timed to detect spring migration of shorebirds and songbirds, and local nesting species. Abbreviated spring migration of shorebirds coinciding with peak spawning of Atlantic Horseshoe Crab on 23 May appears to have occurred on schedule as attested by over 8000 shorebirds within the project site on the 26 May census where Cells 2 & 5 hosted most birds on exposed saturated flats and shallow-water habitats created from recent water removal from those cells. Spring migrant songbirds are indicted by over 10 species of woodpecker and songbirds on the 9 May census, while American Black Duck and Bank Swallow are new species confirmed nesting within the project site. Merlin, Black-necked Stilt, Red Knot, Red-necked Phalarope, Black Tern, Savannah Sparrow, and Rusty Blackbird top the outstanding bird observations. Census found no bird fatalities during this period.

6 and 16 June 2005 (06-05)

Construction activity centered on storm water removal from Cells 2 & 5, accumulated water consolidation in Cells 1A-D and 3A-C, elevation survey of depositional cells, volunteer planting in Cell 3D; and mining materials at Cells 5 and 6 for construction of a Cell 5 dissecting dike. Construction may have disturbed nesting birds in Cells 1A, 3C-D and 5 temporarily or for extended periods of time, while deep water in Cells 1B & D and 4 and no aquatic habitat in Cells 1C, 3B and most of 3A may have discouraged birds from those cells. Water covered the entirety of Cells 1B & D, and portions of 2, 3A & C, 4, 4C and 5. Tidewater Cells 3D and 4DX had variable water levels while Cells 1A & C and 3B are void of surface water. Bird census is timed to detect late spring and early fall migrations of shorebirds, and local nesting species. North transient shorebirds appear to have ceased by 17 June while the few shorebirds on that date may

be early south transients. A total of 19 species are confirmed nesting in 2005 with Cattle Egret, Black Duck, and Bank Swallow new species, while 2004 nesting Rough-winged Swallow and Common Grackle have not been confirmed in 2005. Late transient shorebirds utilized Cells 1A & D, 2 and 3C while nesting birds are centered in Cells 1A and 3C. Outstanding bird observations include Black-necked Stilt, American Avocet and Black Tern.